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2009-2010: Academic MC & OR
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How to use this Document

1. Use PDF bookmarks to navigate.
2. Study the examples in the scoring guide.
3. Answer a wide selection of multiple-choice questions.
4. Answer a wide selection of open-response questions.

Answering Multiple-Choice Questions

1. READ EACH QUESTION CAREFULLY!
2. Before looking at the provided choices, think of what the answer is likely to be. Then check to see whether your answer matches any of the choices.
3. Frequently, two of the four answers can be eliminated right off the bat.
4. It is usually not necessary to perform complicated calculations.
5. Trial and error is a useful strategy. With certain multiple-choice questions, the fastest approach is to try each answer and select the one that works.
6. Estimation is also a useful strategy for certain multiple-choice questions.
7. BE CAREFUL! Many of the given choices are answers that result from common mistakes. (e.g. volume formula used when area formula should have been used)

Legend

MC: Multiple Choice
OR: Open Response
SA: Short Answer

Note that EQAO discontinued the use of short-answer questions after the 2003-2004 academic year. Nonetheless, it is still worthwhile answering these questions because they cover important concepts.

Education Quality and Accountability Office

EQAO

Grade 9 Assessment of Mathematics

2014, Academic

Released Item-Specific Rubrics and Sample Student Responses with Annotations

Assessment of Mathematics
Grade 9 Academic Program
Specific Open-Response Scoring Guide

Share the Profits

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Application of knowledge and skills used to determine the share of the profit for each partner using ratios/rates shows limited effectiveness due to ● misunderstanding of concepts. ● incorrect selection or misuse of procedures;
20	Application of knowledge and skills used to determine the share of the profit for each partner using ratios/rates shows some effectiveness due to ● partial understanding of the concepts. ● errors and/or omissions in the application of the procedures;
30	Application of knowledge and skills used to determine the share of the profit for each partner using ratios/rates shows considerable effectiveness due to ● an understanding of most of the concepts. ● minor errors and/or omissions in the application of the procedures;
40	Application of knowledge and skills used to determine the share of the profit for each partner using ratios/rates shows a high degree of effectiveness due to ● a thorough understanding of the concepts. ● an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding);

Anchor - Code 10
Academic (Question 6) Item: Share the Profits

Share the Profits

Three partners, Luc, Deborah and Melanie, share the profits of a business in the ratio 2:3:7 respectively.

The profit for this year is $176 496.

Determine the share of the profit for each partner.

Show your work.

Score: 10

$176496 \div 3 = 58832$

This answer would be correct if each person received an equal share.

See further details at the bottom of the page.

Annotation:
Response demonstrates a limited identification of important elements of the problem; number of parts (12) not determined, no division by 12 and no multiplying by a percentage or 2, 3, 7.

Anchor - Code 20
Academic (Question 6) Item: Share the Profits

Share the Profits

Three partners, Luc, Deborah and Melanie, share the profits of a business in the ratio 2:3:7 respectively.

The profit for this year is $176 496.

Determine the share of the profit for each partner.

Show your work.

Luc = 20% ×

176 496 x .2 = $35 299

Deborah = 30% ×

141 197 x .30 = $42 359

Melanie = 70% ×

98 838 x .70 = $69 186

Annotation:
Response demonstrates an identification of some of the important elements of the problem; number of parts (12) not determined and no division by 12, but multiplied by percentages to determine profits for each partner (percentages were incorrect).

Anchor - Code 30
Academic (Question 6) Item: Share the Profits

Share the Profits

Three partners, Luc, Deborah and Melanie, share the profits of a business in the ratio 2:3:7 respectively.

The profit for this year is $176 496.

Determine the share of the profit for each partner.

Show your work.

2:3:7 = 12 } Very poor! Should be: 2+3+7=12
∴ there are 12 parts (shares) altogether

$\frac{176\,496}{12} = 14708$ = value of one share

Wrong operation! Should be multiplication

Luc – $\frac{14708}{2} \times = 7354$ ∴ Lucs profit is 7354

Deborah – $\frac{14708}{3} \times = 4902.67$ ∴ Deborahs profit is 4902.67

Melanie – $\frac{14708}{7} \times = 2101.14$ ∴ Melanies profit is 2101.14

should add up to $176,496

Annotation:
Response demonstrates a considerable understanding of the relationships between important elements of the problem; number of parts (12) determined, divided total by 12 but then divided by 2, 3, 7 instead of multiplying.

Anchor - Code 40
Academic (Question 6) Item: Share the Profits

Share the Profits

Three partners, Luc, Deborah and Melanie, share the profits of a business in the ratio 2:3:7 respectively.

The profit for this year is $176 496.

Determine the share of the profit for each partner.

Show your work.

176 496 ÷ 12 = 14 708

Luc: 14 708 × 2 = 29 416

Deborah: 14 708 × 3 = 44 124

Melanie: 14 708 × 7 = 102 956

29 416 + 44 124 + 102 956 = 176 496

∴ Luc will recieve $29 416, Deborah will recieve 44124, and Melanie will recieve $102 956 of the total profit.

Annotation:
Response demonstrates a thorough understanding of the relationships between all of the important elements of the problem; number of parts determined (12), divided total by 12 and multiplied by 2, 3, 7 to determine profits for each partner correctly.

Assessment of Mathematics
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Specific Open-Response Scoring Guide

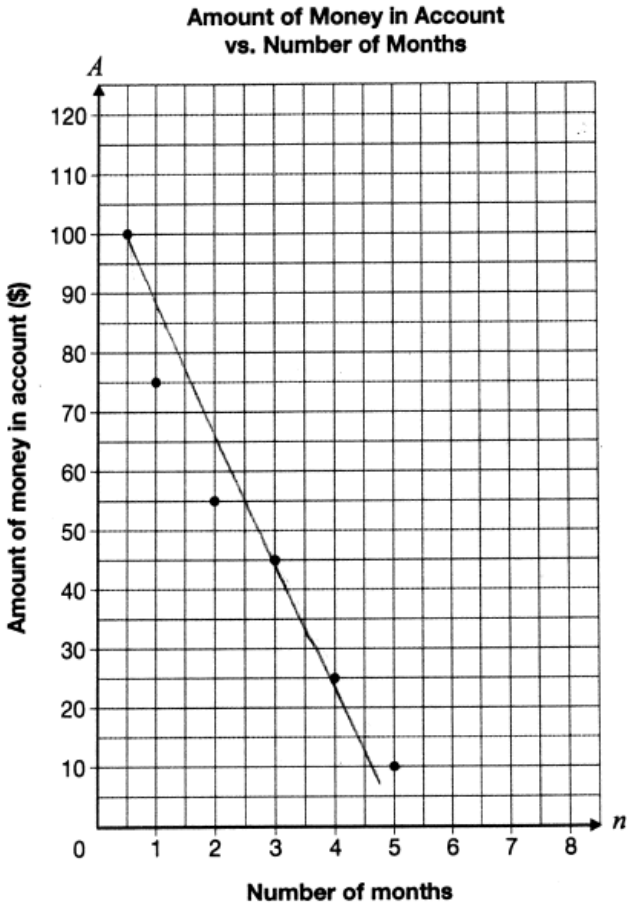
More Money Please!

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Application of knowledge and skills to draw a line of best fit and determine the equation of the line of best fit shows limited effectiveness due to ● misunderstanding of concepts. ● incorrect selection or misuse of procedures;
20	Application of knowledge and skills to draw a line of best fit and determine the equation of the line of best fit shows some effectiveness due to ● partial understanding of the concepts. ● errors and/or omissions in the application of the procedures;
30	Application of knowledge and skills to draw a line of best fit and determine the equation of the line of best fit shows considerable effectiveness due to ● an understanding of most of the concepts. ● minor errors and/or omissions in the application of the procedures;
40	Application of knowledge and skills to draw a line of best fit and determine the equation of the line of best fit shows a high degree of effectiveness due to ● a thorough understanding of the concepts. ● an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding);

Anchor - Code 10
Academic (Question 13) Item: More Money Please!

More Money, Please!

The graph below shows information about the amount of money, A, in Shreya's bank account and the number of months, n, she has had the account.



Draw the line of best fit for the data.

Determine the equation of your line of best fit.

$y = 5x + 100$

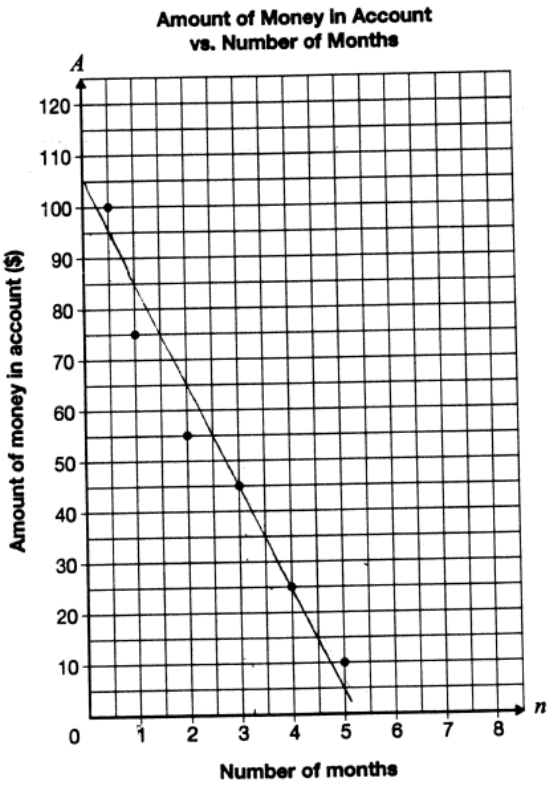
Show your work.

Annotation:
Response demonstrates misunderstanding of concepts; shows appropriate line of best fit. Equation set up correctly, but does not reflect A-intercept on graph and has incorrect slope (does not match counting boxes or actual slope). Rate of change not attempted for slope (appears used A-coordinate of first point as A-intercept and n-coordinate of last point as slope).

Anchor - Code 20
Academic (Question 13) Item: More Money Please!

More Money, Please!

The graph below shows information about the amount of money, A, in Shreya's bank account and the number of months, n, she has had the account.



Draw the line of best fit for the data.

Determine the equation of your line of best fit.

$y = 2x + 100$

Show your work.

the b variable is 100 because the amount starts at that.
the slope is 2.

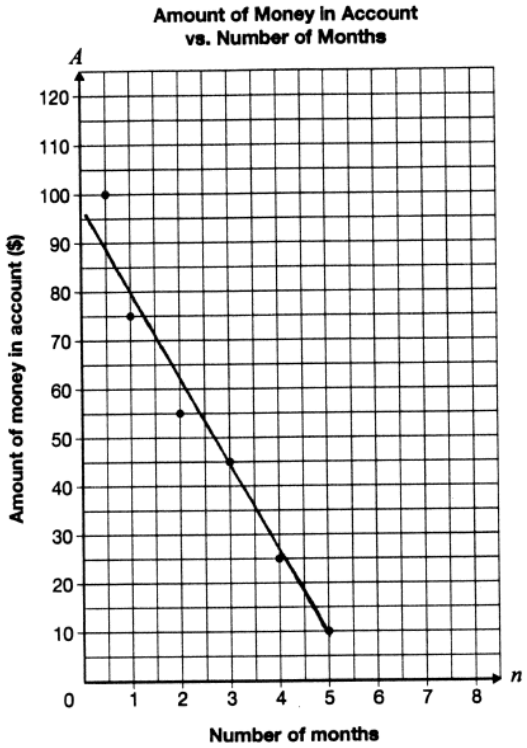
$y = 2x + 100$

Annotation:
Response demonstrates a partial understanding of the concepts; shows appropriate line of best fit, equation set up correctly but slope shows scale ignored (counting boxes) and equation does not reflect A-intercept on graph. Rate of change attempted as slope matches box counting on graph.

Anchor - Code 30
Academic (Question 13) Item: More Money Please!

More Money, Please!

The graph below shows information about the amount of money, A, in Shreya's bank account and the number of months, n, she has had the account.



Draw the line of best fit for the data.

Determine the equation of your line of best fit.

$y = -20x + 105$

Show your work.

x y
(3, 45)
(4, 25)

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{45 - 25}{3 - 4}$

$= \frac{20}{-1} = -20$

$y = mx + b$

$45 = -20(3) + b$

$45 + 60 = -60 + b + 60$

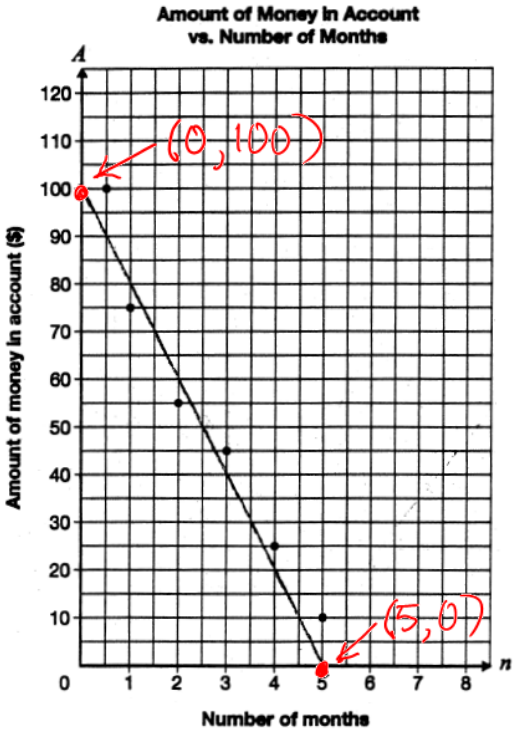
$105 = b$

Annotation:
Response demonstrates an understanding of most of the concepts; shows appropriate line of best fit and equation set up correctly that reflects slope, but A-intercept incorrect based on graph.

Anchor - Code 40
Academic (Question 13) Item: More Money Please!

More Money, Please!

The graph below shows information about the amount of money, A, in Shreya's bank account and the number of months, n, she has had the account.



Draw the line of best fit for the data.

Determine the equation of your line of best fit.

$A = -20n + 100$

Show your work.

The line starts at 100. Since the line is constant and linear, the amount of money she loses is the same the whole time.

n	A
1	80
2	60
3	40
4	20

poorly explained (see above)

Better Explanation

y-intercept = b = 100

$\text{slope} = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 100}{5 - 0}$

$= \frac{-100}{5}$

$= -20$

∴ equation in form $y = mx + b$ is

$A = -20n + 100$

dependent, independent

Annotation:
Response demonstrates a thorough understanding of the concepts; shows appropriate line of best fit and equation is set up correctly that matches A-intercept and slope on graph.

Assessment of Mathematics
Grade 9 Academic Program
Specific Open-Response Scoring Guide

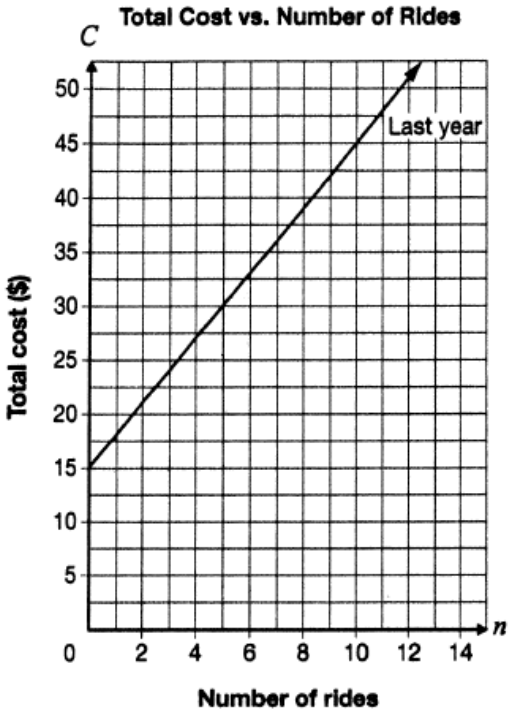
Roll with It!

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Problem-solving process using given conditions to determine a possible equation for the total cost this year shows limited effectiveness due to • minimal evidence of a solution process. • limited identification of important elements of the problem. • too much emphasis on unimportant elements of the problem. • no conclusions presented or conclusion presented without supporting evidence;
20	Problem-solving process using given conditions to determine a possible equation for the total cost this year shows some effectiveness due to • an incomplete solution process. • identification of some of the important elements of the problem. • some understanding of the relationships between important elements of the problem. • simple conclusions with little supporting evidence;
30	Problem-solving process using given conditions to determine a possible equation for the total cost this year shows considerable effectiveness due to • a solution process that is nearly complete. • identification of most of the important elements of the problem. • a considerable understanding of the relationships between important elements of the problem. • appropriate conclusions with supporting evidence;
40	Problem-solving process using given conditions to determine a possible equation for the total cost this year shows a high degree of effectiveness due to • a complete solution process. • identification of all important elements of the problem. • a thorough understanding of the relationships between all of the important elements of the problem. • appropriate conclusions with thorough and insightful supporting evidence;

Anchor - Code 10
Academic (Question 14) Item: Roll with It!

Roll with It!

The total cost at an amusement park is made up of an admission fee and a cost per ride. Information about the total cost for n rides last year is shown below.



This year, the cost per ride is reduced from last year, but the total cost for 10 rides is the same.

Determine a possible equation for the total cost, C, for this year. Include an admission fee and a cost per ride.

Justify your answer.

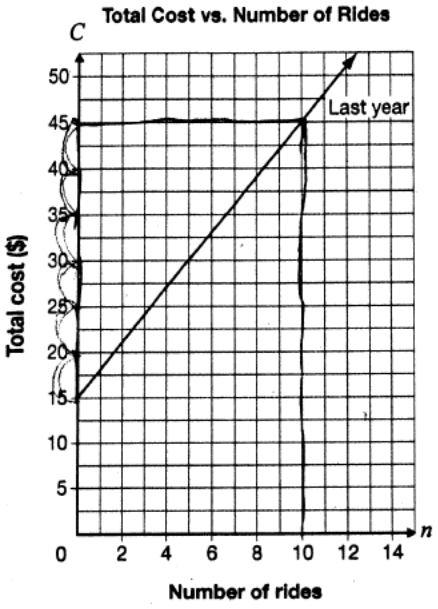
$C = 1.20n + 15$

Annotation:
Response demonstrates a limited identification of important elements of the problem; equation determined but no evidence of slope calculation. (10,45) is not used in solution process and equation does not satisfy (10,45).

Anchor - Code 20
Academic (Question 14) Item: Roll with It!

Roll with It!

The total cost at an amusement park is made up of an admission fee and a cost per ride. Information about the total cost for n rides last year is shown below.



15 - constant Rate

$30 - every 10 rides

$\frac{30}{10}$ = per ride

$3 = per ride

This year, the cost per ride is reduced from last year, but the total cost for 10 rides is the same.

Determine a possible equation for the total cost, C, for this year. Include an admission fee and a cost per ride.

Justify your answer.

Y = mx + b

C = 3n + 15

Let C = cost for year

Let n = number of rides

$C = 3n + 15$

Example $C = 3n + 15$

$C = 3(10) + 15$

$C = 30 + 15$

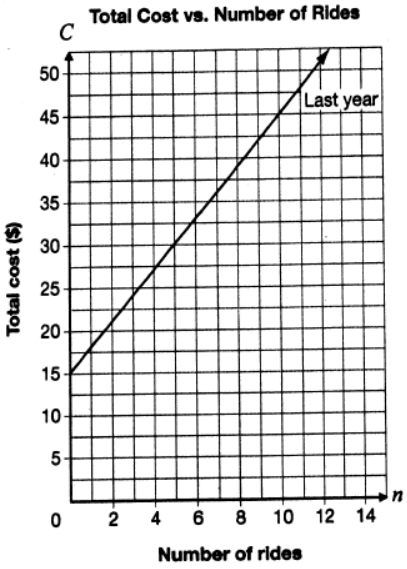
$= \$45$

Annotation:
Response demonstrates an identification of some of the important elements of the problem; equation for the total cost for last year determined correctly.

Anchor - Code 30
Academic (Question 14) Item: Roll with It!

Roll with It!

The total cost at an amusement park is made up of an admission fee and a cost per ride. Information about the total cost for n rides last year is shown below.



This year, the cost per ride is reduced from last year, but the total cost for 10 rides is the same.

Determine a possible equation for the total cost, C, for this year. Include an admission fee and a cost per ride.

Justify your answer.

10rides = $45

C = 4n + 5

= (4)(number of rides = n) + (5)

(4) ↑ cost per ride

(5) admission fee

∴ C = 4n + 5

For 10 rides — check

4(10) + 5

= 40 + 5

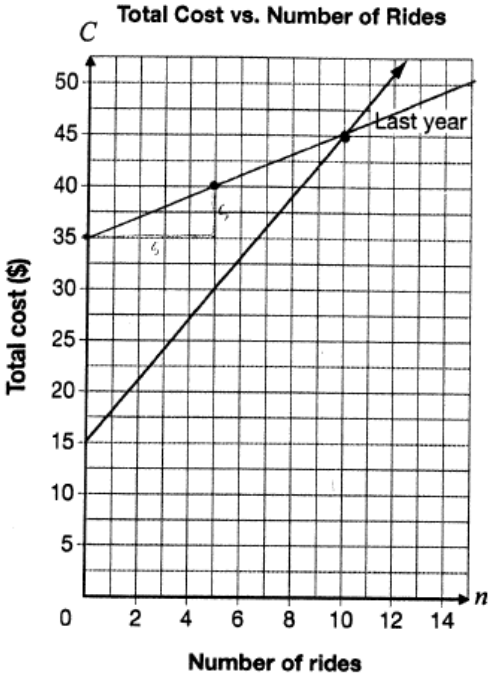
C = 45

Annotation:
Response demonstrates an identification of most of the important elements of the problem; equation determined with a rate that is higher than last year (instead of lower) and with a corresponding initial value so that line passes through (10,45). Shows (10,45) satisfies the equation.

Anchor - Code 40
Academic (Question 14) Item: Roll with It!

Roll with It!

The total cost at an amusement park is made up of an admission fee and a cost per ride. Information about the total cost for n rides last year is shown below.



This year, the cost per ride is reduced from last year, but the total cost for 10 rides is the same.

Determine a possible equation for the total cost, C, for this year. Include an admission fee and a cost per ride.

Justify your answer.

$C = ln + 35$

admission fee = 35

$1 per ride

The cost for ten rides is the same because I reduced the cost per ride but also raised the admission fee.

Annotation:
Response demonstrates an identification of all important elements of the problem; equation determined with a possible rate that is lower than last year and with a corresponding initial value so that line passes through (10,45). Shows (10,45) satisfies the equation through graphing.

Assessment of Mathematics
Grade 9 Academic Program
Specific Open-Response Scoring Guide

Is It a Line?

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Application of knowledge and skills to determine whether the relations are linear or non-linear with justification shows limited effectiveness due to ● misunderstanding of concepts. ● incorrect selection or misuse of procedures;
20	Application of knowledge and skills to determine whether the relations are linear or non-linear with justification shows some effectiveness due to ● partial understanding of the concepts. ● errors and/or omissions in the application of the procedures;
30	Application of knowledge and skills to determine whether the relations are linear or non-linear with justification shows considerable effectiveness due to ● an understanding of most of the concepts. ● minor errors and/or omissions in the application of the procedures;
40	Application of knowledge and skills to determine whether the relations are linear or non-linear with justification shows a high degree of effectiveness due to ● a thorough understanding of the concepts. ● an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding);

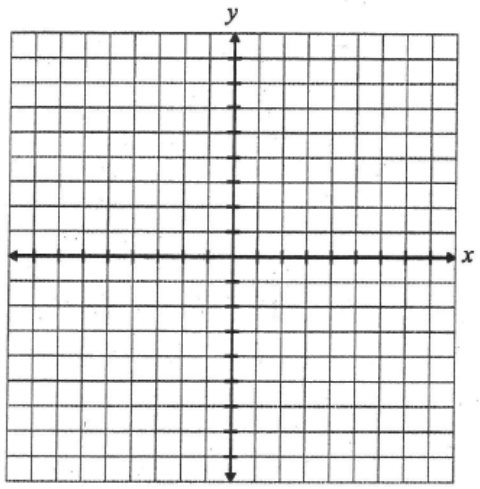
Anchor - Code 10
Academic (Question 22) Item: Is It a Line?

Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear.

Justify your answers. You may use the grid if you wish.

$-2x + 6y = 18$	$y = 4x^2 + 3$
Circle one: (Linear) Non-linear	**Circle one:** Linear (Non-linear)
Justification 2 and 6 can go into 18 evenly	**Justification** $4x^2+3$



Annotation:
Response demonstrates an incorrect selection of procedures; linear/non-linear circled correctly but justification does not show an understanding of linear or non-linear as no graph, rearranging, or reference to exponent or first differences for either.

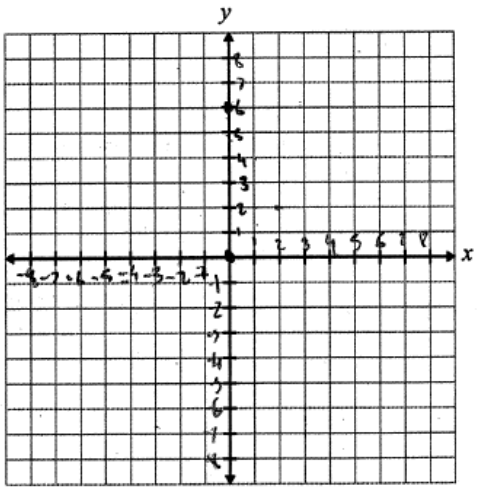
Anchor - Code 20
Academic (Question 22) Item: Is It a Line?

Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear.

Justify your answers. You may use the grid if you wish.

$-2x + 6y = 18$	$y = 4x^2 + 3$
Circle one: (Linear) Non-linear	**Circle one:** Linear (Non-linear)
Justification: It is linear because it is a straight line	**Justification:** This is not a linear line because it does not pass through the (0, 0) points.



Annotation:
Response demonstrates a partial understanding of the concepts; both circled correctly with some (or full) justification for only one (references a straight line but not graphed, and illogical jusitifcation for non-linear).

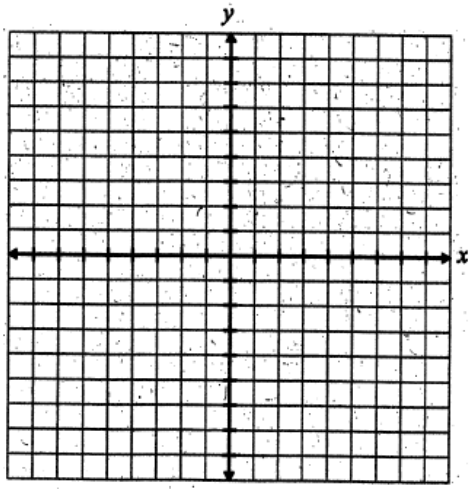
Anchor - Code 30
Academic (Question 22) Item: Is It a Line?

Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear.

Justify your answers. You may use the grid if you wish.

$-2x + 6y = 18$	$y = 4x^2 + 3$
Circle one: (Linear) Non-linear	**Circle one:** Linear (Non-linear)
Justification $-2x+6y=18$ $-2x+6y-18=0$ $\frac{-6y}{-6} = \frac{-2x}{-6} - \frac{18}{-6}$ $y = \frac{1}{3}x + 3$	**Justification** x | y 1 | 17 (12) 2 | 29 (20) 3 | 39 First differences are not consistant



Annotation:
Response demonstrates a minor omission in the application of the procedures; linear and non-linear circled correctly for both with a minor omission in justification (calculates first differences and references not equal ('not consistent') and converts to y = mx + b form but does not make reference to it).

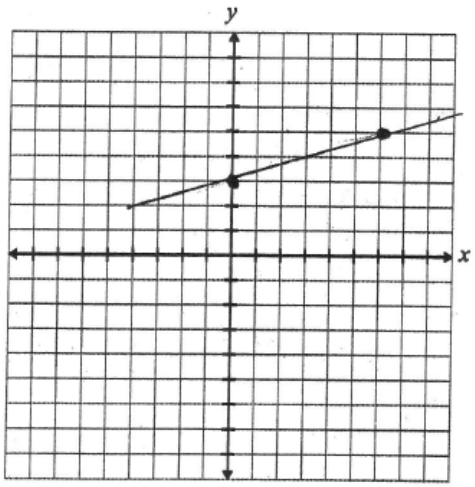
Anchor - Code 40
Academic (Question 22) Item: Is It a Line?

Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear.

Justify your answers. You may use the grid if you wish.

$-2x + 6y = 18$	$y = 4x^2 + 3$
Circle one: (Linear) Non-linear	**Circle one:** Linear (Non-linear)
Justification $-2x + 6y = 18$ $\frac{6y}{6} = \frac{2x}{6} + \frac{18}{6}$ $y = \frac{2}{6}x + 3$ It is linear because it can be in the form $y = mx + b$ which is the form of an equation of a line.	**Justification** $y = 4x^2 + 3$ It is non linear because it is not in the form $y = mx + b$, there is an exponent on the x which makes it non-linear.



Annotation:
Response demonstrates a thorough understanding of the concepts; linear and non-linear circled correctly and full justification for both (references y = mx + b with equation rearranged correctly and references exponent on the variable x even though does not mention other than 1).

Assessment of Mathematics
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Movie Night

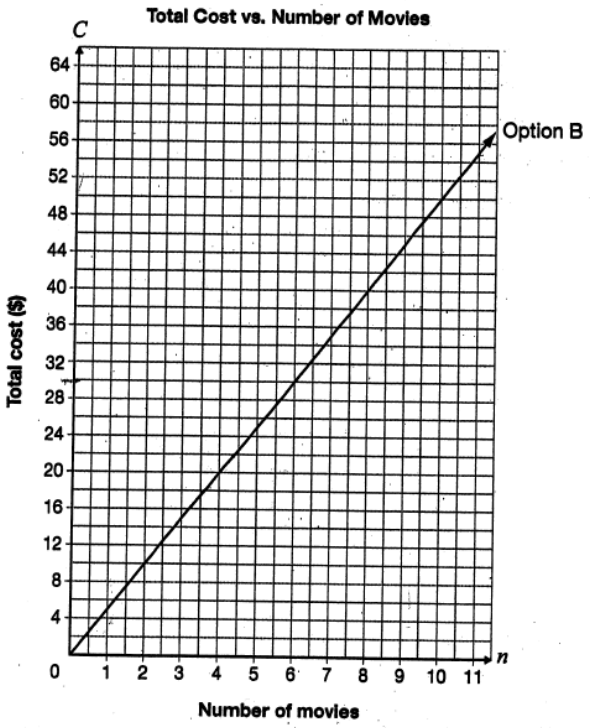
Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Problem-solving process involving the point of intersection and its interpretation to determine the conditions under which a person should select each option shows limited effectiveness due to • minimal evidence of a solution process. • limited identification of important elements of the problem. • too much emphasis on unimportant elements of the problem. • no conclusions presented or conclusion presented without supporting evidence;
20	Problem-solving process involving the point of intersection and its interpretation to determine the conditions under which a person should select each option shows some effectiveness due to • an incomplete solution process. • identification of some of the important elements of the problem. • some understanding of the relationships between important elements of the problem. • simple conclusions with little supporting evidence;
30	Problem-solving process involving the point of intersection and its interpretation to determine the conditions under which a person should select each option shows considerable effectiveness due to • a solution process that is nearly complete. • identification of most of the important elements of the problem. • a considerable understanding of the relationships between important elements of the problem. • appropriate conclusions with supporting evidence;
40	Problem-solving process involving the point of intersection and its interpretation to determine the conditions under which a person should select each option shows a high degree of effectiveness due to • a complete solution process. • identification of all important elements of the problem. • a thorough understanding of the relationships between all of the important elements of the problem. • appropriate conclusions with thorough and insightful supporting evidence;

Anchor - Code 10
Academic (Question 23) Item: Movie Night

Movie Night

There are two payment options for downloading movies from a Web site.

- Option A: Pay $30 for a membership and $2 per movie downloaded.
- Option B: Shown on the grid below.



Determine under which conditions a person should select Option A and under which conditions a person should select Option B.

Justify your answer.

O1 = $30 + $2 x 11 movies

30 + 22

$52 for 11 movies

O2 = $55 for 11 movies

A person should choose option A because it is cheaper for 11 movies than Option B which no one should choose.

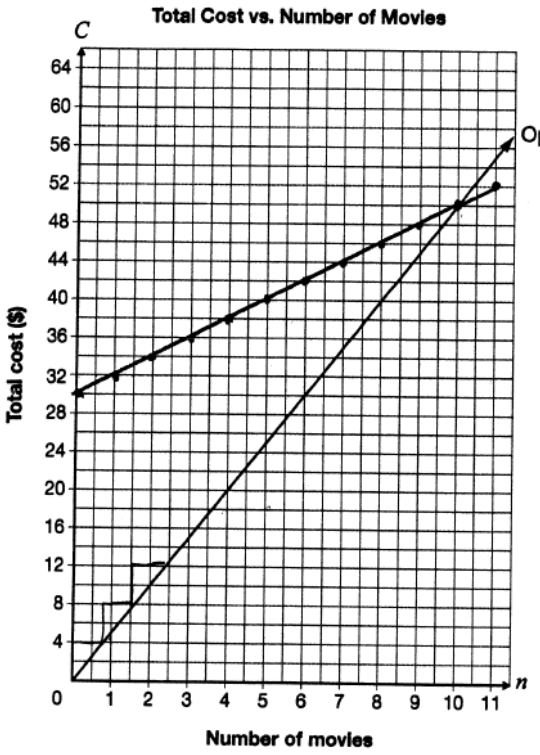
Annotation:
Response demonstrates a limited identification of important elements of the problem; no evidence of graphing Option A and conclusion is based on calculations for only one point. Point of intersection not identified and no reference to when Option B is cheaper.

Anchor - Code 20
Academic (Question 23) Item: Movie Night

Movie Night

There are two payment options for downloading movies from a Web site.

- Option A: Pay $30 for a membership and $2 per movie downloaded.
- Option B: Shown on the grid below.



Option A
$C = \frac{2}{1}n + 30$

Option B
$C = \frac{4}{1}n$

Determine under which conditions a person should select Option A and under which conditions a person should select Option B.

Justify your answer.

optiona) A person who would select optionA wouldbe prominent viewer of movies.

optionB) A person who would select option B would be a person watches movies when he/she chooses.

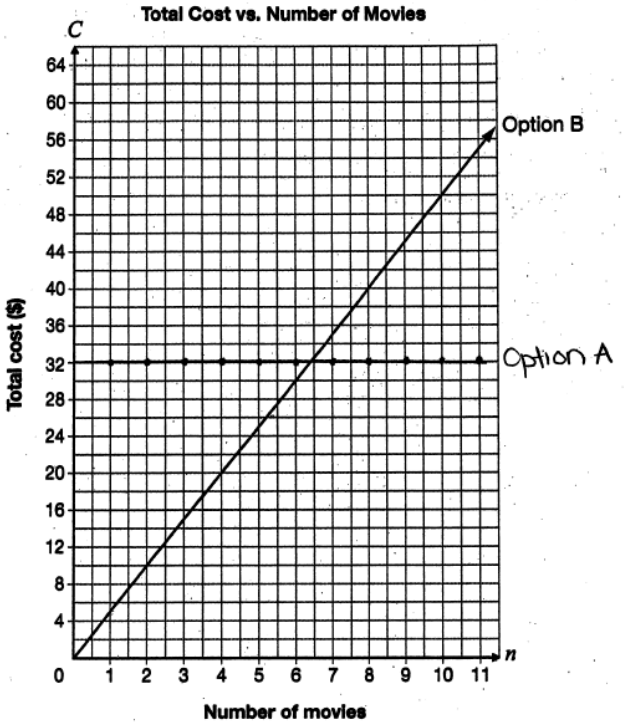
Annotation:
Response demonstrates some understanding of the relationships between important elements of the problem; graph of Option A drawn correctly but point of intersection not identified or interpreted as justification does not reference less than or more than 10 movies.

Anchor - Code 30
Academic (Question 23) Item: Movie Night

Movie Night

There are two payment options for downloading movies from a Web site.

- Option A: Pay $30 for a membership and $2 per movie downloaded.
- Option B: Shown on the grid below.



Determine under which conditions a person should select Option A and under which conditions a person should select Option B.

Justify your answer.

A person should select option A if they tend or want to watch a lot of movies because the price stays constant. A person should select option B if then don't tend or don't want to watch many movies because then the price stays lower. A person should choose option A if they watch 7 or more movies and a person should choose option B if they watch 6 or less movies.

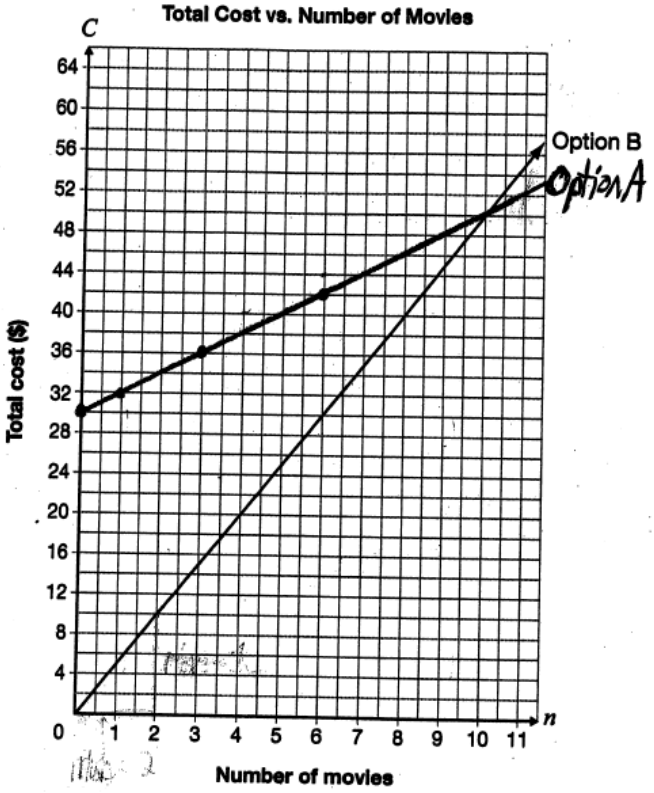
Annotation:
Response demonstrates an identification of most of the important elements of the problem; error(s) graphing Option A (slope incorrect) but point of intersection identified and interpreted correctly as justification includes reference to both 6 or less movies and 7 or more movies.

Anchor - Code 40
Academic (Question 23) Item: Movie Night

Movie Night

There are two payment options for downloading movies from a Web site.

- Option A: Pay $30 for a membership and $2 per movie downloaded.
- Option B: Shown on the grid below.



Determine under which conditions a person should select Option A and under which conditions a person should select Option B.

Justify your answer. : you should choose Option B if you plan to buy less than 10 movies, either if you plan on buying 10 movies, and Option A if you plan to buy more than 10 movies.

Annotation:
Response demonstrates a through understanding of the relationships between all of the important elements of the problem; graph of Option A correct and point of intersection interpreted accurately as justification includes reference to less than and more than 10 movies. Note: reference to exactly 10 movies not required.

Assessment of Mathematics
Grade 9 Academic Program
Specific Open-Response Scoring Guide

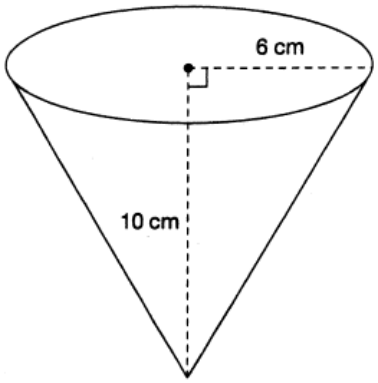
Coated Cones

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Problem-solving process to determine the slant height of the cone using Pythagorean Theorem and the area of the surface that is coated in chocolate shows limited effectiveness due to • minimal evidence of a solution process. • limited identification of important elements of the problem. • too much emphasis on unimportant elements of the problem. • no conclusions presented or conclusion presented without supporting evidence;
20	Problem-solving process to determine the slant height of the cone using Pythagorean Theorem and the area of the surface that is coated in chocolate shows some effectiveness due to • an incomplete solution process. • identification of some of the important elements of the problem. • some understanding of the relationships between important elements of the problem. • simple conclusions with little supporting evidence;
30	Problem-solving process to determine the slant height of the cone using Pythagorean Theorem and the area of the surface that is coated in chocolate shows considerable effectiveness due to • a solution process that is nearly complete. • identification of most of the important elements of the problem. • a considerable understanding of the relationships between important elements of the problem. • appropriate conclusions with supporting evidence;
40	Problem-solving process to determine the slant height of the cone using Pythagorean Theorem and the area of the surface that is coated in chocolate shows a high degree of effectiveness due to • a complete solution process. • identification of all important elements of the problem. • a thorough understanding of the relationships between all of the important elements of the problem. • appropriate conclusions with thorough and insightful supporting evidence;

Anchor - Code 10
Academic (Question 30) Item: Coated Cones

Coated Cones

An ice cream store offers chocolate-coated cones as shown in the diagram below.



The cone is open topped, and the entire outside is coated in chocolate.

Determine the area of the surface that is coated in chocolate.

Show your work.

Surface Area: πr^2 X

$= \pi \times 6^2$

$= 113.09 cm^2$

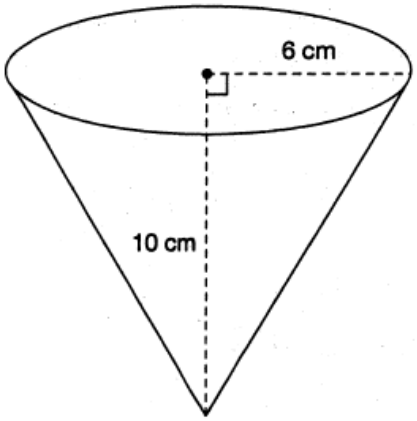
The surface area of the cone is $113.09 cm^2$

Annotation:
Response demonstrates limited identification of important elements of the problem; lateral surface area formula not selected (area of circle calculated) and no evidence of determining slant height (no Pythagorean theorem).

Anchor - Code 20
Academic (Question 30) Item: Coated Cones

Coated Cones

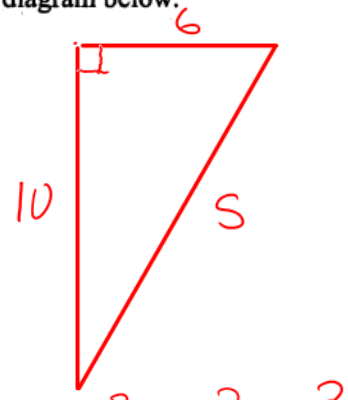
An ice cream store offers chocolate-coated cones as shown in the diagram below.



$r = 6$

$h = 10$

$s = ?$



$s^2 = 10^2 + 6^2$

The cone is open topped, and the entire outside is coated in chocolate.

Determine the area of the surface that is coated in chocolate.

Show your work.

$\frac{10}{2} = 5$

$SA = \pi rs + \pi r^2$ ✓

$= \pi(6)(5) + \pi(6)^2$

$= 207.3\ cm^3$ ✗

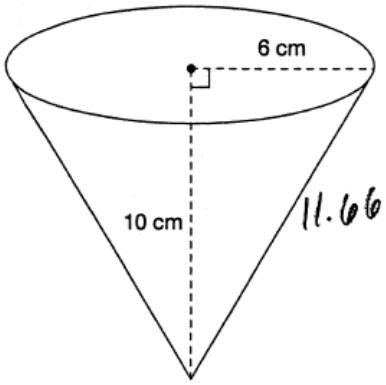
∴ the area that is coated in chocolate is $207.3\ cm^3$

Annotation:
Response demonstrates some understanding of the relationships between important elements of the problem; shows formula for surface area selected, but not adapted to account for open top and no evidence of determining slant height (no Pythagorean theorem, height of cone used). Surface area calculated based on errors.

Anchor - Code 30
Academic (Question 30) Item: Coated Cones

Coated Cones

An ice cream store offers chocolate-coated cones as shown in the diagram below.



The cone is open topped, and the entire outside is coated in chocolate.

Determine the area of the surface that is coated in chocolate.

Show your work.

Only area of lateral surface is needed. To find s

πrs + ~~πr^2~~

don't bother

$(a)^2 + (6)^2 = (c)^2$

$(6)^2 + (10)^2 = (c)^2$

$36 + 100 = (c)^2$

$\sqrt{136} = c$

$11.66 = c$

$\pi rs - \pi r^2$

$\pi(6)(11.66) - \pi(6)^2$

$= 219.78 - 113.09$

$= 106.69 cm^2$

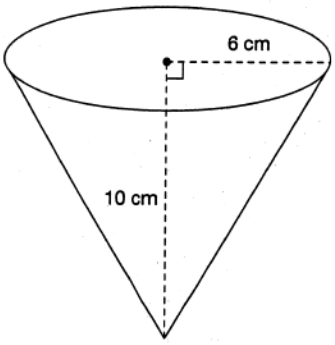
$\therefore$ The surface area coated in choclate is $106.69 cm^2$

Annotation:
Response demonstrates a considerable understanding of the relationships between important elements of the problem; shows formula for surface area selected and adapted (with error) to account for open top, slant height determined using Pythagorean theorem and surface area calculated correctly based on error.

Anchor - Code 40
Academic (Question 30) Item: Coated Cones

Coated Cones

An ice cream store offers chocolate-coated cones as shown in the diagram below.



The cone is open topped, and the entire outside is coated in chocolate.

Determine the area of the surface that is coated in chocolate.

Show your work.

$SA_{LATERAL\ SURFACE} = \pi rs$

$= \pi(6)(\sqrt{136})$

$\approx 219.82 cm^2$

$a^2 + b^2 = s^2$

$10^2 + 6^2 = s^2$

$s = \sqrt{136}$

$s = 11.6$

The area of the surface coated in chocolate is about $219.82 cm^2$

Annotation:
Response demonstrates a thorough understanding of the relationships between all of the important elements of the problem; shows formula for lateral surface area selected, slant height determined using Pythagorean theorem and correct lateral surface area calculated.

Assessment of Mathematics
Grade 9 Academic Program
Specific Open-Response Scoring Guide

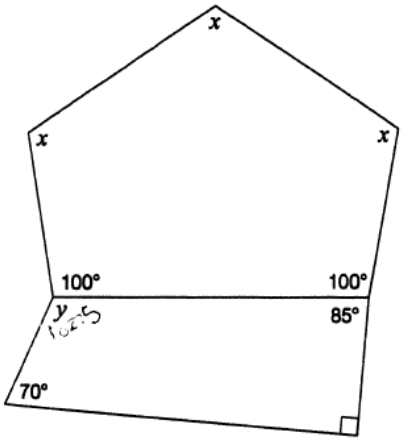
Daring Diagram

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Application of knowledge and skills to determine the values of x and y with justification using geometric properties including the sum of interior angles for various polygons shows limited effectiveness due to ● misunderstanding of concepts. ● incorrect selection or misuse of procedures;
20	Application of knowledge and skills to determine the values of x and y with justification using geometric properties including the sum of interior angles for various polygons shows some effectiveness due to ● partial understanding of the concepts. ● errors and/or omissions in the application of the procedures;
30	Application of knowledge and skills to determine the values of x and y with justification using geometric properties including the sum of interior angles for various polygons shows considerable effectiveness due to ● an understanding of most of the concepts. ● minor errors and/or omissions in the application of the procedures;
40	Application of knowledge and skills to determine the values of x and y with justification using geometric properties including the sum of interior angles for various polygons shows a high degree of effectiveness due to ● a thorough understanding of the concepts. ● an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding);

Anchor - Code 10
Academic (Question 31) Item: Daring Diagram

Daring Diagram

A diagram is shown below.



Complete the table below with the values of x and y. Justify your answers using geometric properties.

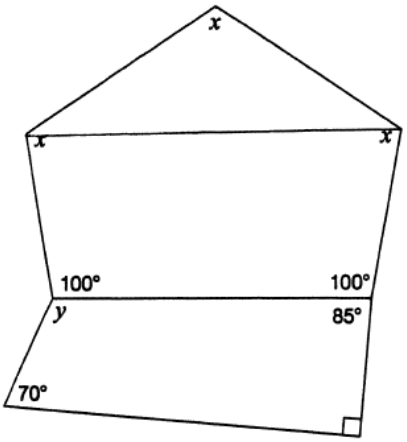
Value	Justification using geometric properties
$x =$ 160	All sides must of a 4 or more side shape must add up to 360°
$y =$ 102.5	y equals to 102.5 because It will add up to the (remaining 360°

Annotation:
Response demonstrates a misunderstanding of concepts; values of x and y both incorrect with illogical justification for x (no reference to 540, subtracting 200 or dividing by 3) but 360 used (incorrectly) to determine y.

Anchor - Code 20
Academic (Question 31) Item: Daring Diagram

Daring Diagram

A diagram is shown below.



Complete the table below with the values of x and y. Justify your answers using geometric properties.

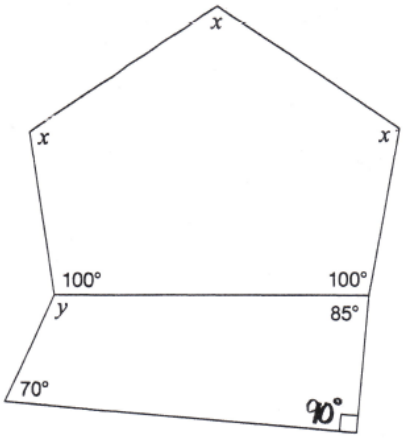
Value	Justification using geometric properties
$x =$ 180°	180° and x are opposite angles ∴ the same value
$y =$ 115°	all angles in a quadrilateral = 360° 70 + 85 + 90 + y = 360° 245 + y = 360 y = 360 − 245 y = 115°

Annotation:
Response demonstrates a partial understanding of the concepts; value of x incorrect with illogical justification (no reference to 540, 340 or dividing by 3) but value of y correct with appropriate justification (given angles subtracted from 360).

Anchor - Code 30
Academic (Question 31) Item: Daring Diagram

Daring Diagram

A diagram is shown below.



Complete the table below with the values of x and y. Justify your answers using geometric properties.

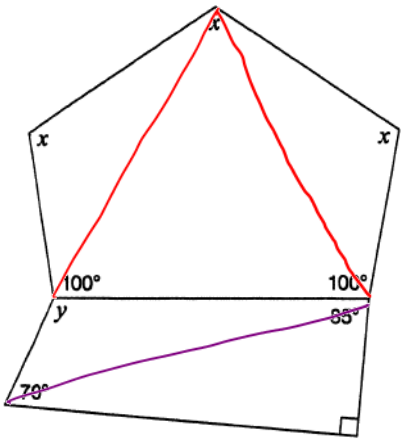
Value	Justification using geometric properties
$x =$ 53.3°	360 − 200 = 160 160 ÷ 3 = 53.3°
$y =$ 115°	70° + 90° + 85° = 245° 360° − 245° = 115°

Annotation:
Response demonstrates minor error in the application of the procedures; value of x incorrect but at least one of: 540, subtraction of 200, or division by 3 included (subtracts 200 and divides by 3). Value of y correct with justification (given angles subtracted from 360 to determine y).

Anchor - Code 40
Academic (Question 31) Item: Daring Diagram

Daring Diagram

A diagram is shown below.



sum of interior angles = 3(180°)
= 540°

sum of interior angles = 2(180°)
= 360°

Complete the table below with the values of x and y. Justify your answers using geometric properties.

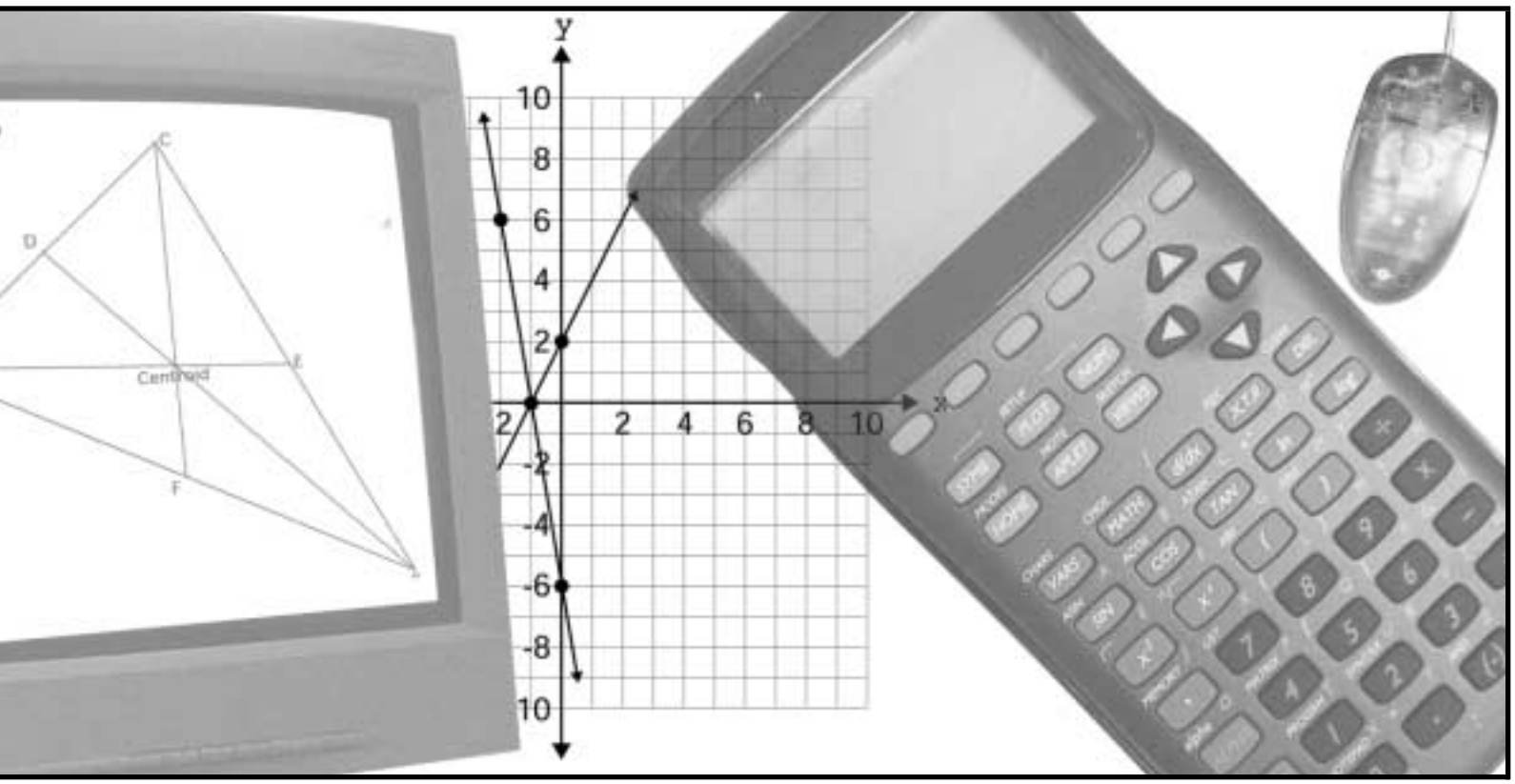
Value	Justification using geometric properties
$x =$ 113°	I know this because a pentagon sum up to 540°. So I subtract 200 from 540 and divide by 3 to find the value of x.
$y =$ 115°	I know this because a quadrilateral sum up to 360°. ~~115°~~. So I subtract 245 from 360 to find the value of y.

the interior angles of a pentagon

the interior angles of a quadrilateral

Annotation:
Response demonstrates a thorough understanding of the concepts; both values of x and y are correct with justification (340 degrees divided by 3 to determine x and given angles subtracted from 360 to determine y).

Grade 9 Assessment of Mathematics, 2000–2001



Tasks

EQAO
Education
Quality and
Accountability
Office

Directions to Students about Answering Tasks

1. For this part of the assessment, make sure you have the following items along with *Booklet 2*:
   - a pencil and an eraser or a pen
   - a scientific or a graphing calculator
   - a ruler and a protractor
2. Do all of your work (even your rough work) in *Booklet 2*.
3. You will have 40 min to do 3 tasks. Allow about 15 min for Tasks 1 and 2 and about 10 min for Task 3. Give yourself time to answer all of the questions.
4. Figures in this section are not drawn to scale.
5. The tasks are designed to allow you an opportunity to show what you know and what you can do. Provide as much information as you can to show your understanding. Your teacher may be marking some of your work. In addition, someone who does not know your work will mark all of it, including what your teacher has marked. So, you must provide clear, well-organized answers to illustrate your complete understanding and ability to communicate in mathematics.
6. Make sure you follow directions from the *Key Words and Phrases in Instructions* sheet. It is provided for you so you will know the kind of question that is being asked.

   For example, the question might ask you to "**Show your work**." Read the *Key Words and Phrases in Instructions* sheet. It says to record all calculations. If you use your calculator, you need to show what calculations you do. If you sketch a graph in the process of getting to your solution, show the sketch and label it. Use proper and correct mathematical conventions when you present your work.
7. When using a calculator, write down the numbers and operations that you carried out on the calculator.

   For example: Find the area of a circle with diameter of 7 cm.

   You need to write $A = \pi(3.5)^2$
   as well as the answer you got on your calculator.
8. There are always many different ways to solve a problem. Use your broad range of mathematical knowledge to present a complete and creative solution to each question.
9. You have **40 min** to work.
10. When you see the

sign, you have completed the work for the day. Check your answers. Then wait quietly for directions from your teacher.

Key Words and Phrases in Instructions

Throughout the assessment, key words and phrases are used to identify the type of response required from you. The key words and their explanations are listed below. Refer to these explanations to ensure you are responding to the question that is asked.

Compare:
Tell what is the same and what is different.

Describe:
Tell about something in a step-by-step manner. Use words, numbers, graphs, diagrams, symbols, charts and/or pictures to do this.

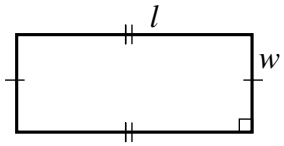
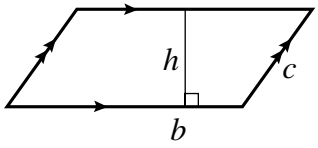
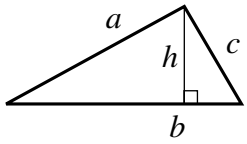
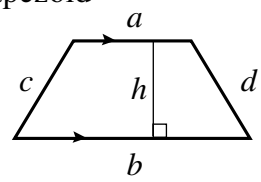
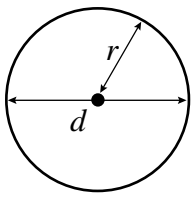
Explain:
Use words and symbols to make your solutions clear and understandable.

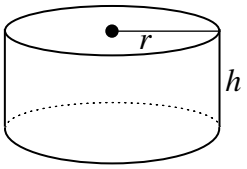
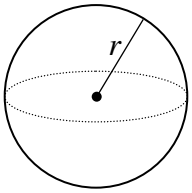
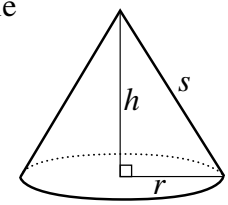
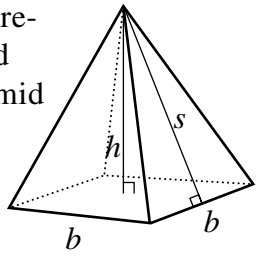
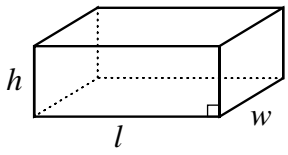
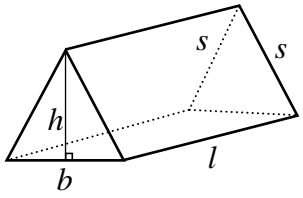
Give reasons for your answer:
Explain your reasoning in your own words. Give reasons and evidence to show your answer is correct or proper.

List:
Write down or identify in point form.

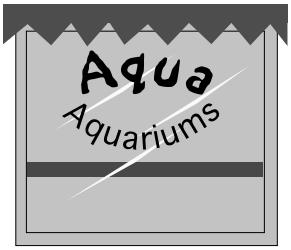
Show your work:
Record all calculations. Include all the steps you went through to get your answer. You may want to use words, numbers, graphs, diagrams, symbols, charts and/or pictures to explain your thinking.

Formula Sheet

Geometric Figure	Perimeter	Area/Surface Area
Rectangle 	$P = 2l + 2w$ $P = 2(l + w)$	$A = lw$
Parallelogram 	$P = b + b + c + c$ $P = 2b + 2c$	$A = bh$
Triangle 	$P = a + b + c$	$A = \frac{bh}{2}$ **or** $A = \frac{1}{2}bh$
Trapezoid 	$P = a + b + c + d$	$A = \frac{(a + b)h}{2}$ **or** $A = \frac{1}{2}(a + b)h$
Circle 	$C = \pi d$ **or** $C = 2\pi r$	$A = \pi r^2$

Geometric Figure	Area/Surface Area	Volume
Cylinder 	$A_{top} = \pi r^2$ $A_{base} = \pi r^2$ $A_{side} = 2\pi rh$ $A_{total} = 2\pi r^2 + 2\pi rh$	$V = \pi r^2 h$
Sphere 	$A = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$
Cone 	$A_{cone} = \pi rs$ $A_{base} = \pi r^2$ $A_{total} = A_{cone} + A_{base}$	$V = \frac{1}{3}\pi r^2 h$
Square-based pyramid 	$A_{triangle} = \frac{1}{2} bs$ *(for each triangle)* $A_{base} = b^2$ $A_{total} = A_{4\ triangles} + A_{base}$	$V = \frac{1}{3} b^2 h$
Rectangular prism 	$A_{total} = wh + wh + lw + lw + lh + lh$ $A = 2(wh + lw + lh)$	$V = lwh$
Isosceles triangular prism 	$A_{triangle} = \frac{1}{2} bh$ *(for each triangle)* $A_{rectangles} = ls + lb + ls$ $A_{total} = A_{rectangles} + A_{2\ triangles}$	$V = \frac{1}{2} (bh)l$

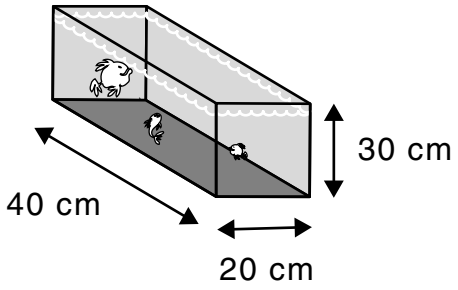
Task 1: Aquarium



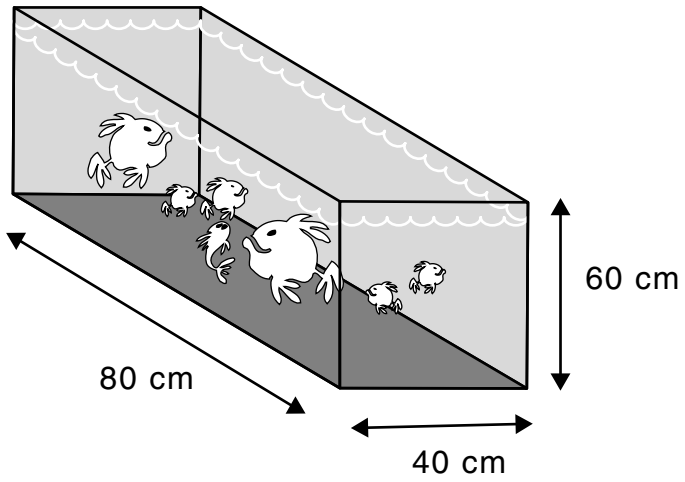
Aqua Aquariums sells aquariums in the shape of rectangular prisms. The aquariums are available in two sizes, small and large, with dimensions as shown. Each aquarium has glass sides and bottom, but no top.

NOTE: These aquariums are NOT drawn to scale.

Small



Large



a) Calculate the volume of each aquarium.

Small

Large

b) Calculate the total outside surface area of each aquarium.

HINT: The aquariums have no tops.

Small	Large

c) The cost of materials required to build the aquariums is \$0.002/cm^2 of **surface area**. Determine the cost of materials required to build each aquarium. **Show your work**.

Small	Large

d) The cost of the materials required to build the large aquarium is _____ times the cost of the materials required to build the small aquarium.

e) The selling price of the small aquarium is $24. The selling price of the large aquarium is $115.

Do the selling prices of the aquariums seem appropriate according to your calculations? **Give reasons for your answer.**

f) Mohammed went into the store to buy an aquarium. After comparing the small and large aquariums, he tells the owner, "The large aquarium should only cost two times as much as the small aquarium."

He gives the following reasons:

- The dimensions of the large aquarium are two times bigger than those of the small aquarium.
- It takes two times more material to build the larger aquarium.

Explain the **mathematical error** in Mohammed's reasons.

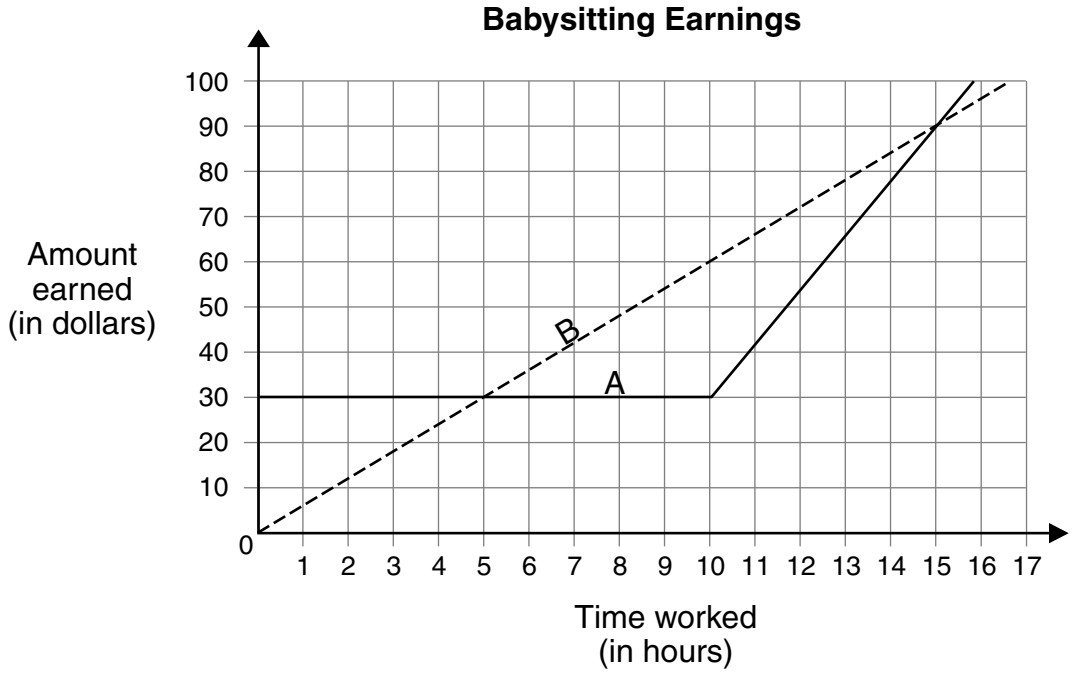
HINT:
To answer this question, refer to your previous answers for help.

Task 2: Babysitters' Club

Nadia and Lisa are comparing their **weekly earnings** from babysitting. The following graph shows their earnings compared to the number of hours they worked in the week.

a) Lisa says:
"If we both work **less than 5 hours** or **more than 15 hours**, I earn more than you do."

Label Lisa's line with her name. Write Nadia's name on the other line.



b) Describe what the graph shows about how each girl is paid for her week of work. Include specific mathematical details about hourly rates of pay.

c) Sana also offers babysitting in the home. She lives on the edge of town and travels by bus to the home where she babysits.

Sana charges a family a set fee of **$15.00 per week** to cover her bus pass **plus an additional $4.00 per hour**.

Draw the graph for Sana's earnings on the graph in question **a)**. Label your line.

d) Your neighbour needs a babysitter for 12 h this week.
How much would each of the three girls charge for this 12 h of babysitting?
Show your work or explain how you get each answer.

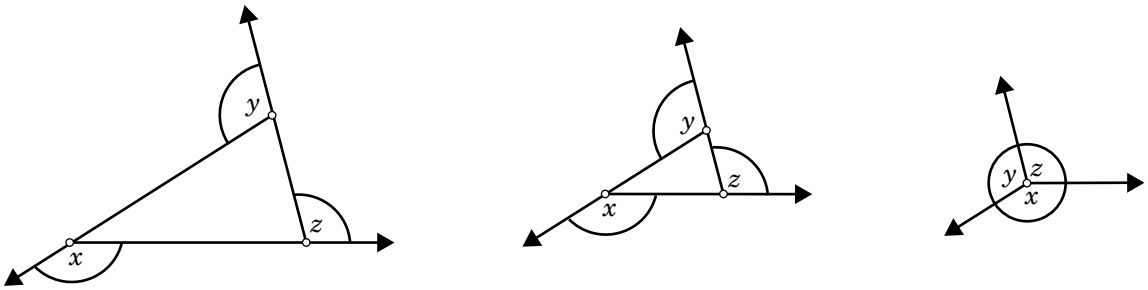
e) Several neighbours have inquired about babysitters. Some require a lot of hours of babysitting per week while others require very few hours. They have asked you which of the babysitters charges the least. What would your answer be?
Explain your reasoning. Be specific about the time intervals.

Task 3: Interior and Exterior Angles

Sandra is doing a dynamic geometry investigation of the **sum of the exterior angles** in polygons.
She uses dynamic geometry software. You don't have to use this software to do this task.

She constructs a triangle using rays instead of line segments.

She shrinks the triangle until it looks like three rays coming from a point, as shown below.



From this, she concludes:

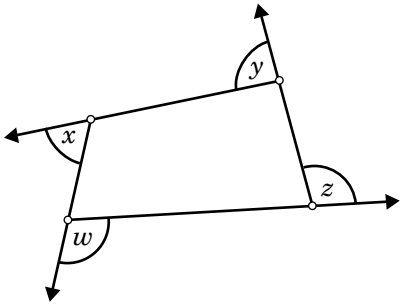
"The **sum of the exterior angles** of a triangle is 360°."

a) Refer to the diagrams above to **explain** why you agree or disagree with this conclusion.

b) Imagine Sandra starts with a **quadrilateral**.

Sketch two more diagrams like those in question **a)** to show what happens as Sandra shrinks the quadrilateral so that all four points get closer together.

Diagram I **Diagram II** **Diagram III**



c) What conjecture can you make about the **sum of the exterior angles of any quadrilateral**?

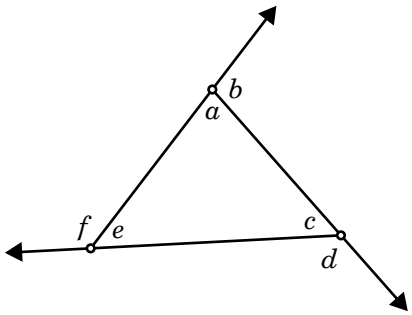
d) Make a conjecture or prediction about the **sum of the exterior angles of any polygon**.

e) Sandra's triangle shows three pairs of supplementary angles:

$a + b = 180°$

$c + d = 180°$

$e + f = 180°$



These three pairs of angles add up to 540°
(180° + 180° + 180° = 540°).

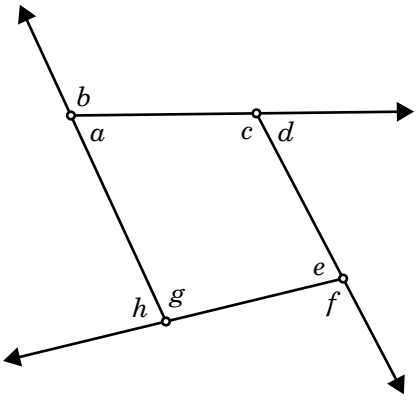
The **exterior** angles ($b + d + f$) add up to 360°.
She calculates that the **interior** angles must add up to 180° (540° – 360° = 180°).

She concludes:

"The sum of the **interior** angles of a triangle ($a + c + e$) is 180°."

Construct a similar argument **to explain why**:

"The sum of the **interior** angles of a quadrilateral is 360°."



Extended Response Coding Guide — Academic Program
Task #1 — Aquarium

b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written "I don't know" or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions
KU N	c), d)	1	• no correct answers
		2	• one correct answer, other answers are incorrect or missing [work may or may not be shown in **c)**]
		3	• two correct answers, other answer is incorrect or missing [work may or may not be shown in **c)**]
		4	• three correct answers with no supporting work in **c)**
		5	• three correct answers based on multiplying to find cost and dividing to find proportion [i.e., \$8.80 and \$35.20 in part **c)** and 4 in part **d)** with correct supporting work in **c)**] **Note:** answers need only be correct based on work in previous sections **Note:** correct units not necessary
KU M	a)	1	• no correct answers
		2	• one correct answer, the other incorrect or missing **or** correct volume formula used with error(s) in calculations
		3	• correct answers (i.e., 24 000 cm^3, 192 000 cm^3) **Note:** correct units not necessary
AP M	b)	1	• both answers incorrect and work shown is not appropriate to the context
		2	• inappropriate selection of formula (e.g., $2lw + 2lh + lw$) with correct substitution **or** • appropriate selection of formula with incorrect substitution
		3	• partially appropriate selection of formula with correct substitution (e.g., calculation does not include bottom of aquarium)
		4	• proper selection of formula for six sides with correct substitution (e.g., includes top of aquarium)
		5	• proper selection of formula for five sides with correct substitution (i.e., correct answers: 4400 cm^2 and 17 600 cm^2)
AP N	e)	1	• answers yes or no, no mention of previous calculations or selling price (e.g., "no it is not appropriate because I paid less for my aquarium")
		2	• answers yes or no, mentions previous calculations, no comparison to selling price (e.g., "no because in all my other calculations the large tank was 4 times bigger") **or** • answers yes or no, mentions selling price, no comparison to previous calculations
		3	• answers yes or no, indirect comparison of previous calculations to selling price (e.g., "No because the price is too high, it only costs \$6.40 to make the small one and \$25.60 to make the large one. They need to make a profit but this is too high.")
		4	• answers yes or no, direct comparison to previous calculations, but no proportional comparison made to selling price (e.g., "\$24 × \$8.80 = \$15.30, \$115 × \$35.20 = \$79.80 no this isn't fair, the companies are making too much profit.")
		5	• answers yes or no, direct proportional comparison between previous calculations and selling price (e.g., "It's appropriate because the cost of materials for the large aquarium is 4 times the cost of materials for the small aquarium and the selling price of the large aquarium is 4.79 times the selling price of the small aquarium. The rate is almost the same so the selling prices are appropriate.") **Note:** student work should be scored relative to answers in previous sections

Extended Response Coding Guide — Academic Program
Task #1 — Aquarium

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Category	Parts	Codes	Descriptions
PSN	f)	1	• no explanation provided (e.g., "Mohammed is wrong" **or** "Mohammed is right")
		2	• provides explanation with errors or inconsistencies (e.g., "Mohammed is right, the large aquarium should cost twice as much"; "In part **e)** I saw that the large aquarium was priced too high, so Mohammed is right, it should cost less.")
		3	• provides correct explanation limited to the context of this problem, which follows from answer given in part **b), c)** or **d)** (e.g., "I calculated that it takes 4 times as much material to make the large aquarium, so it should cost 4 times as much.")
		4	• provides correct explanation of the error in Mohammed's reasoning with reference to wider mathematical context (e.g., "The dimensions may be twice as large, but since the SA formula multiplies two dimensions together, this means the SA will be 4 times as large, so it will take 4 times as much material to make the large aquarium.") • **Note:** work is to be scored based on the answer in **d)**
CM	e), f) (presentation of thinking)	1	• communication of thinking is rarely clear and does not reveal processes (e.g., work shown and explanations given in **e)** and **f)** reveal little of the thinking process and are unclear)
		2	• communication is somewhat clear and reveals some processes (e.g., work shown and explanations given in **e)** and **f)** reveal some of the thinking process and are somewhat clear)
		3	• communication is clear and reveals processes (e.g., work shown and explanations given in **e)** and **f)** reveal the thinking process and are clear)
	a), b), c), e) (mathematical conventions)	1	• mathematical conventions are rarely used properly when required [e.g., does not include proper units (\$, cm^2, cm^3) in **a)**, **b)**, **c)** and **e)** where appropriate]
		2	• mathematical conventions are often used properly when required (e.g., includes units where appropriate and misuses equal signs consistently)
		3	• mathematical conventions [use of symbols (+, =, etc.), units (\$, cm^2, cm^3) and mathematical form] are used properly when required

Extended Response Coding Guide — Academic Program
Task #2 — Babysitters' Club

b – blank: nothing at all is written for the solution

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Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions
KU R	c)	1	• all points are incorrect
		2	• one correct point [e.g., the vertical intercept (0, 15) has been plotted]
		3	• at least two correct points have been plotted but line has not been drawn or is incorrect
		4	• line drawn correctly going through two or more correct points [e.g., straight line through (0, 15), (1, 19), (2, 23), …]
AP R	a)	1	• neither line is labelled correctly
		2	• one line is labelled correctly
		3	• both lines are labelled correctly
	b)	1	• none of the information stated is correct
		2	• stated information is correct or partially correct but contains no details about hourly rates of pay (e.g., "Nadia earns more than Lisa" or refers to slopes of A and B)
		3	• stated information is correct for both girls but hourly rates of pay are missing or incorrect (e.g., "Lisa is paid a flat rate for so many hours, then an hourly rate after that. Nadia earns the same hourly rate no matter how much she works.") **Note:** based on graph labels
		4	• identifies one appropriate babysitting rate (e.g., Nadia earns \$6/h **or** Lisa earns a flat rate of \$30 then she earns \$12/h after that) (**Note:** based on graph labels)
		5	• identifies both babysitting rates (e.g., "Lisa is paid a flat rate of \$30 for up to 10 hours, then she is paid \$12/h after that. Nadia earns \$6/h no matter how many hours she works.") **Note:** based on graph labels
	d)	1	• chooses inappropriate tool(s) to arrive at amounts that don't fit the problem
		2	• chooses appropriate tool(s) (e.g., calculations or graph as labelled) and arrives at one or two amounts that fit the problem
		3	• chooses appropriate tool (e.g., calculations or graph as labelled) and arrives at amount of pay for each babysitter that fits the problem (i.e., dollar amounts **close to** 54 for Lisa, 72 for Nadia and 63 for Sana)
PS R	e)	1	• reasoning illogical and inappropriate or no conclusions drawn (e.g., discussion of least cost does not follow from graph or calculations)
		2	• simple repetition of hourly pay rate details with no comparison or reference to graph (e.g., "Pick Sana because she charges only \$15 flat fee and \$4 an hour")
		3	• logical reasoning leads to appropriate and largely incomplete conclusion (e.g., least cost is stated for only one time interval)
		4	• logical reasoning leads to appropriate and somewhat incomplete conclusion (e.g., least cost is stated for only two time intervals, or the conclusion does not address precise time intervals: "For few hours Nadia charges the least. For many hours Sana charges the least. In the middle Lisa charges the least.")
		5	• logical reasoning leads to appropriate and complete conclusion that includes full details about time intervals (e.g., "hire Nadia for 5 h or less; hire Lisa for 5 h to 13 h; hire Sana for more than 13 h")
CM	b), d), e) (presentation of thinking)	1	• communication is unclear and does not reveal the thinking process
		2	• communication is somewhat clear and reveals some of the thinking process
		3	• communication is clear and reveals the thinking process
	b), d) (mathematical conventions)	1	• mathematical conventions are rarely used properly
		2	• mathematical conventions are sometimes used properly
		3	• mathematical conventions are used properly (e.g., proper units and equal signs)

Extended Response Coding Guide — Academic Program
Task #3 — Interior and Exterior Angles

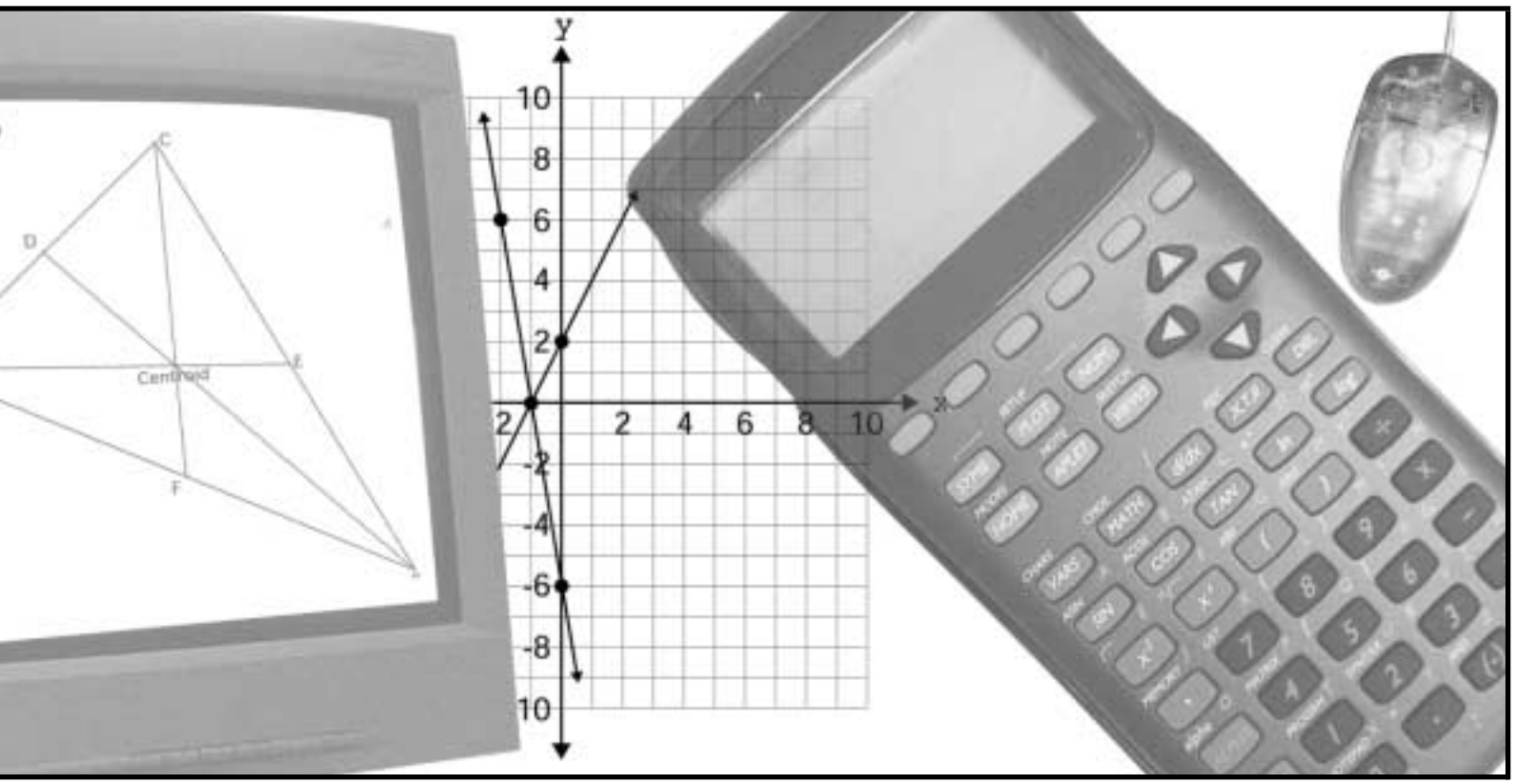
b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written "I don't know" or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Erasures – If it is rubbed out and readable, mark it. If it is rubbed out and not readable, give it a code of u.

Category	Parts	Codes	Descriptions
KU M	c), d)	1	• one or more conjectures do not relate to the problem (e.g., sides are equal)
		2	• one or more conjectures do not relate correctly to the sum of exterior angles (e.g., sums to 180º)
		3	• one or more conjectures correctly relate to the problem in one part, other part is blank or incorrect
		4	• one or more conjectures correctly relate to the problem with conclusion that the sum is 360º
AP M	b)	1	• diagrams do not show appropriate fitting to the context
		2	• one diagram shows appropriate fitting to the context and the other diagram is missing or shows inappropriate fitting to the context
		3	• both diagrams show partially appropriate fitting to the context or • one diagram shows appropriate fitting to the context, the other shows inappropriate fitting to the context
		4	• one diagram shows appropriate fitting to the context and the other shows partially appropriate fitting to the context
		5	• both diagrams show appropriate fitting to the context
PS M	a)	1	• no conclusion stated, illogical reasoning given or • no conclusion stated, reasoning given that does not refer to the diagrams
		2	• conclusion stated with illogical reasoning that refers to the diagrams (e.g., "I agree because I measured them with my protractor") or • conclusion stated with reasoning that does not refer to the diagrams or • conclusion stated with no reasoning provided
		3	• conclusion stated and supported with logical but incomplete reasoning that refers to the diagrams (e.g., "I agree. In the last diagram the angles make a full circle, so they must add to 360º")
		4	• conclusion stated and supported with complete and logical reasoning that includes reference to the fact that the angles stay fixed as the diagrams shrinks (e.g., "I agree. As the diagram shrinks the marked angles, which are the exterior angles of the triangle stay the same. In the last diagram they make a full circle, so they must add to 360º")
	e)	1	• argument is illogical
		2	• argument does not connect to the given argument (e.g., "In a square each angle is 90º and there are four of them, so the total is 360º") • argument is partially logical and incomplete (e.g., each pair of angles add to 180º)
		3	• argument is logical and does not refer to diagram (e.g., four groups of 180º makes 720º, 360º)
		4	• argument is complete and logical (e.g., a + b + c + d + e + f + g + h = 720º but b + d + f + h = 360º so a + c + e + g = 720º – 360º = 360º)
CM	b), d), e) (presentation of thinking)	1	• communication is unclear and incomplete and does not reveal the thinking process
		2	• communication is partially clear and complete and reveals some of the thinking process
		3	• communication is clear and complete and reveals the thinking process
	b), d) (mathematical conventions)	1	• mathematical conventions are rarely used properly when required [e.g., does not include proper units (i.e., º) where appropriate, and most equations incomplete in e)]
		2	• mathematical conventions are sometimes used properly when required [e.g., sometimes includes proper units (i.e., º) where appropriate, and some equations are complete in e)]
		3	• mathematical conventions are used properly when required [e.g., includes proper units (i.e., º) where appropriate, and uses complete equations in e)]

Grade 9 Assessment of Mathematics, 2002–2003



Academic Booklet 1

EQAO

Education
Quality and
Accountability
Office

EQAO
Education Quality and Accountability Office

Student Answer Sheet— Booklet 1

Please ensure that all your answers to the multiple-choice questions in *Booklet 1* are entered on this Student Answer Sheet. To ensure your multiple-choice answers are included in the calculation of your final results, they must be entered on this sheet.

To indicate the correct answer, **fill in the circle completely using an HB pencil,** as shown below.

Correct ● Incorrect ⊗ ⊘ ◒ ◉

If you fill in more than one answer to a question, the question will be scored incorrect. To make a correction, cleanly erase the answer you wish to change and fill in the circle for your new answer.

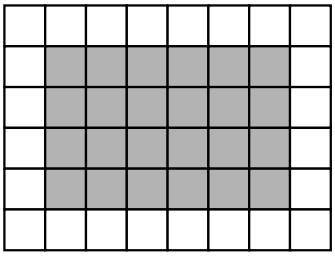
1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓕ	Ⓖ	Ⓗ	Ⓙ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓕ	Ⓖ	Ⓗ	Ⓙ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓕ	Ⓖ	Ⓗ	Ⓙ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓕ	Ⓖ	Ⓗ	Ⓙ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓕ	Ⓖ	Ⓗ	Ⓙ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓕ	Ⓖ	Ⓗ	Ⓙ

Directions to Students About Answering Multiple-Choice Questions

1. For this part of the assessment, make sure that you have the following materials along with *Booklet 1:*
   - a Student Answer Sheet
   - an HB pencil
   - a ruler and a protractor
   - a scientific calculator or graphing calculator
   - some paper for rough work
2. Be sure to read the problem and all four answer choices for each question carefully. When you choose an answer, fill in the appropriate circle on your answer sheet.
3. Always choose the best answer. Mark only one answer for each question.
4. There are 24 questions in *Booklet 1.* Try to answer all of them. Do not spend too much time on any one question.
5. Figures in this section are not drawn to scale.
6. Now do the following sample question. Fill in your choice below the sample question.

Sample Question

1. Find the area of the shaded region of the rectangle below.



1 square unit

A 16 square units

B 24 square units

C 30 square units

D 36 square units

1. Ⓐ Ⓑ Ⓒ Ⓓ

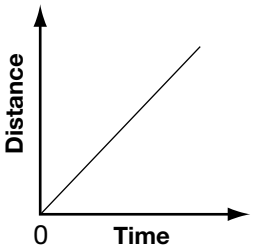
You should have filled in Ⓑ. To make a correction, cleanly erase the answer you wish to change and fill in the circle for your new answer.

7. You will have **30 min** to do the 24 multiple-choice questions.
8. When you see the

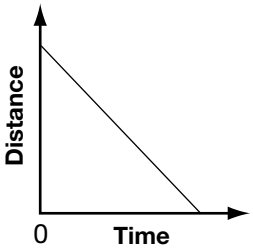
sign, you have completed *Booklet 1*. Check your answers. Then wait quietly for directions from your teacher.

1. Which distance-time graph below **best** illustrates a car that **gradually** increases its speed?

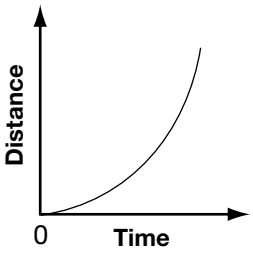
A



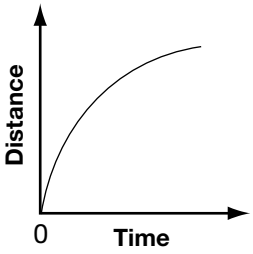
B



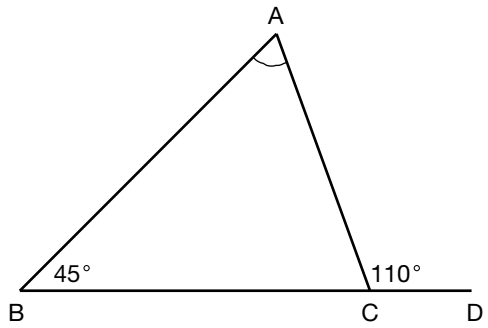
C



D



2. In the figure, $\angle B = 45°$ and BC is produced to D.



If $\angle ACD = 110°$, what is the measure of $\angle A$?

F 45°

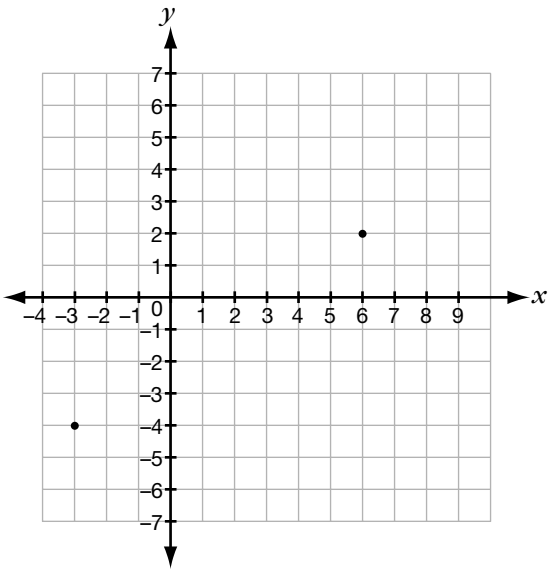
G 55°

H 65°

J 75°

1.C 2. H

3. The points (–3, –4) and (6, 2) are marked on an xy-plane.



Which statement about the line through (–3, –4) and (6, 2) is **not** true?

A Its x-intercept is 3.

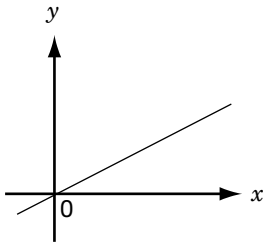
B Its slope is positive.

C Its y-intercept is –2.

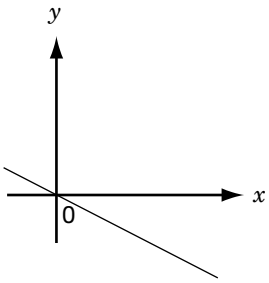
D It passes through (4, 9).

4. Which graph below is likely the graph for $y = 2x$?

F



G



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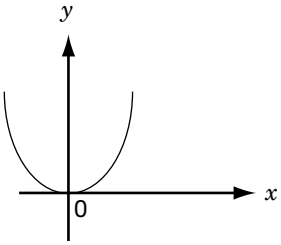

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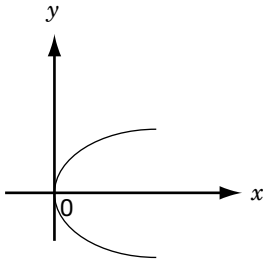
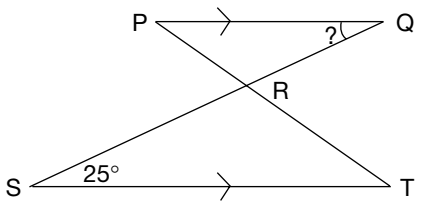


5. If PQ is parallel to ST, what is the measure of ∠PQR?



A 25°

B 35°

C 60°

D 120°

6. Pierre and his friends order from a hot dog stand.

Based on the price list given, how many hot dogs and colas do they buy with $17.80?

F 3 hot dogs and 5 colas

G 5 hot dogs and 3 colas

H 6 hot dogs and 4 colas

J 5 hot dogs and 5 colas

7. The area of a square is between 5000 cm^2 and 7500 cm^2.

Which value could be the length, in centimetres, of one side of the square?

A 50

B 60

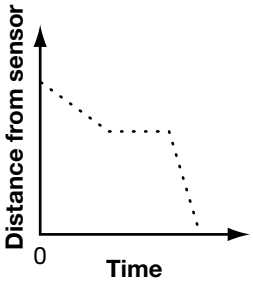
C 70

D 80

8. Mark places a motion sensor on a table. He walks slowly toward the sensor, waits a moment, then walks quickly backward away from the sensor.

Which graph below best represents his motion?

F



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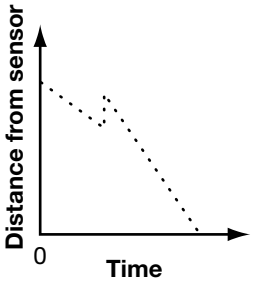

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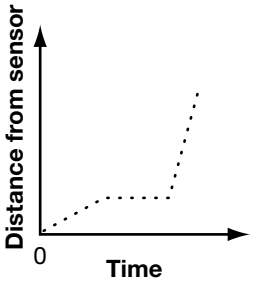

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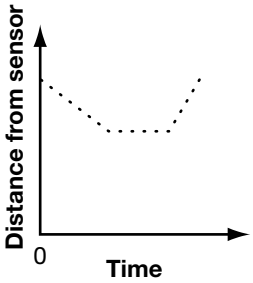
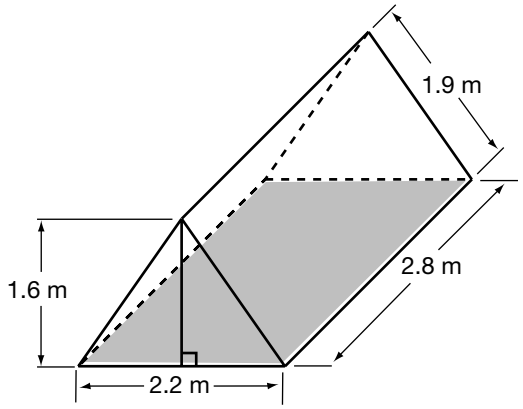


9. The figure below shows the dimensions of a tent.



What is the total area of the walls on the **two sides** and the **two ends**, correct to the nearest square metre?

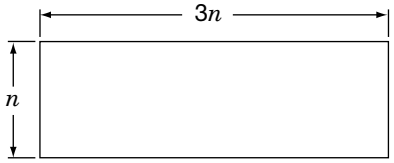
A 12 m^2

B 14 m^2

C 16 m^2

D 20 m^2

10. If the perimeter of this rectangle is 120 units, what is its area in square units?



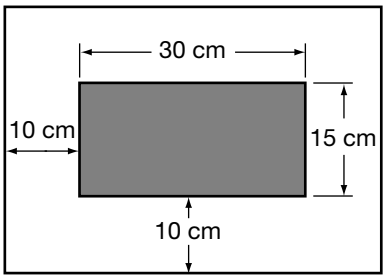
F 675

G 900

H 1225

J 2700

11. A picture measures 30 cm by 15 cm. The mat around the picture is 10 cm wide as shown.



Find the **area** of the mat.

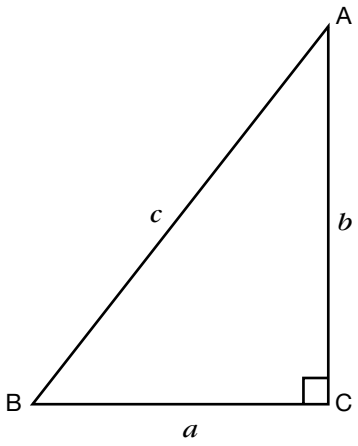
A 450 cm^2

B 1000 cm^2

C 1200 cm^2

D 1300 cm^2

12. △ABC is a right-angled triangle with BC = a, AC = b and AB = c.



Which statement is **not** true?

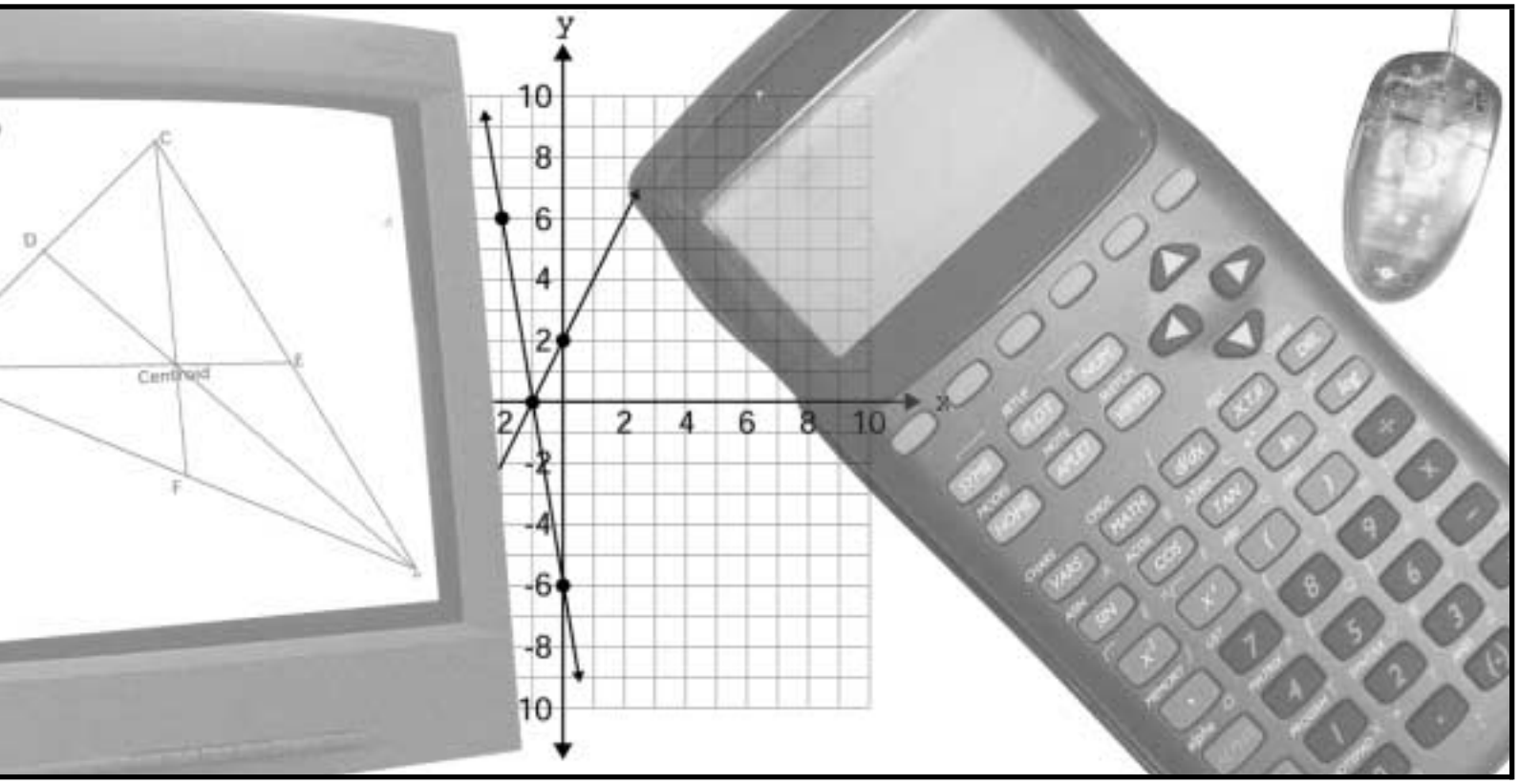
F $c > a + b$

G $c^2 = a^2 + b^2$

H $\angle C = 90°$

J $\angle A + \angle B = 90°$

Grade 9 Assessment of Mathematics, 2002–2003



Academic Booklet 2

EQAO
Education
Quality and
Accountability
Office

Directions to Students About Answering Tasks

1. For this part of the assessment, make sure you have the following items along with *Booklet 2*:
   - a pencil and an eraser or a pen
   - a scientific or graphing calculator
   - a ruler and a protractor
2. Do all of your work (even your rough work) in *Booklet 2*.
3. You will work in the booklet on two different days. Each day you will have 40 min to do 3 tasks. Allow about 15 min for each of the first two tasks and about 10 min for the third. Give yourself time to answer all of the questions.
4. Figures in this section are not drawn to scale.
5. The tasks are designed to allow you an opportunity to show what you know and what you can do. Provide as much information as you can to show your understanding. Your teacher may be marking some of your work. In addition, someone who does not know your work will mark all of it, including what your teacher has marked. So, you must provide clear, well-organized answers to illustrate your complete understanding and ability to communicate in mathematics.
6. Make sure you follow directions from the Key Words and Phrases in Instructions sheet. It is provided for you so you will know the kind of question that is being asked.

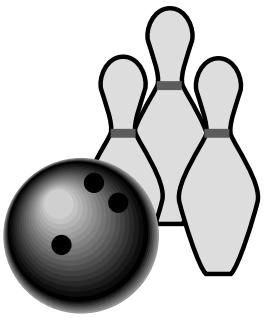
   For example, the question might ask you to "**Show your work**." Read the Key Words and Phrases in Instructions sheet. It says to record all calculations. If you use your calculator, you need to show what calculations you do. If you sketch a graph in the process of getting to your solution, show the sketch and label it. Use proper and correct mathematical conventions when you present your work.
7. When using a calculator, write down the numbers and operations that you carried out on the calculator.

   For example: Find the area of a circle with a diameter of 7 cm.

   You need to write $A = \pi(3.5)^2$
   as well as the answer you got on your calculator.
8. There are always many different ways to solve a problem. Use your broad range of mathematical knowledge to present a complete and creative solution to each question.
9. You have **40 min** to work.
10. When you see the

sign, you have completed the work for the day. Check your answers. Then wait quietly for directions from your teacher.

Task 1: Bowling!



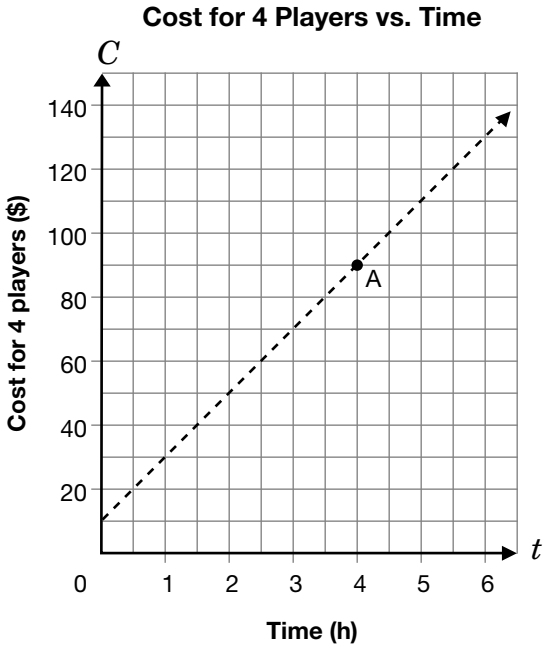
A group of 4 friends is going bowling at **Bowling Bonanza.** **Bowling Bonanza** charges

- $2.50 for each player to rent shoes
  plus
- $20/h for a group of 4 to bowl.

a) The graph below represents the relationship between cost, C, in dollars, and time, t, in hours, for 4 players to bowl.

i) **Write the coordinates** of point A.

ii) **Explain** what the coordinates of point A tell you about the cost of bowling.



b) **Explain** how this graph would change if the cost for renting the shoes increased.

> **Hint:**
> Refer to slope and y-intercept.

c) **Circle** the equation that represents the graph in question **a).**

$C = 20t + 10$ $C = 20t^2 + 10$ $C = \frac{20}{t} + 10$

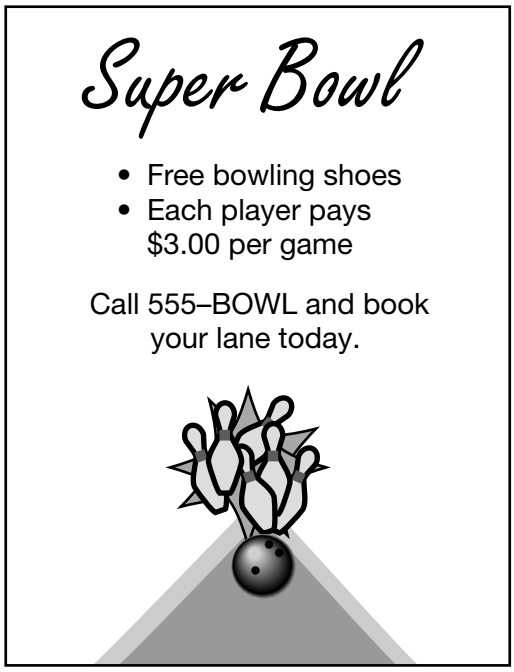
Give reasons for your answer.

d) This group of friends wants to spend $80.
How many hours can they bowl at **Bowling Bonanza?**
Give reasons for your answer or **show your work.**

e) William **and** his 3 friends are going bowling.
He finds an advertisement in the newspaper for a new bowling alley, **Super Bowl.**
William and his friends will play 6 games in 3 hours.

Determine whether William and his friends should go bowling at **Bowling Bonanza** or **Super Bowl.** Use the information given in the advertisement and in the hint box.

Give reasons for your answer.



Hint:
Bowling Bonanza charges
• $2.50 for each player to rent shoes
and
• $20/h for a group of 4 to bowl.

Task 2: BC Bound

Students at Jayson's school are planning a school trip to Vancouver. Jayson is working with the organizers. They have gathered the following information about costs.

- The price of airfare for each person is $600.
- The cost of the hotel room is $60 **per night per student** and twice that **per night per adult**.

The organizers want to calculate the total cost of different combinations of numbers of nights and numbers of students and teachers.

a) Calculate the total cost of the trip, including airfare, for **one** student staying **six** nights in the hotel. **Show your work**.

b) Calculate the total cost of the trip, including airfare, for **one** adult staying **four** nights in the hotel. **Show your work**.

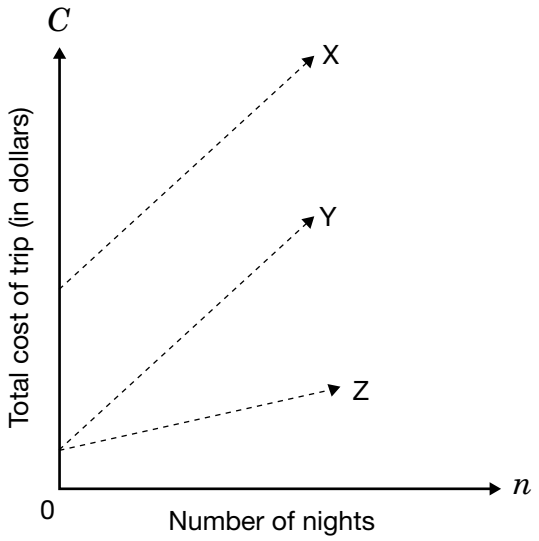
c) Let n represent the number of nights the students and adults will stay in the hotel and let C represent the total cost including airfare for the Vancouver trip.

i) Write an **equation** to represent the total cost of a trip for Jayson (a student) if he stays n nights.

ii) Write an **equation** to represent the total cost of a trip for **five** students if each stays n nights. Expand and simplify if possible.

iii) Write an **equation** to represent the total cost of a trip for **five** students and **one** adult if each stays n nights.
Simplify if possible.

d) There are three lines on the graph below.
One line represents the total cost of a trip for **one** student if he or she stays n nights.
Another line represents the total cost of a trip for a group of **five** students if they stay n nights.



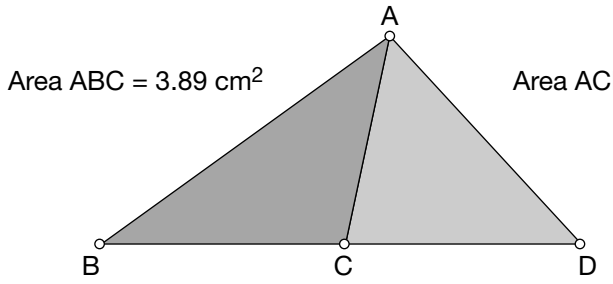
i) Which line represents the total cost of a trip for one student who stays n nights?
Give reasons for your answer.

ii) Which line represents the total cost of a trip for **five** students who stay n nights?
Give reasons for your answer.

e) **Five teachers** travel to Vancouver and stay **seven** nights. How many **students** could travel to Vancouver and stay for **seven** nights for the same total cost?
Show your work.

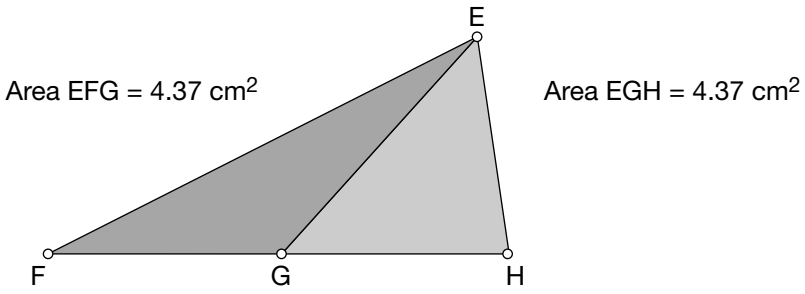
Task 3: Mission Improbable

Case 1: AC is the median of $\triangle ABD$.

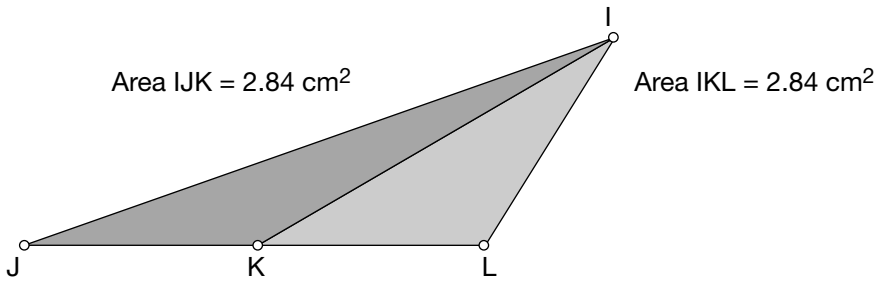


Hint:
A median is a line segment joining a vertex of a triangle to the midpoint on the opposite side.

Case 2: EG is the median of $\triangle EFH$.



Case 3: IK is the median of $\triangle IJL$.



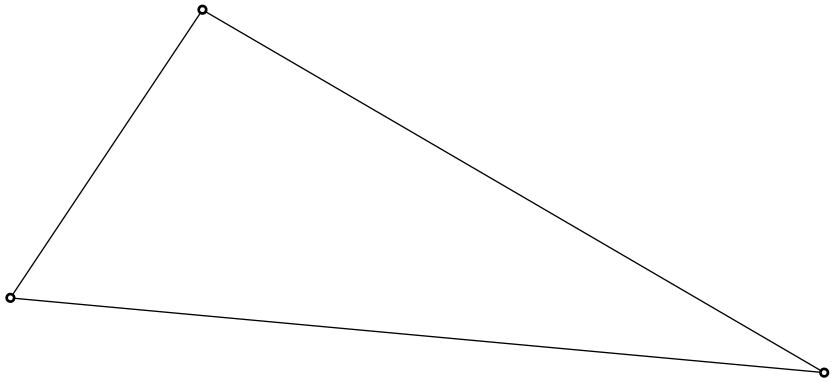
a) Each median cuts a triangle into two smaller triangles.
Examine the information about the two smaller triangles within each triangle.

Write a hypothesis about the relationship between a **median** and the **areas** of the smaller triangles.

b) A compact disc containing top secret information has been lost in a triangular field. Agent 008 and three members of her crew are preparing to search for the missing disc. The triangle below represents the field.

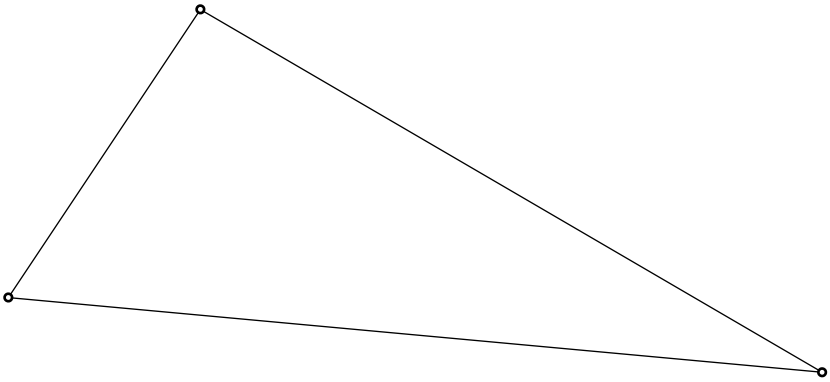
i) Divide the triangle into four equal search areas.
List the steps you used to construct the equal parts.
Explain how you know you are right.

Hint:
Refer to question **a).**

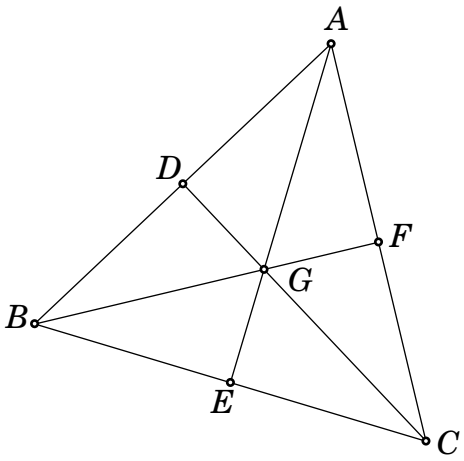


Steps:

ii) **Sketch** a possible construction for dividing the triangle into four equal areas that is different from the one you drew above.



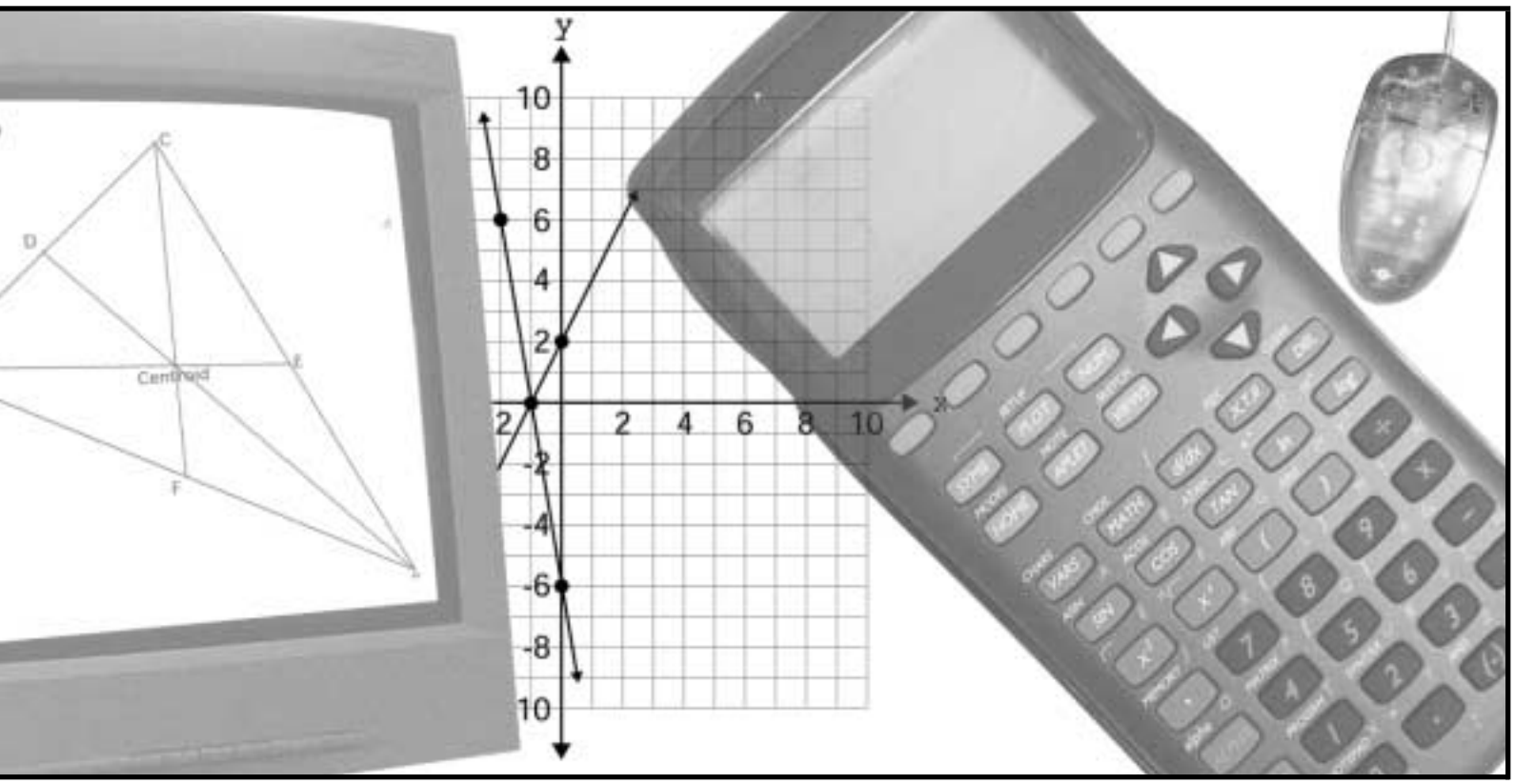
c) Agent 008 has just found out that the field is in the shape of an equilateral triangle. She has also found out that there will now be a total of six agents searching for the lost disc.



The diagram on the right above shows how Agent 008 divided the field into six sections, using the medians of the triangle.

Describe in detail how you would use geometry tools to determine whether the field has been divided into six sections of equal area. Your geometry tools could include rulers, protractors, compasses and dynamic geometry software such as The Geometer's Sketchpad.

Grade 9 Assessment of Mathematics, 2002–2003



Academic Booklet 3

EQAO
Education
Quality and
Accountability
Office

Directions to Students About Answering Short Answer Items

1. For this part of the assessment, make sure you have the following items along with *Booklet 3*:

   - a pencil and an eraser or a pen
   - a scientific or graphing calculator
   - a ruler and a protractor

2. Do all of your work (even rough work) in *Booklet 3*.

3. You will have 30 min to do these 10 items. That means you have about 3 min for each one. Give yourself time to answer all of the questions.

4. Figures in this section are not drawn to scale.

5. These questions are designed to get you to think deeply about the mathematics you know but they do not require you to write a great deal. Be sure to watch for the terms listed in the Key Words and Phrases in Instructions and do just what the prompt asks you to do.

   For example, the question might ask you to "**Explain** your answer." The Key Words and Phrases in Instructions sheet says, "**Explain** means to use words and symbols to make your solutions clear and understandable." As soon as you can explain a mathematical reason for the answer, do so. You do not need to provide lots of calculations to illustrate your point.

6. In short answer questions, you do not have to provide lots of examples to illustrate your answer. Write a short answer.

7. You have **30 min** to work.

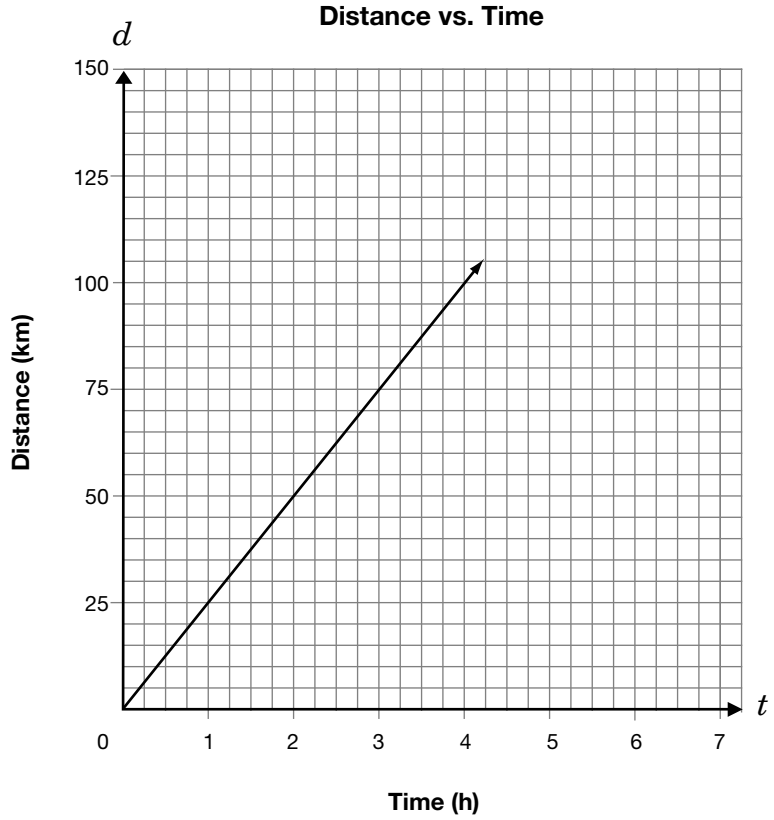
8. When you see the

sign, you have completed *Booklet 3*. Check your answers. Then wait quietly for directions from your teacher.

1. The relationship between the distance, d, in kilometres, travelled by a person on a bicycle and the time, t, in hours, is described in two ways:

- The equation is $\boldsymbol{d = 25t}$.
- The graph is shown below.

Determine the time it will take to travel 140 km.
Show your work.



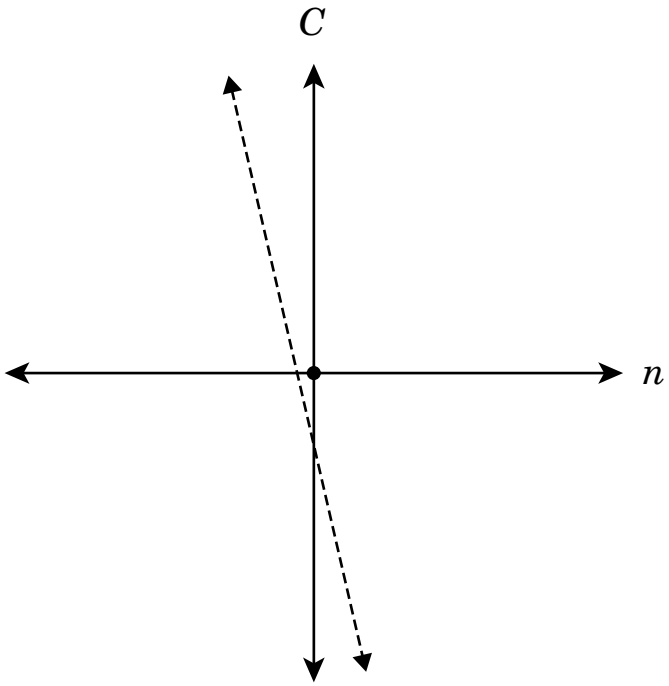
2. Veza uses the equation $C = 43n + 50$ to model the cost of soccer shirts for the team, where

C represents the total cost in dollars,
and
n represents the number of soccer shirts.

Veza sketches the graph of this relationship.

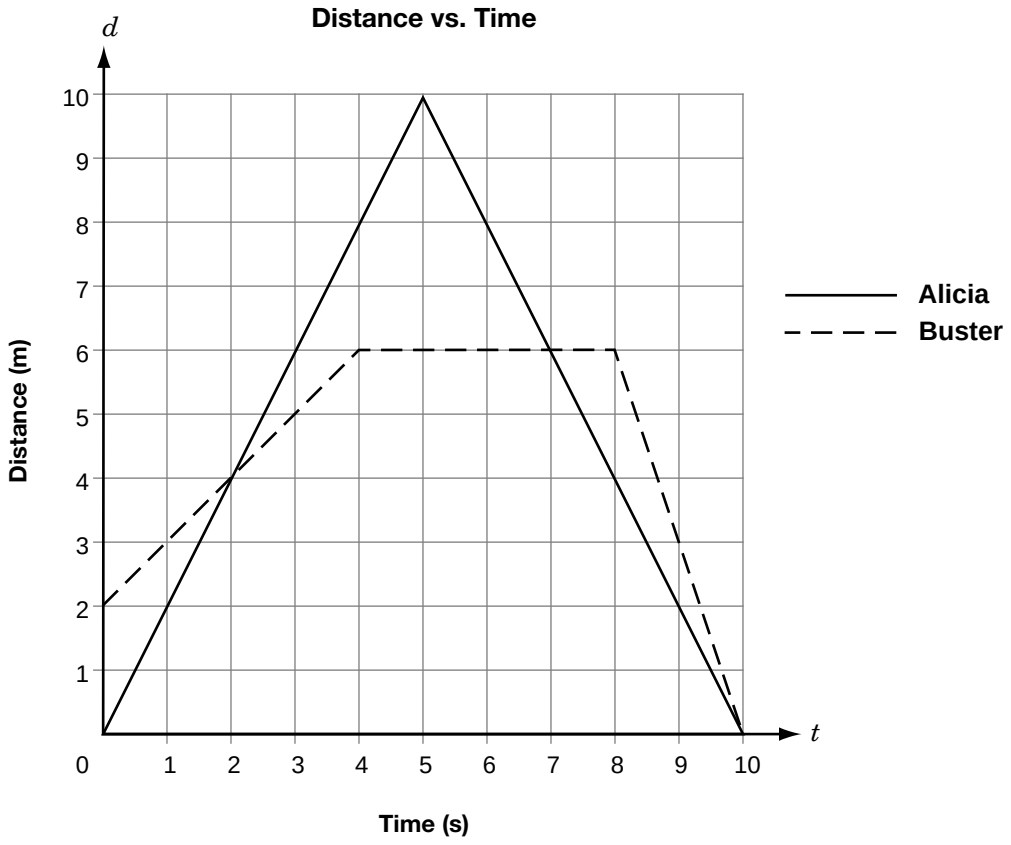
Explain why the graph shown **cannot** represent the total cost of soccer shirts.

List at least two reasons.

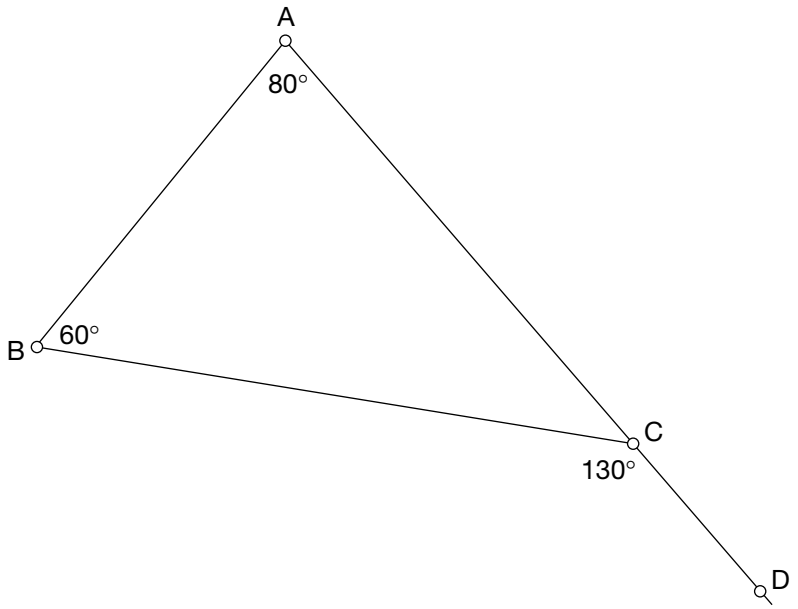


3. Alicia and Buster walked in front of a motion detector. The graph below shows the relationship between the distance from the detector, d, in metres, and time, t, in seconds.

When was Buster moving faster than Alicia? **Give reasons for your answer**.



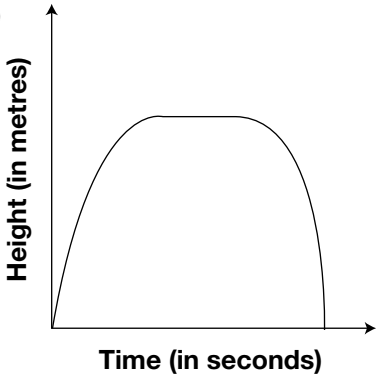
4. There is an error in this diagram. **Describe** the error and give **reasons for your answer.**



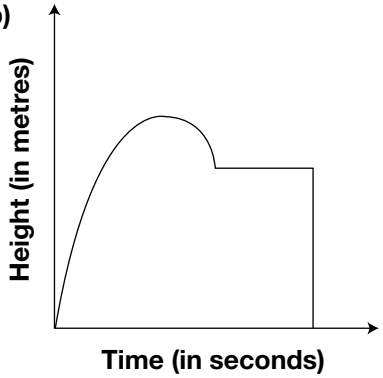
5. Sergio hits a golf ball.
As the ball is **falling,** it gets caught in a tree.
After a few seconds, the ball falls out of the tree.

Circle the height vs. time graph that models the path of Sergio's ball.

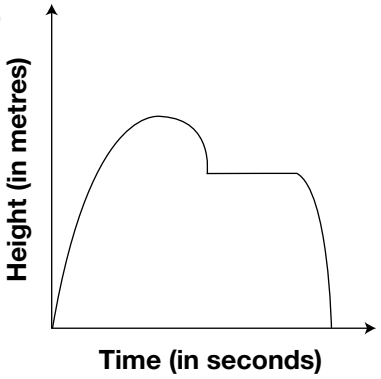
a)



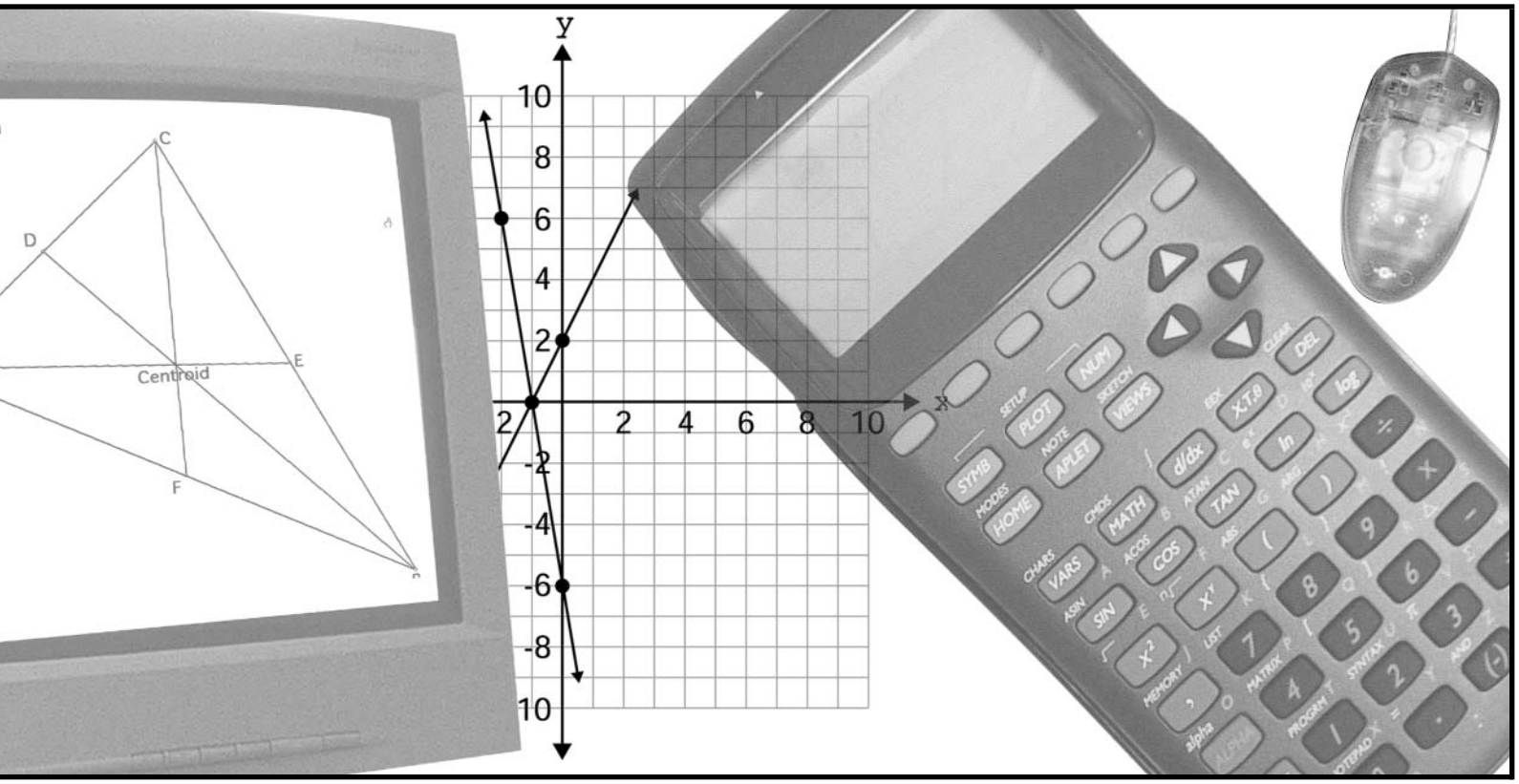
b)



c)



Grade 9 Assessment of Mathematics, 2003–2004



Release Items

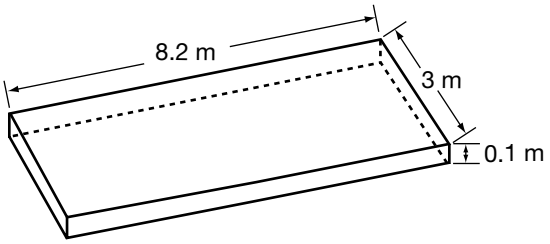
Academic Program

EQAO
Education
Quality and
Accountability
Office

Multiple-Choice Questions

1. Richard wants to buy new soil for his garden. He wants the new soil to be approximately 0.1 m deep.

The figure shows the dimensions of Richard's garden, which is a **rectangular prism.**



What **volume** of soil does Richard need?

A 2.24 m^3

B 2.46 m^3

C 11.3 m^3

D 24.6 m^3

2. Given A (2, 5) and B (−6, 5), which statement about the line segment AB is **true?**

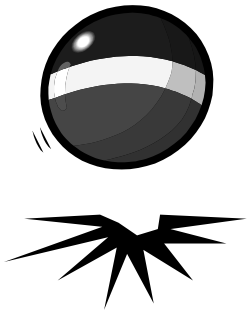
F The slope of AB is zero.

G The slope of AB is positive.

H The slope of AB is negative.

J The slope of AB is undefined.

3. A ball is dropped from a height of 10 m above the ground. It bounces to **90% of its previous height** on each bounce.



What is the approximate height that the ball bounces to on the **fourth** bounce?

A 2.8 m

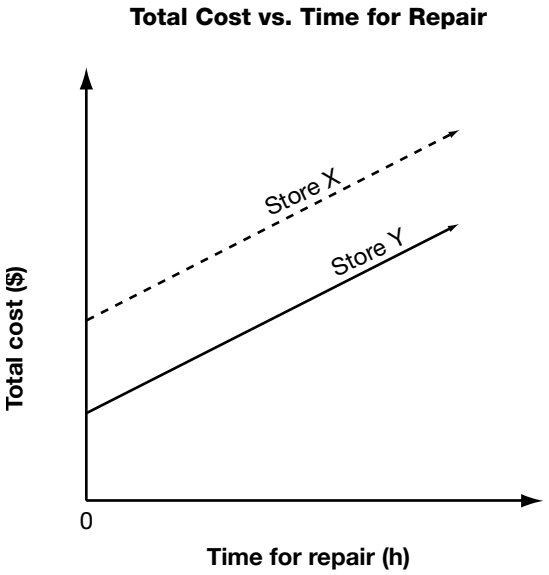
B 4.3 m

C 6.6 m

D 7.2 m

4. Two bicycle repair stores charge an initial fee and an hourly rate for repairs.

The graph below shows the total cost of repairs versus time for the repair.



Which statement is **true?**

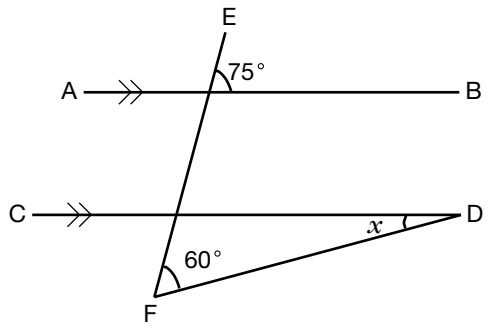
F The two stores charge different hourly rates and the same initial fee.

G The two stores charge the same hourly rate and different initial fees.

H The two stores charge different hourly rates and different initial fees.

J The two stores charge the same hourly rate and the same initial fee.

5. What is the value of x?



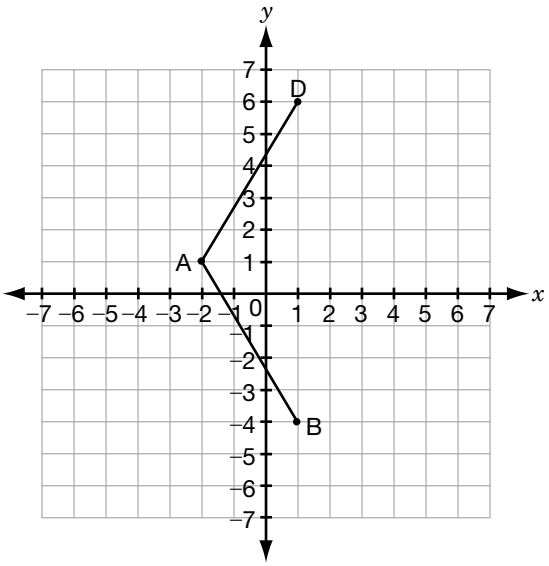
A 15°

B 30°

C 45°

D 60°

6. A is the point (−2, 1), B is the point (1, −4) and D is the point (1, 6).



If ABCD is a **rhombus,** which of the following is **point C**?

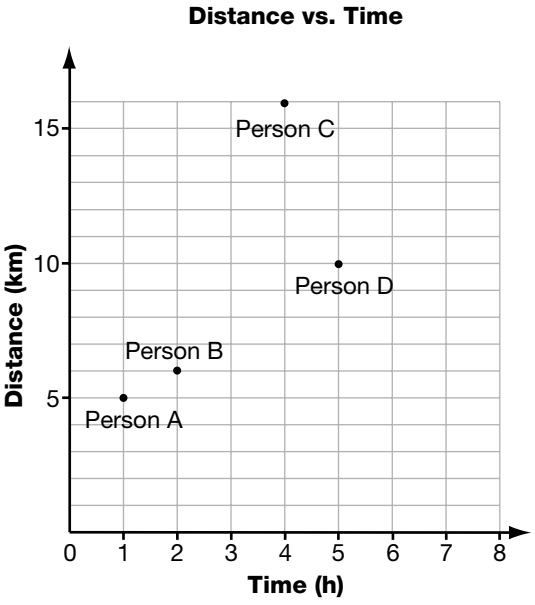
F (1, 1)

G (1, 4)

H (4, 1)

J (4, 4)

7. The graph below shows the distance travelled by four people in a walkathon and the time they take.



Which person walks at the greatest average speed?

A Person A

B Person B

C Person C

D Person D

8. Simplify the following algebraic expression:

$$\frac{a^6b^4}{a^2b}$$

F $\frac{a^3}{b^3}$

G $\frac{a^4}{b^3}$

H a^3b^3

J a^4b^3

9. A basketball has a radius of 12 cm.

What is its **surface area,** correct to the nearest square centimetre?

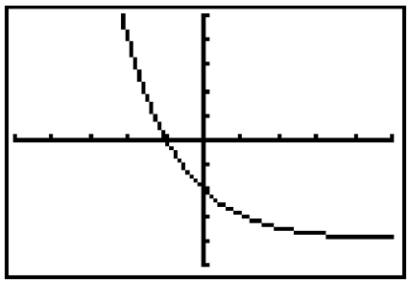
A 450 cm^2

B 1810 cm^2

C 5429 cm^2

D 7238 cm^2

10. The graph below shows the display on Kalib's graphing calculator. The horizontal axis is the x-axis and the vertical axis is the y-axis.



Which statement describes the **change** in ***y* as *x* increases**?

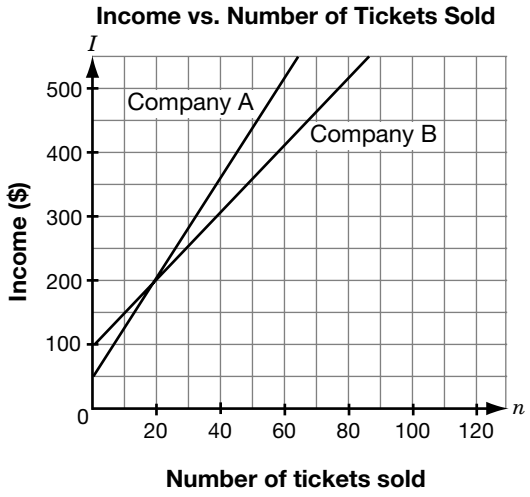
F y increases linearly.

G y decreases non-linearly.

H y decreases linearly.

J y increases non-linearly.

11. High school theatre companies earn their income through start-up grants and ticket sales. The graph shows the relationship between **income,** I, in dollars and **number of tickets sold,** n.



Which statement is true, given the information shown on the graph?

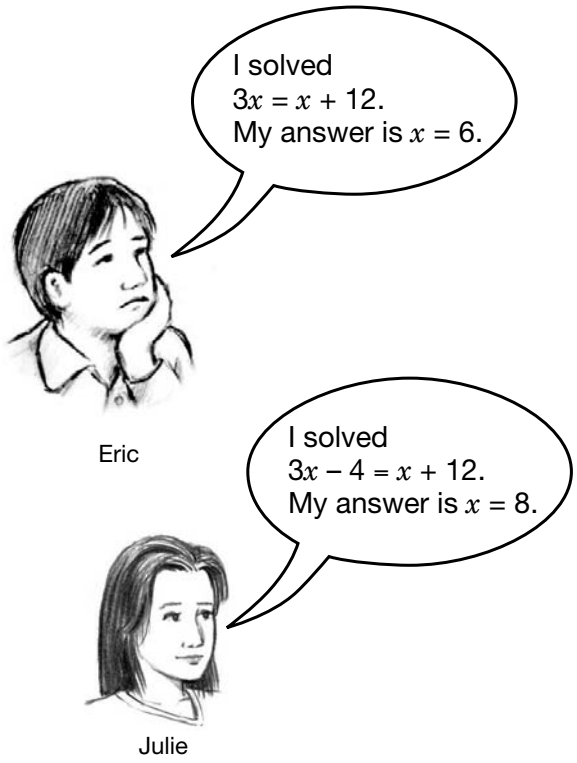
A Company A always had more income than Company B.

B The two companies had the same income when 40 tickets were sold.

C Company A got a larger start-up grant than Company B.

D Company A charged more per ticket than Company B.

12. Eric and Julie are each asked to solve an equation.



Who has correctly solved his or her equation?

F Eric only

G Julie only

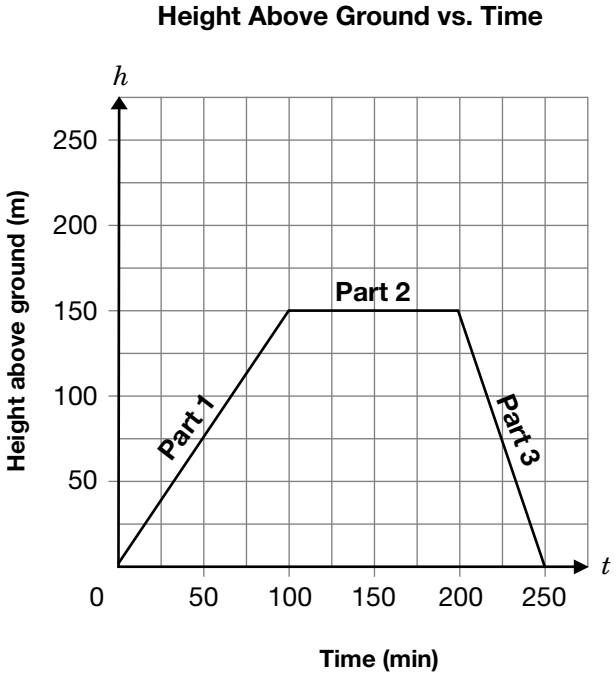
H Both Eric and Julie

J Neither of them

Short-Answer Questions

1.1 Terri is a rock climber.

The graph below shows the relationship between her height in metres above the ground and the time in minutes she spends climbing.



In the table below, **describe** Terri's climb.

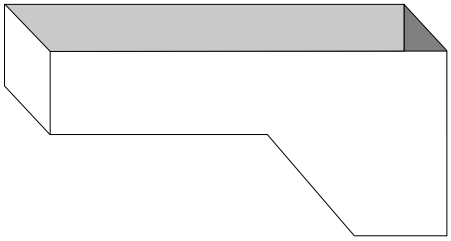
Hint: Use words like
- direction
- distance
- time
- speed

Section of graph	Description
Part 1	
Part 2	
Part 3	

1.2 Jackie runs a pool maintenance service.

In order to add the correct amount of chlorine to keep the pool clean, she needs to know how much water is in the pool when the pool is full.

The following is a diagram of the pool.

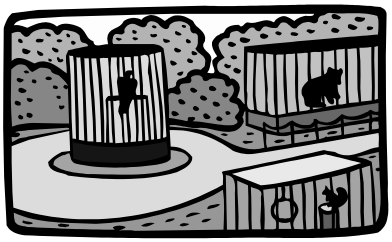


Assuming she knows all the lengths, widths and heights, **list the steps** that Jackie should take to determine the amount of water in the pool.

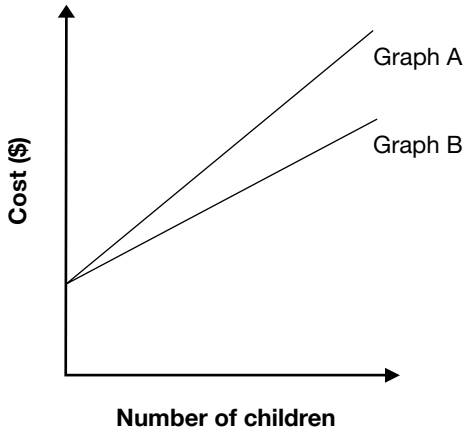
1.3 Amina is going to take some children to the zoo or to the museum.

The following equations represent the total cost of each trip, where C is the total cost, in dollars, and n is the number of children.

A trip to the zoo	$C = 5n + 8$
A trip to the museum	$C = 4n + 8$



Cost vs. Number of Children



Which graph represents the total cost of a trip to the **zoo?**

Circle one: Graph A or Graph B

Give reasons for your choice.

Tasks

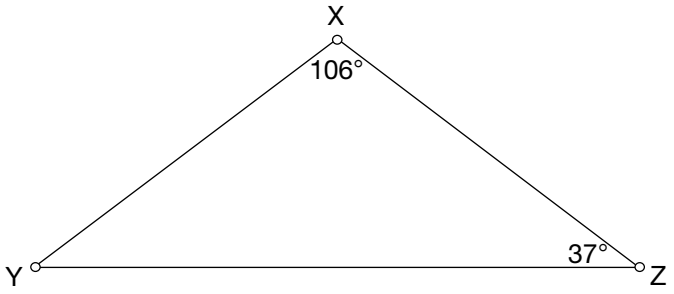
1.4 Everyone's a Winner with Math!

The math department has organized a contest.
Try the questions below.

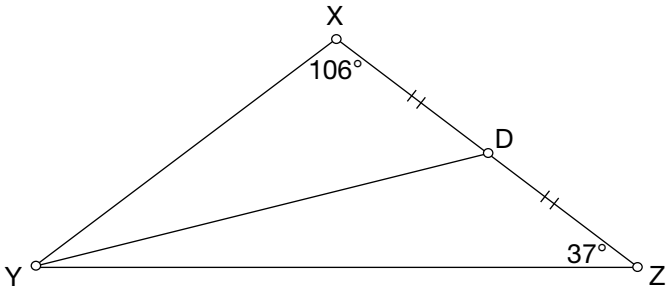
a) What **type of triangle** is △XYZ?

Check one:
- ❑ equilateral
- ❑ isosceles
- ❑ scalene

Give reasons for your answer.

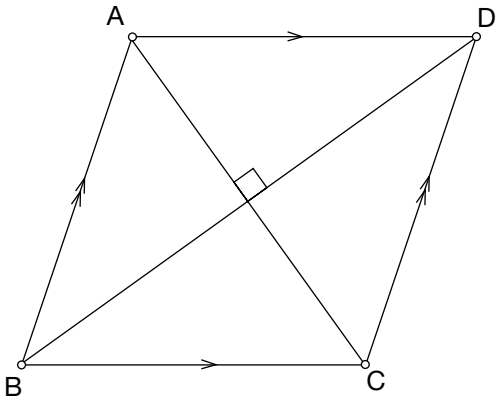


b) Line segment YD is **a median** from vertex Y.

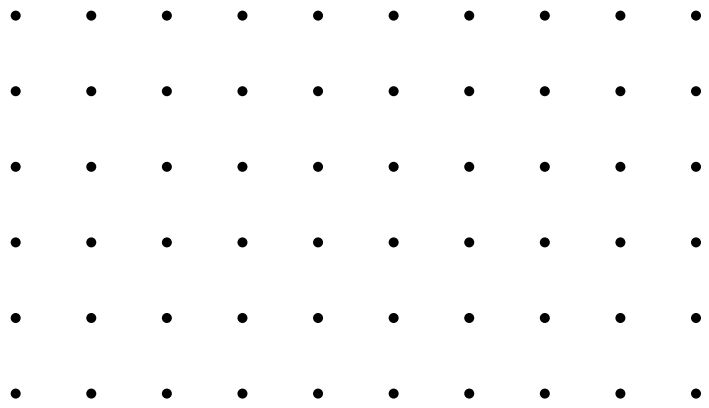


Draw the other **two medians** in the triangle and label the **point of intersection.**

c) The diagram below shows a **parallelogram** with diagonals that are **perpendicular.**



Draw a **quadrilateral** that has **perpendicular diagonals** but is **not** a parallelogram.



d) Pick up your prize for the contest.

Solve the **equation** below to find the number of the prize room:

$$3(2x - 9) - 4x = 13$$

1.5 In Hot Water

Demetrius's science class is performing an experiment.
Demetrius fills a beaker with **room temperature** water.
He slowly **heats** the water over a source of constant heat and records the **water temperature** at **different times** in the table below.

Time elapsed, x (min)	Water temperature, y (°C)	First differences
2	30	
4	43	
6	54	
8	66	
10	77	

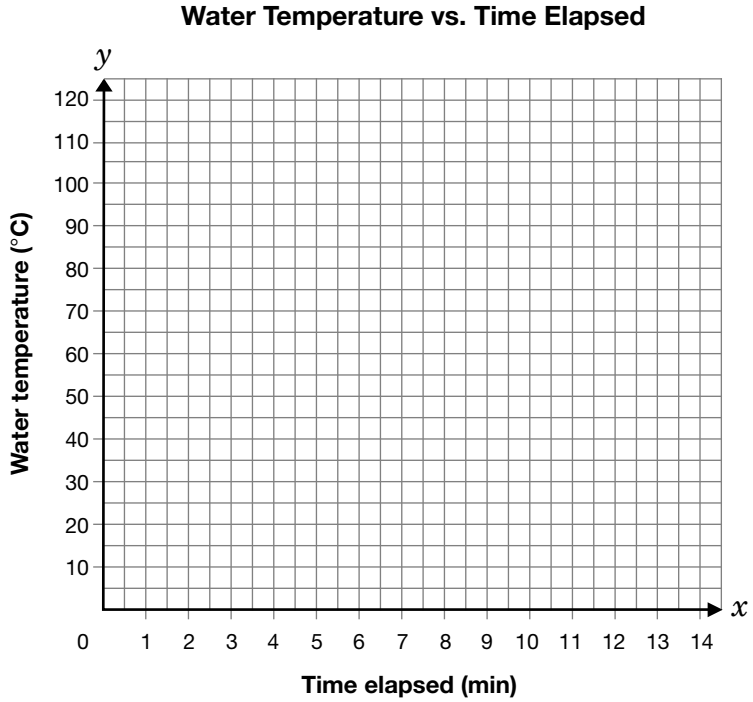
a) i) Complete the **first differences** column in the table of values above.

ii) Is the **relationship** between the **water temperature** and the **time elapsed** linear or non-linear?

Check one: ❑ linear or ❑ non-linear

Give reasons for your answer.

b) Graph the **data** from question **a)** on the grid below.
Draw a **line of best fit.**



c) Water **boils** when it reaches a temperature of **100 °C.**

Predict **how long** it will take the water in Demetrius's beaker to **boil.**
Justify your answer.

d) Suppose that Demetrius repeats the above experiment but fills his beaker with **cold** water taken from the refrigerator instead of **room temperature** water.

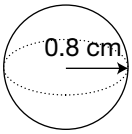
Compare **the line of best fit** for the data from this **new** experiment with the line in question **b).**

1.6 Math Munch

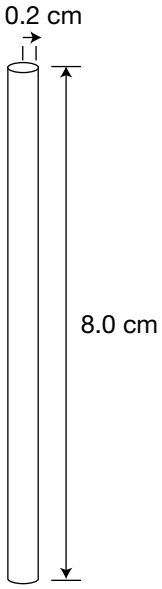
Math Munch is a new snack made of pretzels and cheese bits.

- The cheese bits are **spherical.**
- The pretzels are **cylindrical.**

a) Calculate the **surface area** of one **spherical** cheese bit with a **radius** of **0.8 cm.**
Show your work.



b) The manufacturer of Math Munch is considering changing the size of the pretzels. Each pretzel will have a **volume** of approximately **1.0 cm^3.**



i) Calculate the **surface area** of a **cylindrical** pretzel with a **radius** of **0.2 cm** and a **height** of **8.0 cm.** Show your work.
Record your answer in the appropriate space in the table on the opposite page.

ii) Calculate the **height** of a **cylinder** with a **radius** of **0.3 cm** and a **volume** of **1.0 cm^3.**
Show your work.
Record your answer in the appropriate space in the table on the opposite page.

Record your answers to questions **i)** and **ii)** in the table below.

Radius (cm)	Height (cm)	Surface area of cylinder (cm^2)	Volume of cylinder (cm^3)
0.2	8.0	**i)**	1.0
0.3	**ii)**	7.2	1.0
0.4	2.0	6.0	1.0
0.5	1.2	5.5	1.0
0.6	0.9	5.6	1.0
0.7	0.6	5.9	1.0
0.8	0.5	6.5	1.0

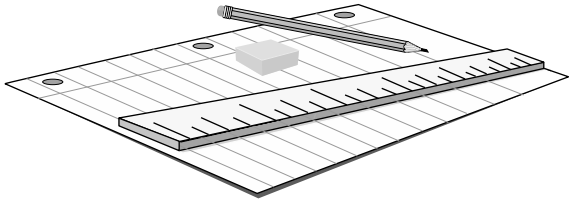
c) The manufacturer wants to cover the **surface** of each Math Munch **pretzel** with chocolate, while keeping her **costs** to a **minimum**.

State **the dimensions** you would recommend for the **cylindrical** pretzel.
Give reasons for your answer.

Short-Answer Questions

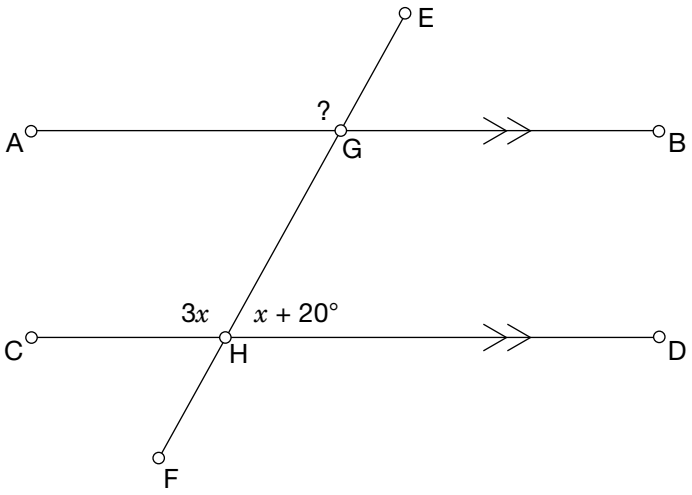
1.7 Expand and simplify.

$2(3x^2 - 5x) + 4x(7 + x)$

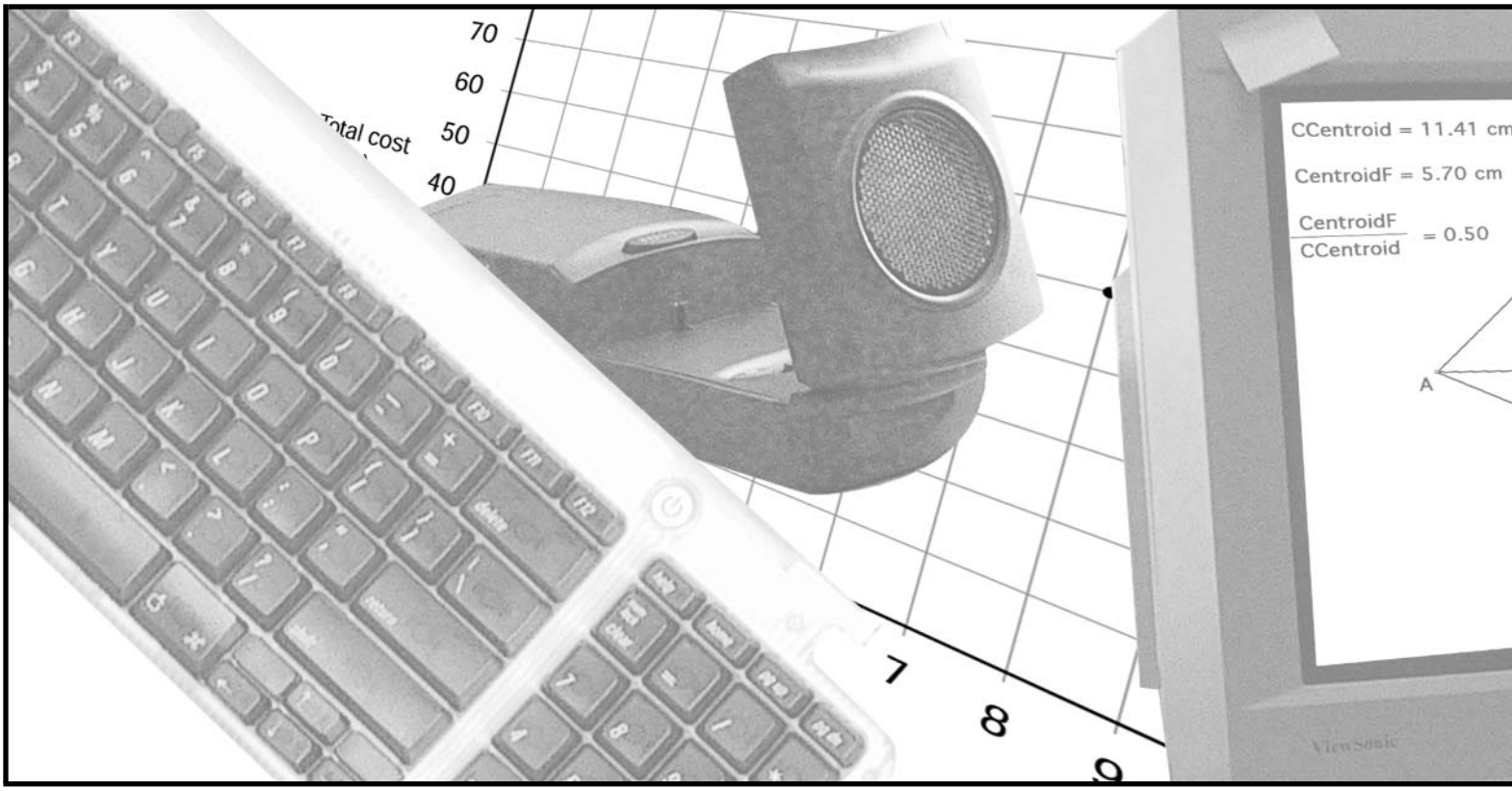


1.8 In the diagram below,

- $\angle DHG = x + 20°$
- $\angle GHC = 3x$
- AB || CD



Determine the **measure** of $\angle$**EGA.**
Justify your answer.



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EQAO
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Academic

Grade 9 Assessment of Mathematics

Multiple-Choice Items

Winter 2005

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

EQAO
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1. What is the sale price of the skateboard?

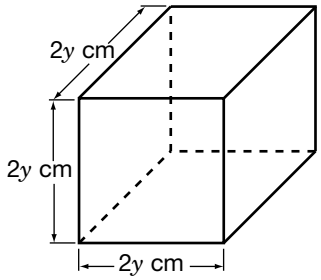
a $40.00

b $64.00

c $120.00

d $135.00

2. Each side of a cube is $2y$ cm long. What is the volume of the cube?



a $8y^3$ cm^3

b $6y$ cm^3

c $2y^3$ cm^3

d $2y$ cm^3

3. Kaya works as a translator. She charges 21¢ for each word she translates.

Which expression should Kaya use to calculate her charge, in dollars, for translating a document with n words?

a $\$\frac{21 \times n}{100}$

b $\$\frac{100}{21 \times n}$

c $\$\frac{n}{21 \times 100}$

d $\$\frac{21 \times 100}{n}$

1. c 2. a 3. a

4. Mark records his car's odometer reading. He travels at approximately the same speed for the whole journey and makes only one 30-min rest stop.

Time	Reading (km)
12:00 noon	25 091
1:00 p.m.	25 178
2:00 p.m.	25 222
3:00 p.m.	25 310
4:00 p.m.	25 395
5:00 p.m.	25 483

When does Mark most likely make his 30-min rest stop?

a Between 1:00 p.m. and 2:00 p.m.

b Between 2:00 p.m. and 3:00 p.m.

c Between 3:00 p.m. and 4:00 p.m.

d Between 4:00 p.m. and 5:00 p.m

5. In a soccer league, a win counts for 2 points, a tie counts for 1 point and a loss counts for 0 points. A soccer team has 5 wins, 2 ties and 3 losses.

If the team continues to win, tie and lose in the same ratio, which of the following values is the best prediction of their point total after 40 games?

a 36 points

b 48 points

c 96 points

d 480 points

4. a 5. b

6. The advertisement below shows the sale price of a big-digit calculator.

What is the best estimate of the **regular price** of the big-digit calculator?

a $12

b $14

c $16

d $18

7. Juan would like to order some stationery items from a catalogue. He can spend up to $15.00 but not more.

Which of the following groups of items, including 15% tax, can Juan afford to buy with his $15.00?

a One binder, one stapler and three steel clips

b Two steel clips, two binders and two notebooks

c One notebook, one stapler and one mechanical pencil

d One binder, one glue stick and two mechanical pencils

8. An influenza virus has a surface area of

$0.000\ 000\ 05\ \text{mm}^2$.

What is this number expressed in scientific notation?

a $5 \times 10^{-7}\ \text{mm}^2$

b $5 \times 10^{-8}\ \text{mm}^2$

c $5 \times 10^{7}\ \text{mm}^2$

d $5 \times 10^{8}\ \text{mm}^2$

Powers with negative exponents have been removed from the grade 9 curriculum.

9. Simplify fully:

$-5x(4 - 3x) + 2x^2$

a $2x^2 - 17x$

b $2x^2 - 23x$

c $17x^2 - 5x$

d $17x^2 - 20x$

Hint: All the answers have a different "x" term

10. Bob is thinking of a number. He adds 15 to his number and finds that the result is four times his number.

Suppose x is Bob's number. Which equation is always true?

a $15 - x = \frac{x}{2}$

b $15 - x = 4x$

c $x + 15 = \frac{x}{4}$

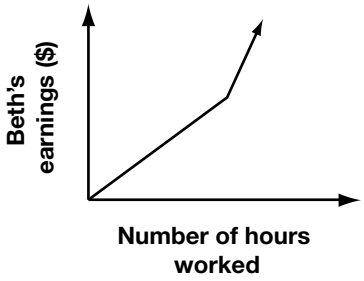
d $x + 15 = 4x$

8. b 9. d 10. d

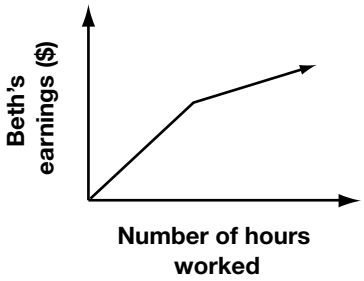
11. Beth works at a grocery store. She earns \$8/h for her first 20 h of work in a week. She earns \$11/h for working beyond 20 h a week.

Which graph shows the relationship between Beth's earnings and the number of hours she works in a week?

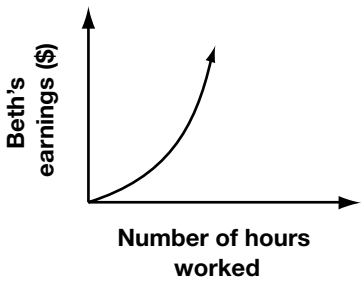
a



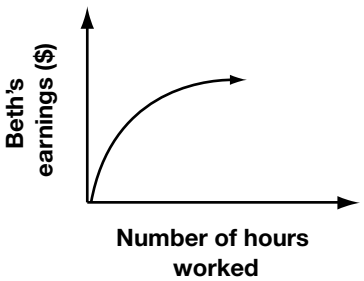
b



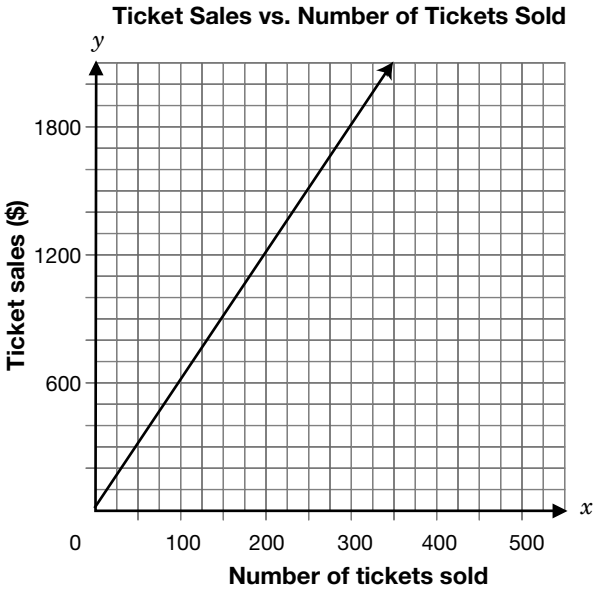
c



d



12. A local community group is organizing a skating event. The group decides how much to charge for tickets to the event and then plots a graph to show the relationship between the money they will make from ticket sales and the number of tickets sold.



According to the graph, how many tickets must the community group sell in order to make \$1500?

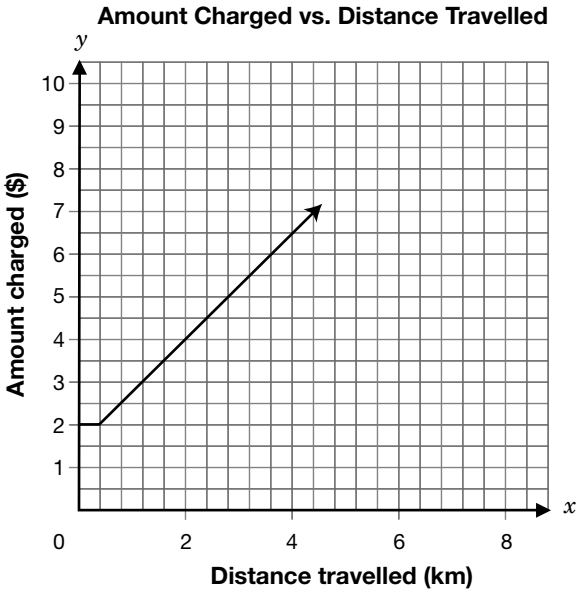
a 200

b 225

c 250

d 275

13. The graph below shows the relationship between how much a taxi company charges for a ride and the distance travelled.



How far has a customer travelled if the charge for the ride is $9?

a 4.8 km

b 5.2 km

c 5.8 km

d 6.0 km

14. Sergio sells 7 models of CD players. The table shows the unit cost of each model and the number of CD players of that model sold in the past month.

Model	Unit cost ($)	Number sold
A	55	11
B	70	14
C	90	17
D	100	21
E	120	24
F	150	29
G	200	41

Which statement about the relationship between the unit cost and the number of CD players sold is **true**?

a There is no relationship between the unit cost and the number sold.

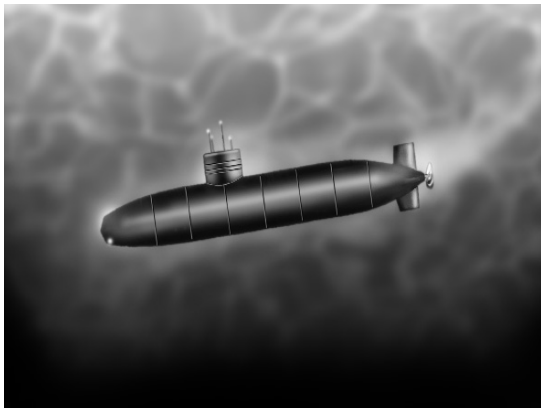
b As the unit cost increases, the number sold decreases.

c As the unit cost increases, the number sold is constant.

d As the unit cost increases, the number sold increases.

13. d 14. d

15. A submarine is submerging. The graph shows the distance below sea level the submarine has descended over time.



How far below sea level has the submarine descended after 24 min?

a 300 m

b 325 m

c 350 m

d 375 m

16. Natasha works for a computer company. The table shows her annual salary in the last five years.

Year	Annual salary ($)
1	32 000
2	33 600
3	35 200
4	36 800
5	38 400

If the trend continues, what will Natasha's annual salary be in the 8th year?

a $40 000

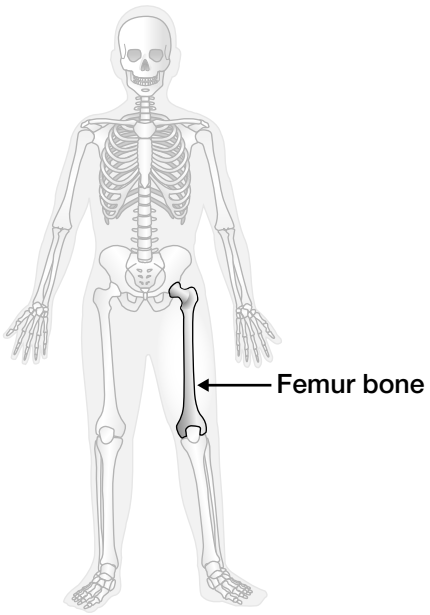
b $43 200

c $46 400

d $49 600

17. Scientists find that the height of a person, h, in centimetres, is related to the length of the person's femur bone, f, in centimetres, according to the following formula:

$$h = 69.09 + 2.24f$$



According to the formula, what is **the height** of a person with a femur bone of 48.6 cm in length?

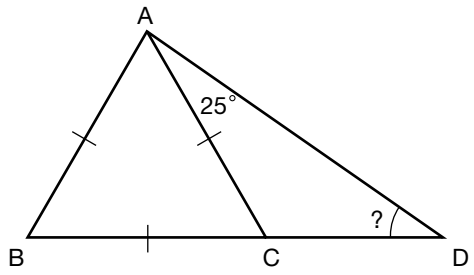
a 109 cm

b 178 cm

c 186 cm

d 347 cm

18. ABC is an equilateral triangle. BC is extended to D so that ∠CAD = 25°.



What is the measure of ∠ADC?

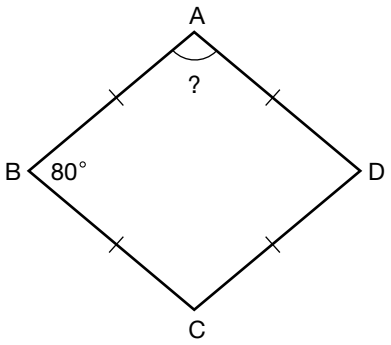
a 25°

b 35°

c 45°

d 55°

19. ABCD is a quadrilateral with all sides the same length. ∠B = 80°.



What is the measure of ∠A?

a 80°

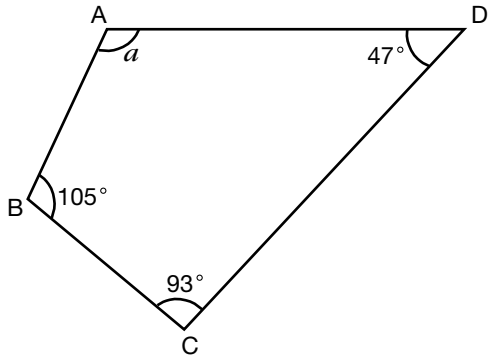
b 90°

c 100°

d 110°

17. b 18. b 19. c

20. ABCD is a quadrilateral.



What is the value of a?

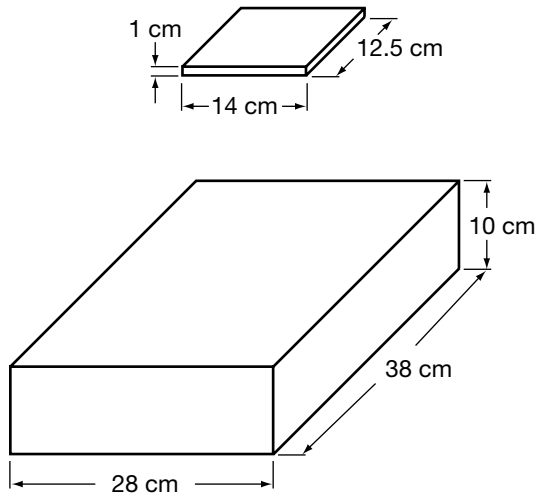
a 105°

b 115°

c 120°

d 125°

21. Elisa wants to pack CD cases into a storage box.



What is the largest number of CD cases Elisa can pack inside the covered storage box?

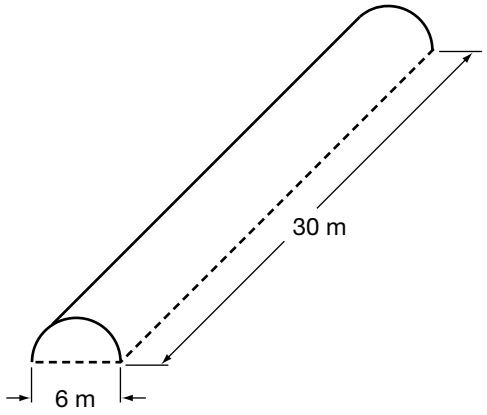
a about 40

b about 50

c about 60

d about 70

22. The figure shows a greenhouse roof in the shape of half a cylinder.



What is the approximate surface area of the curved roof?

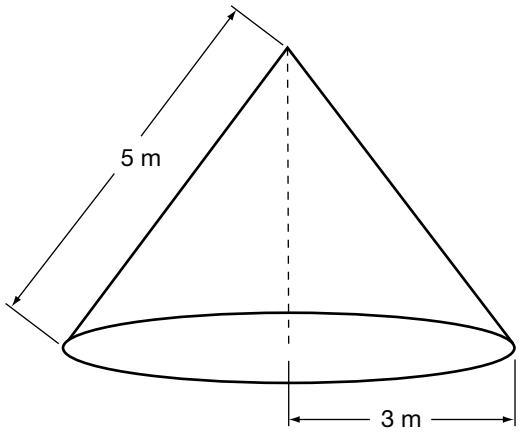
a 283 m^2

b 424 m^2

c 565 m^2

d 848 m^2

23. A tent has the shape of a cone. The radius of the base is 3 m, and the slant height is 5 m.



What is the approximate surface area of the tent, including the floor?

a 38 m^2

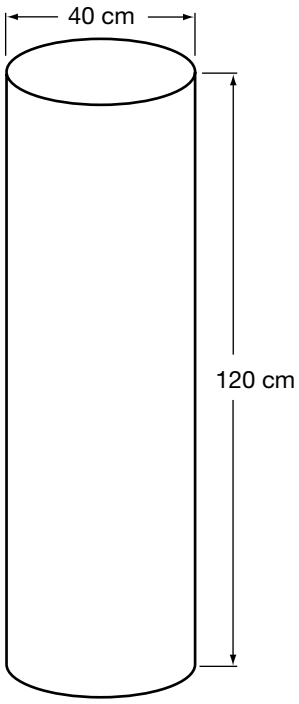
b 48 m^2

c 75 m^2

d 95 m^2

 22. a 23.c

24. A cylindrical hot water heater has a diameter of 40 cm and a height of 120 cm.



Which of the following expressions shows the maximum volume of water that the heater can hold?

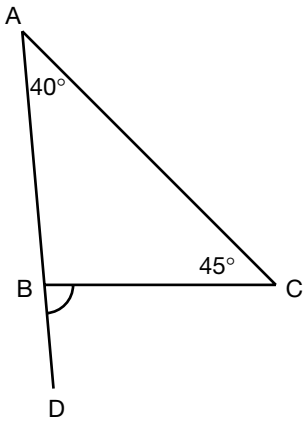
a $\pi \times 20^2 \times 120$ cm^3

b $\pi \times 40^2 \times 120$ cm^3

c $2\pi \times 20 \times 120$ cm^3

d $2\pi \times 40 \times 120$ cm^3

25. ABC is a triangle. AB is extended to D.



What type of angle is ∠CBD?

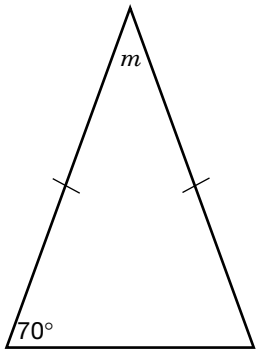
a A straight angle

b An obtuse angle

c An acute angle

d A reflex angle

26. The figure below shows an isosceles triangle.



What is the value of m?

a 40°

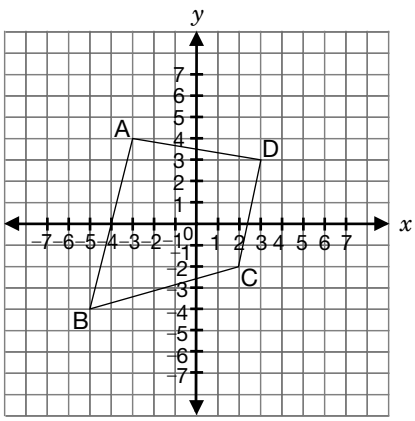
b 50°

c 60°

d 70°

24. a 25. c 26. a

27. Four points, A, B, C and D, are marked on an xy-plane and joined by line segments as shown.



Which line segment has a **negative** slope?

a BA

b BC

c CD

d AD

28. Identify the equation that represents the line with a y-intercept of 600 and a slope of 50.

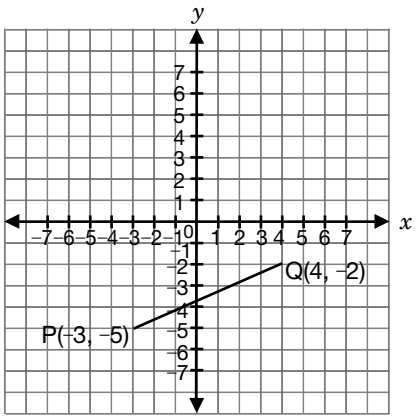
a $y = 50x$

b $x = 600y$

c $y = 600x + 50$

d $y = 50x + 600$

29. PQ is a line segment with slope $\frac{3}{7}$, as shown below.



The point R is plotted so that RQ is **perpendicular** to PQ.

Which of the following points could be point R?

a (1, 5)

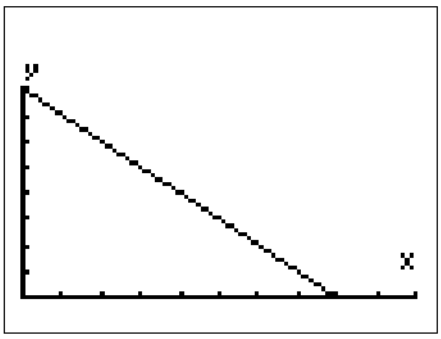
b (2, 4)

c (3, 2)

d (4, 1)

 27. d 28. d 29. a

30. Study the display on Marie's graphing calculator.



Which statement describes the relation between x and y?

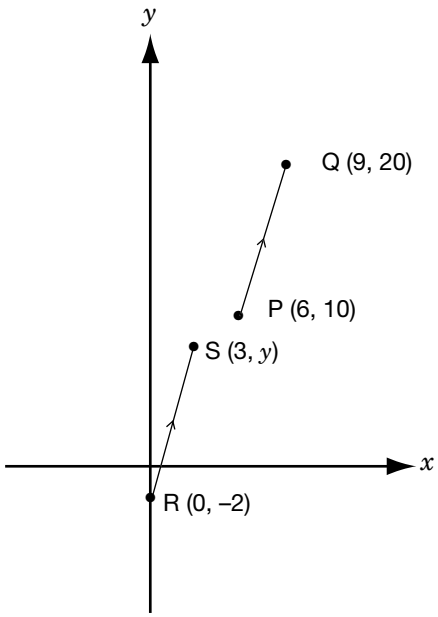
a y increases linearly as x increases.

b y decreases linearly as x increases.

c y increases non-linearly as x increases.

d y decreases non-linearly as x increases.

31. PQ and RS are parallel line segments. What is the value of y?



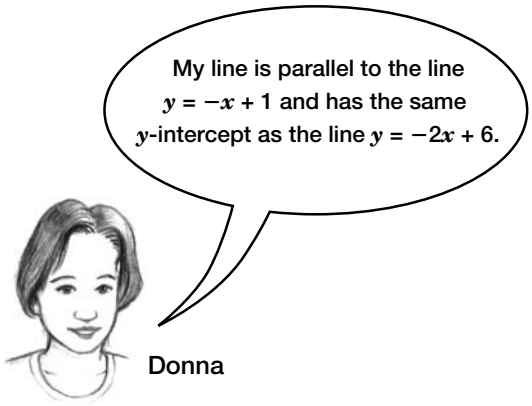
a 5

b 6

c 7

d 8

32. Donna has correctly drawn a line on an xy-plane.



Which of the following equations represents the line that Donna has drawn?

a $y = x + 3$

b $y = x + 6$

c $y = -x + 6$

d $y = -x + 3$

Hint: You don't need to do any calculations. Donna's line has the same y-intercept as y=-2x+6 and the same slope as y=-x+1.

 32. c

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EQAO
Education Quality and Accountability Office

Printed on recycled paper.

Academic

Grade 9 Assessment of Mathematics

Multiple-Choice Items

Spring 2005

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

EQAO
Education Quality and Accountability Office

1. The average temperature during **10 days** in March is given by the expression

$$\frac{6(-2) - 5 + 3(-1)}{10}$$

What is the value of the expression?

a 2

b 1

c −1

d −2

2. Simplify the following expression:

$$3x(2x + 3) - 5x$$

a $6x^2 - 5x + 3$

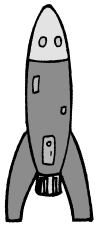
b $6x^2 - 6x$

c $15x^2 - 5x$

d $6x^2 + 4x$

3. While experimenting with a toy rocket, Dan determines that he can model the rocket's height, h, in metres, with respect to time, t, in seconds, using the equation

$$h = \frac{1}{2}t^2$$



Which calculation correctly finds the value of h when $t = 10$?

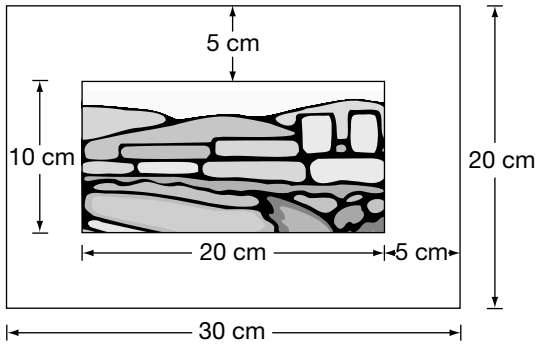
a $h = \frac{1}{2} \times 10^2$
$= 5^2$
$= 25$

b $h = \frac{1}{2} \times 10^2$
$= \frac{1}{2} \times 20$
$= 10$

c $h = \frac{1}{2} \times 10^2$
$= \frac{1}{2} \times 100$
$= 50$

d $h = \frac{1}{2} \times 10^2$
$= \frac{1}{4} \times 100$
$= 25$

4. A frame around a photograph is 5 cm wide.



What **percentage** of the entire area is the frame?

a 25%

b 33%

c 50%

d 67%

5. In a soccer league, a win counts for 2 points, a tie counts for 1 point and a loss counts for 0 points. A soccer team has 5 wins, 2 ties and 3 losses.

If the team continues to win, tie and lose in the same ratio, which of the following values is the best prediction of their point total after 40 games?

a 36 points

b 48 points

c 96 points

d 480 points

6. The advertisement below shows the sale price of a big-digit calculator.

What is the best estimate of the **regular price** of the big-digit calculator?

a $12

b $14

c $16

d $18

7. Juan would like to order some stationery items from a catalogue. He can spend up to $15.00 but not more.

Which of the following groups of items, including 15% tax, can Juan afford to buy with his $15.00?

a One binder, one stapler and three steel clips

b Two steel clips, two binders and two notebooks

c One notebook, one stapler and one mechanical pencil

d One binder, one glue stick and two mechanical pencils

8. An influenza virus has a surface area of

$0.000\ 000\ 05\ \text{mm}^2$.

What is this number expressed in scientific notation?

a $5 \times 10^{-7}\ \text{mm}^2$

b $5 \times 10^{-8}\ \text{mm}^2$

c $5 \times 10^{7}\ \text{mm}^2$

d $5 \times 10^{8}\ \text{mm}^2$

Powers with negative exponents are no longer found in the grade 9 curriculum.

9. Simplify fully:

$-5x(4 - 3x) + 2x^2$

a $2x^2 - 17x$

b $2x^2 - 23x$

c $17x^2 - 5x$

d $17x^2 - 20x$

10. A pill contains 1.75×10^{-3} g of calcium and 1.25×10^{-4} g of iron.

What is the **combined mass** of the calcium and iron in the pill?

a 1.875×10^{-3} g

b 3.0×10^{-3} g

c 1.875×10^{-7} g

d 1.42×10^{-4} g

11. The following tables express distance, in metres, as a function of time, in seconds.

Which table represents a **linear** relation?

a

Time (s)	Distance (m)
0	236
1	231
2	216
3	191

b

Time (s)	Distance (m)
0	1
1	2
2	4
3	8

c

Time (s)	Distance (m)
0	28
1	46
2	50
3	64

d

Time (s)	Distance (m)
0	16
1	12
2	8
3	4

 8. b 9. d 10. a 11. d

12. Inez created the following table of values based on a relationship between x and y and calculated the first differences. The values of y have been concealed.

x	y	First differences
11		
12		–3
13		–3
14		–3

Which statement describes the relationship between x and y?

a y increases linearly as x increases.

b y decreases linearly as x increases.

c y increases non-linearly as x increases.

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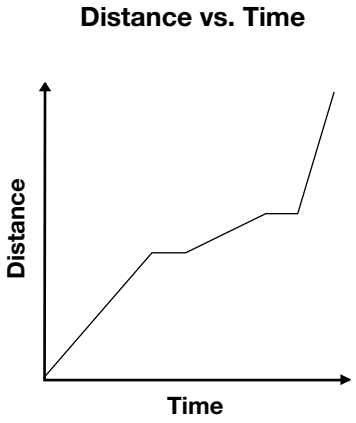
13. The graph below shows a runner's **distance** from the starting point of a race over time.



The runner

a ran at 2 different speeds and took 3 breaks.

b ran at 3 different speeds and took 2 breaks.

c always ran at the same speed and took 2 breaks.

d ran at 5 different speeds.

12. b 13. b

14. Sergio sells 7 models of CD players. The table shows the unit cost of each model and the number of CD players of that model sold in the past month.

Model	Unit cost ($)	Number sold
A	55	11
B	70	14
C	90	17
D	100	21
E	120	24
F	150	29
G	200	41

Which statement about the relationship between the unit cost and the number of CD players sold is **true**?

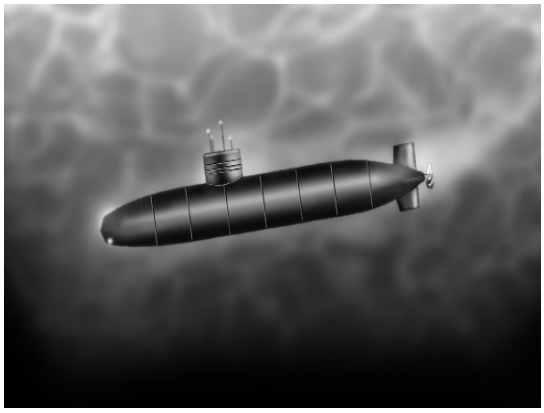
a There is no relationship between the unit cost and the number sold.

b As the unit cost increases, the number sold decreases.

c As the unit cost increases, the number sold is constant.

d As the unit cost increases, the number sold increases.

15. A submarine is submerging. The graph shows the distance below sea level the submarine has descended over time.



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5	38 400

If the trend continues, what will Natasha's annual salary be in the 8th year?

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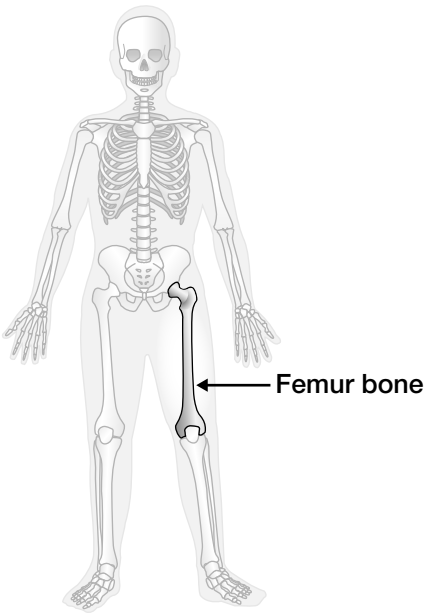


According to the formula, what is **the height** of a person with a femur bone of 48.6 cm in length?

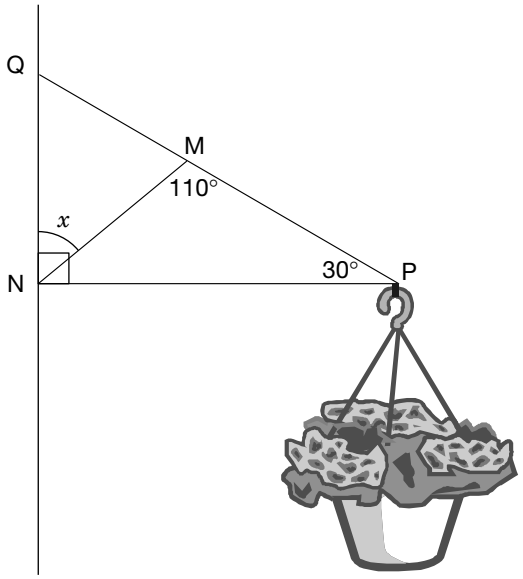
a 109 cm

b 178 cm

c 186 cm

d 347 cm

18. A flowerpot hangs from a brace. △MNQ and △MNP form the brace.



What is the value of x?

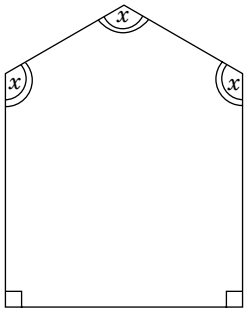
a 22°

b 30°

c 40°

d 50°

19. What is the measure of x?



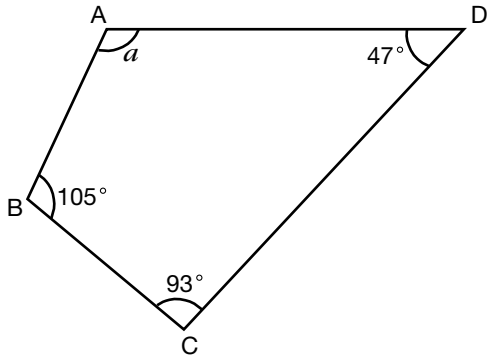
a 95°

b 110°

c 120°

d 132°

20. ABCD is a quadrilateral.



What is the value of a?

a 105°

b 115°

c 120°

d 125°

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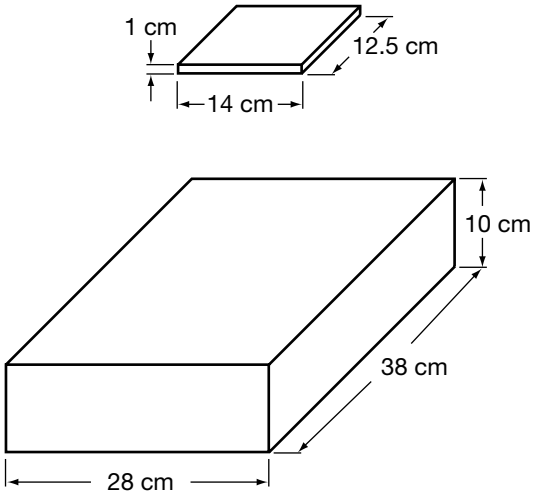

What is the largest number of CD cases Elisa can pack inside the covered storage box?

a about 40

b about 50

c about 60

d about 70

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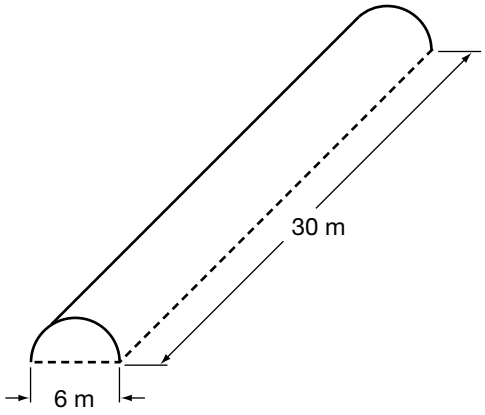


What is the approximate surface area of the curved roof?

a 283 m^2

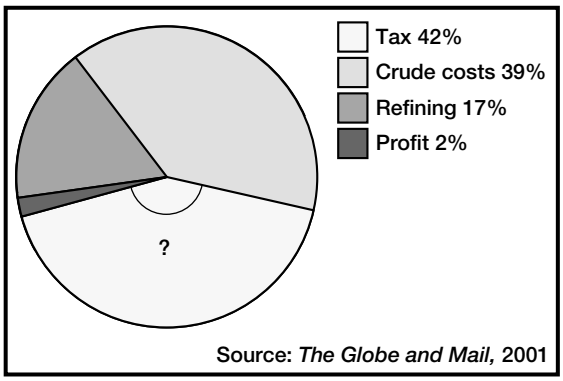
b 424 m^2

c 565 m^2

d 848 m^2

21. c 22. a

23. The circle graph shows the breakdown of the price of gasoline in Ontario in 2001.



What is the approximate measure of the marked angle?

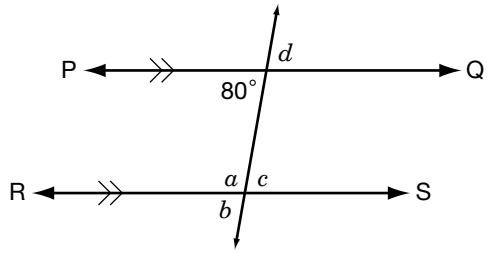
a 60°

b 90°

c 110°

d 150°

24. In the figure, PQ is parallel to RS.



Which of the following angles has a measure equal to 100°?

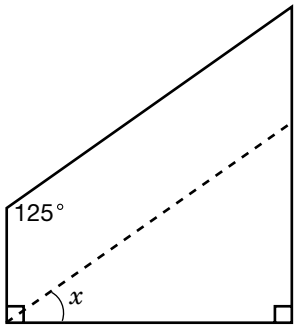
a a

b b

c c

d d

25. Teresa needs to cut a piece of wood in order to make a parallelogram. She marks a line on the wood where she will cut.



What is the size of angle x?

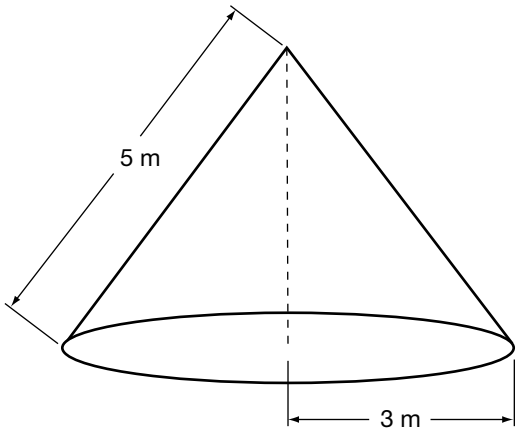
a 25°

b 35°

c 45°

d 55°

26. A tent has the shape of a cone. The radius of the base is 3 m, and the slant height is 5 m.



What is the approximate surface area of the tent, including the floor?

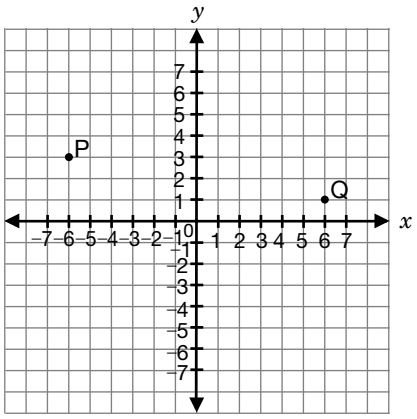
a 38 m^2

b 48 m^2

c 75 m^2

d 95 m^2

27. P is the point (−6, 3) and Q is the point (6, 1).



Which statement about the line segment PQ is **true**?

a It has a positive slope.

b It has a negative slope.

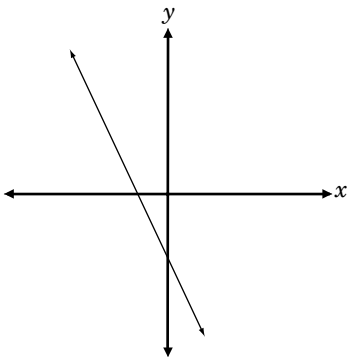
c It has a slope of 0.

d It is parallel to the y-axis.

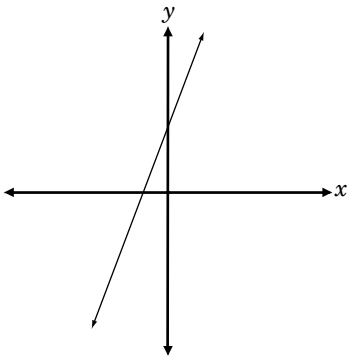
28. Which of the following graphs best represents the line with

- a slope of 3 and
- a y-intercept of -2?

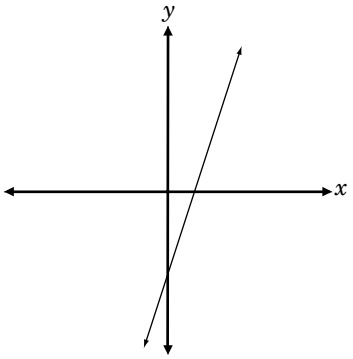
a



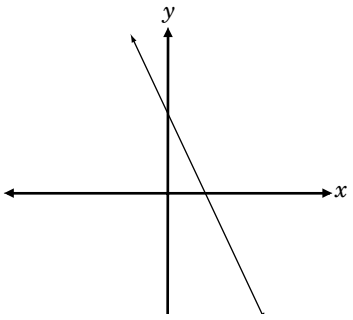
b



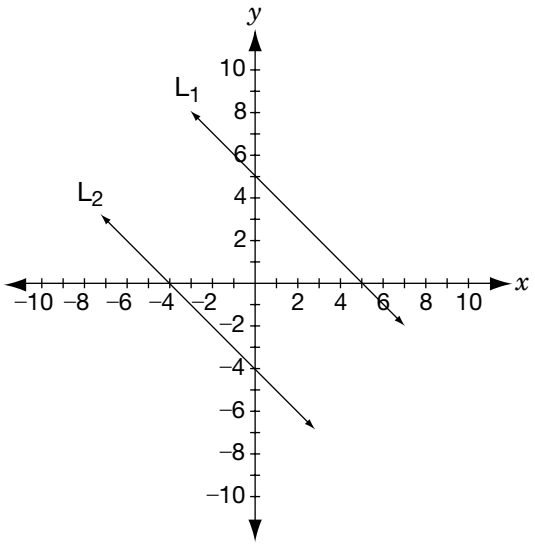
c



d



29. Which pair of equations best matches the lines shown on the graph?



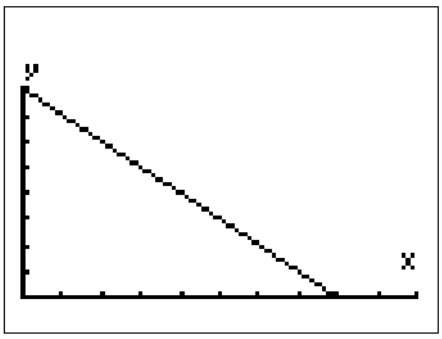
a $L_1: y = x + 5$
$L_2: y = x - 4$

b $L_1: y = x + 5$
$L_2: y = -x + 4$

c $L_1: y = -x + 5$
$L_2: y = x - 2$

d $L_1: y = -x + 5$
$L_2: y = -x - 4$

30. Study the display on Marie's graphing calculator.



Which statement describes the relation between x and y?

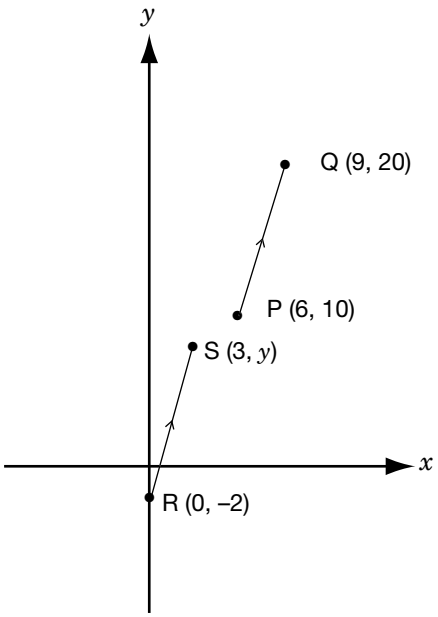
a y increases linearly as x increases.

b y decreases linearly as x increases.

c y increases non-linearly as x increases.

d y decreases non-linearly as x increases.

31. PQ and RS are parallel line segments. What is the value of y?



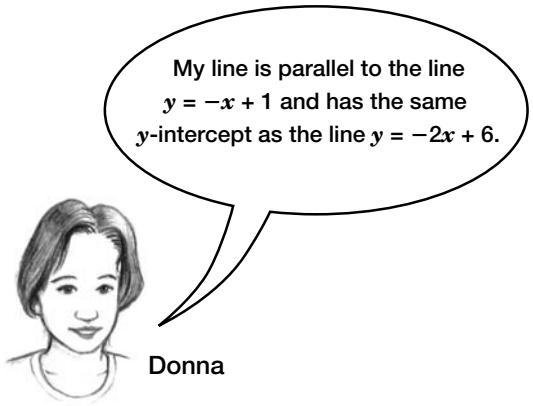
a 5

b 6

c 7

d 8

32. Donna has correctly drawn a line on an xy-plane.



Which of the following equations represents the line that Donna has drawn?

a $y = x + 3$

b $y = x + 6$

c $y = -x + 6$

d $y = -x + 3$

Academic

Grade 9 Assessment of Mathematics

Winter 2006

EQAO

Education
Quality and
Accountability
Office

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

1. Asha receives $10 000.

Asha keeps **half** his money and gives **the rest** to Bertha.

Bertha keeps **half** her money and gives **the rest** to Calvin.

Calvin keeps **half** his money and gives **the rest** to Dane.

Dane keeps **half** his money and gives **the rest** to Evanna.

Which expression shows the dollar amount of money that **Evanna** receives from Dane?

a $10\,000 \div 2^4$ *

b $5000 \times \frac{1}{2} \times \frac{1}{2}$

c $10\,000 \div \frac{1}{2} \div \frac{1}{2} \div \frac{1}{2} \div \frac{1}{2}$

d $2500 \div 2$

Correct answers are marked with a tiny asterisk (*).

2. With $12.00, Sam and a friend are buying lunch from the menu below.

Which of the following orders could they buy with their $12.00?

a two soft drinks and two turkey sandwiches

b one tomato soup, one tea and two ham and cheese sandwiches

c one tomato soup, one juice, two green salads and one hamburger *

d one soft drink, one tea, one turkey sandwich and one ham and cheese sandwich

Correct answers are marked with a tiny asterisk (*).

3. If $x = 3$, what is the value of $2x^2 + 5x$?

a 21

b 27

c 33 *

d 51

4. The cost, C, in dollars to print n leaflets is given by the formula

$C = 35 + 0.03n$.

What is the cost of printing 900 leaflets?

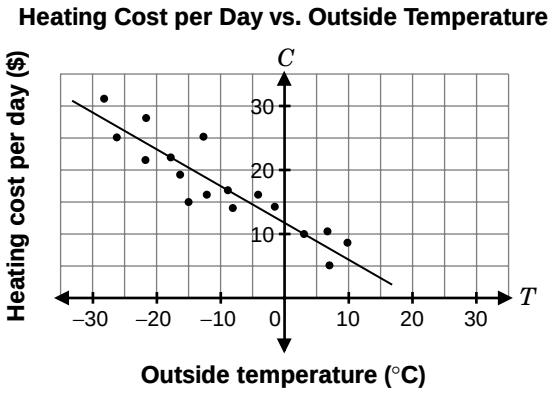
a $27.00

b $35.00

c $37.70

d $62.00 *

5. Duncan records the outside temperature at noon each day. He also records the heating cost per day. The graph shows a scatter plot and a line of best fit for his data.



By approximately how much does the heating cost per day **decrease** when the outside temperature increases **by 5°**?

a $1

b $3 *

c $5

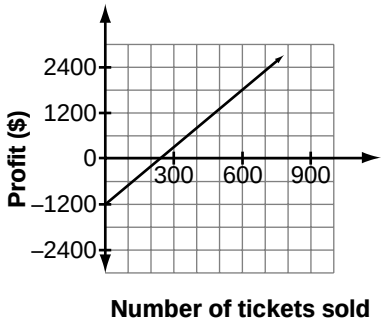
d $7

Correct answers are marked with a tiny asterisk (*).

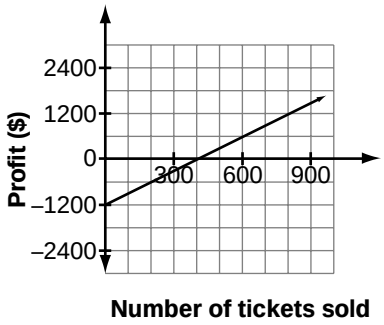
6. A student council is selling tickets to a video dance for $5 each. The cost of the disc jockey and the equipment is $1200.

Which of the following graphs represents the relationship between the profit in dollars made by the student council and the number of tickets sold?

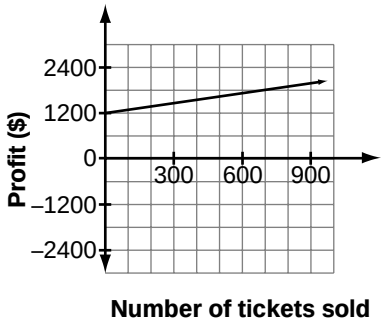
a *



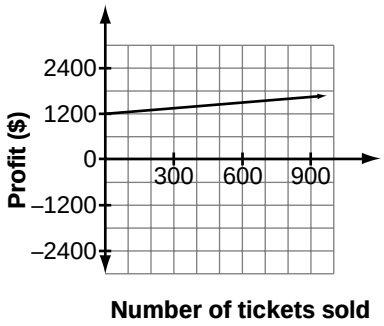
b



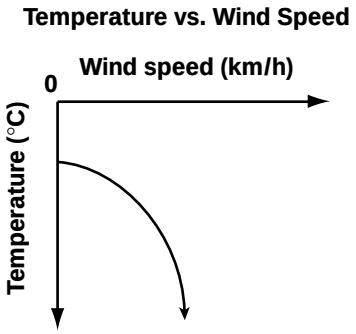
c



d



7. The graph below shows a **non-linear** relationship between temperature and wind speed.



Which table of values represents this non-linear relationship?

a

Wind speed (km/h)	Temperature (°C)
0	–20
10	–30
20	–40
30	–50

b *

Wind speed (km/h)	Temperature (°C)
0	–20
10	–25
20	–35
30	–50

c

Wind speed (km/h)	Temperature (°C)
0	–20
10	–40
20	–60
30	–80

d

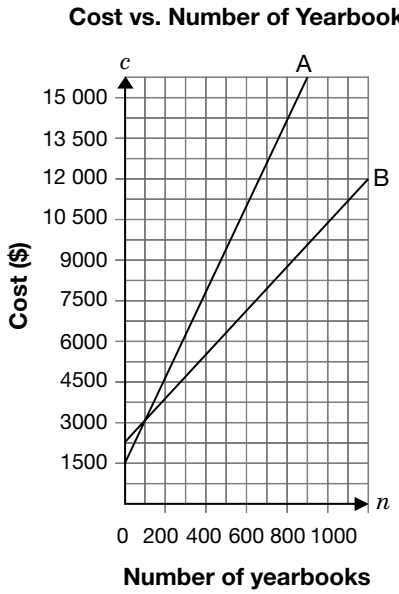
Wind speed (km/h)	Temperature (°C)
0	–20
10	–35
20	–50
30	–65

Correct answers are marked with a tiny asterisk (*).

8. The **total cost of printing** yearbooks is made up of a **fixed setup cost,** plus a **cost per book.**

Graph A represents the total cost of printing the yearbooks **last** year.

Graph B represents the total cost of printing the yearbooks **this** year.



Which statement is **true**?

a The fixed setup costs for printing yearbooks last year and this year are the same.

b The fixed setup cost for printing yearbooks this year is lower than the fixed setup cost last year.

c The cost per book for printing this year is more than the cost per book for printing last year.

d The cost per book for printing last year is more than the cost per book for printing this year. *

9. How many of these equations represent straight lines?

$y = x - 2$

$y = 2 - 4x$

$y = x^2 + 8$

a one

b two *

c three

d none

10. Rearrange $4y - x = 8$ so that it is in the form $y = mx + b$.

a $y = x + 8$

b $y = -x + 2$

c $y = \frac{1}{4}x + 2$ *

d $y = -\frac{1}{4}x + 2$

11. What is the equation of the line that passes through the point (2, 0) and is parallel to the line $y = -3x + 4$?

a $y = 3x + 2$

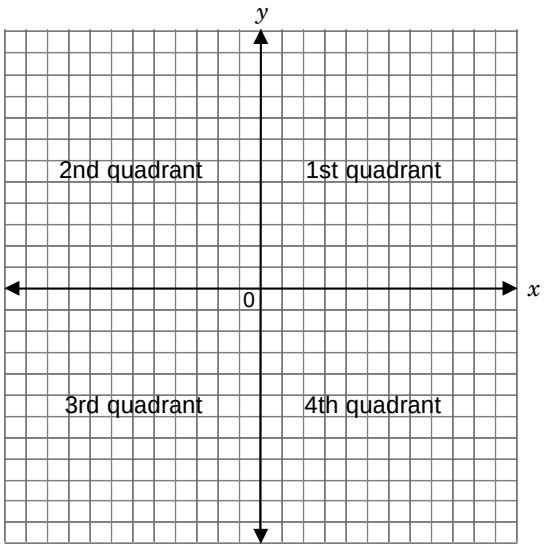
b $y = 3x + 6$

c $y = -3x + 2$

d $y = -3x + 6$ *

Correct answers are marked with a tiny asterisk (*).

12. The equations $y = -x - 5$ and $y = 3$ represent straight lines that intersect.



In which quadrant do they intersect?

a 1st

b 2nd *

c 3rd

d 4th

13. If the diameter of a volleyball is three times the diameter of a tennis ball, which statement below is true?

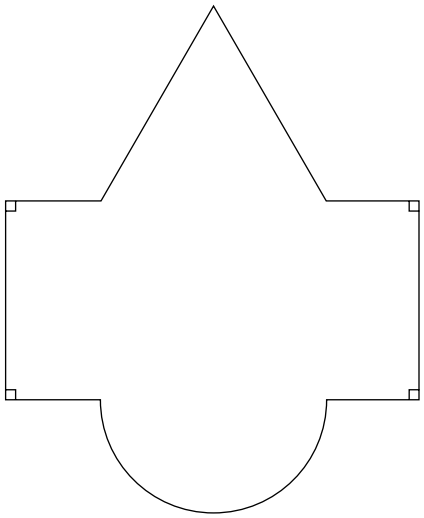
a The volume of the volleyball is 3 times the volume of the tennis ball.

b The volume of the volleyball is 9 times the volume of the tennis ball.

c The surface area of the volleyball is 9 times the surface area of the tennis ball. *

d The surface area of the volleyball is 27 times the surface area of the tennis ball.

14. The floor plan of the lobby of a hotel is shown below.



Which of the following formulas is not useful to determine the area of part of the lobby?

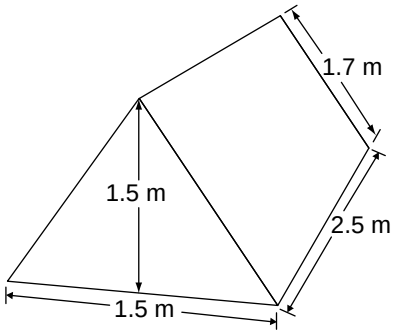
a $\frac{b \times h}{2}$

b $\frac{\pi r^2}{2}$

c $\frac{4}{3}\pi r^3$ *

d $l \times w$

15. Examine the tent below.



Which of the following is the surface area of the tent, including the ends and the floor?

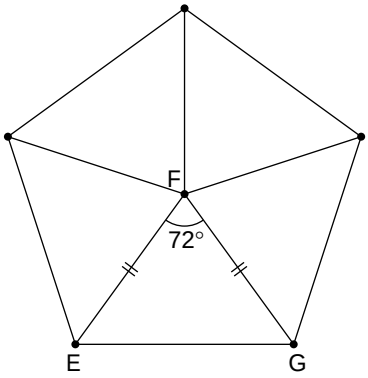
a 4.6 m^2

b 10.5 m^2

c 14.5 m^2 *

d 20.0 m^2

16. Examine the figure below.



What is the measure of ∠FEG?

a 36°

b 54° *

c 60°

d 72°

Correct answers are marked with a tiny asterisk (*).

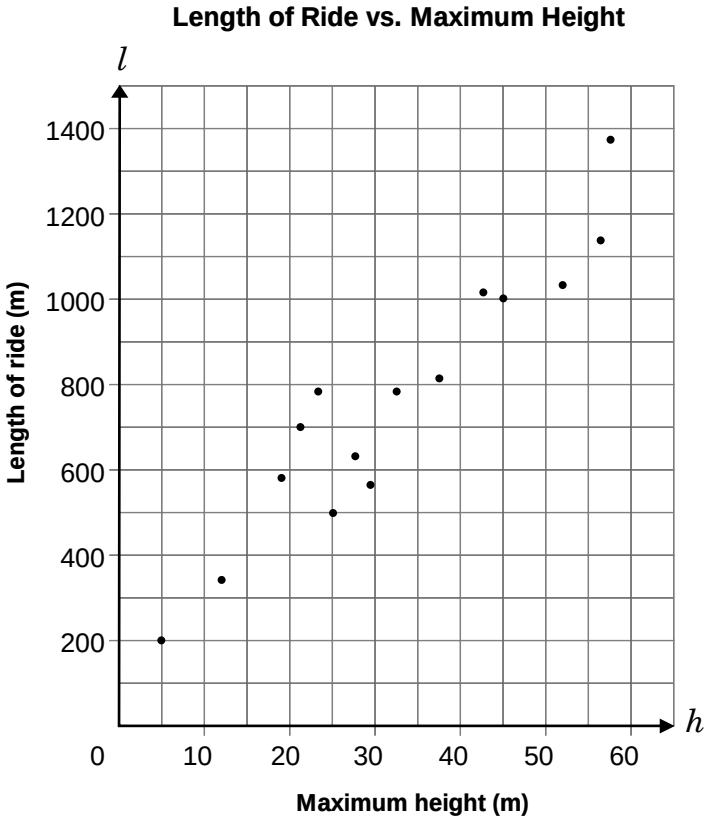
1. Thrill Rides

Susanna travels to different amusement parks to ride 15 roller coasters and collect data about each ride.

She constructs a scatter plot to show the relationship between the **total length** of the ride, l, in metres, and the **maximum height** of its peaks, h, in metres.

a) Draw a **line of best fit** to represent the data.

b) Determine an **equation** for your line of best fit. Justify your answer.



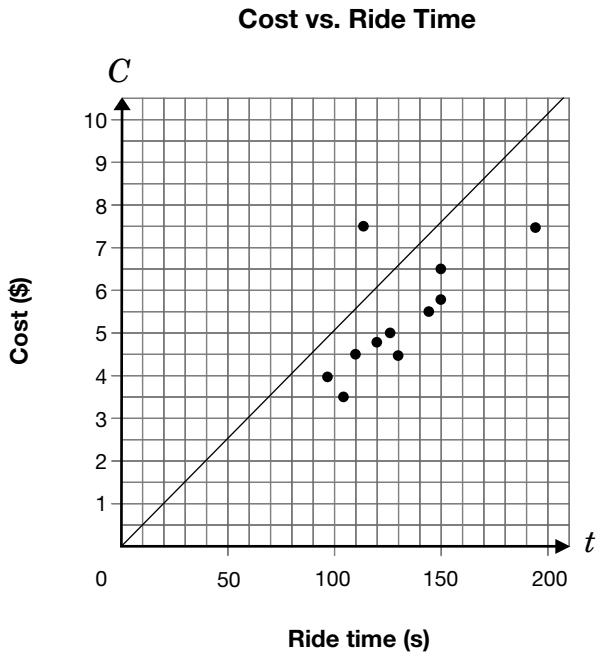
c) Susanna rides another roller coaster. The **length** of the ride on this roller coaster is **500 m.**

Determine its **maximum height,** using your results from part **a)** or **b).**
Justify your answer.

d) Susanna collects data about the relationship between the **cost of each ride,** *C,* in dollars, and **the time the ride lasts,** *t,* in seconds. She plots the data on the graph below.

Susanna graphs the equation $C = 0.05t$. She notices that its line is **not** the line of best fit.

Describe how to change the equation so that it represents the equation of a line of best fit for her data.
Justify your answer.

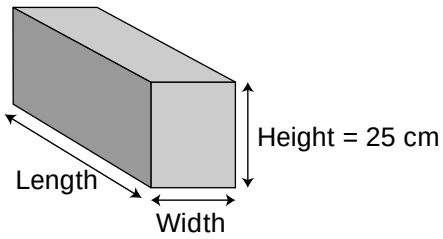


2. Calculating Crates

The Ultraflight Golf Ball Company is designing new shipping crates for its golf balls.

The company requires large crates with a volume of 64 000 cm^3 for shipping boxes of golf balls. The table below gives data about five different crates with heights of 25 cm.

Crate



	Length (cm)	Width (cm)	Height (cm)	Volume (cm^3) $V = lwh$	Surface area (cm^2) $SA = 2(wh + lw + lh)$
Crate 1	128	20	25	64 000	12 520
Crate 2	102.4	25	25	64 000	11 500
Crate 3	80	32	25	64 000	**a)**
Crate 4	64	40	25	64 000	10 320
Crate 5	50.6	50.6	25	64 000	10 180

a) Determine the surface area of Crate 3. Show your work.

Write your answer in the table above.

b) In the table, Crate 5 has the **smallest** surface area.

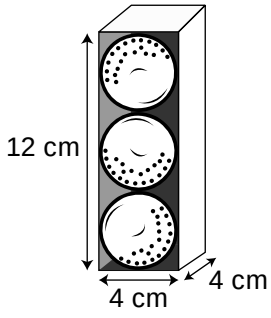
Describe the **relationship** between its length and width that makes it have the smallest surface area.

c) The company designs a **new** crate with a **volume** of **64 000 cm^3.** Its height is **40 cm.**

Use the relationship you found in **b)** to determine the **length and width** of the crate with the smallest surface area.
Justify your answer.

d) Golf balls come in packages of three.
The **radius** of each golf ball is **2 cm.**

How much **wasted space** (air) is in the package? Show your work.



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EQAO
Education Quality and Accountability Office

Academic

Grade 9 Assessment of Mathematics

Spring 2006

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

EQAO
Education Quality and Accountability Office

1. Asha receives $10 000.

Asha keeps **half** his money and gives **the rest** to Bertha.

Bertha keeps **half** her money and gives **the rest** to Calvin.

Calvin keeps **half** his money and gives **the rest** to Dane.

Dane keeps **half** his money and gives **the rest** to Evanna.

Which expression shows the dollar amount of money that **Evanna** receives from Dane?

a $10\,000 \div 2^4$ *

b $5000 \times \frac{1}{2} \times \frac{1}{2}$

c $10\,000 \div \frac{1}{2} \div \frac{1}{2} \div \frac{1}{2} \div \frac{1}{2}$

d $2500 \div 2$

Correct answers are marked with an asterisk (*).

2. With $12.00, Sam and a friend are buying lunch from the menu below.

Which of the following orders could they buy with their $12.00?

a two soft drinks and two turkey sandwiches

b one tomato soup, one tea and two ham and cheese sandwiches

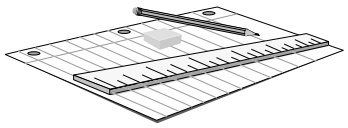
c one tomato soup, one juice, two green salads and one hamburger *

d one soft drink, one tea, one turkey sandwich and one ham and cheese sandwich

Correct answers are marked with an asterisk (*).

3. Sabeeta expands and simplifies the expression below.

$$2(3x^2 - 5x) + 4x(7 + x)$$



Which expression is equivalent to the one above?

a $6x^2 + 22x$

b $10x^2 + 18x$ *

c $10x^2 - 38x$

d $28x^2$

4. If $x = 3$, what is the value of $2x^2 + 5x$?

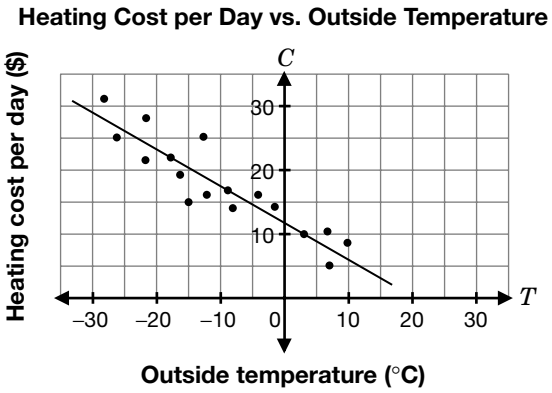
a 21

b 27

c 33 *

d 51

5. Duncan records the outside temperature at noon each day. He also records the heating cost per day. The graph shows a scatter plot and a line of best fit for his data.



By approximately how much does the heating cost per day **decrease** when the outside temperature increases **by 5°**?

a $1

b $3 *

c $5

d $7

Correct answers are marked with an asterisk (*).

6. The student council sells lollipops for 10¢ each. They pay 4¢ for each lollipop and spend $10 to advertise the sale.

P represents the student council's profit, in dollars, and n represents the number of lollipops sold.

Which **equation** represents the profit?

a $P = 0.06n - 10$ *

b $P = 0.06n + 10$

c $P = 10n + 0.06$

d $P = 10 + 0.04n$

7. Soheila needs to calculate the first differences for the relations below. Which relation will she find is **linear**?

a

Time (in hours)	Distance (km)	First differences
3	10	
4	100	?
5	1000	?
6	10000	?

b

Time (in hours)	Distance (km)	First differences
1	25	
2	30	?
3	35	?
4	45	?

c

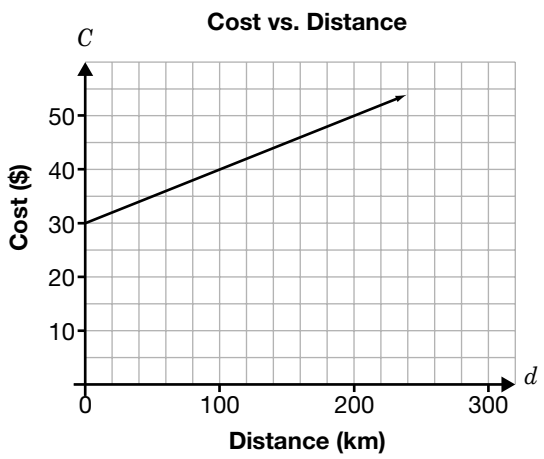
Time (in hours)	Distance (km)	First differences
3	20	
5	30	?
7	40	?
9	60	?

d *

Time (in hours)	Distance (km)	First differences
10	60	
8	55	?
6	50	?
4	45	?

Correct answers are marked with an asterisk (*).

8. Which equation represents the line on the graph?



a $C = 0.1d + 30$ *

b $C = 0.4d + 30$

c $C = d + 30$

d $C = 10d + 30$

9. How many of these equations represent straight lines?

$y = x - 2$

$y = 2 - 4x$

$y = x^2 + 8$

a one

b two *

c three

d none

10. Rearrange $4y - x = 8$ so that it is in the form $y = mx + b$.

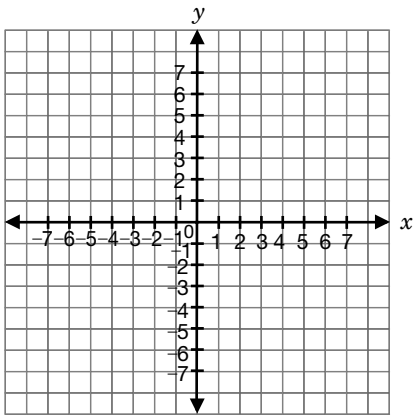
a $y = x + 8$

b $y = -x + 2$

c $y = \frac{1}{4}x + 2$ *

d $y = -\frac{1}{4}x + 2$

11. What are the coordinates of the point of intersection of the lines $y = -x + 1$ and $x = 3$?



a (2, 3)

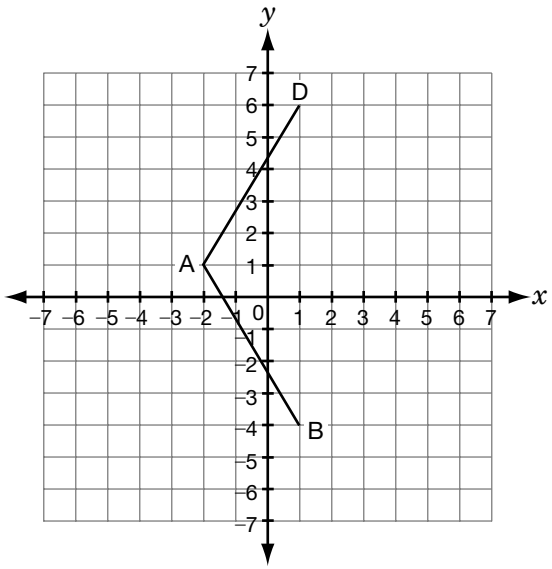
b (3, 2)

c (3, –2) *

d (–2, 3)

Correct answers are marked with an asterisk (*).

12. A is the point (−2, 1), B is the point (1, −4) and D is the point (1, 6).



If ABCD is a rhombus, which of the following points is point C?

a (1, 1)

b (1, 4)

c (4, 1) *

d (4, 4)

13. If the diameter of a volleyball is three times the diameter of a tennis ball, which statement below is true?

a The volume of the volleyball is 3 times the volume of the tennis ball.

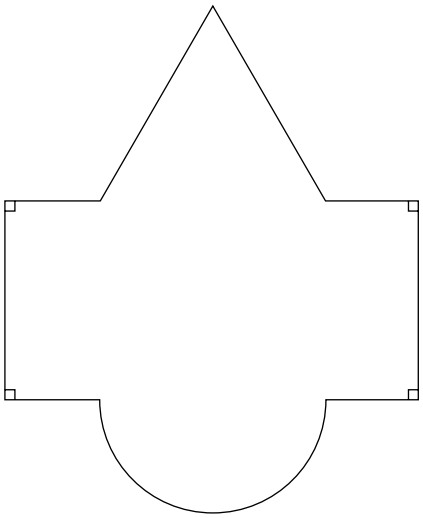
b The volume of the volleyball is 9 times the volume of the tennis ball.

c The surface area of the volleyball is 9 times the surface area of the tennis ball. *

d The surface area of the volleyball is 27 times the surface area of the tennis ball.

Correct answers are marked with an asterisk (*).

14. The floor plan of the lobby of a hotel is shown below.



Which of the following formulas is not useful to determine the area of part of the lobby?

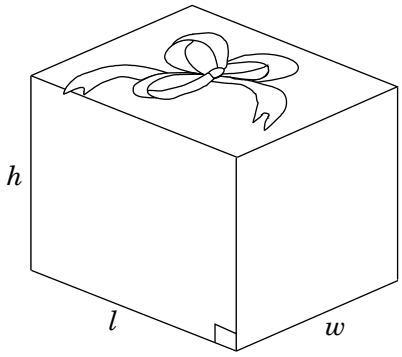
a $\frac{b \times h}{2}$

b $\frac{\pi r^2}{2}$

c $\frac{4}{3}\pi r^3$ *

d $l \times w$

15. Hunaid is wrapping the gift shown below.



Which formula should he use to determine **the amount of wrapping paper** he needs to cover the box?

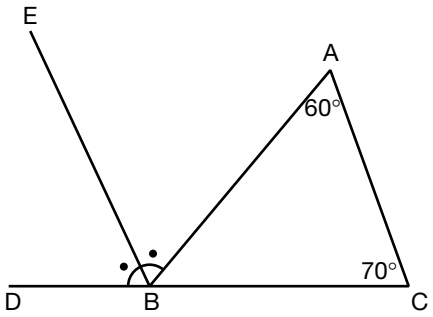
a $V = lwh$

b $A = lw$

c $P = 2l + 2w$

d $SA = 2(wh + lw + lh)$ *

16. In the diagram below, line segment EB bisects ∠ABD.



What is the measure of ∠ABE?

a 60°

b 65° *

c 70°

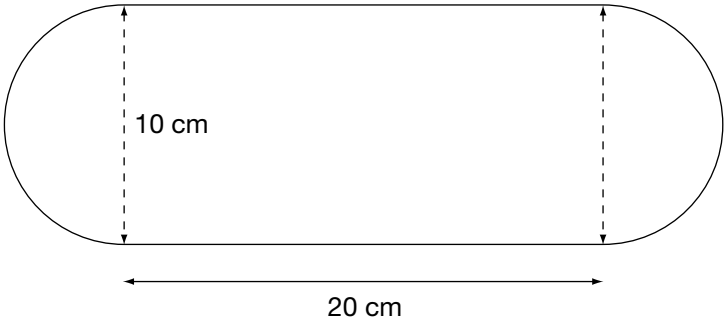
d 130°

Correct answers are marked with an asterisk (*).

1. Choc-o-Can

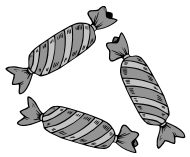
Sweet Shapes is a company that makes chocolate. Each year, the company produces a new can for its specialty chocolates. This year's can is illustrated below. The top of the can swings open for easy access.

Derek makes a sketch of the bottom of the can and records the measurements below.

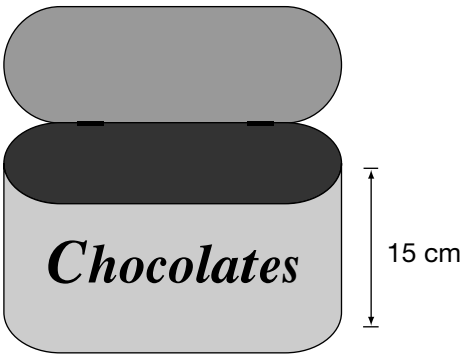


a) Determine the area of the bottom of the can.
Show your work.

b) The can contains individually wrapped chocolates that each take up about **28 cm^3** of space.



Determine how many chocolates a container of height 15 cm will hold.
Show your work.

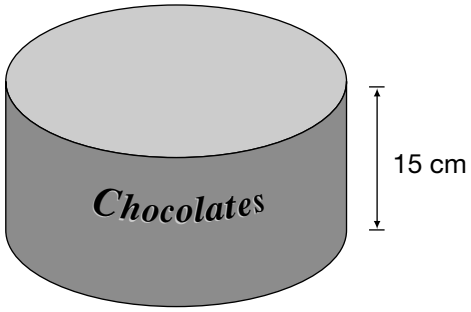


c) Sweet Shapes wants to reduce the size of each chocolate by 15%. Determine the volume of 100 of the reduced chocolates.
Show your work.

Reminder:
The original chocolates each take up about **28 cm^3** of space.

d) Next year, Sweet Shapes will produce a **cylindrical can** for the chocolates. The can will contain 75 wrapped chocolates, each with a volume of 19 cm^3. This can will also have a **height** of **15 cm.**

Determine the radius of this can.
Show your work.

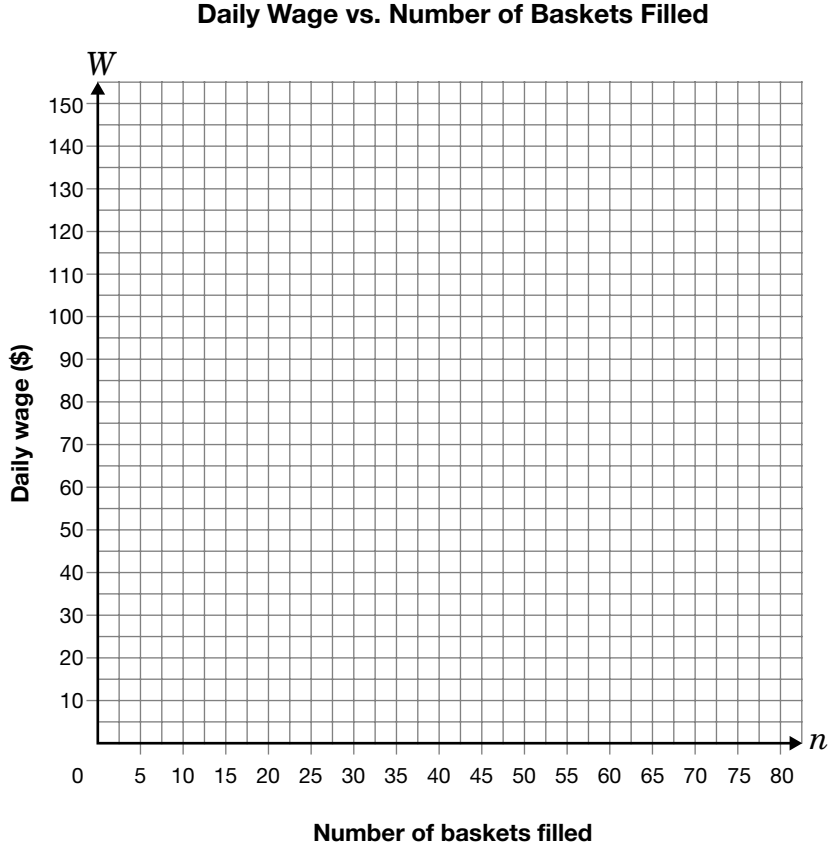


2. Berries for Picking

Sanya has a summer job picking berries at a farm. Each day, she is paid a base salary, plus an amount for each basket she fills with berries.

The equation $W = 15 + 1.25n$ represents the relationship between Sanya's **daily wage,** *W,* in dollars, and the **number of baskets** she fills, *n.*

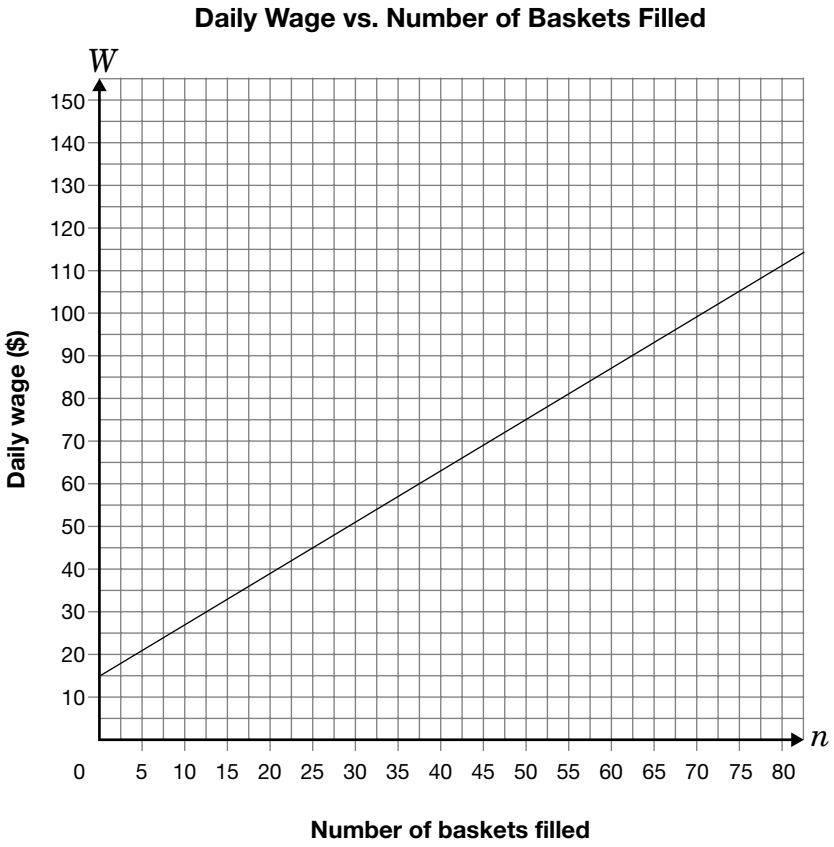
a) Graph the relationship represented by the equation on the grid below.



b) Explain what the **slope** of the line means in relation to picking berries.

c) Determine **the number of baskets** that Sanya must fill to have a daily wage of **$70.** Show your work.

d) Sanya's brother picks cucumbers at another farm. His payment structure is represented on the graph below.



He is offered a **new** payment structure of $2.00 per basket but **no daily base salary.**

Should Sanya's brother accept this new payment structure?
Explain your answer.

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Student responses in this booklet may be used as examples for the marking of the assessment, and may be included without attribution in public reports.

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EQAO
Education Quality and Accountability Office

Academic

Grade 9 Assessment of Mathematics

Winter 2007

SAMPLE ASSESSMENT QUESTIONS

Education Quality and Accountability Office

EQAO

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

1 Meg has been asked to determine the value of the numerical expression below.

$$\frac{2^{400}}{2^{396}} - 2^3$$

Which of the following is the value of Meg's expression?

A 1

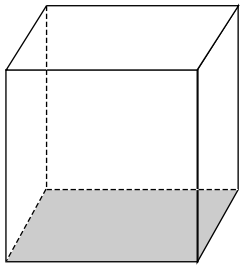
B 2

C 4

D 8

2 Expressions for the base area and volume of a prism are given below.

Volume = $64a^3b^6$



Base area = $16ab^3$

Which expression represents the height of the prism?

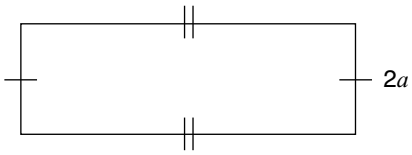
F $4a^2b^3$

G $4a^3b^3$

H $1024a^3b^9$

J $1024a^4b^9$

3 A rectangular field has a **perimeter** of $(10a - 6)$ metres and a width of $2a$ metres.



Which expression represents the **length** of this field?

A $8a - 6$

B $12a - 6$

C $3a - 3$

D $3a^2 - 3$

4 Which value of x satisfies the equation $5 - 2x = 9$?

F $x = -7$

G $x = -2$

H $x = 2$

J $x = 3$

 1. D 2. F 3. C 4. G

5 Sales Goals

Alexis works part-time at a clothing store. She is paid an hourly rate of $10.25/h and also earns a commission of 3.5% of her total weekly sales.

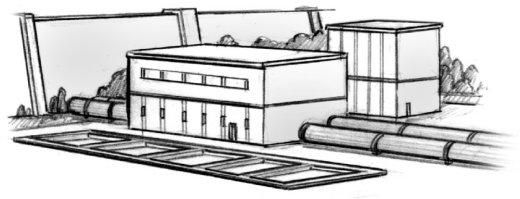
Alexis works at the store 12 hours a week.

If Alexis's goal is to earn $150 every week, what do her total weekly sales need to be?

Show your work.

6 The charges on a monthly water bill are \$0.86 per m^3 of water used plus a service charge of \$4.49.

Let C = total charge, in dollars, and
w = total amount of water used, in m^3.



Which equation represents the relationship between C and w?

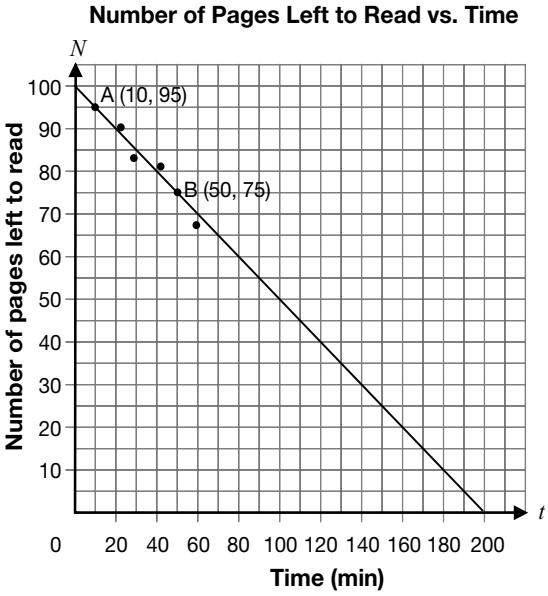
F $C = 4.49 \times 0.86w$

G $C = 4.49w + 0.86$

H $C = 4.49 + 0.86w$

J $C = (4.49 + 0.86)w$

7 The following scatter plot shows the relationship between N, the number of pages in Annie's textbook that she has left to read, and t, the time in minutes she spends reading the book.



Which equation represents the line above?

A $N = -\frac{1}{2}t + 100$

B $N = -\frac{1}{2}t + 200$

C $N = -t + 100$

D $N = -t + 200$

8 Temira needs to rent a car. She considers the following price equations, where C is the total cost, in dollars, and n is the number of days.

Company	Equation
Rentway	$C = 20n + 100$
Cheapie's Rentals	$C = 25n + 50$
Cars Cars Cars	$C = 50n$
Drive Away	$C = 15n + 125$

Which company should she choose if she is planning to rent the car for at least 10 days?

F Rentway

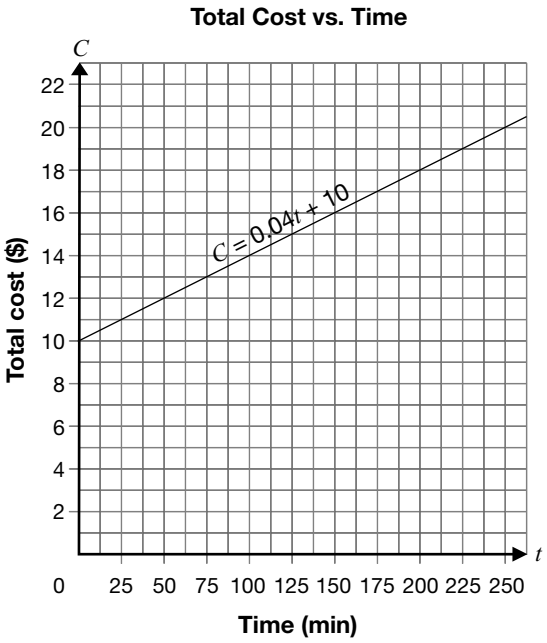
G Cheapie's Rentals

H Cars Cars Cars

J Drive Away

9 Two Internet service providers are competing.

The equation $\boldsymbol{C = 0.04t + 10}$ represents the relationship between the total cost, C, charged by Internet Connections and the time, t.



Surf Away wants **always** to be cheaper than Internet Connections.

Which of the following equations represents this situation?

A $C = 15$

B $C = 0.02t + 11$

C $C = 0.03t + 9$

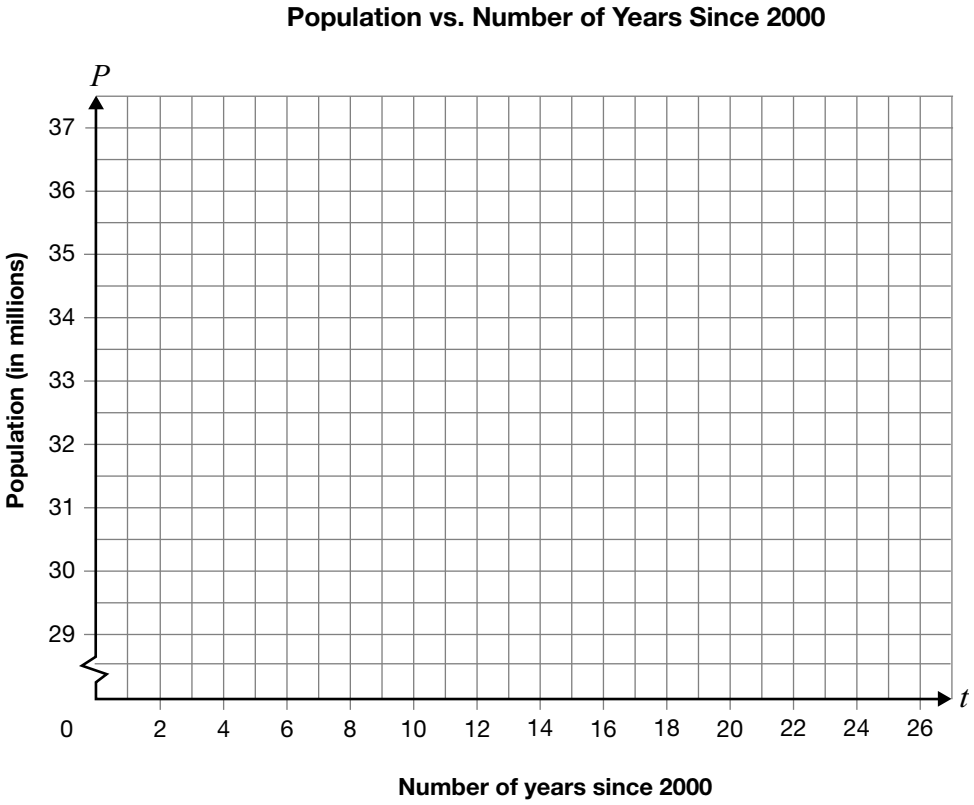
D $C = 0.05t + 8$

8. J 9. C

10 Population Plans

Alvin is researching the population of Canada. He finds data for the year 2001 and predictions for every 5 years after that, as shown below.

Number of years since 2000, *t*	Population (in millions), *P*
1	31.1
6	32.2
11	33.4
16	34.4
21	35.4
26	36.2



Determine an algebraic model for Alvin's data, and use it to make a reasonable prediction for the population of Canada in 2036.

Justify your answer.

11 Which of the following equations is **not** represented by a straight line on a graph?

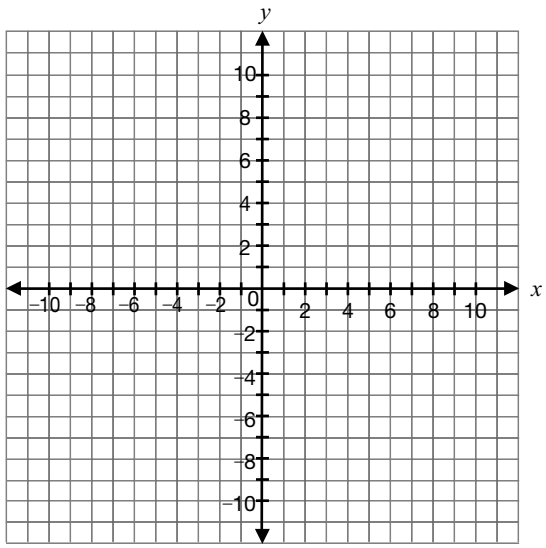
A $x = 3y - 4$

B $y = -2x$

C $x = 4$

D $y = 2x^2 - 2$

12 Imagine the graph for the relation $4x - 5y + 20 = 0$.



What is the **slope**?

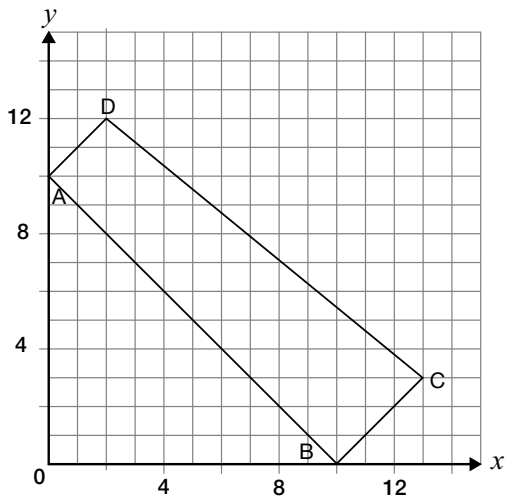
F $\frac{4}{5}$

G $-\frac{4}{5}$

H $\frac{5}{4}$

J 4

13 The following graph shows the quadrilateral ABCD.



Which of the following statements is **false**?

A AD is parallel to BC.

B DC is parallel to AB.

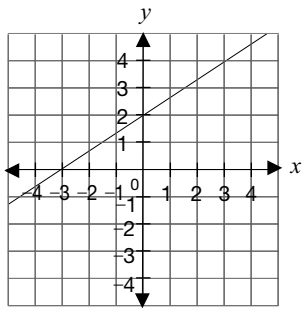
C CB is perpendicular to AB.

D DA is perpendicular to AB.

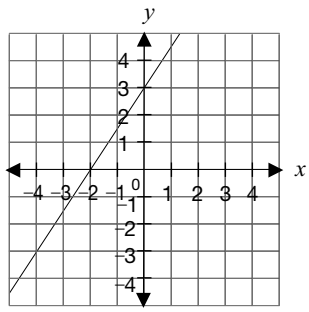
11. D 12. F 13. B

14 Which **graph** represents the relation $y = \frac{2}{3}x + 2$?

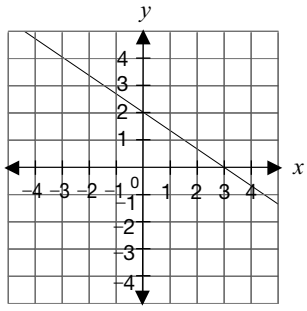
F



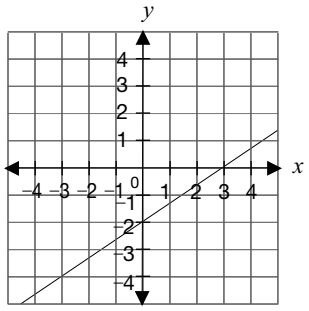
G



H



J



15 A line has the following characteristics.

- It is perpendicular to the line $y = \frac{1}{2}x + 3$.
- It passes through the point (4, 0).

What are m, the slope, and b, the y-intercept, of the line?

A $m = \frac{1}{2}$; $b = 0$

B $m = \frac{1}{2}$; $b = 3$

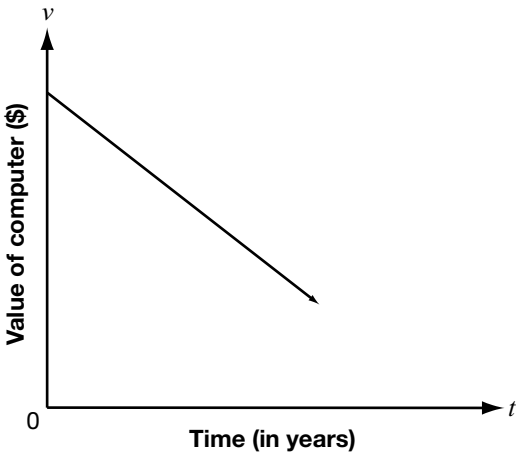
C $m = -2$; $b = 0$

D $m = -2$; $b = 8$

16 A computer decreases in value over time. The relationship between the value of the computer, v, in dollars after t years is written as the equation

$$v = -300t + 2100.$$

A line representing the relationship is graphed.



What does the v-intercept of the line represent?

F The decrease in value per year

G The initial value of the computer

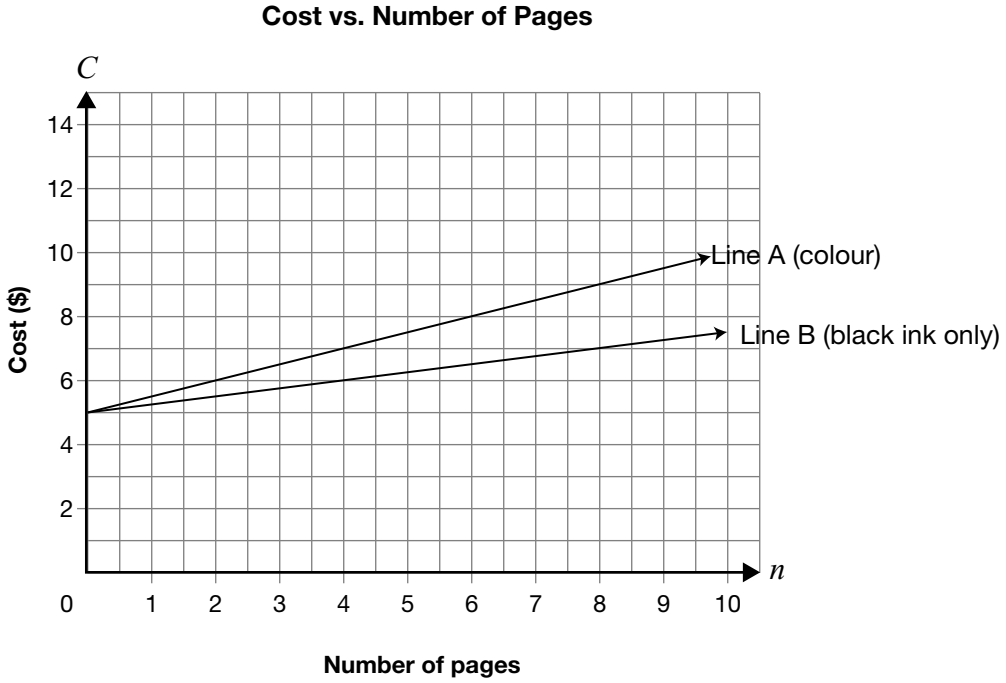
H The number of years until the value is $0

J The number of years the computer will work

 14. F 15. D 16. G

17 To Colour or Not to Colour

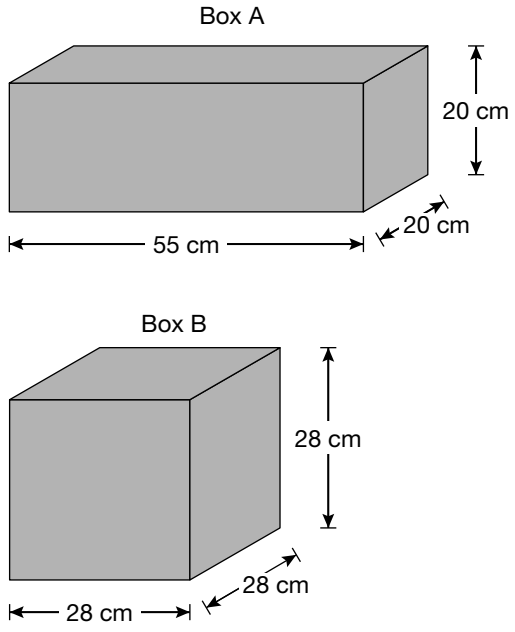
The graph below shows the cost to print a document at the Graphics Shop. Line A represents the cost of printing the document in colour. Line B represents the cost to print it with black ink only.



For a 500-page document, how much more will it cost to print in colour than with black ink only?

Show your work.

18 Box A and Box B have about the same volume. The cost to make a box depends on the amount of cardboard used.



Which of the following statements is correct?

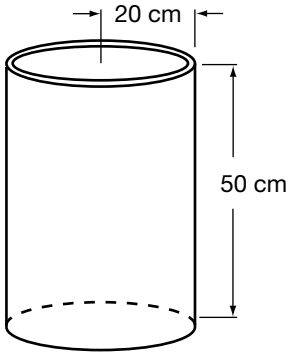
F Box B costs less; it uses 48 cm^3 less cardboard to make.

G Box A costs less; it uses 290 cm^3 less cardboard to make.

H Box B costs less; it uses 496 cm^2 less cardboard to make.

J Box A costs less; it uses 496 cm^2 less cardboard to make.

19 Brad has a cylindrical metal container that is open at the top. He wants to paint the outer surfaces of the container, including the bottom.



Which expression should he use to calculate the area to be painted?

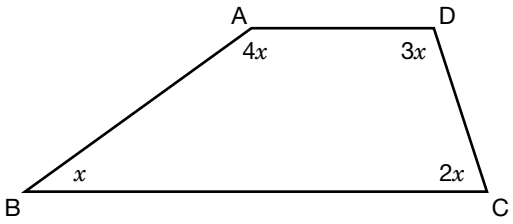
A $\pi(20)(50)$ cm^2

B $2\pi(20)(50)$ cm^2

C $2(\pi(20)^2 + \pi(20)(50))$ cm^2

D $(\pi(20)^2 + 2\pi(20)(50))$ cm^2

20 ABCD is a quadrilateral.



What is the measure of $\angle BAD$?

F 108°

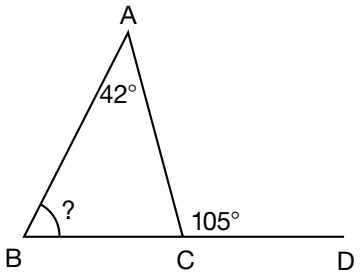
G 120°

H 132°

J 144°

 18. H 19. D 20. J

21 In the figure, BC is extended to D. $\angle BAC = 42°$ and $\angle ACD = 105°$.



What is the value of $\angle ABC$?

A 33°

B 42°

C 52°

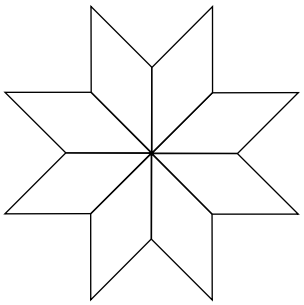
D 63°

21. D

22 Geometric Quilts

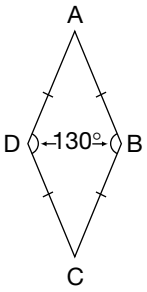
Paul's grandmother wants to use quilt pieces to make an **eight-pointed star** like the one shown.

Eight-Pointed Star



Her quilt pieces are in the shape of a rhombus with two angles of 130°.

Quilt Piece



Is it possible to make an **eight-pointed star** using copies of her quilt piece?

Justify your answer.

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Academic

Grade 9 Assessment of Mathematics

Spring 2007

SAMPLE ASSESSMENT QUESTIONS

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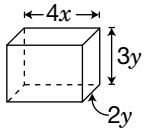
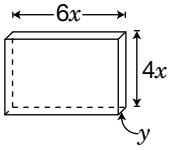
1 Which of the following fish tanks would contain an amount of water represented by the expression $V = 24x^2y$ when completely full?

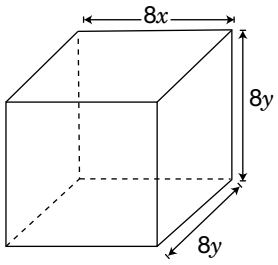
A



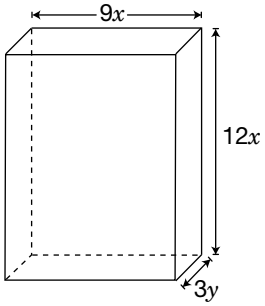
B



C



D



2 Theo plans to purchase a new long-distance telephone plan called the Silver Plan. Under this plan, the telephone company determines the monthly cost using the following charges.

- The base fee is \$30/month, which includes up to 150 minutes of long distance.
- The cost for all minutes over 150 each month is \$0.15/minute.

With the Silver Plan, how much will it cost Theo to talk long-distance for 230 minutes over one month?

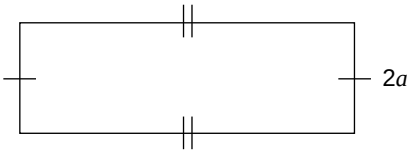
F \$12.00

G \$34.50

H \$42.00

J \$64.50

3 A rectangular field has a **perimeter** of $(10a - 6)$ metres and a width of $2a$ metres.



Which expression represents the **length** of this field?

A $8a - 6$

B $12a - 6$

C $3a - 3$

D $3a^2 - 3$

 1. B 2. H 3. C

4 Disc-ussion

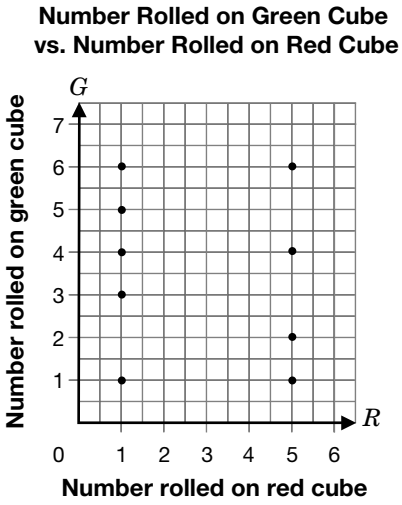
Tyler, Raven and Deb are discussing the number of CDs they each own. They find that the following statements are true:

- Tyler owns five more than twice the number of CDs Raven owns.
- Deb owns three times as many CDs as Tyler.

Using x to represent the number of CDs Raven owns, write an expression for the total number of CDs the three friends own. Show your work and simplify your answer.

5 For a new game, Xiao makes two numbered cubes: one green and one red. She randomly assigns numbers on the six faces of each of the cubes, **possibly** repeating some numbers.

She rolls the red and the green cubes together nine times. She displays the results in a graph.



Which of the following statements does the data in the graph **most likely** suggest about the cubes?

A Each cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cubes' faces.

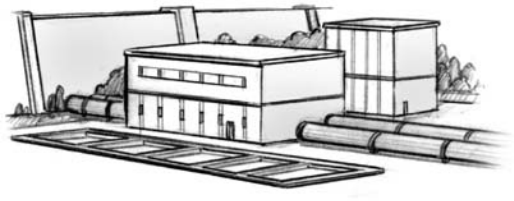
B Each cube has 6 distinct numbers on its faces, as no numbers are repeated on the cubes' faces.

C The green cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cube's faces.

D The red cube has fewer than 6 distinct numbers on its faces, as some numbers are repeated on the cube's faces.

6 The charges on a monthly water bill are \$0.86 per m^3 of water used plus a service charge of \$4.49.

Let C = total charge, in dollars, and
w = total amount of water used, in m^3.



Which equation represents the relationship between C and w?

F $C = 4.49 \times 0.86w$

G $C = 4.49w + 0.86$

H $C = 4.49 + 0.86w$

J $C = (4.49 + 0.86)w$

7 Alex's Rose Shop makes up bouquets and charges for the vase, plus a cost per rose.

- The shop charges \$32.85 for a bouquet of 12 roses.
- The shop charges \$50.85 for a bouquet of 20 roses.

What does Alex's Rose Shop charge for a vase?

A \$18.00

B \$8.00

C \$5.85

D \$2.74

5. D 6. H 7. C

8 Temira needs to rent a car. She considers the following price equations, where C is the total cost, in dollars, and n is the number of days.

Company	Equation
Rentway	$C = 20n + 100$
Cheapie's Rentals	$C = 25n + 50$
Cars Cars Cars	$C = 50n$
Drive Away	$C = 15n + 125$

Which company should she choose if she is planning to rent the car for at least 10 days?

F Rentway

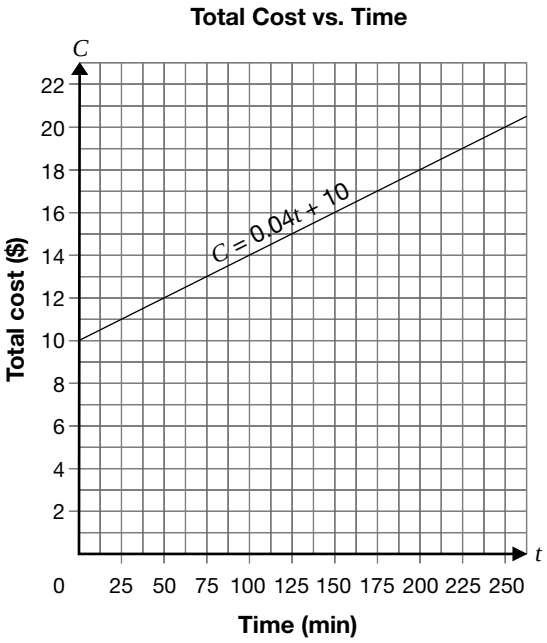
G Cheapie's Rentals

H Cars Cars Cars

J Drive Away

9 Two Internet service providers are competing.

The equation $\boldsymbol{C = 0.04t + 10}$ represents the relationship between the total cost, C, charged by Internet Connections and the time, t.



Surf Away wants **always** to be cheaper than Internet Connections.

Which of the following equations represents this situation?

A $C = 15$

B $C = 0.02t + 11$

C $C = 0.03t + 9$

D $C = 0.05t + 8$

8. J 9. C

10 Selena's Stroll

The graph below represents 4 segments of Selena's morning walk.

Describe the four segments of Selena's walk.

Hint
Include information about
- direction,
- distance,
- time and
- speed, in m/min.

11 Salazar is asked to graph the linear relation represented by $2x - 3y + 6 = 0$. What is the y-intercept of this line?

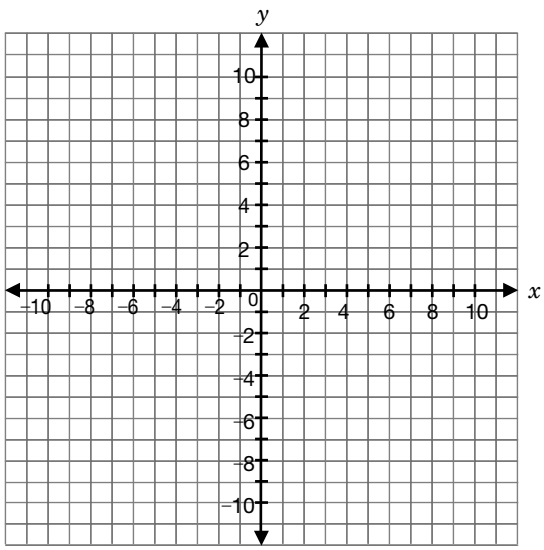
A -6

B -2

C 2

D 6

12 Imagine the graph for the relation $4x - 5y + 20 = 0$.



What is the **slope**?

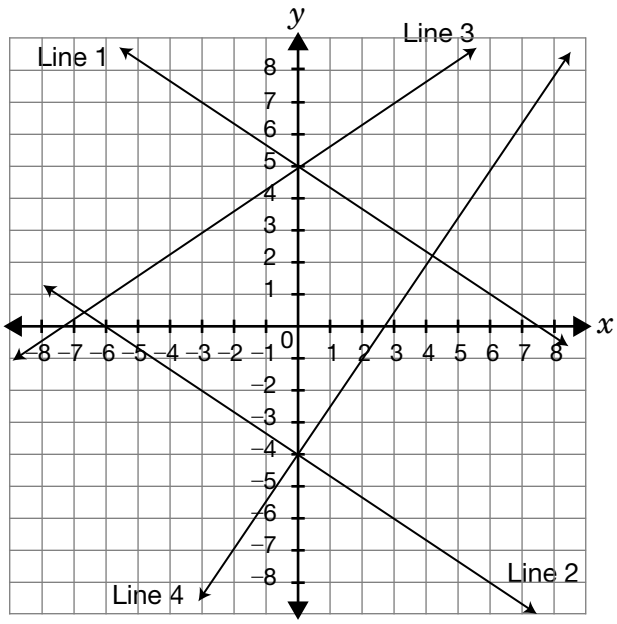
F $\frac{4}{5}$

G $-\frac{4}{5}$

H $\frac{5}{4}$

J 4

13 The grid below shows the graphs of four linear relations.



Which of the following matches the line with its equation?

A Line 1: $y = -\frac{3}{2}x + 5$

B Line 2: $2x + 3y + 12 = 0$

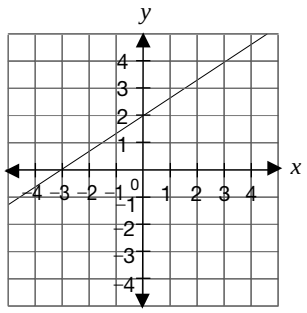
C Line 3: $y = \frac{3}{2}x + 5$

D Line 4: $2x - 3y - 12 = 0$

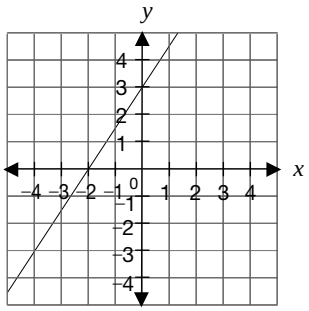
11. C 12. F 13. B

14 Which **graph** represents the relation $y = \frac{2}{3}x + 2$?

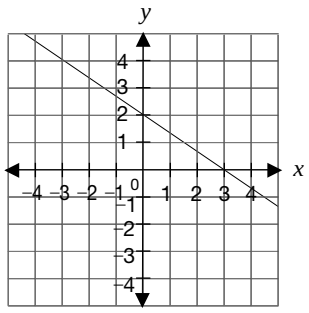
F



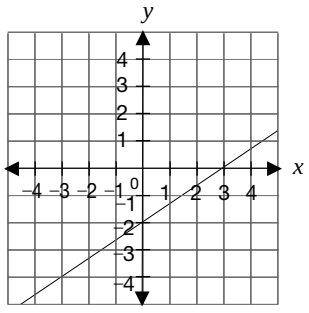
G



H



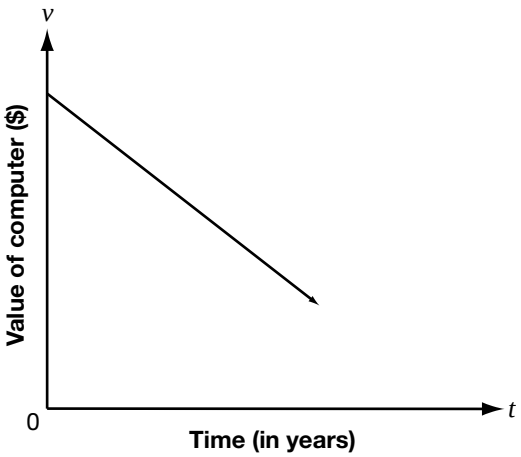
J



15 A computer decreases in value over time. The relationship between the value of the computer, v, in dollars after t years is written as the equation

$$v = -300t + 2100.$$

A line representing the relationship is graphed.



What does the v-intercept of the line represent?

A The decrease in value per year

B The initial value of the computer

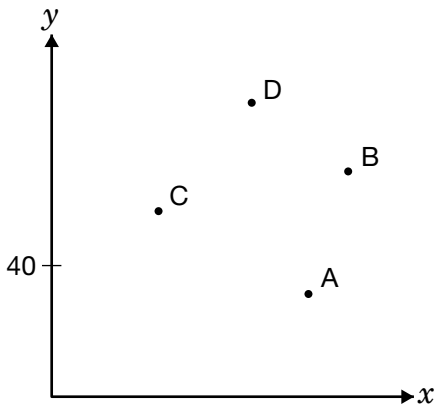
C The number of years until the value is $0

D The number of years the computer will work

14. F 15. B

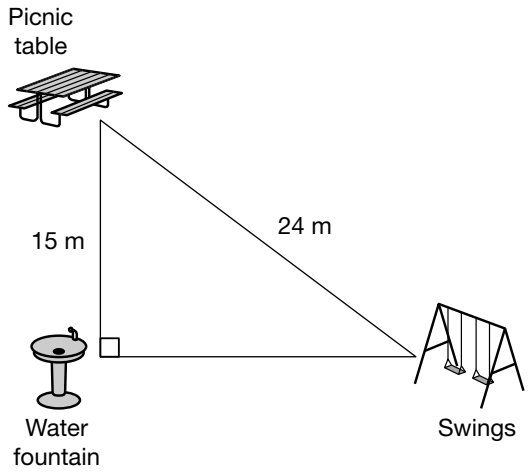
16 Lineup

The line $y = \frac{1}{5}x + 50$ passes through only one pair of points below.



Which pair of points could the line pass through? Justify your response.

17 The positions of the water fountain, the picnic table and the swings at a local park are shown below.



The Pythagorean theorem was used to determine the distance, in metres, from the water fountain to the swings. Which of the following is closest to this distance?

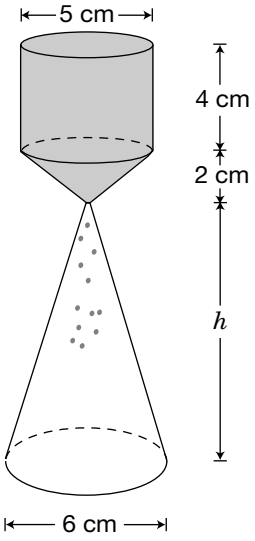
A 28 m

B 19 m

C 15 m

D 9 m

18 Sand is being poured from one container to another, as shown below. The sand flows from the shaded part to the unshaded cone.



The shaded part starts full of sand. The sand empties into the unshaded cone and fills it to the top. What is the height of the unshaded cone?

F 6.0 cm

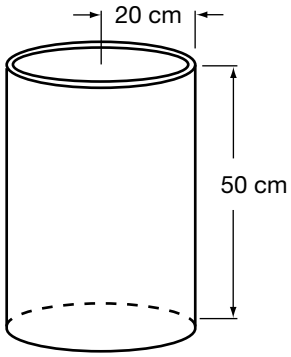
G 8.3 cm

H 9.7 cm

J 12.5 cm

 17. B 18. H

19 Brad has a cylindrical metal container that is open at the top. He wants to paint the outer surfaces of the container, including the bottom.



Which expression should he use to calculate the area to be painted?

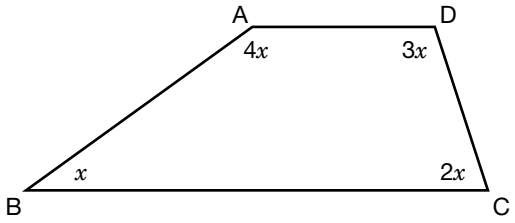
A $\pi(20)(50)$ cm^2

B $2\pi(20)(50)$ cm^2

C $2(\pi(20)^2 + \pi(20)(50))$ cm^2

D $(\pi(20)^2 + 2\pi(20)(50))$ cm^2

20 ABCD is a quadrilateral



What is the measure of ∠BAD?

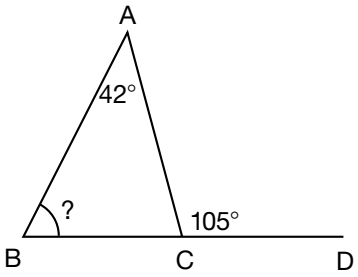
F 108°

G 120°

H 132°

J 144°

21 In the figure, BC is extended to D. ∠BAC = 42° and ∠ACD = 105°.



What is the value of ∠ABC?

A 33°

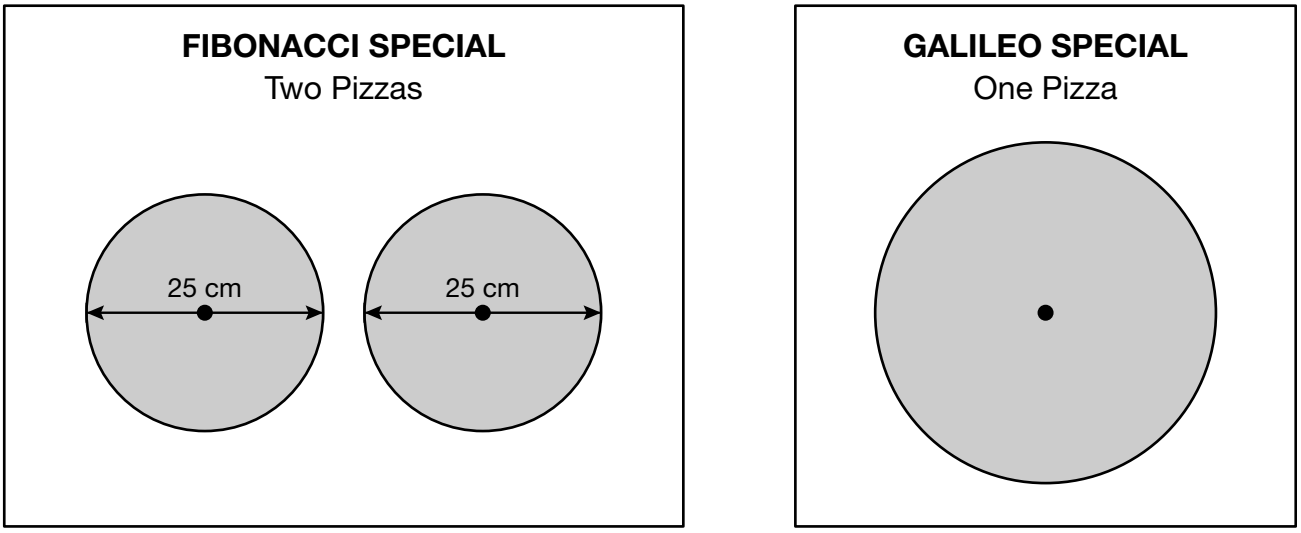
B 42°

C 52°

D 63°

22 Pizza Puzzle

One weekend, a pizza shop offers two specials for the same price. The pizzas are all the same thickness.



Determine the diameter of the Galileo Special if the two specials contain the same amount of pizza. Show your work.

Education Quality and Accountability Office

EQAO

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Academic

Grade 9 Assessment of Mathematics

Winter 2008

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the blank Student Answer Sheet (Winter 2008, Academic).

Education Quality and Accountability Office

EQAO

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

1 The area of the rectangle shown below is $6xy^2$ square units.

Hint: $A = lw$

If the width is $3x$ units, which expression represents the length of the rectangle?

a $2xy^2$ units

b $2y^2$ units

c $3xy^2$ units

d $3y^2$ units

2 The expression below can be simplified.

$$\frac{(x^2y)^3}{(xy)^2}$$

Which of the following shows the expression in its simplest form?

a x^4y

b x^4

c xy

d x^3y

3 Josie works in a sports store. She receives 8% of the total sales each day. One day, she receives $35 for her portion of the total sales. What are the total sales for that day?

a $37.80

b $43.75

c $280.00

d $437.50

4 Which of the following represents the expression $2(3x + 4) + 3(x - 1)$ in a simplified form?

a $9x + 3$

b $9x + 5$

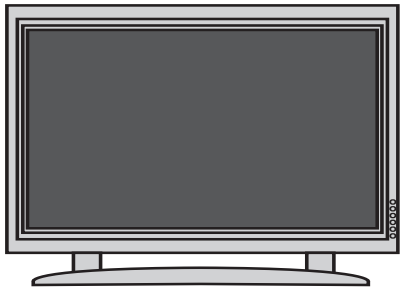
c $8x + 8$

d $8x + 11$

1. b 2. a 3. d 4. b

5 Competing Sales

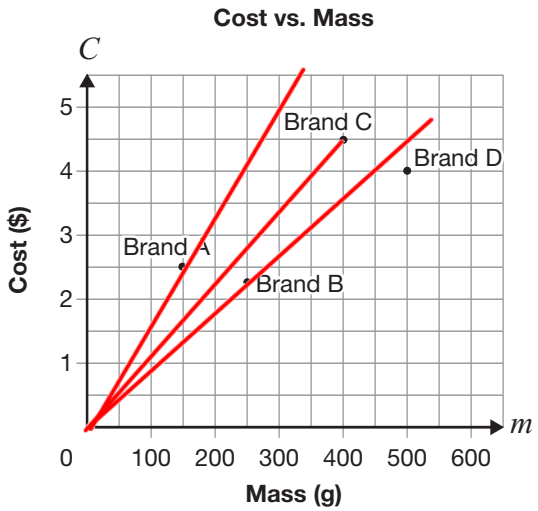
Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at $599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at $899.99 and is on sale for 30% off the regular price.



What is the difference in the sale price of the TV between these two stores?

Show your work.

6 The following graph shows the relationship between the mass and the cost of four different brands of strawberry jam.



Which statement is true?

a Brand A has the lowest cost.

b Brand B has the smallest mass.

c Brand C has the highest cost per gram.

d Brand D has the lowest cost per gram.

7 Gerry has a table of values representing a linear relation. Two of the numbers are hidden behind a ketchup spill.

x	y
−2	−6
−1	
0	
1	18

The values that are hidden are

a −2 and 14.

b 0 and 12.

c 2 and 10.

d 3 and 9.

8 Nadia lives 11.4 km from school and rides her bike to school every day.

The equation $d = 11.4 - 0.6t$ represents the relationship between d, her distance from school in km, and t, her time spent travelling in minutes.

If she leaves home at 8:05 a.m., what time will she get to school?

a 8:11 a.m.

b 8:16 a.m.

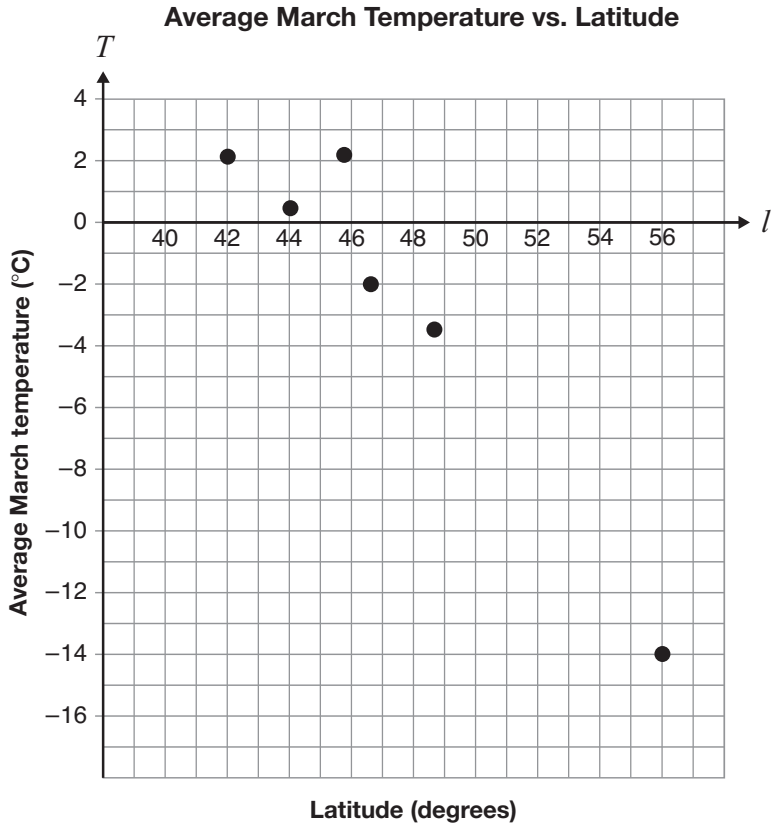
c 8:17 a.m.

d 8:24 a.m.

 6. d 7. c 8. d

9 March Temperatures

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.



The city of Kenora has a latitude of 50° and has an average March temperature of −6.3 °C. Does the community of Kenora follow the trend of the data?

Justify your answer.

10 The table below shows examples of linear and non-linear equations.

Equation Examples

Linear equations	Non-linear equations
$y = 5x - 3$	$y = 5x^2 - 3$
$y = 125 - 4.25x$	$y = 2x^3$
$y = -3x$	$2x^2 + 5y^2 = 10$

Which of these statements best describes how linear equations are different from non-linear equations in the table above?

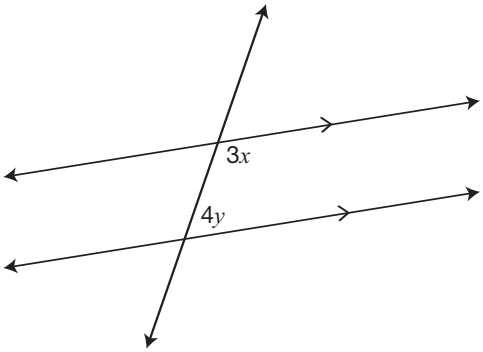
a The exponent of both variables in the linear equations is 1.

b The exponent of exactly one variable in the linear equations is 1.

c The exponent of both variables in the non-linear equations is 1.

d The exponent of exactly one variable in the non-linear equations is 1.

11 The relation shown below can be expressed as $3x + 4y - 180 = 0$.



Another way to write this relation is

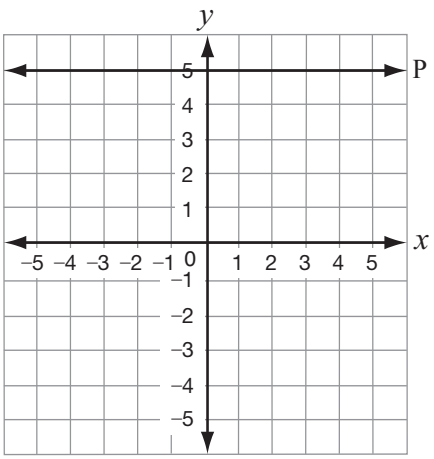
a $y = \frac{3}{4}x - 45.$

b $y = -\frac{3}{4}x + 45.$

c $y = -\frac{4}{3}x + 60.$

d $y = \frac{4}{3}x - 60.$

12 Line P is shown below.



Which equation represents Line P?

a $x = 5$

b $y = 5$

c $y = x + 5$

d $x = y + 5$

10. a 11. b 12. b

13 What is the equation of the line that passes through the points (2, 4) and (4, 0)?

a $y = -\frac{1}{2}x + 2$

b $y = -\frac{1}{2}x + 5$

c $y = -2x + 4$

d $y = -2x + 8$

14 Identical bottles are packed in a box. The box will hold a maximum of 38 bottles. The relationship between M, the total mass of the box and its contents, and n, the number of bottles in the box, is represented by the equation $M = 500n + 800$.

Which of the following are possible integer values for the variable n?

a n is greater than 37.

b n is greater than or equal to 0.

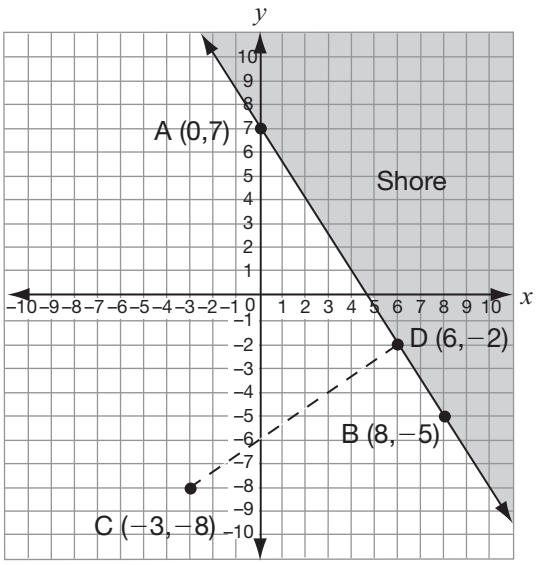
c n is greater than 0 but less than 39.

d n is greater than or equal to 0 but less than 39.

13. d 14. d

15 Washed Up on the Shore

A boat is travelling from Point C toward Point D, which is on the shoreline.
The shoreline is represented by the line through points A and B.



Determine whether the path from C to D is perpendicular to the shoreline.

Justify your answer.

16 Maria grows several varieties of plants in a rectangular-shaped garden. She uses fencing to divide the garden into 16 squares that are each 1 m by 1 m. She also puts fencing around the perimeter of the garden.

Which of the following represents the smallest amount of fencing that Maria needs?

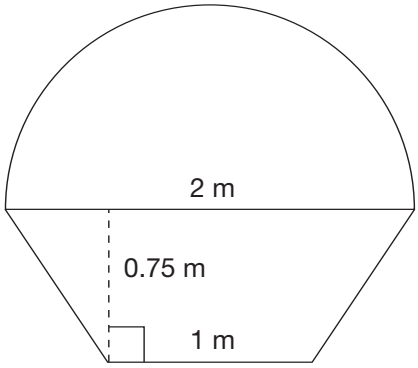
a 24 m

b 40 m

c 42 m

d 49 m

17 The Cutie Cupcake Company is having a sign made. The sign will be a semicircle on top of a trapezoid.



Which of the following is closest to the total area of the sign?

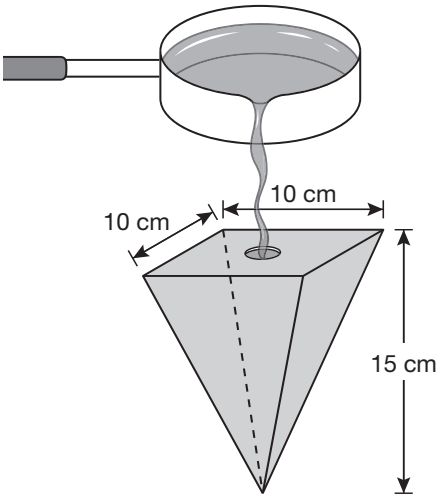
a 4.27 m^2

b 2.70 m^2

c 1.57 m^2

d 1.13 m^2

18 The mould shown below is used to make a candle in the shape of a square-based pyramid.



What is the volume of the mould?

a 1500 cm^3

b 500 cm^3

c 400 cm^3

d 35 cm^3

19 If the radius of a sphere is tripled, the surface area of the sphere will increase

a by a factor of 3.

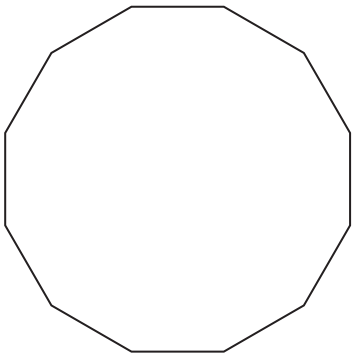
b by a factor of 4.

c by a factor of 6.

d by a factor of 9.

16. b 17. b 18. b 19. d

20 What is the measure, in degrees, of the sum of the interior angles of a 12-sided regular polygon?



a 2160°

b 1800°

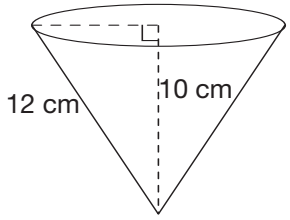
c 1500°

d 1080°

 20. b

21 Cone Zone

Zach measures the slant height of a cone-shaped cup and finds that it is 12 cm. The height is 10 cm.



Determine the volume of water in the cup if Zach fills it to the top.

Show your work.

Education Quality and Accountability Office

EQAO

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Academic

Grade 9 Assessment of Mathematics

Spring 2008

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the blank Student Answer Sheet (Spring 2008, Academic).

Education Quality and Accountability Office

EQAO

Please note: The format of these booklets is slightly different from that used for the assessment. The items themselves remain the same.

1 The expression below can be simplified.

$$\frac{(x^2y)^3}{(xy)^2}$$

Which of the following shows the expression in its simplest form?

a x^4y

b x^4

c xy

d x^3y

2 Josie works in a sports store. She receives 8% of the total sales each day. One day, she receives \$35 for her portion of the total sales. What are the total sales for that day?

a \$37.80

b \$43.75

c \$280.00

d \$437.50

3 Which of the following represents the expression $2(3x + 4) + 3(x - 1)$ in a simplified form?

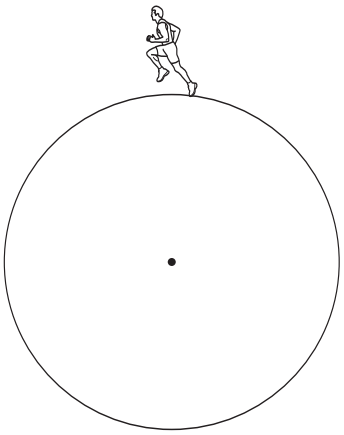
a $9x + 3$

b $9x + 5$

c $8x + 8$

d $8x + 11$

4 The distance covered in 5 laps of a circular track is 400π metres.



What is the shortest distance between any point on the track and the centre?

a 400 m

b 200 m

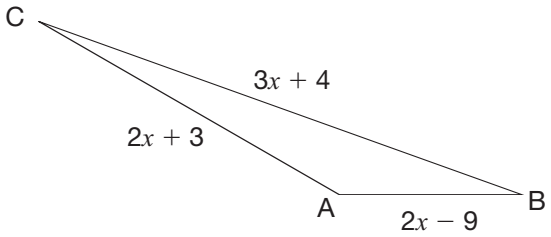
c 80 m

d 40 m

 1.a 2. d 3. b 4. d

5 What Side?

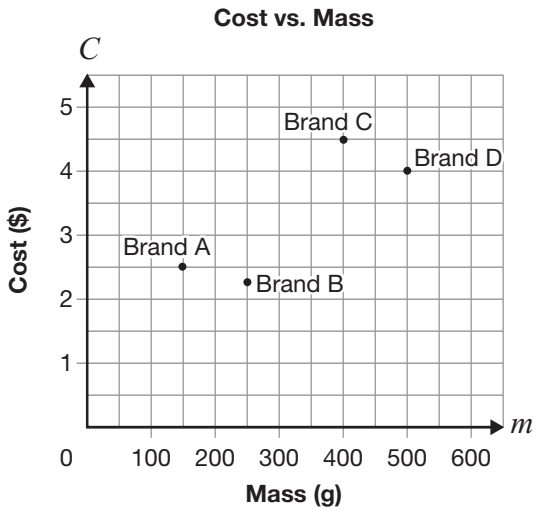
The perimeter of the triangle below is 75 m.



Determine the measure of each side of the triangle.

Show your work.

6 The following graph shows the relationship between the mass and the cost of four different brands of strawberry jam.



Which statement is true?

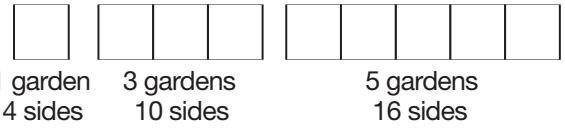
a Brand A has the lowest cost.

b Brand B has the smallest mass.

c Brand C has the highest cost per gram.

d Brand D has the lowest cost per gram.

7 Square gardens are arranged side by side as shown below.



Which table of values represents the relationship between the number of gardens and the number of sides?

a

Number of gardens	Number of sides
1	4
2	8
3	12
4	16
5	20

b

Number of gardens	Number of sides
1	4
2	5
3	10
4	11
5	16

c

Number of gardens	Number of sides
1	4
2	6
3	10
4	14
5	16

d

Number of gardens	Number of sides
1	4
2	7
3	10
4	13
5	16

 6. d 7. d

8 Gerry has a table of values representing a linear relation. Two of the numbers are hidden behind a ketchup spill.

x	y
−2	−6
−1	
0	
1	18

The values that are hidden are

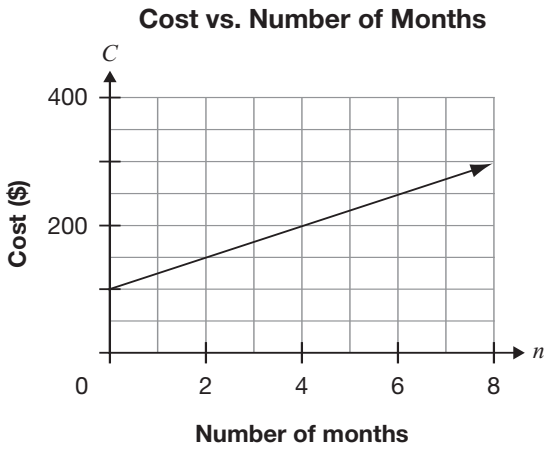
a −2 and 14.

b 0 and 12.

c 2 and 10.

d 3 and 9.

9 The graph below represents the cost to belong to a local gym.



Which equation represents the graph?

a $C = \frac{1}{25}n + 100$

b $C = \frac{1}{2}n + 100$

c $C = 2n + 100$

d $C = 25n + 100$

8. c 9. d

10 Wing Length

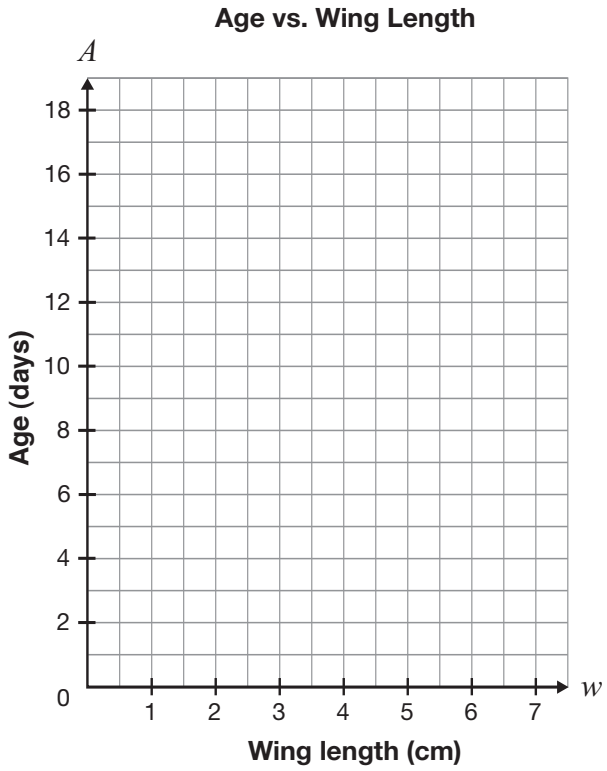
Wing length is a reliable method for determining the age of young birds. Below is an example of data for a particular species.

Wing length (cm)	Age (days)
1.5	4
3.1	8
3.2	10
4.1	12
5.2	16

Determine the age of a bird with a wing length of 3.6 cm.

You may use the grid if you wish.

Justify your answer.



11 The table below shows examples of linear and non-linear equations.

Equation Examples

Linear equations	Non-linear equations
$y = 5x - 3$	$y = 5x^2 - 3$
$y = 125 - 4.25x$	$y = 2x^3$
$y = -3x$	$2x^2 + 5y^2 = 10$

Which of these statements best describes how linear equations are different from non-linear equations in the table above?

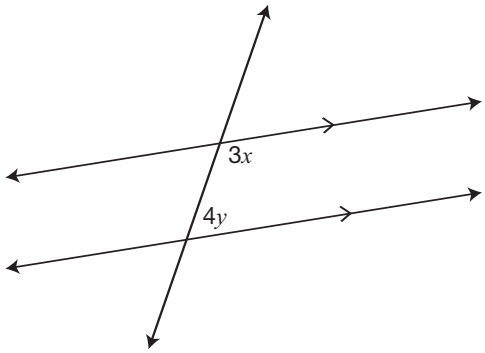
a The exponent of both variables in the linear equations is 1.

b The exponent of exactly one variable in the linear equations is 1.

c The exponent of both variables in the non-linear equations is 1.

d The exponent of exactly one variable in the non-linear equations is 1.

12 The relation shown below can be expressed as $3x + 4y - 180 = 0$.



Another way to write this relation is

a $y = \frac{3}{4}x - 45.$

b $y = -\frac{3}{4}x + 45.$

c $y = -\frac{4}{3}x + 60.$

d $y = \frac{4}{3}x - 60.$

13 How would the graph of the relation $y = 3x - 2$ change if the 3 and -2 were both doubled?

The graph would be

a steeper and have a lower y-intercept.

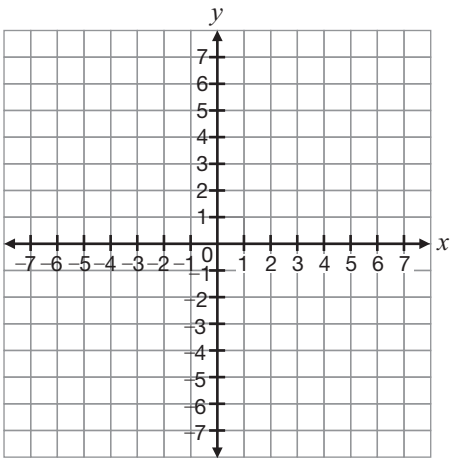
b steeper and have a higher y-intercept.

c less steep and have a lower y-intercept.

d less steep and have a higher y-intercept.

11. 1 12. c 13. a

14 Consider the points A(1, 4), B(6, 3), C(−1, 5), D(−3, 0) and E(2, −1).



Which line segment is parallel to AB?

a AE

b BE

c CE

d DE

15 Identical bottles are packed in a box. The box will hold a maximum of 38 bottles. The relationship between M, the total mass of the box and its contents, and n, the number of bottles in the box, is represented by the equation $M = 500n + 800$.

Which of the following are possible integer values for the variable n?

a n is greater than 37.

b n is greater than or equal to 0.

c n is greater than 0 but less than 39.

d n is greater than or equal to 0 but less than 39.

16 Excellent Equations

A line is perpendicular to the line $y = 2x + 3$ and has the same ***x*-intercept** as $x + 3y + 10 = 0$.

Find the equation of this line. Express your answer in the form $y = mx + b$.

Justify your answer.

17 Maria grows several varieties of plants in a rectangular-shaped garden. She uses fencing to divide the garden into 16 squares that are each 1 m by 1 m. She also puts fencing around the perimeter of the garden.

Which of the following represents the smallest amount of fencing that Maria needs?

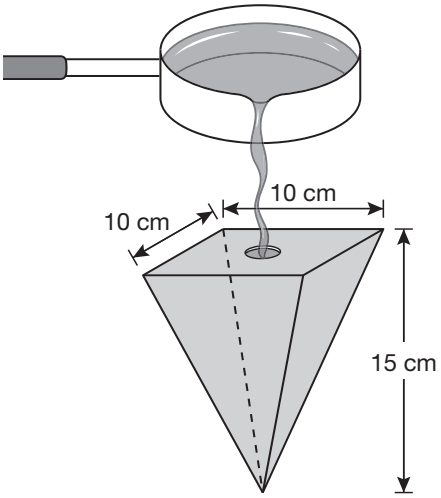
a 24 m

b 40 m

c 42 m

d 49 m

18 The mould shown below is used to make a candle in the shape of a square-based pyramid.



What is the volume of the mould?

a 1500 cm^3

b 500 cm^3

c 400 cm^3

d 35 cm^3

19 If the radius of a sphere is tripled, the surface area of the sphere will increase

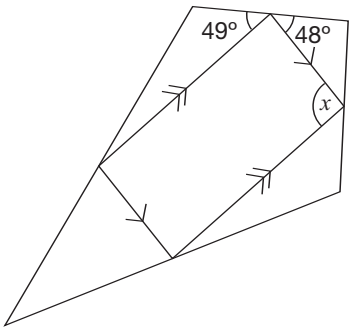
a by a factor of 3.

b by a factor of 4.

c by a factor of 6.

d by a factor of 9.

20 A parallelogram is inscribed in a quadrilateral as shown.



What is the value of x?

a 48°

b 49°

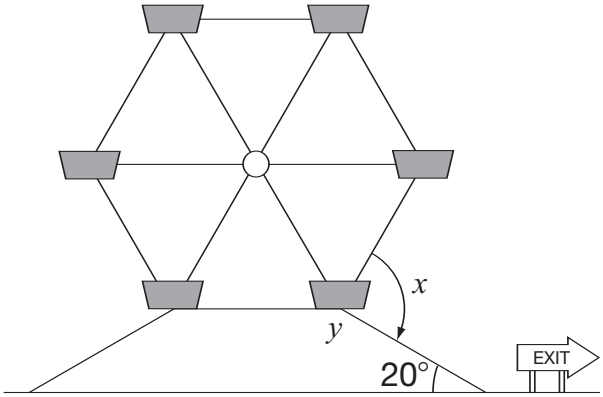
c 83°

d 97°

 17. b 18. b 19. d 20. d

21 Wheels of Fun

A Ferris wheel has six sides of equal length. The exit ramp of the Ferris wheel is in the shape of a trapezoid and has an angle of incline of 20°.



What are the values of x and y?

Use geometric properties to justify your answer.

Education Quality and Accountability Office

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Academic

Grade 9 Assessment of Mathematics

Winter 2009

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the blank Student Answer Sheet (Winter 2009, Academic).

Education Quality and Accountability Office

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Please note: The format of this booklet is different from that used for the assessment. The items themselves remain the same.

1 What is the value of $(x^2)^3$ when $x = \frac{1}{2}$?

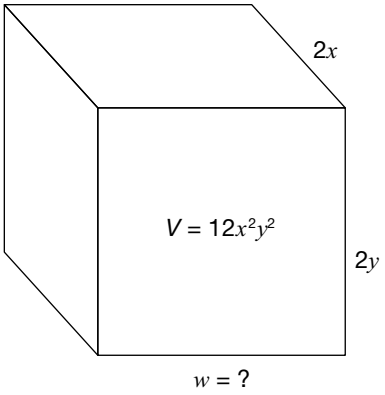
a $\frac{1}{4}$

b $\frac{1}{12}$

c $\frac{1}{32}$

d $\frac{1}{64}$

2 A box with a volume of $12x^2y^2$ is shown below.



Hint: $V = lwh$

What is the width of the box?

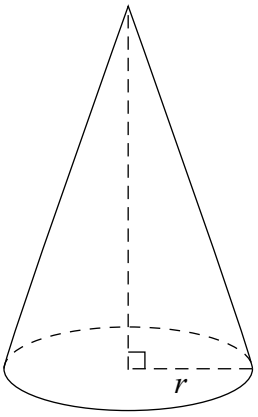
a $2xy$

b $3xy$

c $4x^3y^3$

d $8x^3y^3$

3 The cone shown below is 20 cm high and has a total volume of 1000 cm^3.



Which of the following is closest to the length of the radius, r?

a 6.9 cm

b 6.2 cm

c 4.0 cm

d 2.3 cm

4 Alfredo and his wife, Jody, work in a restaurant.

Last week Alfredo received an average of $15 in tips for each of the 55 tables he served. Jody received an average of $20 in tips for each of the 60 tables she served.

They are planning a weekend trip. Alfredo will pay a total of $220 for their hotel room and Jody will pay a total of $160 for their rental car.

How much of their combined tips will be left over after they have paid for their hotel room and rental car?

a $1620

b $1645

c $2025

d $2405

 1. d 2. b 3. a 4. b

5 CD Sell-Off

Juan belongs to a CD club that sells CDs for $11.44 each before tax. His first shipment of CDs costs $90.49 including 13% tax.

How many CDs are in his first shipment?

Show your work.

6 Which table of values represents a linear relation?

a

x	y
1	$\frac{1}{3}$
2	$\frac{2}{3}$
3	1
4	$\frac{4}{3}$

b

x	y
0	5
5	7
10	10
15	14

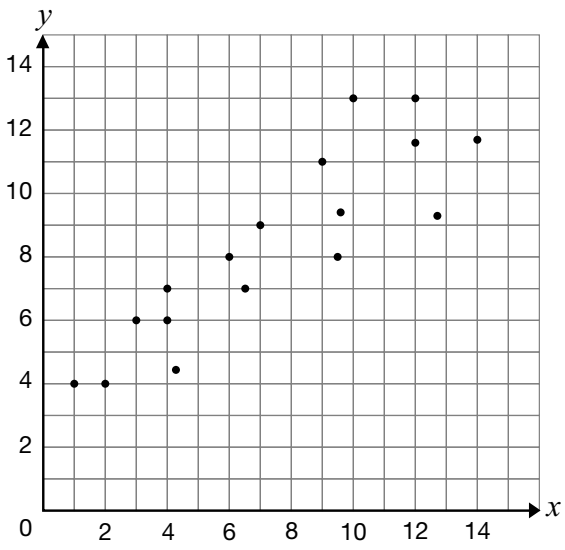
c

x	y
1	2
2	4
3	8
4	16

d

x	y
0	$\frac{1}{2}$
5	$\frac{1}{4}$
10	$\frac{1}{6}$
15	$\frac{1}{8}$

7 Which of the following could be the slope of a line of best fit for the data shown in the scatter plot below?



a -2

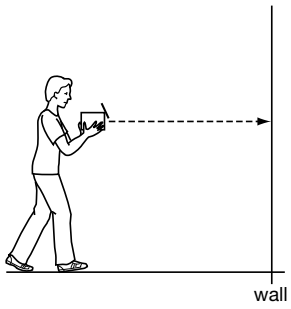
b -1

c 1

d 2

 6. a 7. c

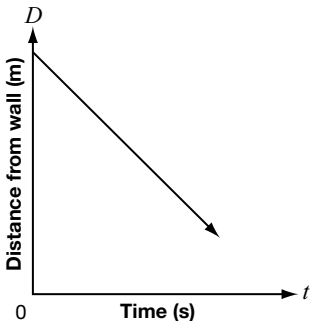
8 In an investigation, a student holds a motion detector, points it at a wall and walks toward the wall.



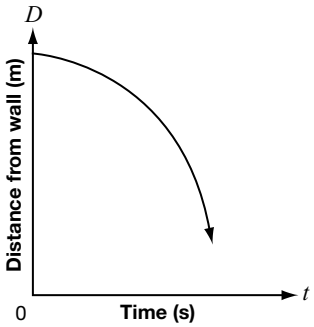
The student walks slowly at first and then speeds up as he approaches the wall.

Which of the following graphs would be produced on the graphing calculator?

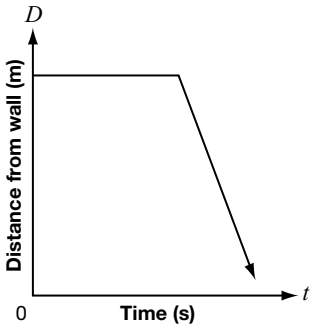
a



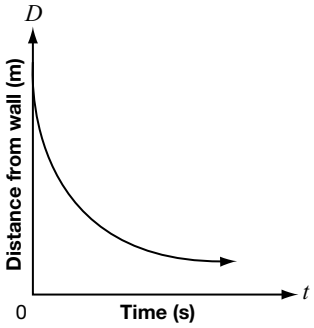
b



c



d



9 The table of values below displays the cost of renting a bicycle.

Time, t **(h)**	**Cost,** C **($)**
0	25
1	30
2	35
3	40

Which equation models the cost of renting a bicycle?

a $C = 5t$

b $C = 25t$

c $C = 5t + 25$

d $C = 25t + 5$

 9. c

10 Picture Perfect

The cost of producing a family photo album is $0.50 per photo, plus a fixed cost for the album.

Circle the table below that represents this scenario.

Option 1

Number of photos, p	Cost, C
5	$2.50
10	$5.00
15	$7.50
20	$10.00

Option 2

Number of photos, p	Cost, C
5	$35.50
10	$36.00
15	$36.50
20	$37.00

Option 3

Number of photos, p	Cost, C
5	$37.50
10	$40.00
15	$42.50
20	$45.00

Justify your choice and include an explanation of why you did not choose the other options.

11 Which of the following statements is true for the line $5x - 2y - 12 = 0$?

a The slope is $\frac{2}{5}$ and the y-intercept is 12.

b The slope is -5 and the y-intercept is 6.

c The slope is 5 and the y-intercept is -12.

d The slope is $\frac{5}{2}$ and the y-intercept is -6.

12 For the slope of a line, the change in x is greater than the change in y. Which of the following could represent the slope of this line?

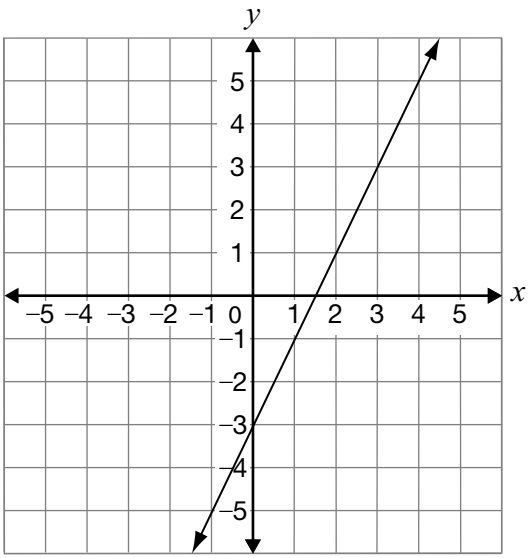
a $\frac{4}{3}$

b 2

c 1

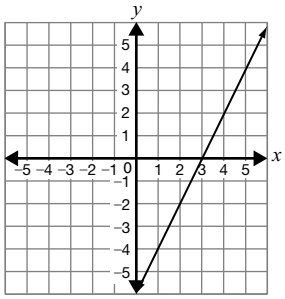
d $\frac{2}{5}$

13 The graph of a line is shown below.

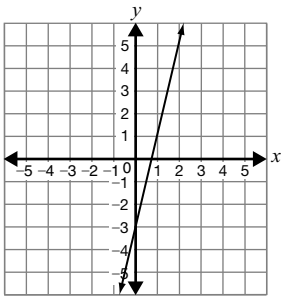


If the slope is doubled and the y-intercept remains constant, which graph below best represents the new line?

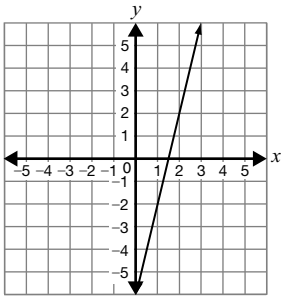
a



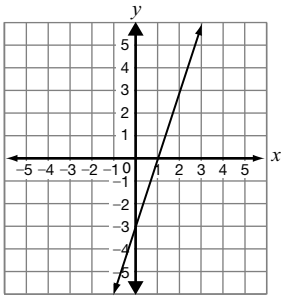
b



c

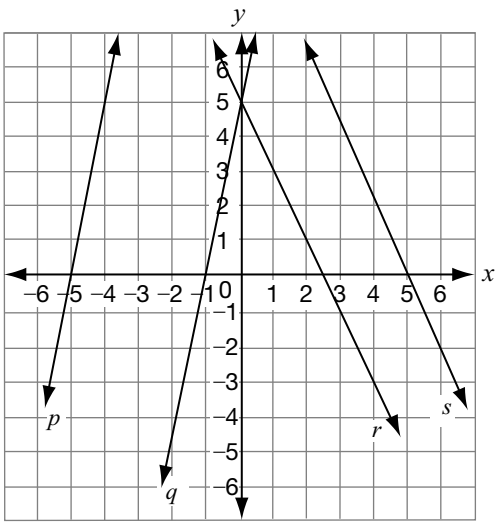


d



 11. d 12. d 13. b

14 Consider the following linear relations.



Which line represents the graph of the equation $y = -2x + 5$?

a Line p

b Line q

c Line r

d Line s

15 The following table shows values for a linear relation.

x	y
−15	−33
−9	−25
3	−9
12	3

Which of the following equations represents the relationship shown in the table of values?

a $y = \frac{4}{3}x - 16$

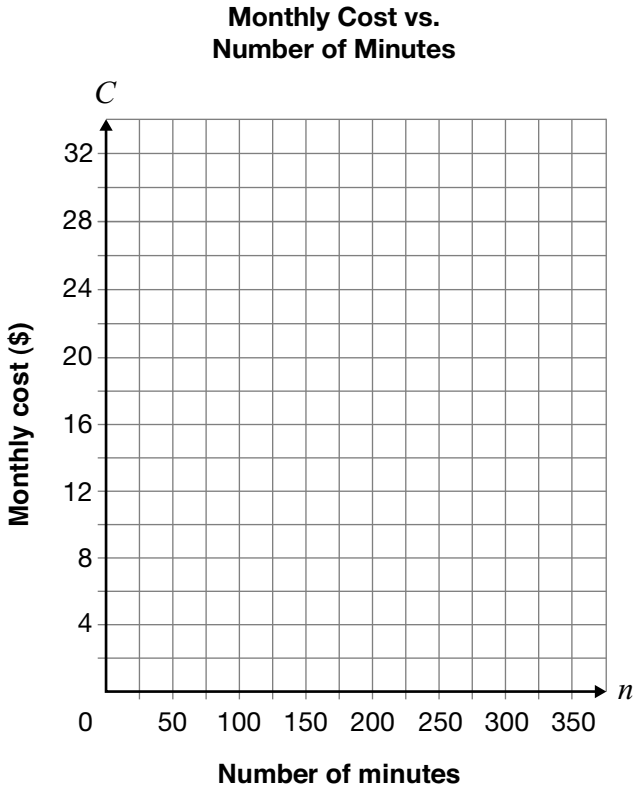
b $y = \frac{4}{3}x - 13$

c $y = \frac{3}{4}x - 9$

d $y = \frac{3}{4}x - 6$

16 Cellphone Plans

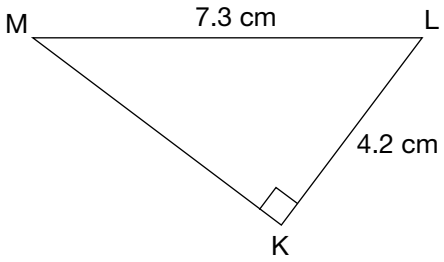
Serge is choosing a cellphone plan and wants the lowest cost. Cell-a-Bration charges $12 per month plus $0.05 per minute for cellphone service. E-Phone charges $28 per month for unlimited minutes.



Determine under which conditions Serge should choose Cell-a-Bration and under which conditions Serge should choose E-Phone.

Justify your answer.

17 Triangle KLM is shown below.



Which of the following is closest to the perimeter of triangle KLM?

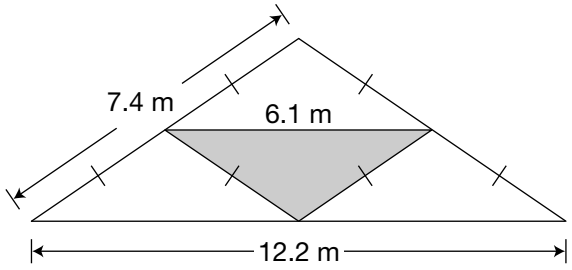
a 12.6 cm

b 16.3 cm

c 17.5 cm

d 21.0 cm

18 The frame of the roof of a small house is being constructed. A portion of the frame consists of four isosceles triangles as shown below.



What is the total length of the three sides that form the shaded interior triangle?

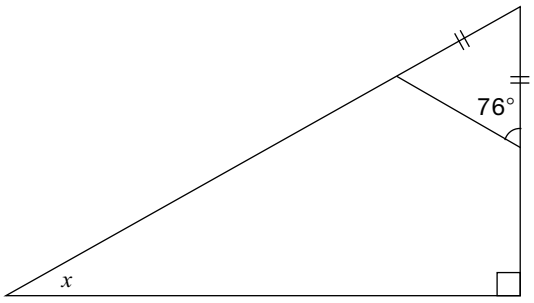
a 3.7 m

b 6.1 m

c 13.5 m

d 18.3 m

19 Consider the following diagram.



What is the value of x?

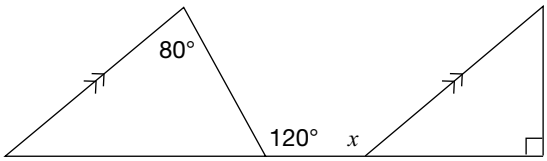
a 14°

b 28°

c 62°

d 76°

20 Consider the diagram below.



What is the value of x?

a 80°

b 120°

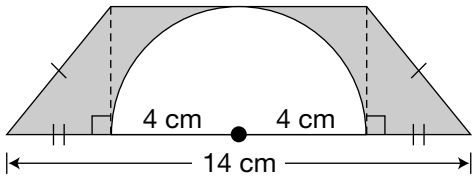
c 140°

d 170°

17. c 18. c 19. c 20. c

21 Something's Missing

The semicircle in the diagram below has a radius of 4 cm.



What is the area of the shaded region?

Show your work.

Education Quality and Accountability Office

EQAO

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Academic

Grade 9 Assessment of Mathematics

2010

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2010, Academic).

Please note: The format of this booklet is different from that used for the assessment. The items themselves remain the same.

Education Quality and Accountability Office

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1 What is the value of $6x^2$ when $x = \frac{1}{3}$?

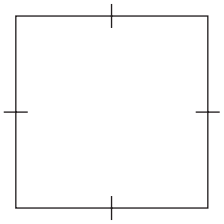
a $\frac{2}{9}$

b $\frac{2}{3}$

c 2

d 4

2 Chris has a square garden with an area of 38.4 m^2, as shown in the diagram.



He decreases the length of each side by 1.7 m to make a smaller garden.

Which is closest to the perimeter of the smaller garden?

a 37 m

b 32 m

c 25 m

d 18 m

3 The sum of the perimeters of two shapes is represented by $13x + 4y$.

The perimeter of one shape is represented by $4x - 2y$.

Which expression represents the perimeter of the other shape?

a $9x + 2y$

b $9x + 6y$

c $17x + 2y$

d $17x + 6y$

4 Consider the expression below.

$3x^2(5x^2 - 2x + 1)$

Which of the following is equivalent to this expression?

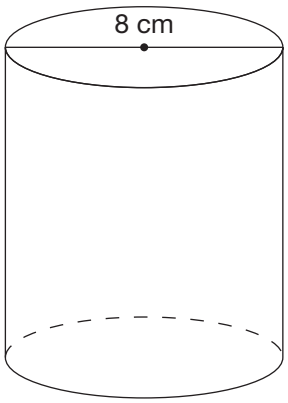
a $8x^2 - 2x + 1$

b $8x^2 + x + 4$

c $15x^4 - 2x + 1$

d $15x^4 - 6x^3 + 3x^2$

5 The cylinder below has a volume of 150 cm^3.



Which of the following is closest to the area of the lateral surface of the cylinder?

Hint:
$V_{\text{cylinder}} = \pi r^2 h$
$A_{\text{lateral surface}} = 2\pi rh$

a 38 cm^2

b 75 cm^2

c 150 cm^2

d 300 cm^2

 1. b 2. d 3. b 4. d 5. b

6 Part-Time Job

Ezre works part-time at a clothing store. He earns $80 per week plus 6% of the value of his weekly sales.

This week Ezre earns $119.

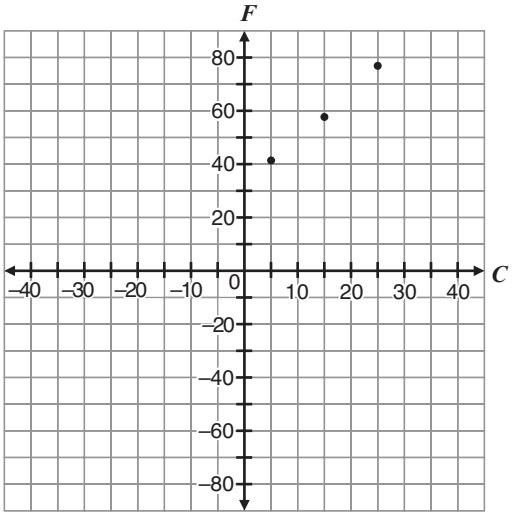
What is the total value of his sales this week?

Show your work.

The total value of his sales is _____.

7 Consider the following chart and graph.

Temperature in degrees Celsius, C	Temperature in degrees Fahrenheit, F
5°	41°
15°	59°
25°	77°



What temperature in degrees Celsius is equivalent to −20 °F?

a −4 °C

b −18 °C

c −29 °C

d −40 °C

8 A bus is rented for a class field trip. The transportation cost for the trip is made up of $225 to rent the bus, $50 for gas and $2 for each bus seat.

Which relation below describes the total transportation cost for the trip if C is the total cost in dollars and n is the number of seats?

a $C = -2n + 225$

b $C = -2n + 275$

c $C = 2n + 225$

d $C = 2n + 275$

9 A sports company uses the equation $C = 8t + 5$ to represent the relationship between the total amount charged to rent a canoe, C, in dollars and the rental time, t, in hours.

What is the initial charge to rent a canoe?

a $0

b $5

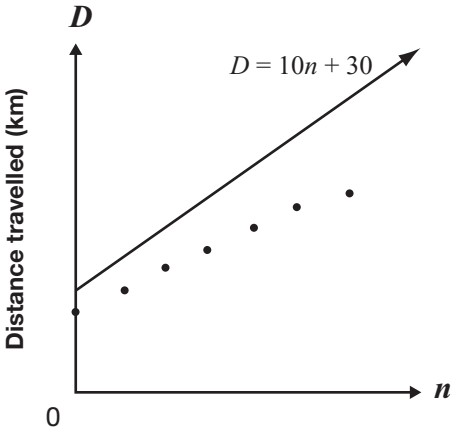
c $8

d $13

10 Data on distance travelled and the number of hours spent travelling are shown on the graph below.

The line $D = 10n + 30$ is also shown on the graph.

Distance Travelled vs. Time



Number of hours

Which equation best represents the line of best fit for the data shown?

a $D = 5n + 33$

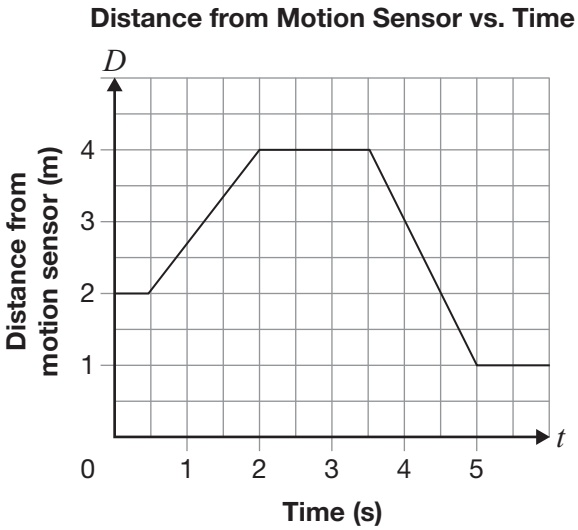
b $D = 8n + 23$

c $D = 10n + 18$

d $D = 12n + 25$

7. a 8. d 9. b 10. b

11 Tyler walks along a line leading from a motion sensor. The graph below shows information about Tyler's walk.



Which of the following is closest to Tyler's speed in metres per second as he walks toward the motion sensor?

a 2.0

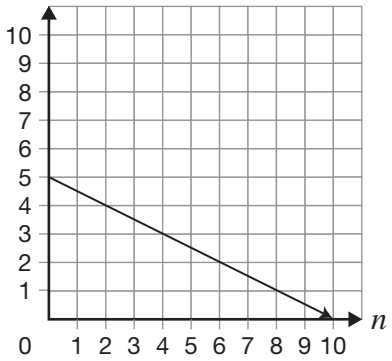
b 1.3

c 0.8

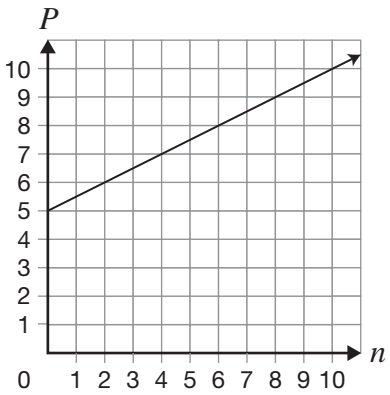
d 0.5

12 Which graph represents the equation $P = -\frac{1}{2}n + 5$?

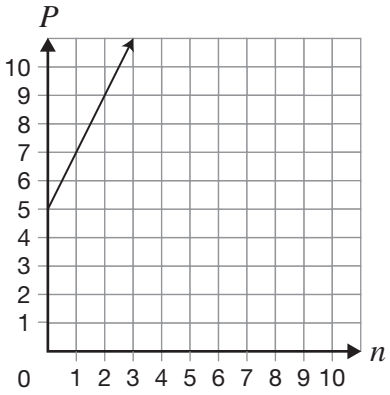
a



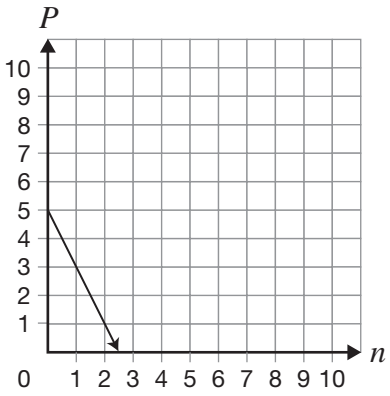
b



c



d



13 What's the Charge?

The table below represents the linear relationship between cost and repair time at an appliance store.

Repair time, t (h)	Cost, C ($)
3	205
6	385
8	505

Determine the initial value of this relationship. Show your work.

Initial value: _____

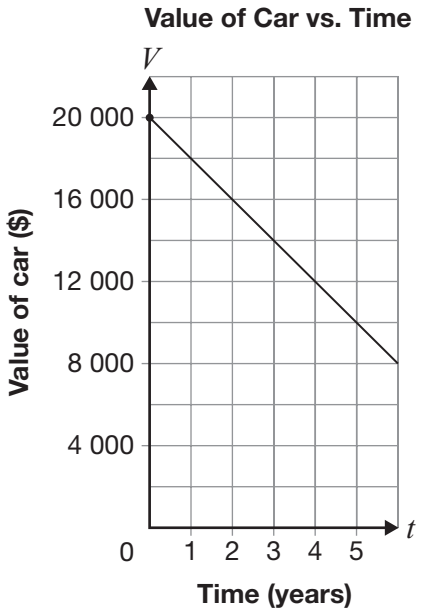
Is this relationship a direct or a partial variation?

Circle one: Direct variation Partial variation

Justify your answer.

14 Hot New Wheels

Cybelle and Peter each buy a car. The graph below represents the value of Cybelle's car over time.



Peter's car costs less than Cybelle's. The value of both cars changes at the same rate.

Determine a possible equation to represent the relationship between the value of Peter's car, V, in dollars, and time, t, in years.

$V =$ _____

Justify your equation.

15 Which of the following represents an equation of a line?

a $y = 2^x$

b $y = x^2 - 5$

c $x^2 + y^2 - 25 = 0$

d $2x + 3y - 5 = 0$

16 What are the slope, m, and y-intercept, b, of the line represented by $3x - 2y + 16 = 0$?

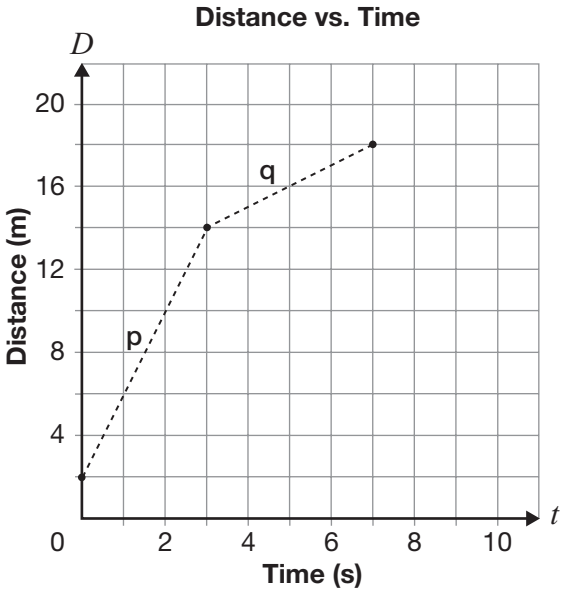
a $m = \frac{3}{2}, b = 8$

b $m = \frac{2}{3}, b = -16$

c $m = -\frac{2}{3}, b = -8$

d $m = -\frac{3}{2}, b = 16$

17 The graph below represents the relationship between distance and time on Javier's walk.



How much greater is Javier's speed in section p than in section q?

a 0.5 m/s

b 1.5 m/s

c 2.0 m/s

d 3.0 m/s

18 The total cost of hiring Beth's Plumbing Services is represented by the equation $C = 50t + 70$, where C is the total cost in dollars and t is the time in hours.

Next month, the rate will change to $60 per hour, but the initial charge will stay the same.

Which of the following describes how the graph of the relation will change?

a The steepness of the line will increase.

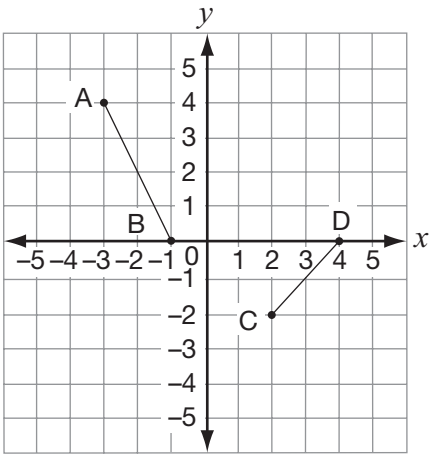
b The steepness of the line will decrease.

c The vertical intercept will increase by 10 units.

d The vertical intercept will decrease by 10 units.

 15. d 16. a 17. c 18. a

19 Consider the following graph.



Which statement is **false**?

a The slope of AB is −2.

b The slope of CD is 1.

c The y-intercept of the line through CD is −4.

d The y-intercept of the line through AB is −1.

20 Janelle draws a line that passes through the points (−1, 6) and (0, 3). If Janelle writes the equation of the line in $y = mx + b$ form, what are the values of m and b?

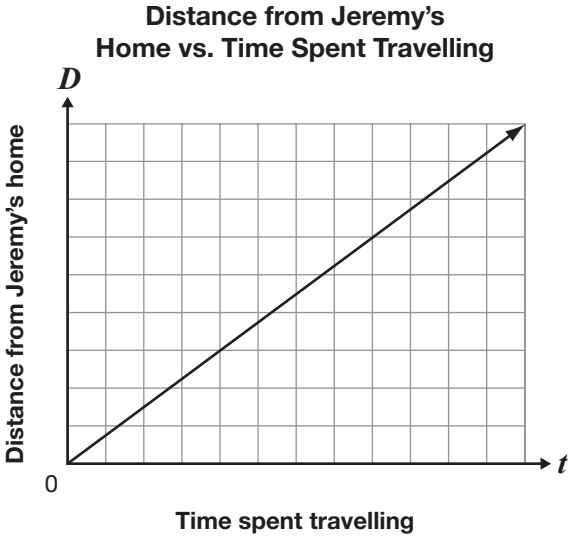
a $m = -9$
$b = 3$

b $m = -3$
$b = 6$

c $m = -9$
$b = 6$

d $m = -3$
$b = 3$

21 Last weekend, Jeremy travelled from his home to a friend's house. The graph below represents the relation between D, the distance from Jeremy's home, and t, the time spent travelling to his friend's house.



This weekend, Jeremy travels to his friend's house but leaves from school. Jeremy's school is between his house and his friend's house.

If he travels at a faster rate this weekend, how will the line representing this trip compare to the line representing the previous trip?

This new line will

a start at a higher point and be steeper.

b start at a higher point and be less steep.

c start at the current point and be steeper.

d start at the current point and be less steep.

19. d 20. d 21. a

22 The New Line

A line has

- the same slope as the line represented by $4x - 3y + 15 = 0$ and
- the same y-intercept as the line represented by $2x + y + 6 = 0$.

Determine an equation of this line.

Show your work.

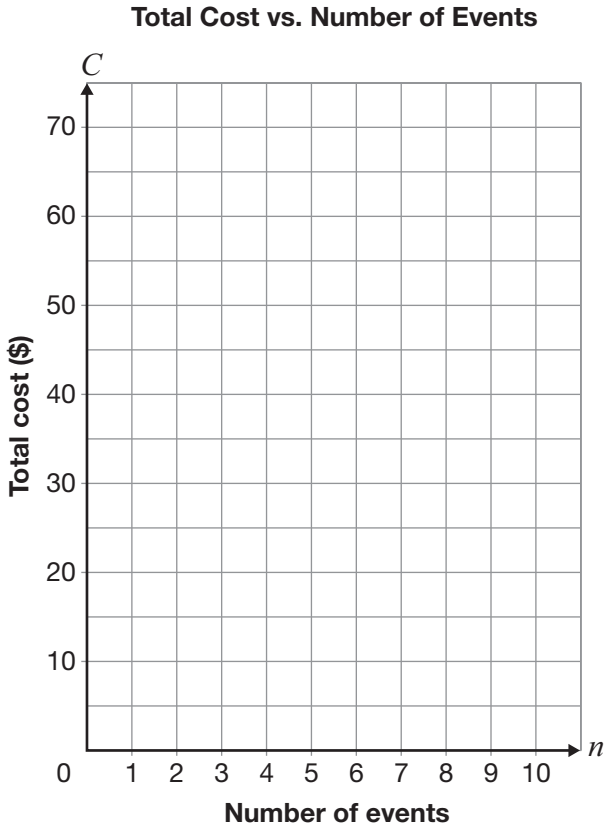
23 Event-full

At Lowell High School, the cost to attend special events depends on whether or not a student has purchased a $10 discount card.

Option A: The student buys a discount card. The cost is $5 per event.

Option B: The student does not buy a discount card. The cost is $7.50 per event.

Graph the relationship between total cost and number of events for each option on the grid.



Determine the conditions under which a student at Lowell High School should choose each option.

Justify your answer.

24 Ella wants a rectangle with

- a perimeter of 100 cm and
- the largest possible area.

What are the dimensions of the rectangle that satisfies her conditions?

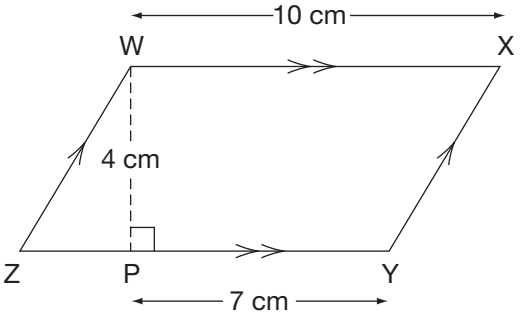
a 10 cm × 10 cm

b 20 cm × 30 cm

c 25 cm × 25 cm

d 40 cm × 60 cm

25 Consider the parallelogram shown below.



What is the perimeter of WXYZ?

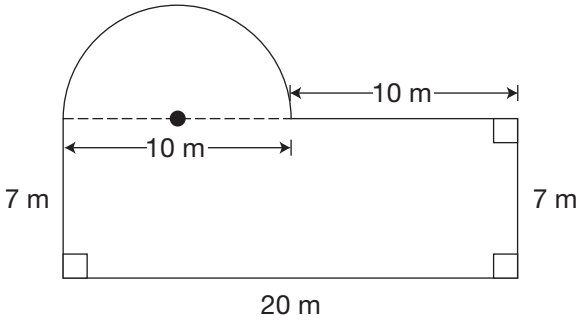
a 28 cm

b 30 cm

c 31 cm

d 34 cm

26 A garden is in the shape of a rectangle and a semicircle as shown below.



Which of the following is closest to the amount of fencing needed to enclose the garden?

a 60 m

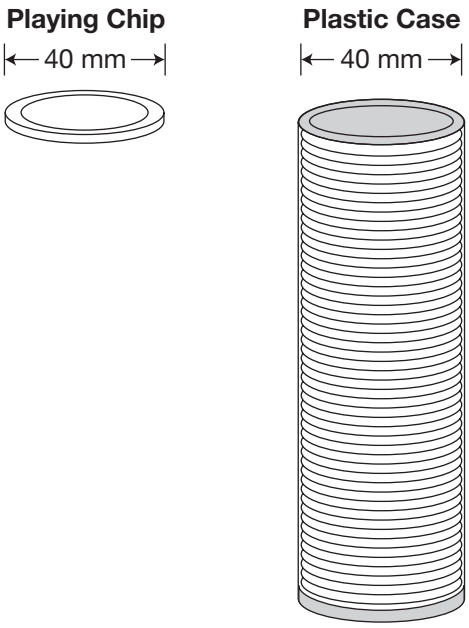
b 70 m

c 75 m

d 85 m

 24. a 25. b 26. c

27 The playing chips of a board game are stored in cylindrical plastic cases. The plastic cases have a volume of 25 120 mm^3 and a diameter of 40 mm.



Which of the following is closest to the height of one playing chip if 50 playing chips can fit tightly into the plastic case as shown above?

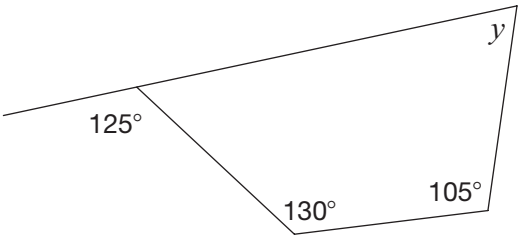
a 0.1 mm

b 0.4 mm

c 1.3 mm

d 2.5 mm

28 Consider the diagram below.



Which of the following is the value of y in the diagram?

a 55°

b 70°

c 125°

d 130°

29 What is the sum of the interior angles of a 12-sided regular polygon?

a 1080°

b 1800°

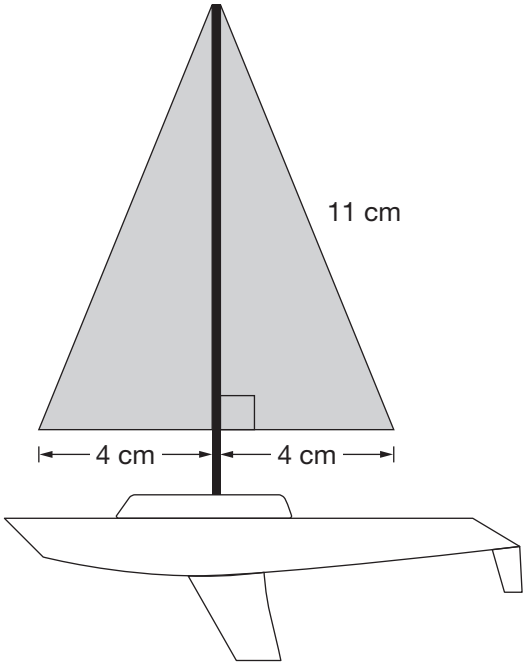
c 1980°

d 2160°

27. d 28. b 29. b

30 Toy Sailboats

Emelina makes toy sailboats as shown below.

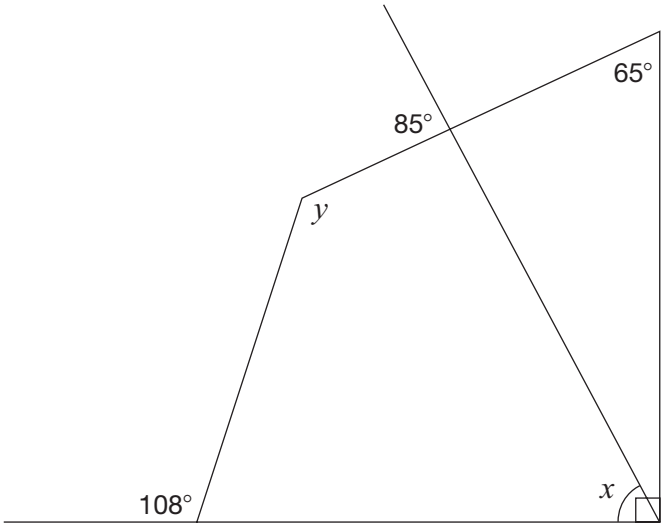


Determine the total area of the shaded sails.

Show your work.

31 What's Missing?

Consider the diagram below.



Complete the table below.

Justify your answers using geometric properties.

Angle measure	Justification
$x =$ _____	
$y =$ _____	

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Academic

Grade 9 Assessment of Mathematics

Spring 2009

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the blank Student Answer Sheet (Spring 2009, Academic).

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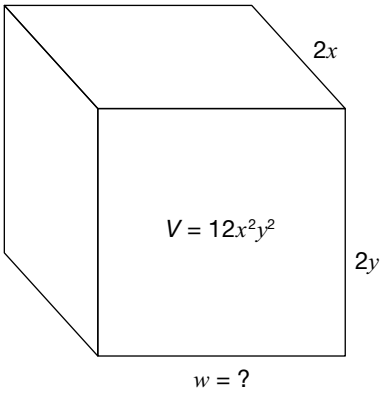
Please note: The format of this booklet is different from that used for the assessment. The items themselves remain the same.

1 A box with a volume of $12x^2y^2$ is shown below.



Hint: $V = lwh$

What is the width of the box?

a $2xy$

b $3xy$

c $4x^3y^3$

d $8x^3y^3$

2 Which of the following is equivalent to the expression below?

$(4x - 5) + (2x + 1)$

a $2x - 6$

b $2x - 4$

c $6x - 6$

d $6x - 4$

3 Alfredo and his wife, Jody, work in a restaurant.

Last week Alfredo received an average of \$15 in tips for each of the 55 tables he served. Jody received an average of \$20 in tips for each of the 60 tables she served.

They are planning a weekend trip. Alfredo will pay a total of \$220 for their hotel room and Jody will pay a total of \$160 for their rental car.

How much of their combined tips will be left over after they have paid for their hotel room and rental car?

a \$1620

b \$1645

c \$2025

d \$2405

 1. b 2. d 3. b

4 Keepin' Tabs

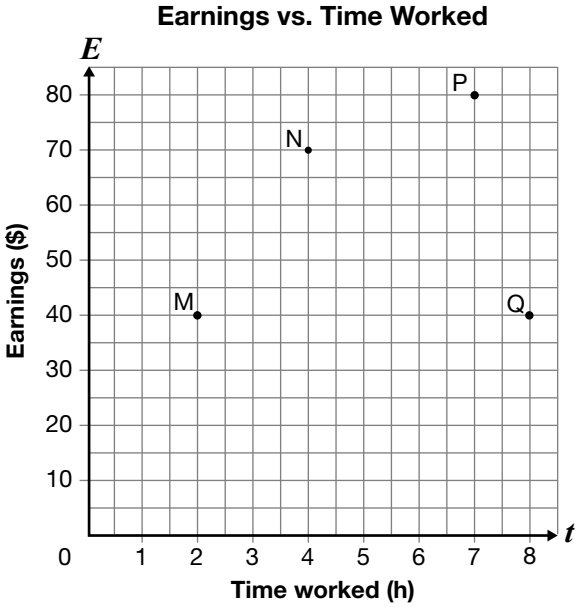
A student council collects aluminum pop tabs to raise money to purchase a wheelchair. A company buys the pop tabs for $0.88 per kilogram.

If 1267 pop tabs have a mass of one pound, how many pop tabs are needed to purchase a wheelchair worth $1500?

Show your work.

Hint:
1 kilogram = 2.2 pounds

5 The graph below represents the relationship between earnings and time worked.



Which of the following points represents the highest rate of pay?

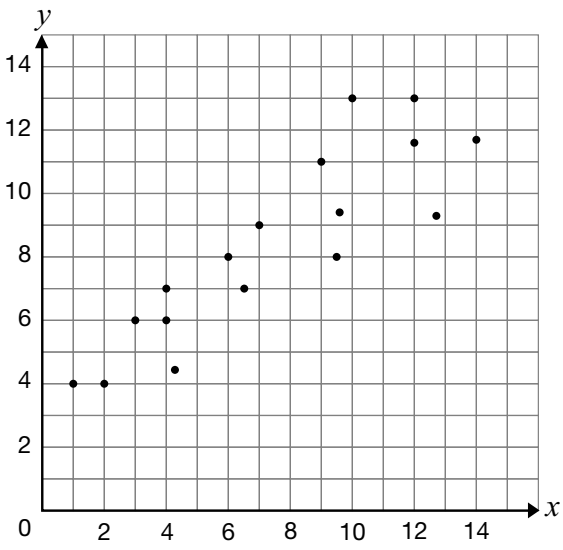
a M

b N

c P

d Q

6 Which of the following could be the slope of a line of best fit for the data shown in the scatter plot below?



a −2

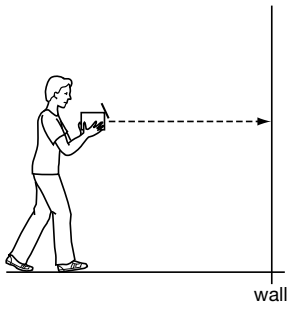
b −1

c 1

d 2

 5. a 6. c

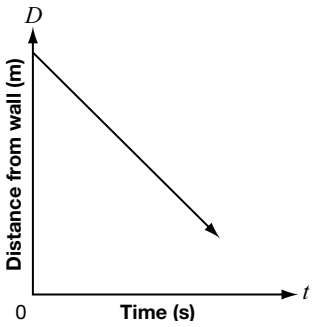
7 In an investigation, a student holds a motion detector, points it at a wall and walks toward the wall.



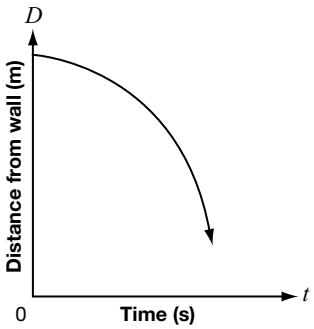
The student walks slowly at first and then speeds up as he approaches the wall.

Which of the following graphs would be produced on the graphing calculator?

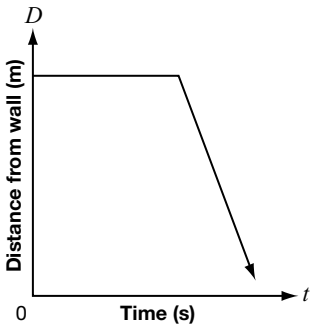
a



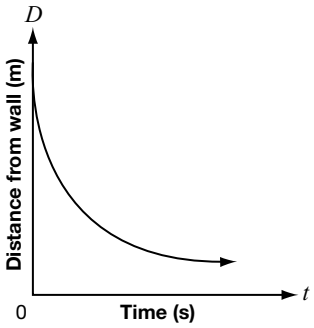
b



c



d



7. b

8 The table of values below displays the cost of renting a bicycle.

Time, t **(h)**	**Cost,** C **($)**
0	25
1	30
2	35
3	40

Which equation models the cost of renting a bicycle?

a $C = 5t$

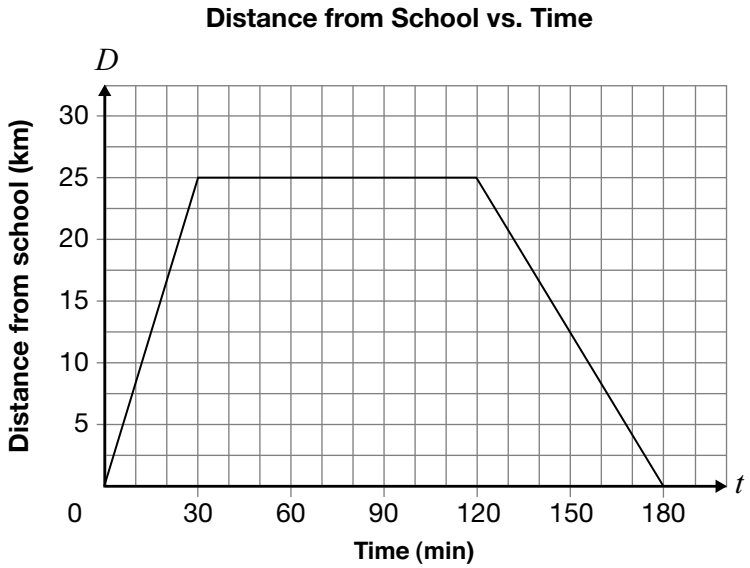
b $C = 25t$

c $C = 5t + 25$

d $C = 25t + 5$

9 Dogs Versus Cats

The Bryant Bulldogs basketball team takes the bus to play the Jordan High Thundercats.



Describe the three parts of the Bulldogs' bus trip, using the information on the graph.

Include information about distance, time, direction and speed in kilometres per minute for each section of the graph.

10 Which of the following equations does **not** represent a linear relation?

a $x = -2$

b $y = 3x - 1$

c $y = x^2 + 3$

d $3x - 2y - 1 = 0$

11 For the slope of a line, the change in x is greater than the change in y. Which of the following could represent the slope of this line?

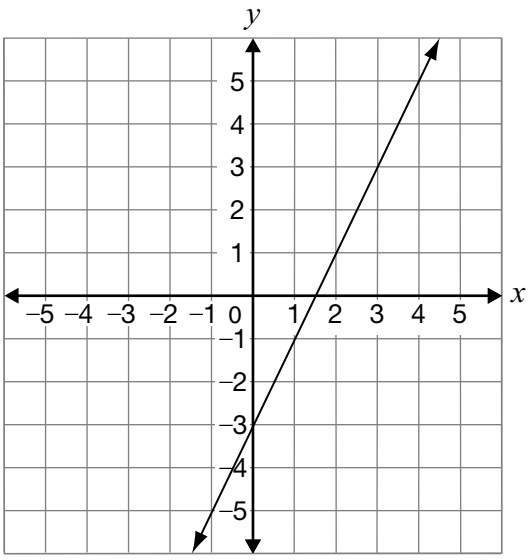
a $\frac{4}{3}$

b 2

c 1

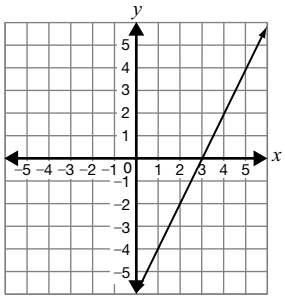
d $\frac{2}{5}$

12 The graph of a line is shown below.

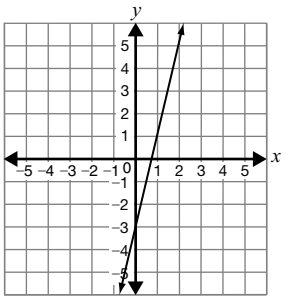


If the slope is doubled and the y-intercept remains constant, which graph below best represents the new line?

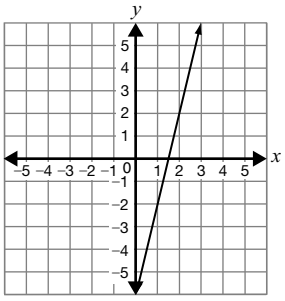
a



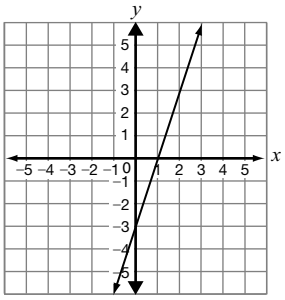
b



c

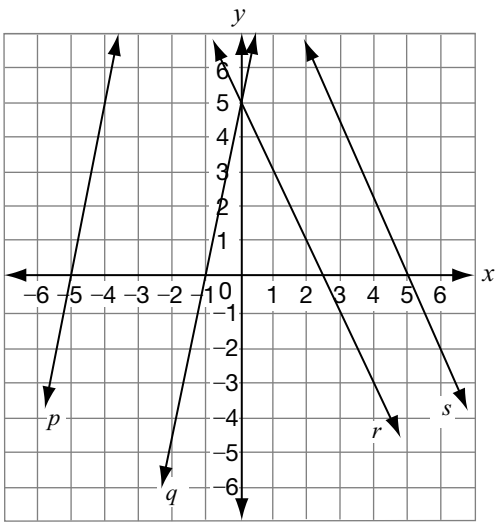


d



 10. c 11. d 12. b

13 Consider the following linear relations.



Which line represents the graph of the equation $y = -2x + 5$?

a Line p

b Line q

c Line r

d Line s

14 The following table shows values for a linear relation.

x	y
−15	−33
−9	−25
3	−9
12	3

Which of the following equations represents the relationship shown in the table of values?

a $y = \frac{4}{3}x - 16$

b $y = \frac{4}{3}x - 13$

c $y = \frac{3}{4}x - 9$

d $y = \frac{3}{4}x - 6$

13. c 14. b

15 A Tale of Two Lines

Below are the equations of two lines.

Line A: $x - 2y + 8 = 0$

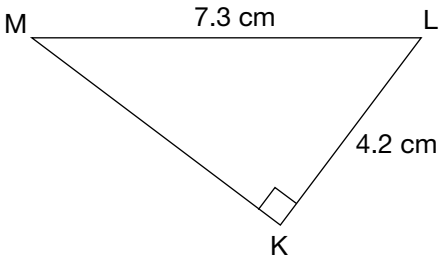
Line B: $2x + y + 1 = 0$

Compare the two lines by considering their slopes.

Justify your answer.

Hint:
Include information about
- steepness,
- direction and
- whether the lines are parallel or perpendicular, or whether they are neither.

16 Triangle KLM is shown below.



Which of the following is closest to the perimeter of triangle KLM?

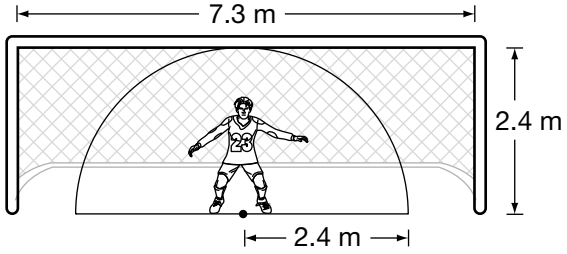
a 12.6 cm

b 16.3 cm

c 17.5 cm

d 21.0 cm

17 A soccer goalie is standing in a goal opening. From this position, she can guard the area represented by the semicircle below.



How much of the goal opening is she not guarding?

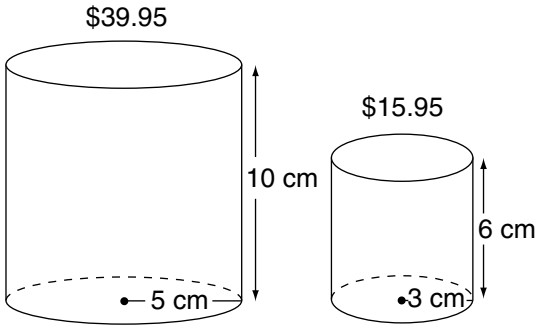
a 0.6 m^2

b 8.5 m^2

c 9.0 m^2

d 26.6 m^2

18 Two different stores sell coffee in cylindrical packages. The prices and dimensions of the packages from the two stores are shown below.



Which is closest to the difference between the unit prices of these two packages?

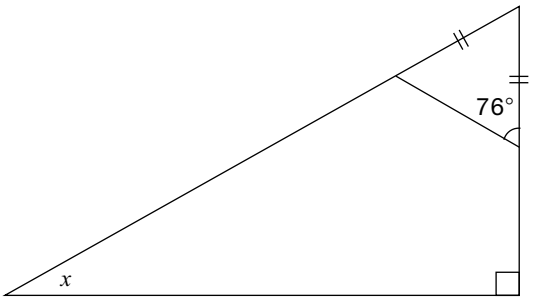
a \$0.04/cm^3

b \$0.05/cm^3

c \$0.09/cm^3

d \$0.24/cm^3

19 Consider the following diagram.



What is the value of x?

a 14°

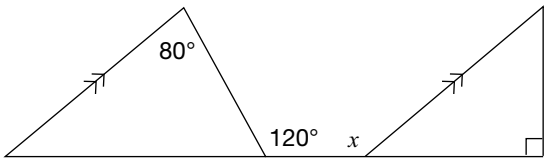
b 28°

c 62°

d 76°

16. c 17. b 18. a 19. c

20 Consider the diagram below.



What is the value of x?

a 80°

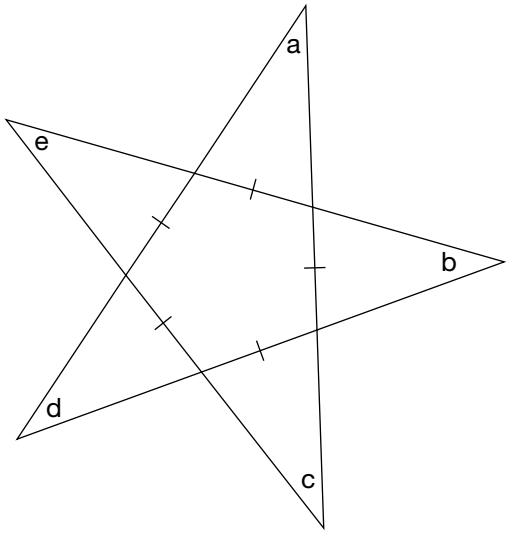
b 120°

c 140°

d 170°

21 Twinkle Twinkle

Nicole notices the star design shown below on the pavement outside a movie theatre.



Determine the sum of the angle measures in the corners of this star: a + b + c + d + e.

Justify your answer using geometric properties.

Education Quality and Accountability Office

EQAO

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Academic

Grade 9 Assessment of Mathematics

2011

SAMPLE ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2011, Academic).

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.

Education Quality and Accountability Office

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Directions

Make sure you have the following materials:

- Student Answer Sheet
- the Formula Sheet
- a pencil and an eraser
- a ruler
- a scientific or graphing calculator
- some paper for rough work for multiple-choice questions only

The diagrams in this booklet are **not** all drawn to scale.

Answering Multiple-Choice Questions

When answering the multiple-choice questions, be sure you use the Student Answer Sheet. The circles you will be filling in are lettered a, b, c, d.

1. Try to answer all of the multiple-choice questions. Do not leave a question blank.

2. Be sure to read each question and its four answer choices carefully. When you choose an answer, fill in the appropriate circle on the Student Answer Sheet. Do not spend too much time on any one question.

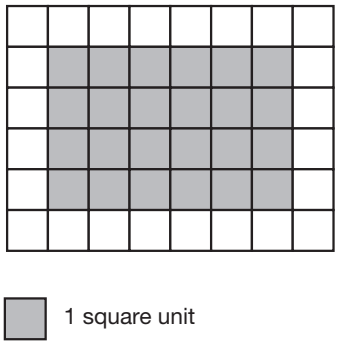
3. Mark only one answer for each question. Do not fill in more than one circle for a question.

4. To make a correction, cleanly erase the answer you wish to change and fill in the circle for your new answer.

5. Now do the following sample question. Fill in your choice in the sample row.

Sample Question

1 Find the area of the shaded region of the rectangle below.



1 square unit

a 16 square units

b 24 square units

c 30 square units

d 36 square units

Sample Row on Answer Sheet

1. ⓐ ⓑ ⓒ ⓓ

You should have filled in ⓑ.

Answering Open-Response Questions

1. The open-response questions are designed to let you show what you know and what you can do. Try to give clear, well-organized solutions to illustrate your complete understanding and ability to communicate. Give as much information as you can.

2. Do all of your work (even your rough work) in this booklet.

3. Write your solutions so that they can be understood by someone who does not know your work.

4. Make sure you follow the directions on the Key Words page.

   For example, a question might ask you to "Show your work." Read the Key Words page. It says to record all calculations and steps. So, if you sketch a graph in the process of getting to your answer, show the sketch and label it. Use proper and correct mathematical conventions when you present your work.

5. When using a calculator, write down the numbers you use and the operations you carry out.

   For example, a question might ask you to "Find the area of a circle with a diameter of 7 cm." You need to write $A = \pi(3.5)^2$ as well as the answer you get on your calculator.

6. There are many different ways to solve any problem. Use your broad range of mathematical knowledge to present a complete and creative solution to each question.

Key Words

Throughout the assessment, key words are used to identify the type of response required from you. The key words are explained below. Refer to this sheet to make sure you are responding fully to each question.

Compare:
Tell what is the same and what is different.

Describe:
Use words to create a mental picture for the reader.

Determine:
Use mathematics to find a solution to the problem.

List:
Use point form.

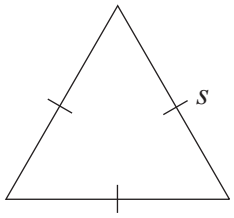
Explain:
Use words and symbols to make your solution clear.

Justify:
Give reasons and evidence to show your answer is correct.

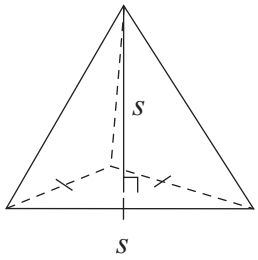
Show your work:
Record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.

1 Which of the following has a volume that can be represented by s^3?

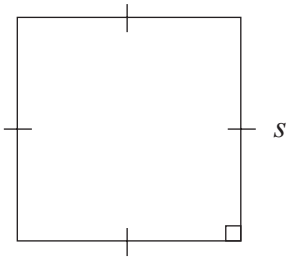
a



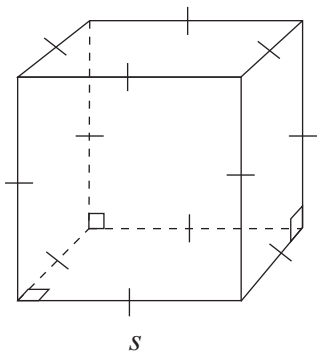
b



c



d



2 What value of m makes the equation $\frac{6a^m}{2a^3} = 3a^5$ true?

a 2

b 8

c 15

d 18

3 What is the value of the expression $\frac{5(-18 + 12)}{-4 + 1}$?

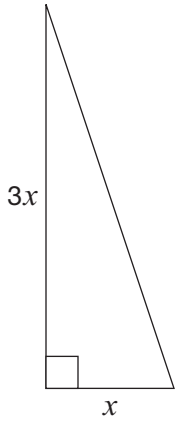
a 10

b 6

c −6

d −10

4 Luke designs a garden in the shape of a right triangle as shown below.



The total area of the garden is 96 m^2.

Hint:

$A = \frac{1}{2}bh$

Which is closest to the value of x in the diagram?

a 6 m

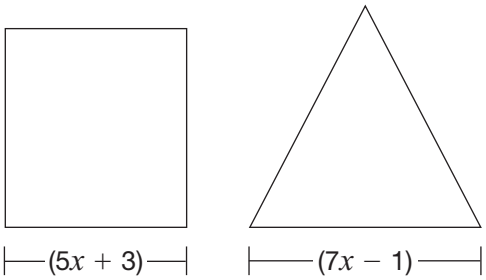
b 8 m

c 32 m

d 64 m

1. d 2. b 3. a 4. b

5 A square and an equilateral triangle are pictured below.



If the square and the triangle have the same perimeter, what is the value of x?

a 2

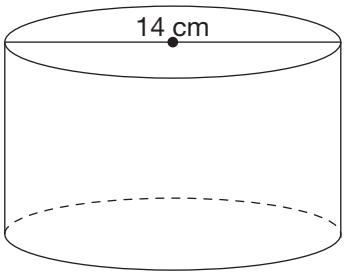
b 4

c 9

d 15

6 How High Is It?

The cylinder pictured below has a surface area of 660 cm^2.

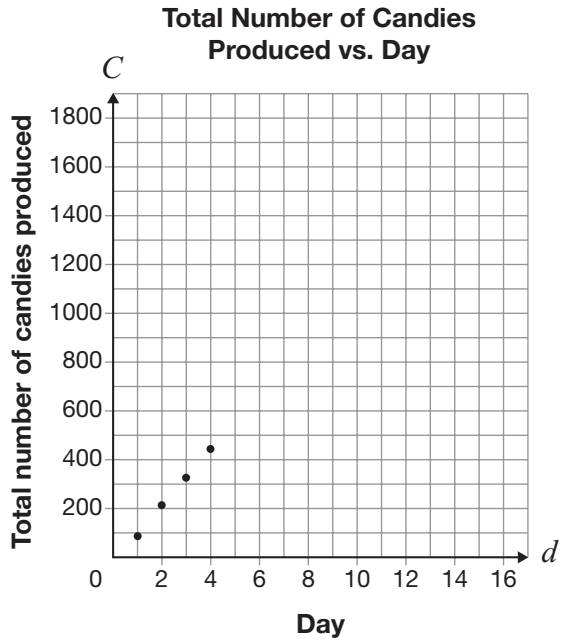


Use the following formula to determine the height of the cylinder:

Surface area = $2\pi r^2 + 2\pi rh$

Show your work.

7 Dechen has a candy-making business. The graph below shows the total number of candies his business has produced by the end of each day for the first four days.



If this trend continues, which of the following points represents a day with more candies produced than expected?

a (5, 500)

b (9, 850)

c (10, 1300)

d (14, 1400)

8 Karina has a job at a video store. The total she is paid each week is made up of an hourly rate plus $14 for transportation.

One week, she works 20 hours and is paid $215.

Which equation represents the relationship between Karina's total pay, P, in dollars, and the number of hours she works, n?

a $P = 10.75n + 14$

b $P = 14n + 10.75$

c $P = 10.05n + 14$

d $P = 14n + 10.05$

9 Which table of values shows a linear relation between C and n?

a

n	C
0	0
1	2
2	4
3	8

b

n	C
0	0
1	1
2	4
3	9

c

n	C
0	0
1	4
2	11
3	15

d

n	C
0	0
1	3
2	6
3	9

10 Which relation does **not** have an initial value of 50?

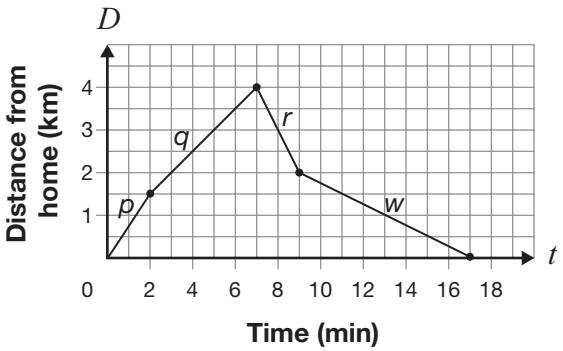
a $y = 50$

b $y = 50 + 8x$

c $y = 50x$

d $y = 50 - x$

11 The graph below represents the relationship between Rena's distance from home and time.



During which section of the graph does Rena travel the fastest?

a p

b q

c r

d w

12 The table below represents a linear relation.

Time, t	Distance, D
0	5
1	15
2	25
3	35
4	45

Which equation represents this relation?

a $D = 5t$

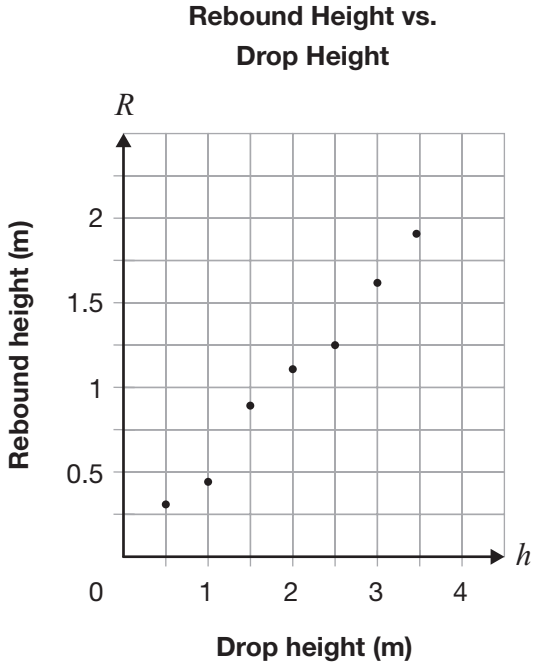
b $D = 10t$

c $D = 10t + 5$

d $D = 5t + 10$

13 Follow the Bouncing Ball

This scatter plot shows the relationship between the rebound height of a ball and the height from which the ball is dropped.



Draw a line of best fit for the data on the grid above.

Determine an equation for your line of best fit.

Show your work.

Equation of line of best fit: _____

14 Getting Paid

Hannah's total pay includes a base salary and a percent of her sales.

The following table shows her total pay for three different sales levels.

Sales ($)	Total pay ($)
15 000	1700
17 500	1825
28 000	2350

Determine Hannah's total pay when her sales are $47 000.

Show your work.

15 Which of the following **cannot** be an equation of a line?

a $x = 2$

b $y = 7$

c $y = 2x^2 + 7$

d $2x + y + 7 = 0$

16 Which of the following is the equation of the line $6x - 2y - 12 = 0$ in the form $y = mx + b$?

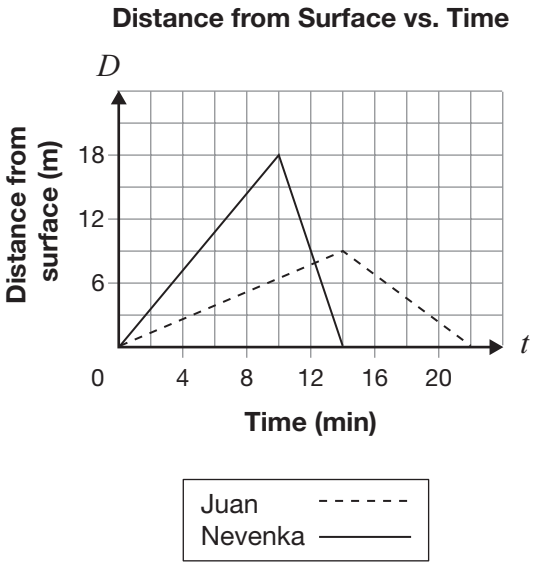
a $y = -3x + 6$

b $y = 3x - 6$

c $y = -\frac{1}{3}x + 12$

d $y = \frac{1}{3}x - 12$

17 Nevenka and Juan scuba dive. The graph below represents the relationship between the distance from the surface, in metres, and time, in minutes, for both divers as they swim down from the surface and then swim back up.



Which statement below is true?

a Juan swims back up at a rate of 0.5 m/min.

b Nevenka swims back up at a rate of 4.5 m/min.

c Nevenka swims down faster than she swims back up.

d Juan swims down and back up at the same rate.

18 Alex has $150. She spends the same amount each week. After 6 weeks, she has $30 remaining.

The relationship between the amount of money Alex has and the number of weeks is represented by a line. What is the slope of this line?

a −25

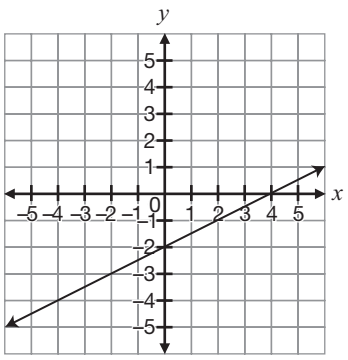
b −20

c 20

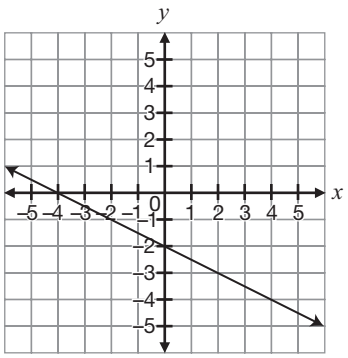
d 25

19 Which of the following represents the graph of the equation $2x - 4y = 8$?

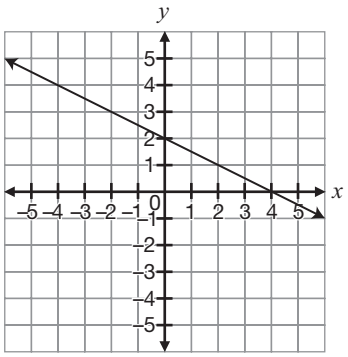
a



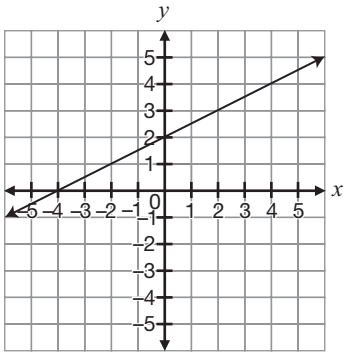
b



c



d



20 Which equation represents a line that has the same y-intercept as $2x + 3y - 6 = 0$?

a $y = \frac{1}{2}x + 2$

b $y = 2x - 2$

c $y = -\frac{1}{2}x + 6$

d $y = -2x - 6$

21 Nate buys a video-game system.

- The system costs $300.
- Games cost $60 each.
- He pays 13% tax on the system and on each game.
- He has $850 in total to spend.

After he pays for the system, how many games is Nate able to buy?

a exactly 12

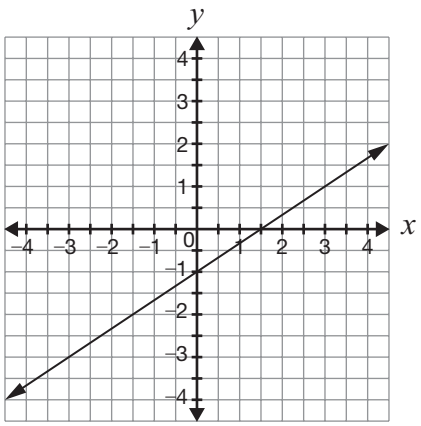
b exactly 9

c no more than 7

d no more than 3

22 Hit the Slopes

Consider the two relations represented below.

Relation 1	Relation 2
$5x-2y=4$	

Determine the slope of the line representing each relation.

Show your work.

Slope of line representing Relation 1: _____

Slope of line representing Relation 2: _____

Which of these relations is represented by the steeper line?

_____

Justify your answer.

23 How Many Uniforms?

The equation $C = 20n + 35$ represents the relationship between the cost of school volleyball uniforms, C, in dollars, and the number of uniforms ordered, n.

- The uniform company requires that the school order a minimum of 15 uniforms.
- The school has a maximum of $600 to spend on the uniforms.

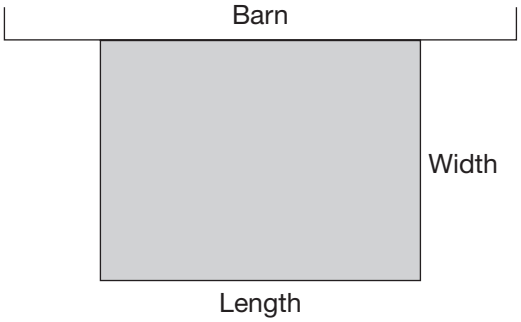
Determine the possible values for n and C in this situation.

Show your work.

The possible values for n are _____.

The possible values for C are _____.

24 Tom uses fencing to create a rectangular horse enclosure. He uses the side of a barn as one of the sides of the enclosure.



Tom has 48 metres of fencing to use for the three sides of the rectangular enclosure.

Which set of dimensions will use the entire 48 m of fencing?

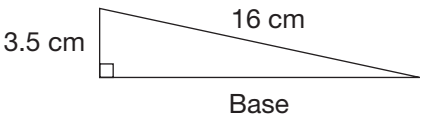
a width is 8 m, length is 6 m

b width is 12 m, length is 12 m

c width is 24 m, length is 12 m

d width is 12 m, length is 24 m

25 Consider the following triangle.



Which expression can be used in the process of determining the length of the base?

a $16^2 - 3.5^2$

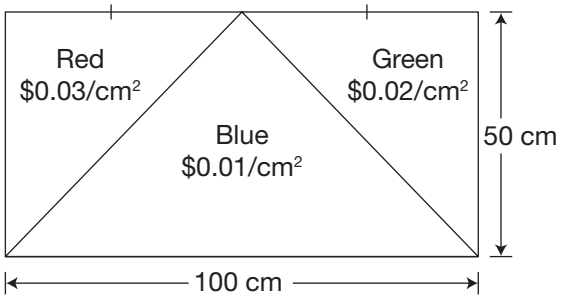
b $16^2 + 3.5^2$

c $\sqrt{16 + 3.5}$

d $\sqrt{16 - 3.5}$

26 Pablo is designing a rectangular flag that consists of three coloured triangles.

The picture below shows the colours of the triangles and the cost of each colour of material.



What is the total cost of the material?

a $75.00

b $87.50

c $150.00

d $175.00

27 A cylinder has a volume of 400π cm^3 and a diameter of 20 cm.

Which of the following is closest to the height of the cylinder?

a 1 cm

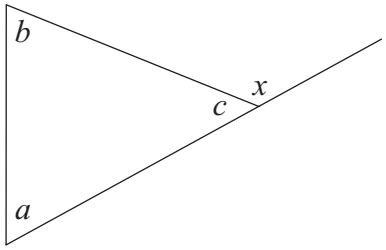
b 4 cm

c 20 cm

d 40 cm

28 Consider the diagram below.

Which of the following equations is always true?



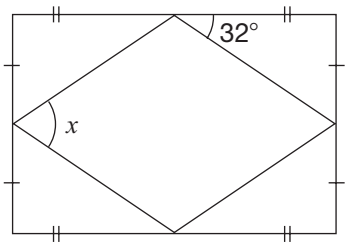
a $x = a + b$

b $x = b + c$

c $x = a - b$

d $x = b - c$

29 A rectangular sign is built as shown below. The four supports for the back of the sign form four congruent triangles.



What is the value of x?

a 26°

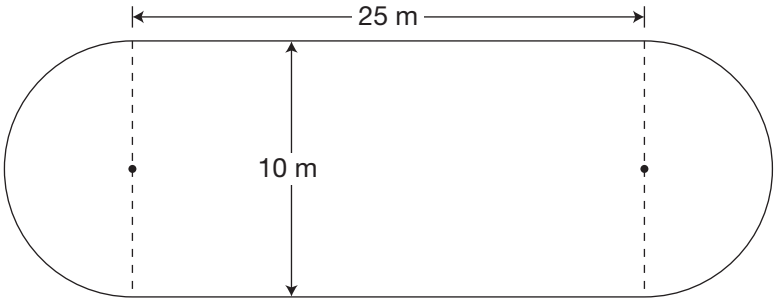
b 32°

c 58°

d 64°

30 Building an Ice Rink

Jake builds an ice rink as shown below.

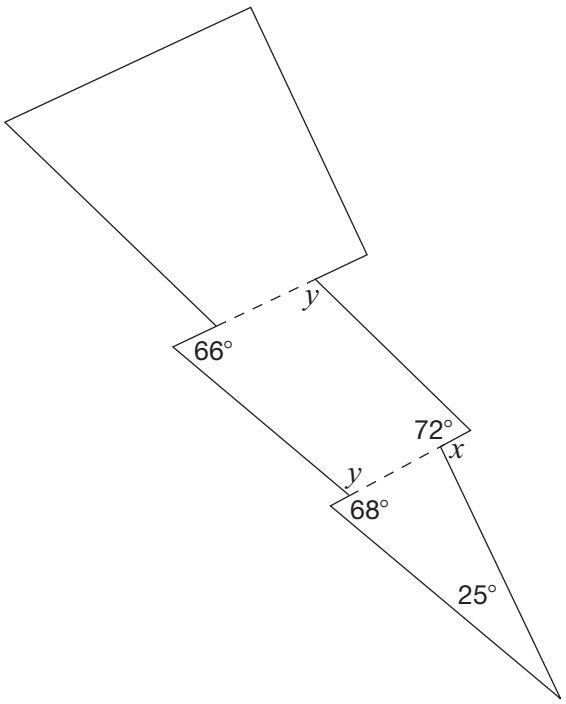


Determine the perimeter of the rink.

Show your work.

31 Shazam

Pravin designs a lightning bolt using two quadrilaterals and one triangle as shown below.



Complete the table below.

Justify your answers using geometric properties.

Angle measure	Justification
$x =$ _____	
$y =$ _____	

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Academic

Grade 9 Assessment of Mathematics

2012

RELEASED ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2012, Academic).

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Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.

Directions

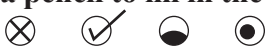
Make sure you have the following materials:

- Student Answer Sheet
- the Formula Sheet
- a pencil and an eraser
- a ruler
- a scientific or graphing calculator
- some paper for rough work for multiple-choice questions only

The diagrams in this booklet are **not** all drawn to scale.

Answering Multiple-Choice Questions

When answering the multiple-choice questions, be sure you use Student Answer Sheet. The circles you will be filling in are lettered a, b, c, d.

1. Try to answer all of the multiple-choice questions. Be sure to read each question and its four answer choices carefully. Do not spend too much time on any one question.
2. To indicate your answer, **use a pencil to fill in the circle completely** on Student Answer Sheet.
   Like this: ● Not like this: 
3. If you fill in more than one answer to a question, the question will be scored zero.
4. If you leave a question blank, the question will be scored zero.
5. Cleanly erase any answer you wish to change and fill in the circle for your new answer.

Answering Open-Response Questions

1. Do all of your work (even your rough work) in this booklet.
2. Present a complete and well-organized solution to each question. Give as much information as you can.
3. Write your solutions so that they can be understood by someone who does not know your work.
4. Make sure you follow the directions on the Key Words page.
   For example, a question might ask you to "Show your work." Read the Key Words page. It says to record all calculations and steps. So, if you sketch a graph in the process of getting to your answer, show the sketch and label it.
5. When using a calculator, write down the numbers you use and the operations you carry out.
   For example, a question might ask you to "Find the area of a circle with a radius of 7 cm." You need to write $A = \pi(7)^2$ as well as the answer you get on your calculator.

Key Words

Throughout the assessment, key words are used to identify the type of response required from you. The key words are explained below. Refer to this sheet to make sure you are responding fully to each question.

Compare:
Tell what is the same and what is different.

Describe:
Use words to create a mental picture for the reader.

Determine:
Use mathematics to find a solution to the problem.

List:
Use point form.

Explain:
Use words and symbols to make your solution clear.

Justify:
Give reasons and evidence to show your answer is correct.

Show your work:
Record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.

1 What is the value of the expression x^2 when $x = \frac{4}{5}$?

a $\frac{8}{5}$

b $\frac{8}{10}$

c $\frac{16}{5}$

d $\frac{16}{25}$

2 The volume of a rectangular prism is represented by $12x^3$. The height is represented by $3x$.

Which of the following represents the area of the base?

Hint:
V = (area of base)(height)

a $4x^2$

b $4x^3$

c $9x^2$

d $9x^3$

3 A basketball player scores 28 points in a game. She scores 35% of the total team points.

How many points does her team score in total?

a 63

b 65

c 72

d 80

4 Which of the expressions below is equivalent to $3(4x - 5) - 7(9x - 2)$?

a $-51x - 1$

b $-51x - 3$

c $-51x - 7$

d $-51x - 29$

5 Liam sells sandwiches at an arena. He earns \$10.50 per hour plus \$0.40 for each sandwich he sells.

How many sandwiches does he need to sell during a 6-hour shift to earn \$125?

a 158

b 155

c 62

d 12

1. d 2. a 3. d 4. a 5. a

6 What a Bargain!

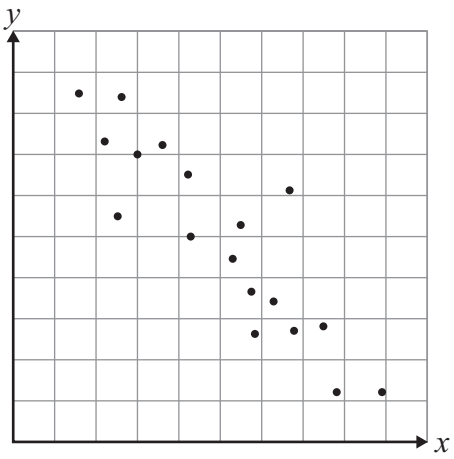
Susan buys a tennis racket from a store.

- The tennis racket's original price is $75.
- All tennis rackets are on sale for 25% off the original price.
- The tennis racket has a scratch, so she receives an additional 10% off the sale price.

How much does Susan pay for her tennis racket, including 13% tax?

Show your work.

7 Consider the graph below.



Which relationship is most likely to be represented by this graph?

a height vs. weight

b pay vs. number of hours worked

c gas remaining vs. distance travelled

d volume of water in a bucket vs. its mass

8 The figures below are made with sticks of equal length. Figure 1 is made with 4 sticks.

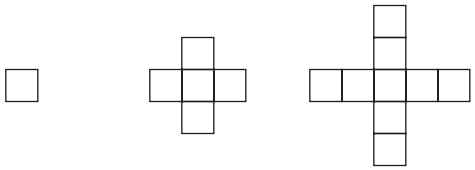


Figure 1 Figure 2 Figure 3

The pattern continues in the same way.Which table shows the relationship between the number of sticks, *S,* and the figure number, *n*?

a

n	*S*
1	4
2	20
3	36

b

n	*S*
4	40
5	52
6	64

c

n	*S*
3	12
4	16
5	20

d

n	*S*
5	17
6	21
7	25

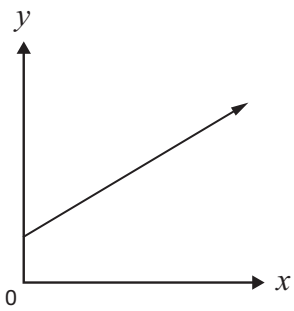
7. c 8. b

9 Which of the following represents a non-linear relation?

a

x	y
1	1
2	4
3	9
4	16

b

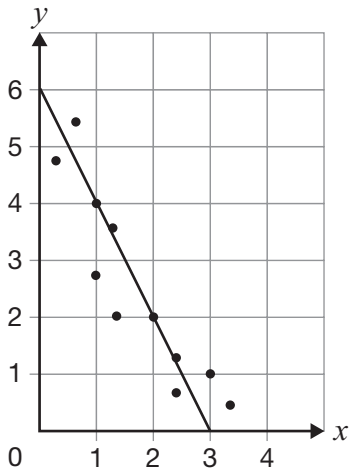


c $y = 2x + 3$

d

x	y
4	8
3	5
2	2
1	−1

10 A line of best fit is drawn on the scatter plot below.



The slope of the line is -2.

Which equation represents the line?

a $y = 6x - 2$

b $y = 3x - 2$

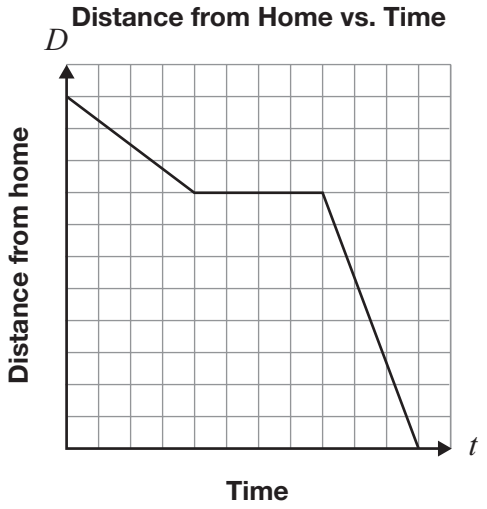
c $y = -2x + 3$

d $y = -2x + 6$

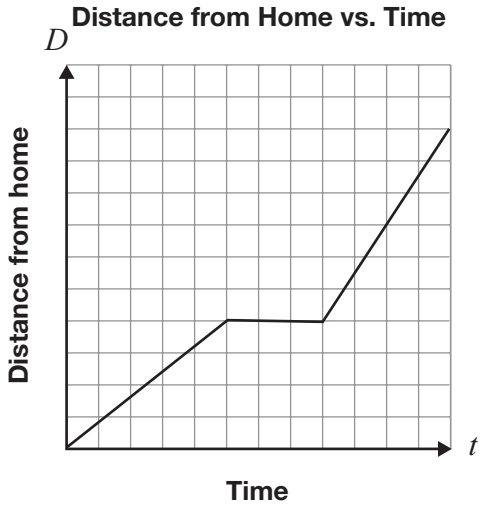
11 Bruno leaves home and goes for a run along a straight path. He runs to the park, stops for a rest and returns home.

Which graph best represents his run?

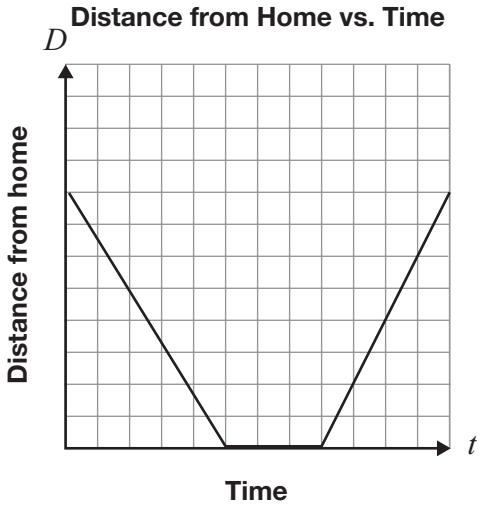
a



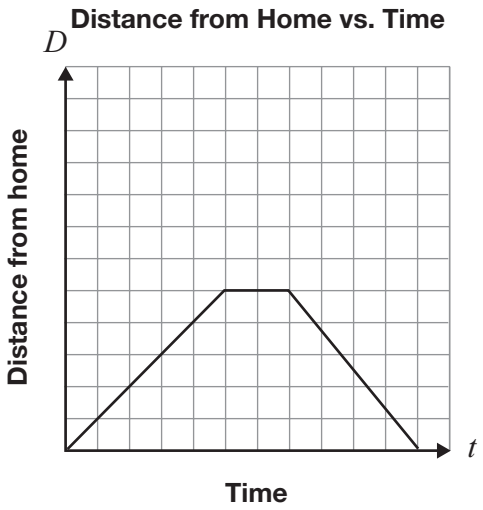
b



c



d



12 Abigail buys a prepaid card for her cellphone. When she talks on her phone, a fee per minute is deducted from the value of the prepaid card.

The table below shows information about the remaining value of the card.

Total number of minutes used, t	Remaining value, V ($)
10	22.00
20	19.00

Which equation represents the relationship between the remaining value and total number of minutes used?

a $V = 22 - 3t$

b $V = 22 - 0.30t$

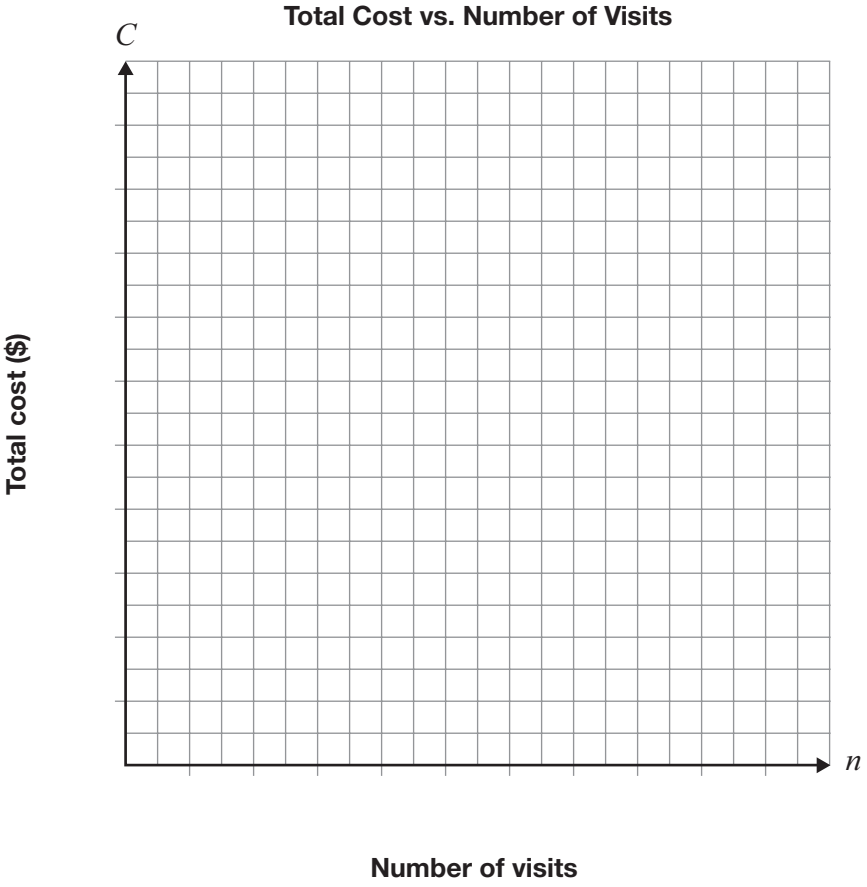
c $V = 25 - 3t$

d $V = 25 - 0.30t$

13 Which Is Which?

A relationship between the total cost to use a gym for a month, C, and the number of visits, n, is a partial variation. The total cost for 10 visits during one month is $50.

Draw a graph that could represent this relationship. Label each axis with an appropriate scale.



Determine the equation for your graph.

$C =$ _____

Explain how you know your equation represents a partial variation.

14 Counting Pennies

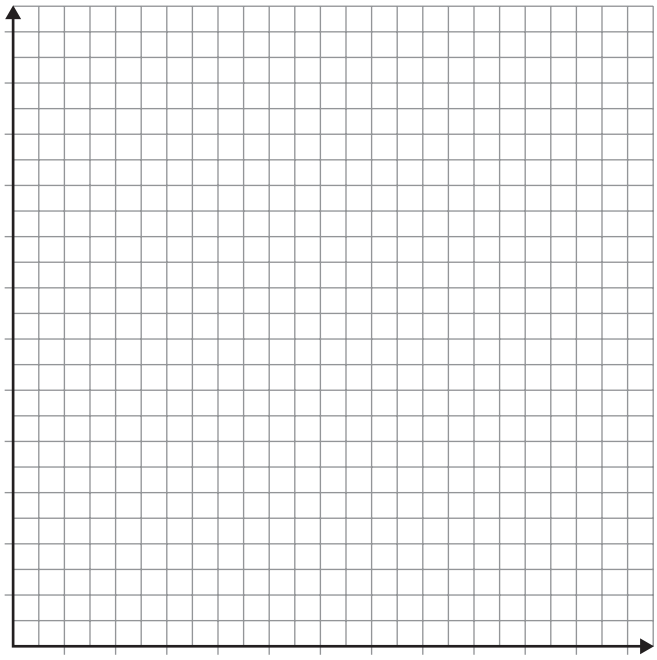
Identical pennies are placed in a container and the total mass is recorded.

The table below gives information about the total mass of different numbers of pennies in the container.

Number of pennies	Total mass (g)
4	60
6	65
10	75

Use the data to determine the number of pennies in the container when the total mass is 185 g.

Justify your answer. You may use the grid if you wish.



15 Which of the following equations does **not** represent a line?

a $x = 5$

b $y = 10$

c $xy = 10$

d $5x - y + 10 = 0$

16 Which of the following is the equation $4x - 5y + 12 = 0$ in the form $y = mx + b$?

a $y = \frac{4}{5}x + \frac{12}{5}$

b $y = \frac{5}{4}x - 3$

c $y = 4x - 7$

d $y = 5x + 16$

17 Consider the equation $y = mx + 5$.

If (7, 3) is a point on the line represented by this equation, which of the following is true?

a The rise is 8 when the run is 7.

b The rise is 7 when the run is 8.

c The rise is -2 when the run is 7.

d The rise is 7 when the run is -2.

18 Consider the relation $y = -3x + 5$.

Which of the following statements about the graph of this relation is **not** true?

a The slope is 3.

b The y-intercept is 5.

c For a rise of 3, the run is -1.

d The graph crosses the y-axis at (0,5).

19 The total cost of swimming at a community swimming pool is made up of a membership fee and a cost per swim.

At this community centre, Jake pays a total of \$100 and swims 40 times. Paula pays a total of \$70 and swims 25 times.

Which of the following statements is true?

a The membership fee is \$20.

b The membership fee is \$30.

c The cost per swim is \$2.50.

d The cost per swim is \$2.80.

20 A local fair charges a \$15 entry fee and \$1.75 per ride. Dustin has \$35 to spend.

What is the maximum number of rides Dustin can go on?

a 8

b 11

c 12

d 20

15. c 16. a 17. c 18. a 19. a 20. b

21 In the relation $C = 60 + 15n$, C represents the total cost of holding an event at a hall, and n represents the number of guests.

The maximum number of guests allowed in the hall is 100.

What are the minimum and maximum possible values for C?

a \$0, \$1500

b \$0, \$1560

c \$60, \$1500

d \$60, \$1560

21. d

22 Know Your Lines

Consider the equations of the two lines below.

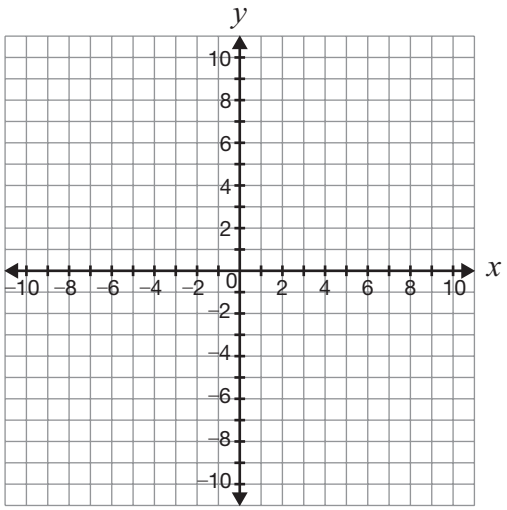
Line A: $y = -\frac{3}{2}x - 7$

Line B: $y = \frac{2}{3}x - 4$

Compare Line A and Line B. You may use the grid if you wish.

Justify your answers.

Complete the table below.



Characteristic	Comparison of Line A and Line B, with justification
Direction from left to right	
Steepness	
Parallel, perpendicular or neither	

23 Reduce, Reuse and Recycle

A high school is starting a recycling program.

The relationship between the total cost of the program, C, and the number of recycling bins, n, is represented by the equation $C = 48n + 75$.

The school must install a minimum of 12 recycling bins and has a maximum of $1000 to spend on the program.

What are the possible values of C and n in this situation?

Justify your answer.

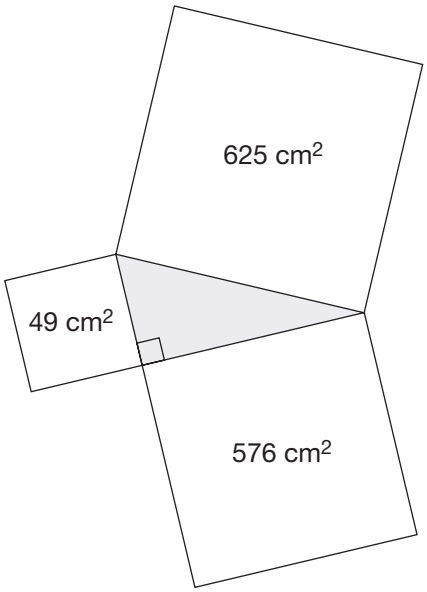
The possible values of n are _____.

The possible values of C are _____.

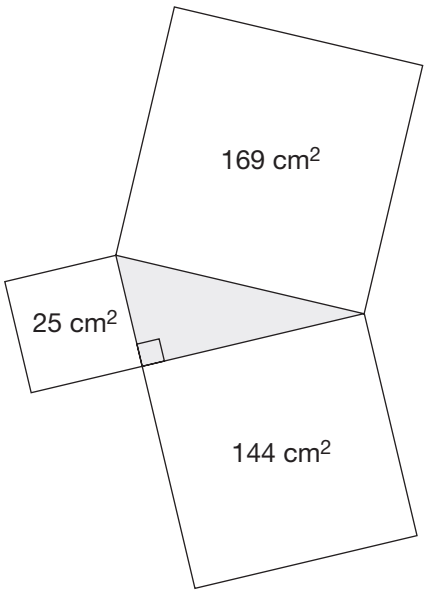
24 Each of the diagrams below shows a right triangle and a square constructed on each of its sides.

According to the Pythagorean theorem, which diagram is **not** correct?

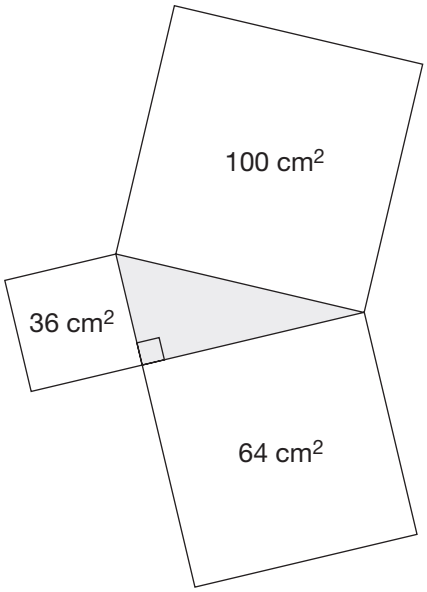
a



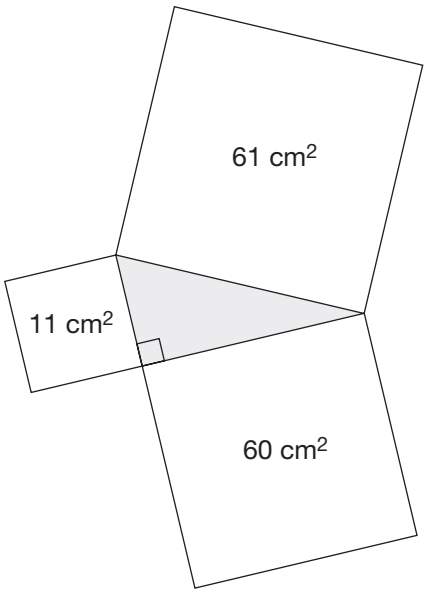
b



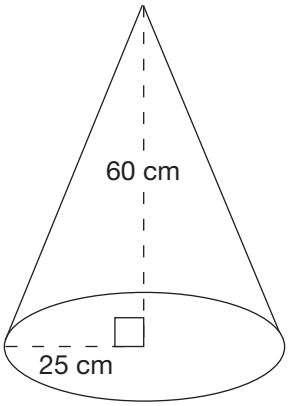
c



d



25 A pylon in the shape of a cone is shown below.



The outside surface of the cone is to be painted, but the bottom will not be painted.

Which of the following is closest to the total surface area to be painted?

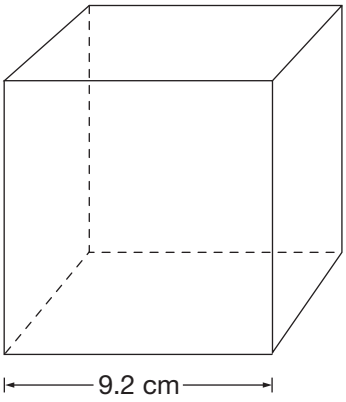
a 4284 cm^2

b 4713 cm^2

c 5105 cm^2

d 5350 cm^2

26 A decoration is packed in a box shaped like a cube as shown below.



The decoration has a volume of 651 cm^3.

Approximately how much empty space remains in the box?

a 128 cm^3

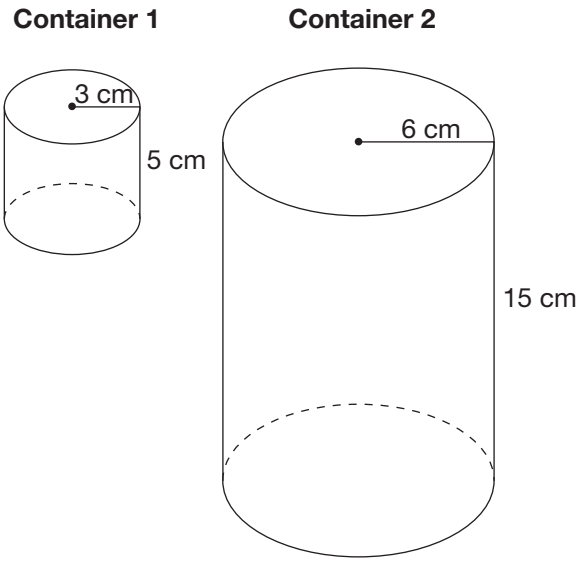
b 143 cm^3

c 623 cm^3

d 779 cm^3

25. c 26. a

27 Two different cylindrical containers are shown below.



When the containers are full of milk, what is the ratio of the amount in Container 1 to the amount in Container 2?

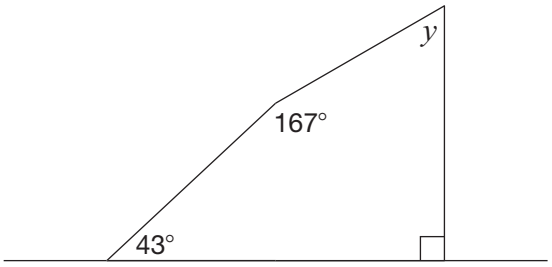
a 1:2

b 1:3

c 1:6

d 1:12

28 Consider the diagram below.



What is the value of y?

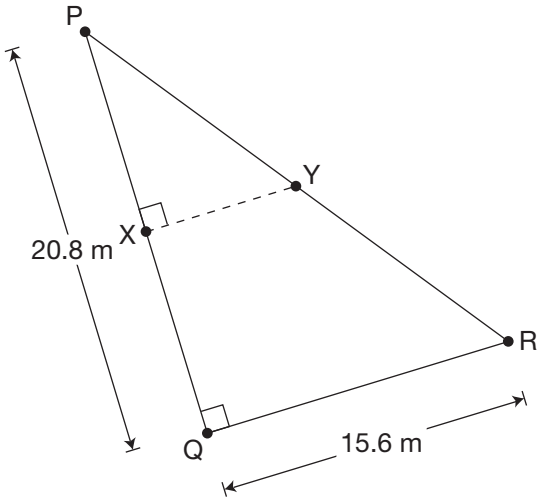
a 43°

b 60°

c 137°

d 150°

29 Consider the right triangle below.



Line segment XY connects the midpoint of PQ to the midpoint of PR.

What is the length of XY?

a 5.2 m

b 7.8 m

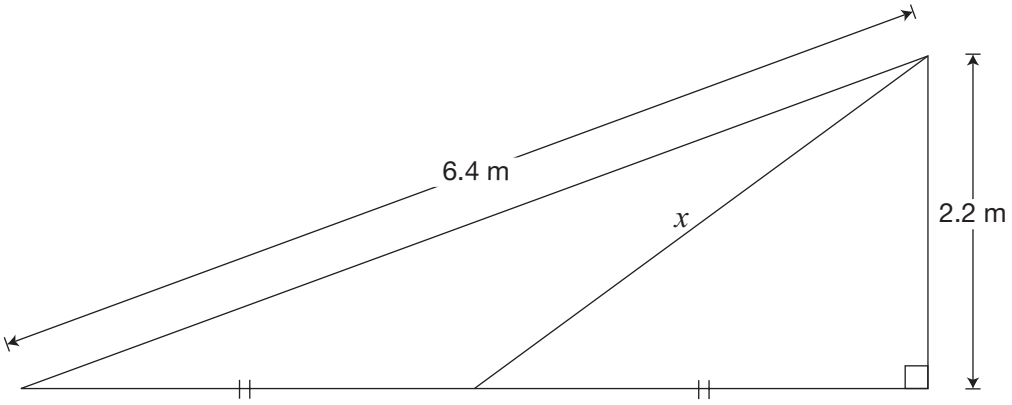
c 10.4 m

d 13.0 m

27. d 28. b 29. b

30 All the Right Stuff

The diagram below shows a small right triangle inside a large right triangle.

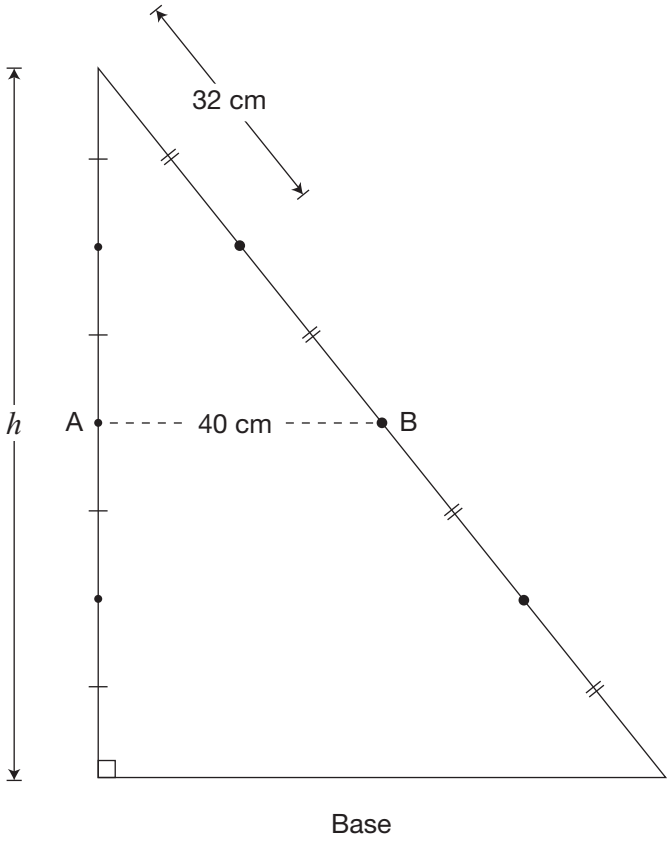


Determine the value of x.

Show your work.

31 Tricky Triangle

Line segment AB joins the midpoints of two sides of the triangle below. The length of AB is half the length of the base of the triangle.



Determine the value of h in the diagram.

Show your work.

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Academic

Grade 9 Assessment of Mathematics

2013

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- a scientific or graphing calculator
- some paper for rough work for multiple-choice questions only

The diagrams in this booklet are **not** all drawn to scale.

Answering Multiple-Choice Questions

When answering the multiple-choice questions, be sure you use the Student Answer Sheet. The circles you will be filling in are lettered a, b, c, d.

1. Try to answer all of the multiple-choice questions. Be sure to read each question and its four answer choices carefully. Do not spend too much time on any one question.
2. To indicate your answer, **use a pencil to fill in the circle completely** on the Student Answer Sheet.
   Like this: ● **Not like this:** ⊗ ⊘ ◒ ◉
3. If you fill in more than one answer to a question, the question will be scored zero.
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Answering Open-Response Questions

1. Do all of your work for each question (even your rough work) in the space provided for the question. Work on additional pages will **not** be scored.
2. Present a complete and well-organized solution to each question. Give as much information as you can.
3. Write your solutions so that they can be understood by someone who does not know your work.
4. Make sure you follow the directions on the Key Words page.
   For example, a question might ask you to "Show your work." Read the Key Words page. It says to record all calculations and steps. So, if you sketch a graph in the process of getting to your answer, show the sketch and label it.
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   For example, a question might ask you to "Find the area of a circle with a radius of 7 cm." You need to write $A = \pi(7)^2$ as well as the answer you get on your calculator.

Key Words

Throughout the assessment, key words are used to identify the type of response required from you. The key words are explained below. Refer to this sheet to make sure you are responding fully to each question.

Compare:
Tell what is the same and what is different.

Describe:
Use words to create a mental picture for the reader.

Determine:
Use mathematics to find a solution to the problem.

List:
Use point form.

Explain:
Use words and symbols to make your solution clear.

Justify:
Give reasons and evidence to show your answer is correct.

Show your work:
Record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.

1 What is the value of $5x^3y^2$ when $x = 2$ and $y = 4$?

- **a** 240
- **b** 320
- **c** 480
- **d** 640

2 What exponent goes in the box to make the following equation true?

$$\frac{x^{\square}x^6}{x^2} = x^{12}$$

- **a** 9
- **b** 8
- **c** 4
- **d** 3

3 Mario is making fruit punch by mixing orange juice and pineapple juice in a ratio of 1:3.

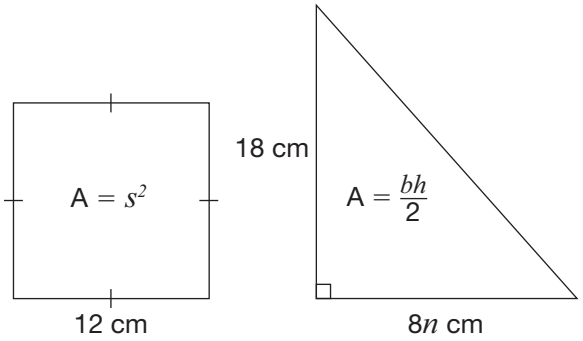
How much pineapple juice should he use to make 3 L of fruit punch?

- **a** 0.75 L
- **b** 2 L
- **c** 2.25 L
- **d** 4 L

4 Which of the following is a simplified form of the expression $4(5x - 8) - 3(2x - 7)$?

- **a** $14x - 11$
- **b** $14x - 53$
- **c** $26x - 11$
- **d** $26x - 53$

5 The square and the triangle below have the same area.



What is the value of n?

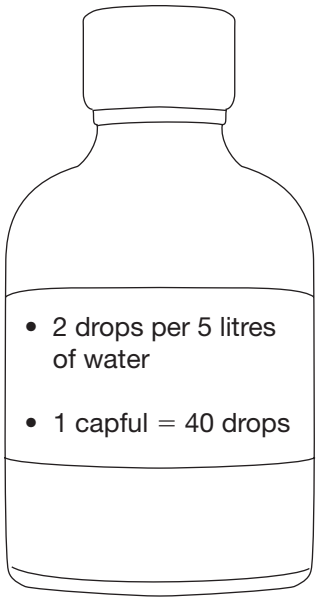
- **a** 1
- **b** 2
- **c** 8
- **d** 16

6 Healthy Fish

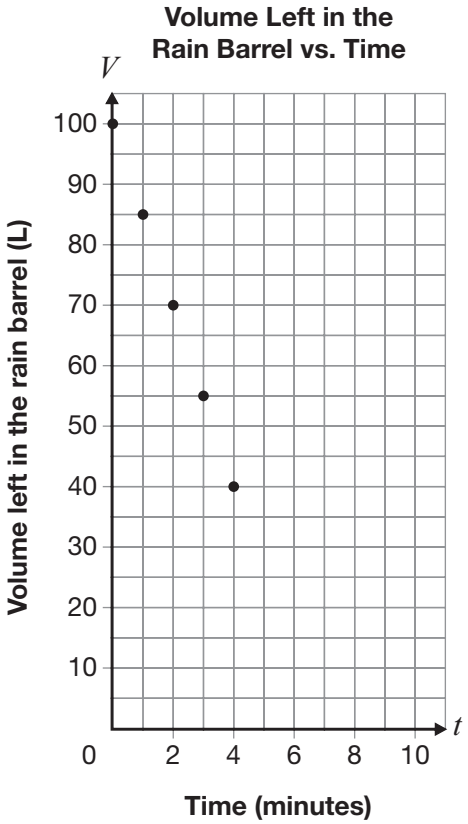
James adds vitamin drops to his fish tank to keep his fish healthy.

If James follows the instructions on the bottle of vitamins, how many capfuls should he add to his 350-litre fish tank?

Show your work.



7 A rain barrel full of water is drained at a constant rate. Data for the first few minutes of draining is shown on the grid below.



After 6 minutes, the draining is stopped.

How much water is needed to refill the rain barrel?

a 90 L

b 75 L

c 25 L

d 10 L

8 Luisa chooses a cellphone plan that charges a flat fee of $20 per month and $0.25 for each text message sent.

Which equation best represents the cost of Luisa's cellphone plan, C, in dollars, where n is the number of text messages sent?

a $C = 20.25n$

b $C = 20(0.25n)$

c $C = 20n + 0.25$

d $C = 0.25n + 20$

9 There is a linear relationship between the total cost of renting a costume and the number of hours the costume is rented.

- For 3 hours, the total cost is $60.
- For 5 hours, the total cost is $80.

What type of variation is this relationship, and what is its initial value?

a a partial variation with an initial value of $30

b a partial variation with an initial value of $20

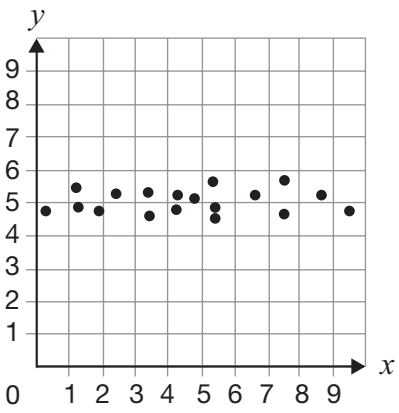
c a direct variation with an initial value of $30

d a direct variation with an initial value of $20

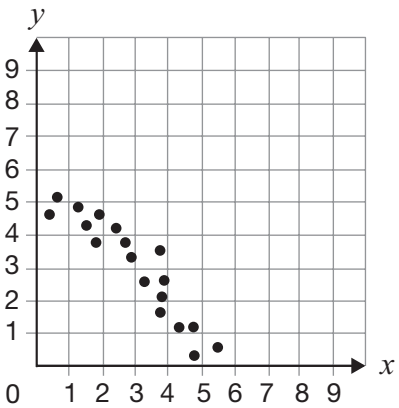
7. a 8. d 9. a

10 For which scatter plot could the line $y = 5$ be the line of best fit?

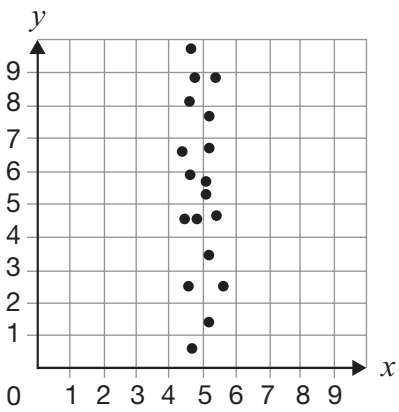
a



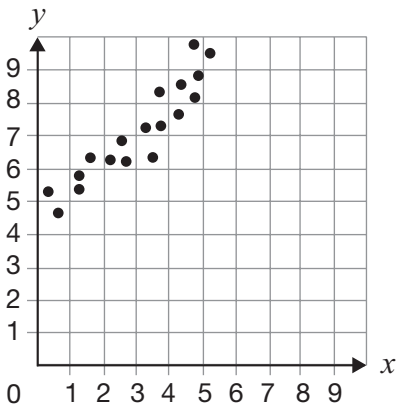
b



c



d



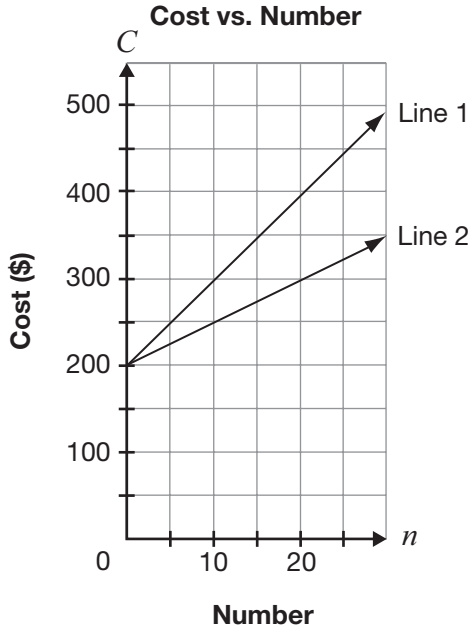
10. a

11 Alex's distance from home is represented by the equation $D = -0.5t + 300$, where D represents his distance from home, in kilometres, and t represents time, in minutes.

How long will it take Alex to reach a distance of 182 km from home?

- **a** 236 minutes
- **b** 209 minutes
- **c** 64 minutes
- **d** 59 minutes

12 Two lines are shown below.



Which of the following describes a difference between Line 1 and Line 2?

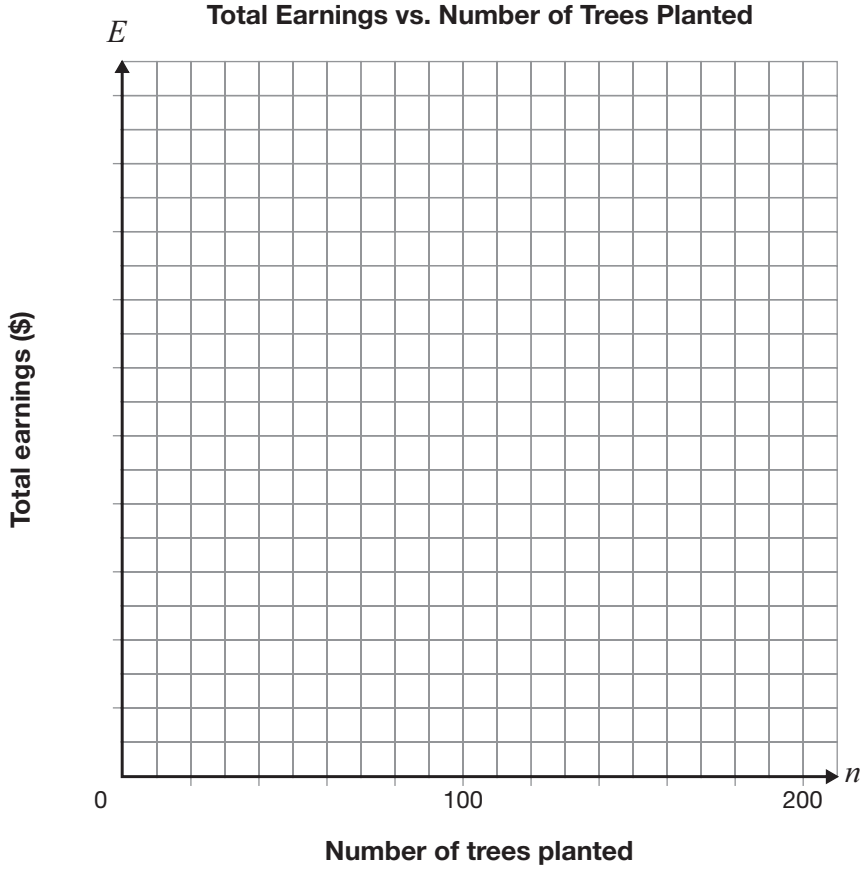
- **a** Line 2 has a larger initial cost.
- **b** Line 1 has a larger initial cost.
- **c** Line 2 has a greater rate of change.
- **d** Line 1 has a greater rate of change.

13 Planting More Trees

Rachel plants trees in Northern Ontario. She is paid $55 a day plus 15¢ for each tree she plants.

On the grid provided, draw the graph of the relationship between Rachel's total earnings for a single day, *E,* in dollars, and the number of trees she plants that day, *n.*

Include a scale on the vertical axis.

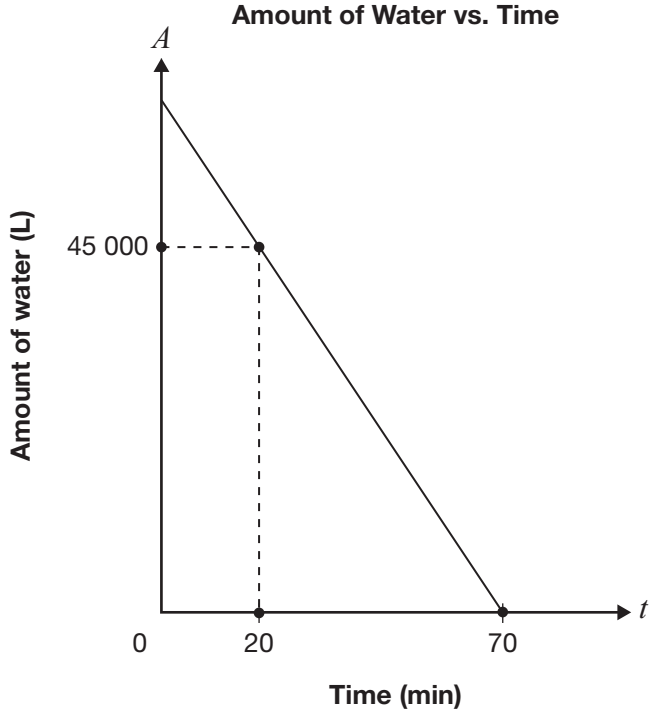


Write an equation to represent the relationship between Rachel's earnings for a single day, *E,* and the number of trees she plants, *n.*

_____

14 Water in a Pool

The graph below represents the relationship between the amount of water, *A,* in a pool as it drains and time, *t*.



Determine the initial amount of water in the pool and the rate of change of this relation.

Show your work.

15 Which of the following equations is equivalent to $3x - 5y = 45$?

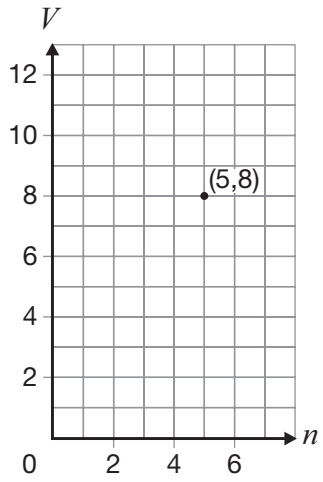
a $y = \frac{3}{5}x - 9$

b $y = -\frac{3}{5}x + 9$

c $y = 3x - 45$

d $y = -3x + 45$

16 The point on the grid below belongs to a linear relation that has $-\frac{3}{2}$ as its rate of change.



Which of the following points also belongs to this relation?

a (2,6)

b (2,10)

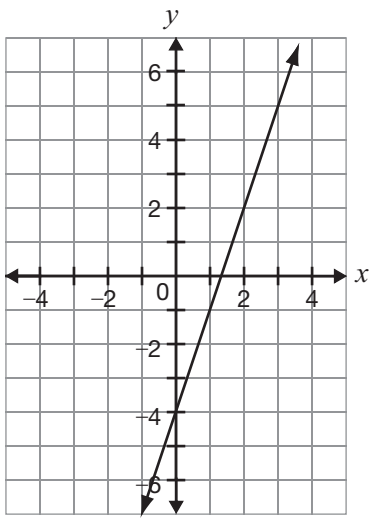
c (3,11)

d (7,11)

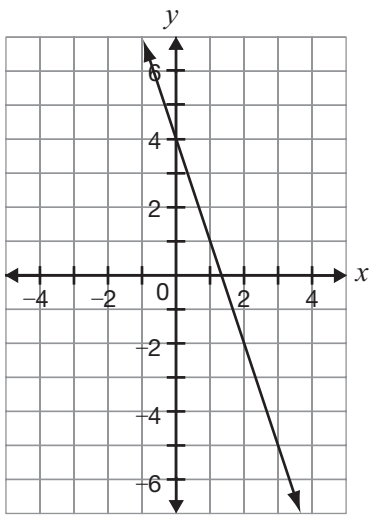
15. a 16. c

17 Which of the following lines has the same slope as the line represented by $y = -3x + 4$?

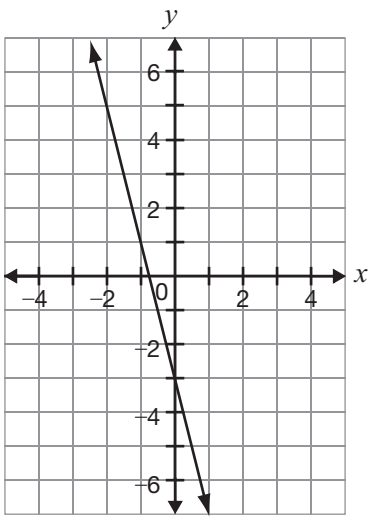
a



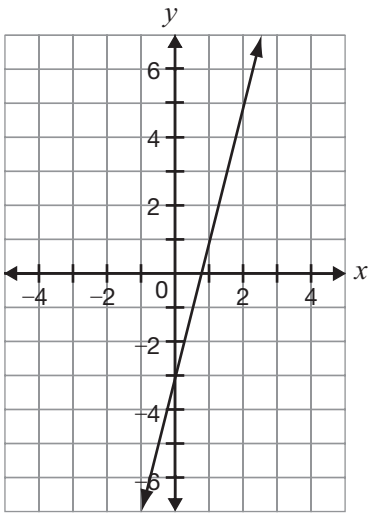
b



c



d



18 Which equation below represents a line that is perpendicular to the line represented by $y = 3x - 5$?

a $y = 3x + \frac{1}{5}$

b $y = -3x - \frac{1}{5}$

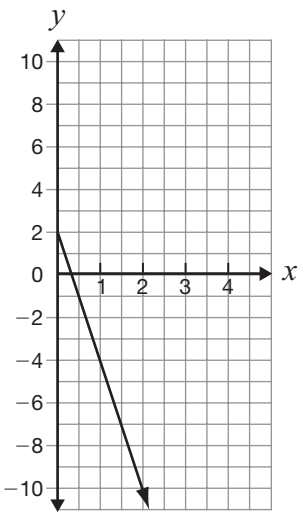
c $y = -\frac{1}{3}x + 7$

d $y = \frac{1}{3}x - 7$

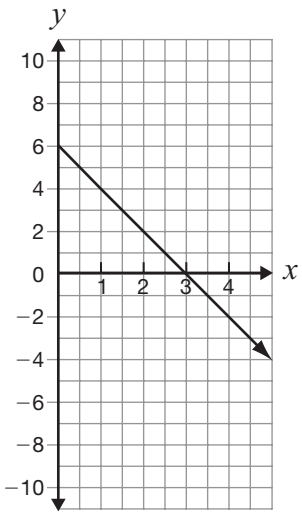
17. b 18. c

19 Which of the following is the graph of the equation $y = -2x + 6$?

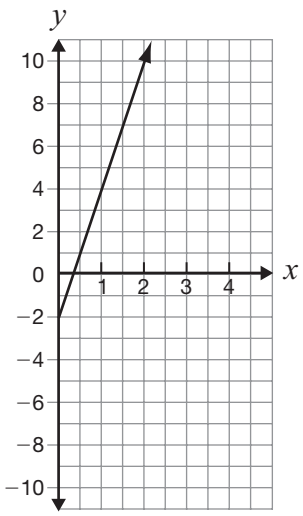
a



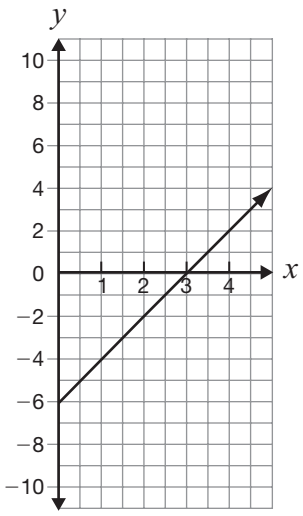
b



c



d



20 The equations below represent the relationship between the total cost, C, in dollars, to repair a computer and the amount of time, t, in hours, at two computer repair stores.

Compu-Fix: $C = 10 + 15t$

Data Repair: $C = 30 + 12t$

It will take between 1 and 5 hours to repair Maria's computer.

What are the smallest and largest possible amounts Maria could pay?

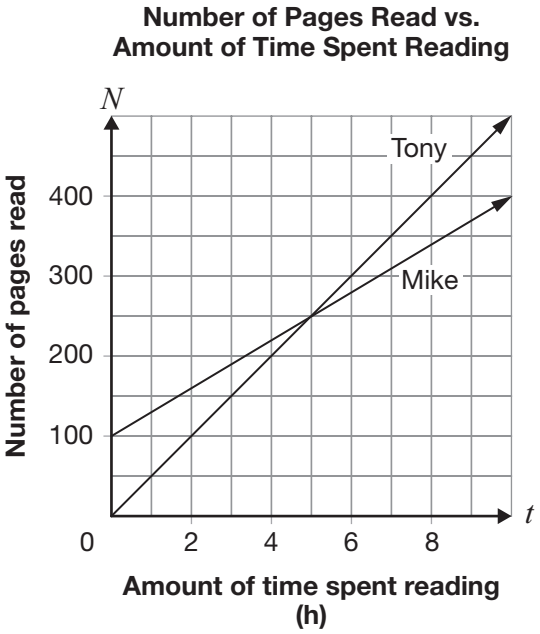
a $10, $85

b $10, $90

c $25, $85

d $25, $90

21 Tony and Mike decide to keep track of their reading. The graph below represents the relationship between the number of pages of a novel each has read and the time spent reading since they started tracking.



Which of the following statements is true?

a At 5 hours, Mike has read 100 pages more than Tony.

b Before 5 hours, Tony has read fewer pages than Mike.

c At 250 minutes, Mike has read the same number of pages as Tony.

d It takes 250 minutes for Tony to catch up to the number of pages that Mike has read.

22 Growing Rates

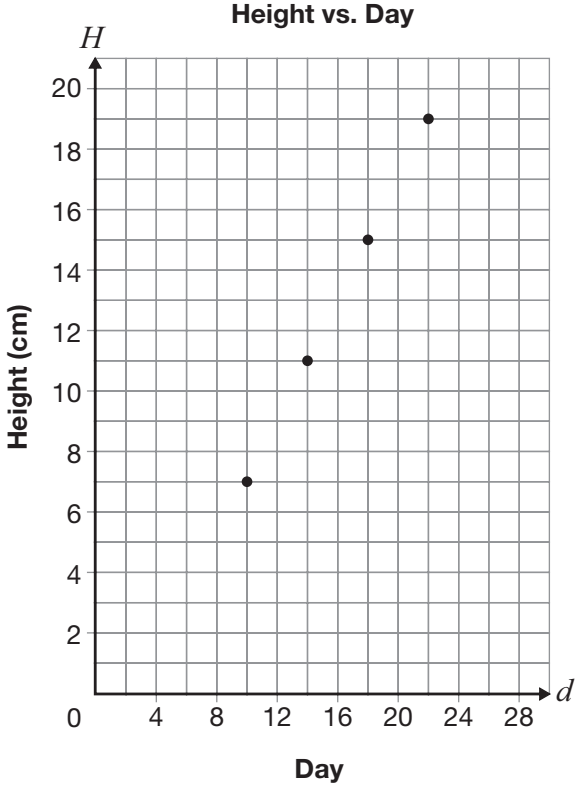
Lucia and Paul each have a plant. Both plants grow at a constant rate.

Lucia records information about the height of her plant in a table, and Paul graphs his results as shown below.

Lucia's Plant

Day	Height (cm)
4	8
7	10
10	12
13	14

Paul's Plant
Height vs. Day



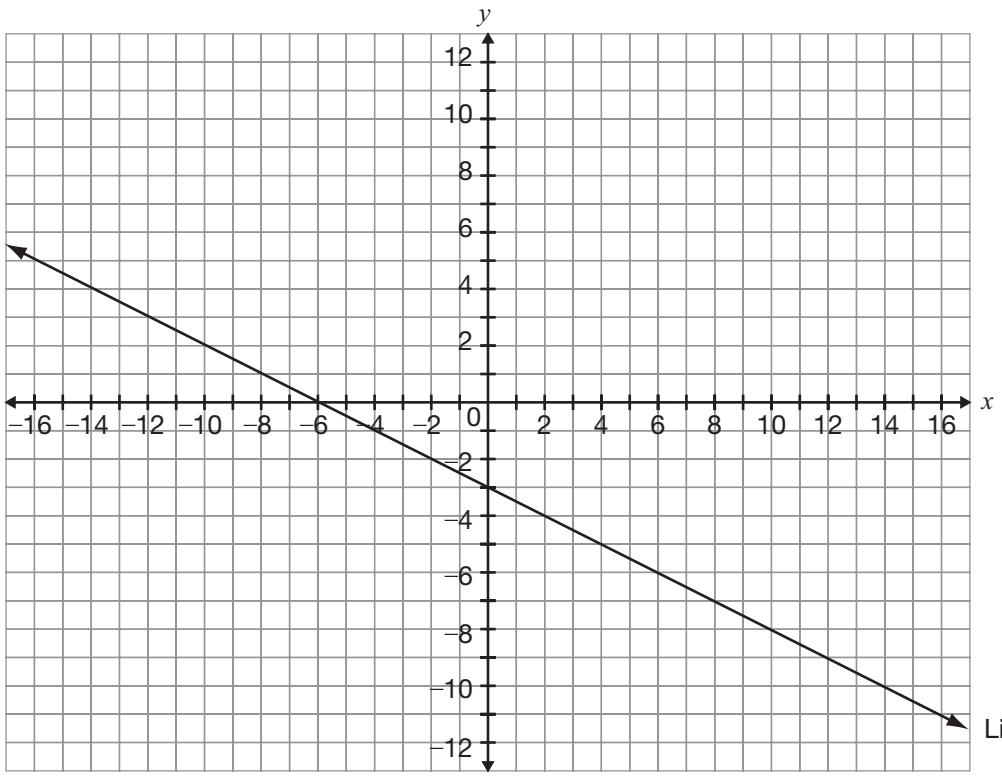
Whose plant is growing faster?

Circle one: Lucia's Paul's

Justify your answer.

23 Lovely Lines

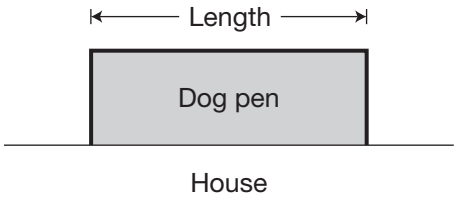
Line 1 is shown on the grid below.



Graph Line 2 on the same grid so that it passes through A(−10, 8) and has a slope that is three times the slope of Line 1.

Justify your answer.

24 Marcus is building a rectangular dog pen along the side of his house as shown below.



Marcus has 20 m of fencing for the 3 sides of the dog pen.

What is the length of the dog pen with the maximum area?

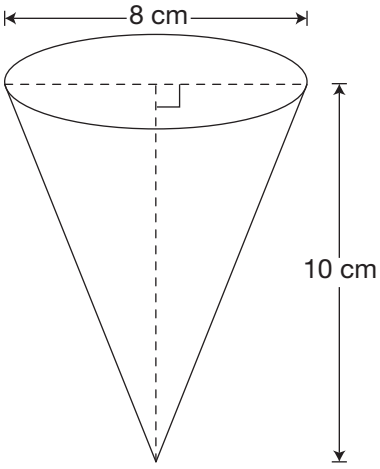
a 4 m

b 5 m

c 10 m

d 12 m

25 An open-topped paper drinking cup in the shape of a cone is pictured below.



Which is closest to the amount of paper required to make the cup?

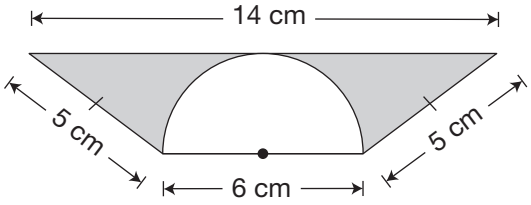
a 185 cm^2

b 167 cm^2

c 135 cm^2

d 126 cm^2

26 The diagram below is made of a trapezoid and a semicircle.



Which is closest to the area of the shaded part of the diagram?

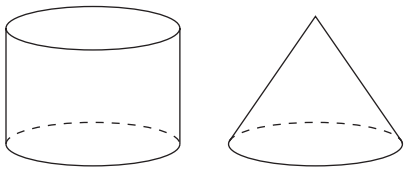
a 2 cm^2

b 16 cm^2

c 21 cm^2

d 36 cm^2

27 The cylinder and the cone shown below have the same height and radius.



Volume of cylinder = ? × Volume of cone

What number completes this equation?

a 3

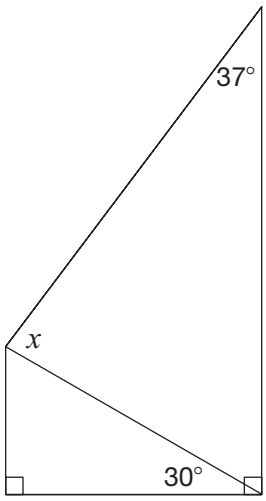
b 2

c $\frac{1}{2}$

d $\frac{1}{3}$

24. c 25. b 26. a 27. d

28 Consider the diagram below.



What is the value of x in the diagram?

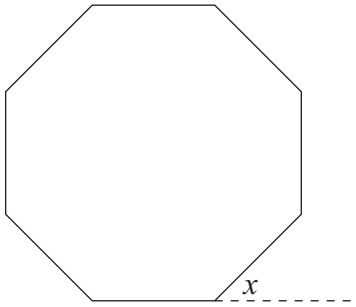
a 30°

b 53°

c 60°

d 83°

29 Consider the regular octagon below.



What is the value of x?

a 15°

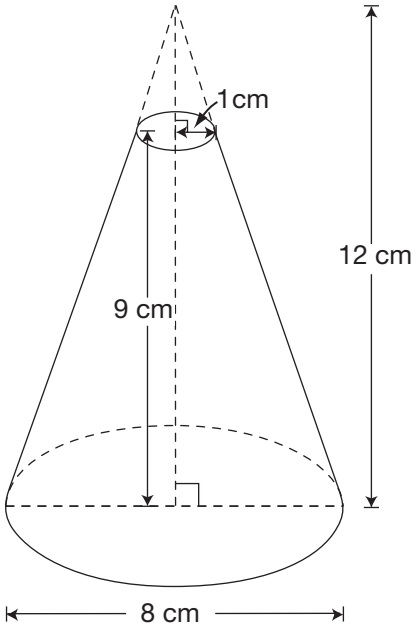
b 30°

c 45°

d 60°

30 Cutting Cones

The figure pictured below is a cone with its top portion removed.

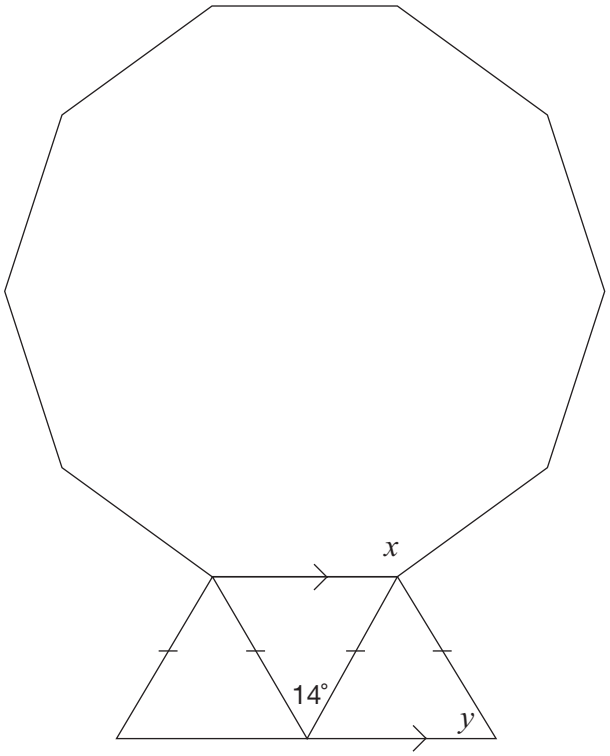


Determine the volume of this figure.

Show your work.

31 Diamond Cut

The diagram below shows a regular decagon and three isosceles triangles.



Determine the values of x and y. Justify your answers using geometric properties.

Value	Justification using geometric properties
$x =$ _____	
$y =$ _____	

Education Quality and Accountability Office

EQAO

2 Carlton Street, Suite 1200, Toronto ON M5B 2M9

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Academic

Grade 9 Assessment of Mathematics

2014

RELEASED ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2014, Academic).

Education Quality and Accountability Office

EQAO

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.

Directions

Make sure you have the following materials:

- Student Answer Sheet
- the Formula Sheet
- a pencil and an eraser
- a ruler
- a scientific or graphing calculator
- some paper for rough work for multiple-choice questions only

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Justify:
Give reasons and evidence to show your answer is correct.

Show your work:
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1 The following is the formula for the area of a circle:

$$A = \pi r^2$$

If the radius of a circle is 1.25 cm, which of the following is closest to its area?

a $15.4\ \text{cm}^2$

b $7.9\ \text{cm}^2$

c $4.9\ \text{cm}^2$

d $3.9\ \text{cm}^2$

2 What goes in the $\square$ to complete the equation below?

$$(8x^3)(\square) = 24x^{12}$$

a $3x^9$

b $3x^4$

c $16x^9$

d $16x^4$

3 A cellphone company offers four choices for purchasing talk time.

Which of the following has the lowest cost per minute?

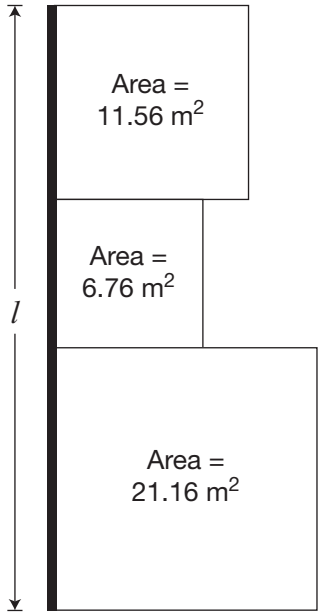
a 200 minutes for $24.50

b 550 minutes for $68.00

c 700 minutes for $80.25

d 850 minutes for $99.50

4 Marc has a garden that is made up of three square sections. He builds a fence on one side of the garden as shown below.



Which of the following is closest to the length of the fence, l?

a 19.7 m

b 10.6 m

c 9.9 m

d 6.3 m

5 What is the value of x in the equation

$$-4(2x - 1) = 36?$$

a -4

b $-\frac{35}{8}$

c $-\frac{37}{8}$

d -5

1. d 2. a 3. c 4. b 5. a

6 Share the Profits

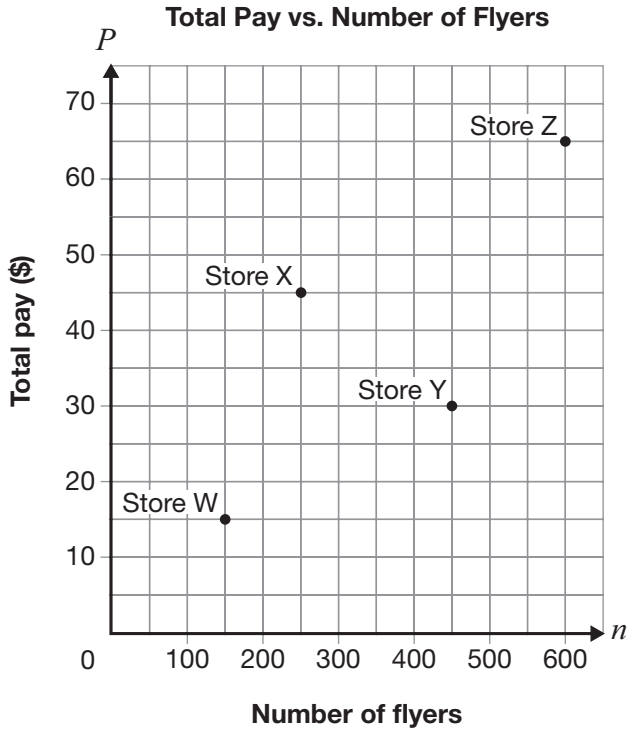
Three partners, Luc, Deborah and Melanie, share the profits of a business in the ratio 2:3:7 respectively.

The profit for this year is $176 496.

Determine the share of the profit for each partner.

Show your work.

7 Four stores hire people to deliver flyers. Each pays a different amount per flyer delivered. The points on the graph below show the total pay for a certain number of flyers delivered for each of the stores.



Which store will pay $45 for 450 flyers delivered?

a Store W

b Store X

c Store Y

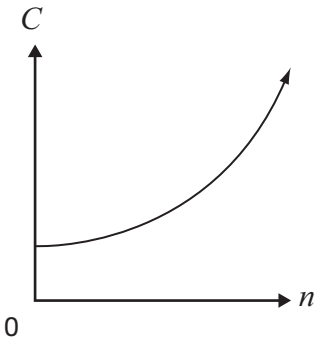
d Store Z

7. a

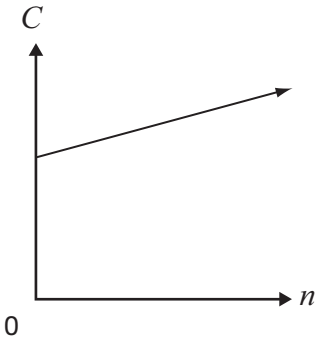
8 The total yearly cost of a museum membership is made up of a fee of $25, plus $5 per visit.

Which graph best represents the relationship between total yearly cost, C, and number of visits, n?

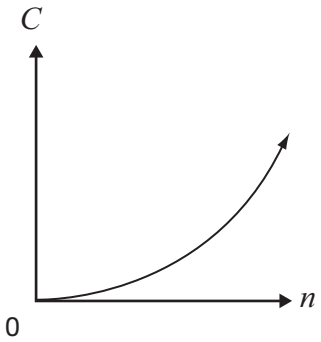
a



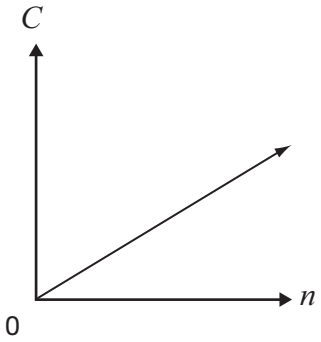
b



c



d



9 Gertrude sells shoes.

Her total pay each week is made up of a base salary and a commission of 15% of her sales that week.

One week, her total pay is $167.50 and she has $850 in sales.

Which equation below represents the relationship between her total pay, P, each week and sales, s?

a $P = 15s$

b $P = 40 + 0.15s$

c $P = 850 + 0.15s$

d $P = 167.50 + 0.15s$

10 Which of the following shows data from a non-linear relation?

a

n	*P*
1	8
2	5
3	2
4	−1

b

n	*P*
5	3.25
10	4.00
15	4.75
20	5.50

c

n	*P*
2	8
4	$8\frac{1}{3}$
6	$8\frac{2}{3}$
8	9

d

n	*P*
3	25
6	16
9	9
12	4

11 What is the value of P in the equation below when $r = -7$?

$$P = 4 - 2r$$

a −14

b −10

c 14

d 18

12 The table below shows information about the linear relationship between Ben's total savings and the number of months he saves money.

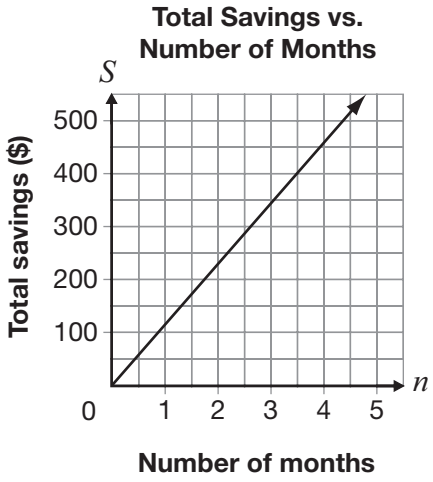
Number of months, n	Total savings, S ($)
3	345
6	540
9	735
12	930

Which of the following represents this relationship?

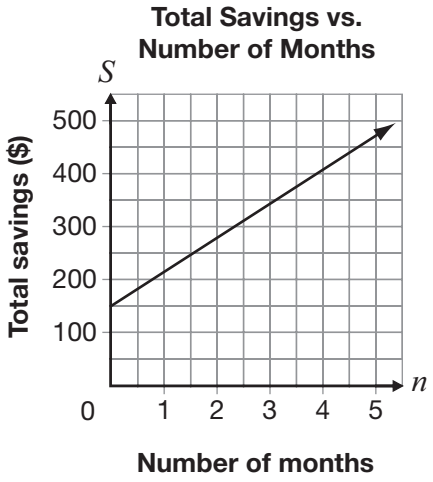
a $S = 65n + 345$

b $S = 195n + 150$

c

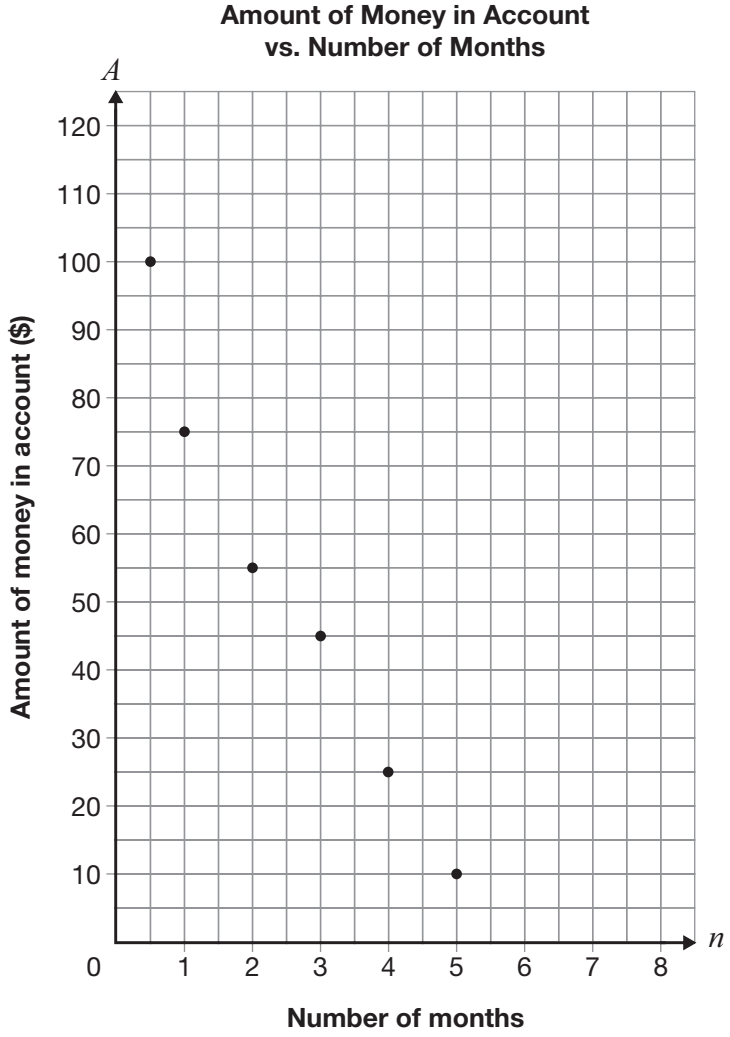


d



13 More Money, Please!

The graph below shows information about the amount of money, A, in Shreya's bank account and the number of months, n, she has had the account.



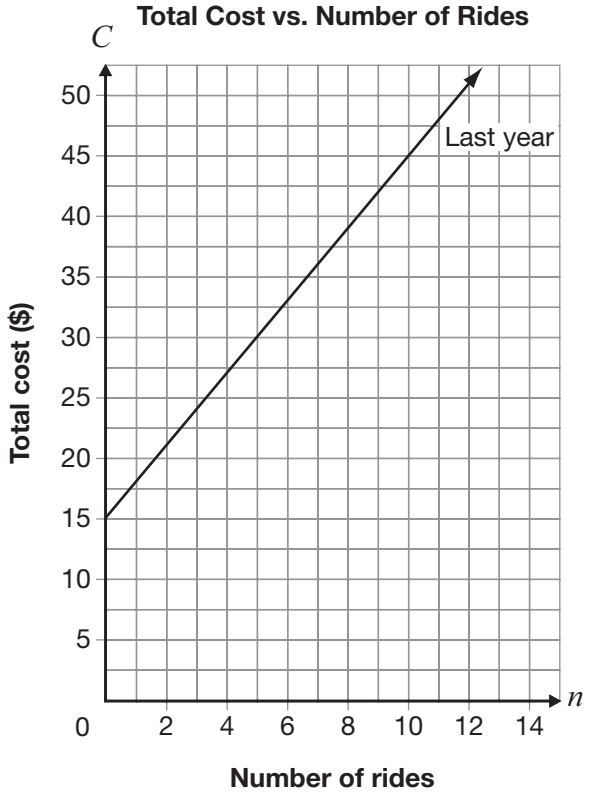
Draw the line of best fit for the data.

Determine the equation of your line of best fit.

Show your work.

14 Roll with It!

The total cost at an amusement park is made up of an admission fee and a cost per ride. Information about the total cost for n rides last year is shown below.



This year, the cost per ride is reduced from last year, but the total cost for 10 rides is the same.

Determine a possible equation for the total cost, C, for this year. Include an admission fee and a cost per ride.

Justify your answer.

15 The equation of a line is $5x - 2y + 10 = 0$.

Which of the following expresses this equation in the form $y = mx + b$?

a $y = \frac{5}{2}x + 5$

b $y = \frac{5}{2}x + 10$

c $y = -\frac{5}{2}x + 5$

d $y = -\frac{5}{2}x + 10$

16 A formula for determining the slope of a line is given below.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

What is the slope of the line that passes through the points (2, 3) and (5, −6)?

a -11

b -3

c $-\frac{1}{3}$

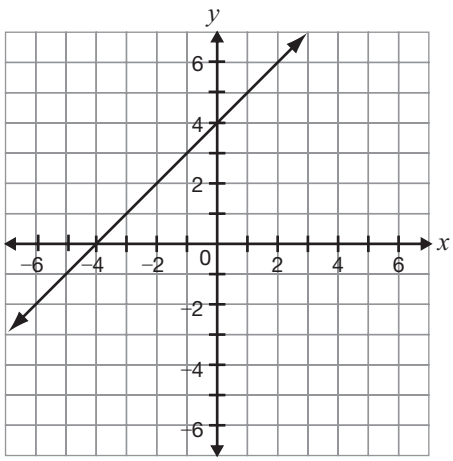
d $-\frac{1}{11}$

17 Consider the line represented by the equation $y = 3x + 2$.

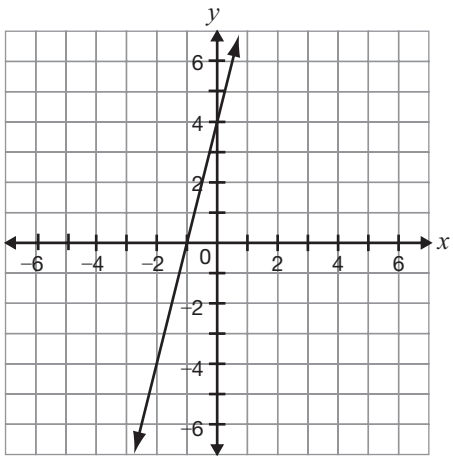
A new line is formed by decreasing the slope and increasing the y-intercept.

Which of the following could be the graph of the new line?

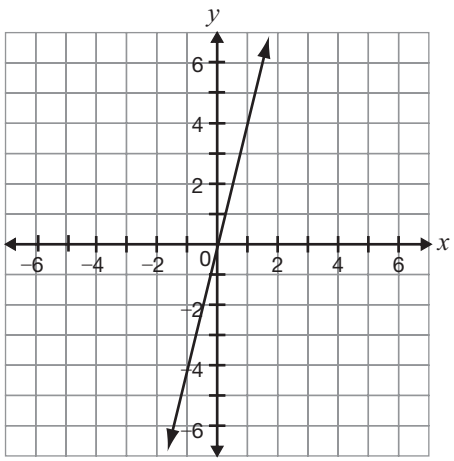
a



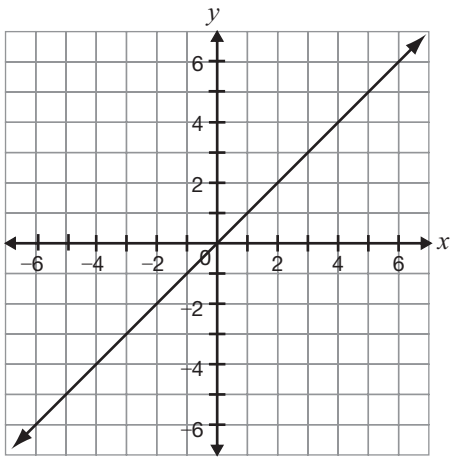
b



c



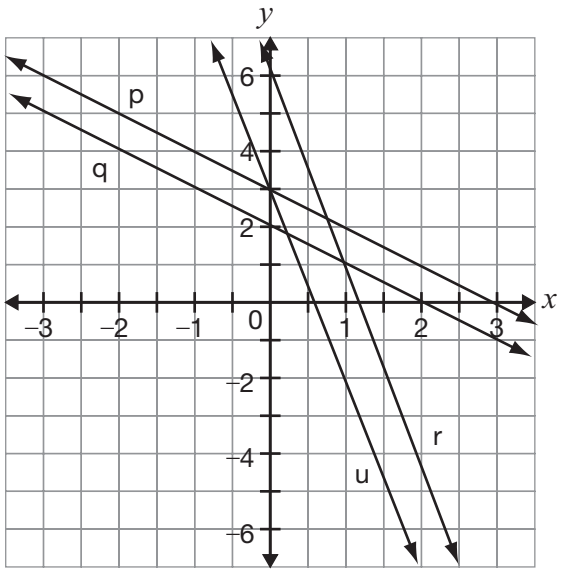
d



18 Lee thinks of a line represented by the equation $y = -4x + 6$.

Which line on the graph below is

- steeper than Lee's line and
- has a y-intercept that has half the value of Lee's line?



a p

b q

c r

d u

19 A line has a y-intercept of 4 and a slope of -3.

Which equation represents this line?

a $y = 4x + 3$

b $y = 4x - 3$

c $y = 4 + 3x$

d $y = 4 - 3x$

20 The table below shows information about the total cost to rent a car and the distance driven.

Distance driven, d (km)	Total cost, C ($)
100	65
200	80
300	95
400	110

What information would the C-intercept and slope of the graph of this linear relationship give?

a There is no fixed fee, and the cost per kilometre is $0.15.

b There is no fixed fee, and the cost per kilometre is $0.65.

c There is a $50 fixed fee, and the cost per kilometre is $0.15.

d There is a $50 fixed fee, and the cost per kilometre is $0.65.

21 Jared uses the equation $C = 30n$ to determine the cost, C, in dollars, for renting a car for n days, where n is a whole number.

If Jared can spend a maximum of $200 on the rental, which of the following describes the possible values of n?

a 7, 8, 9, ...

b 6, 7, 8, 9, ...

c 0, 1, 2, 3, 4, 5, 6

d 0, 1, 2, 3, 4, 5, 6, 7

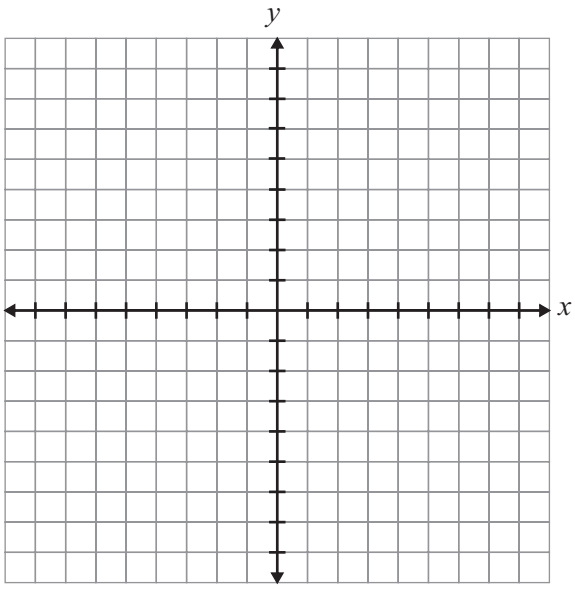
18. d 19. d 20. c 21. c

22 Is It a Line?

Determine whether each of the relations in the chart below is linear or non-linear.

Justify your answers. You may use the grid if you wish.

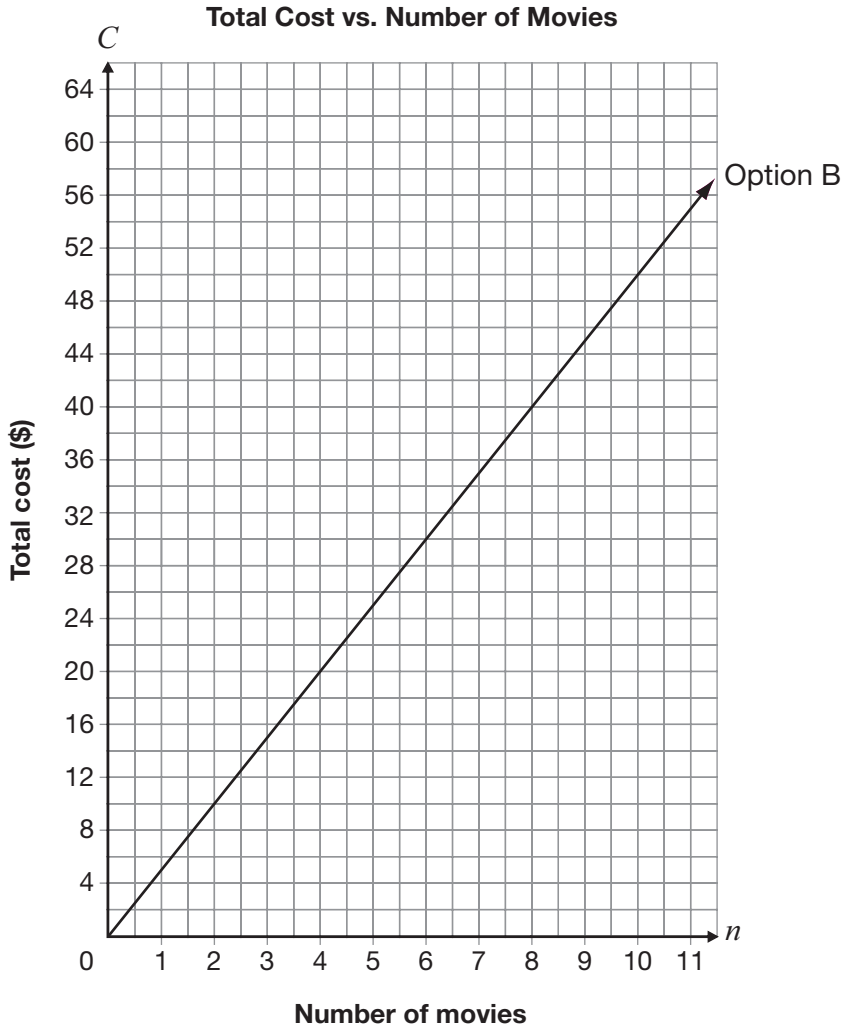
$-2x + 6y = 18$			$y = 4x^2 + 3$		
Circle one:	Linear	Non-linear	**Circle one:**	Linear	Non-linear
Justification			**Justification**		



23 Movie Night

There are two payment options for downloading movies from a Web site.

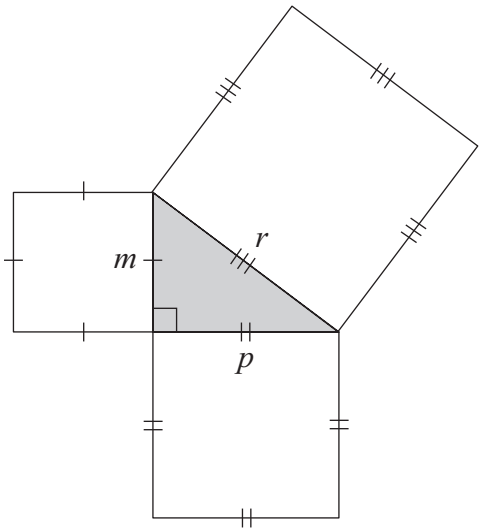
- Option A: Pay $30 for a membership and $2 per movie downloaded.
- Option B: Shown on the grid below.



Determine under which conditions a person should select Option A and under which conditions a person should select Option B.

Justify your answer.

24 The diagram below is made of a right triangle and three squares.



Which of the following is represented by this diagram?

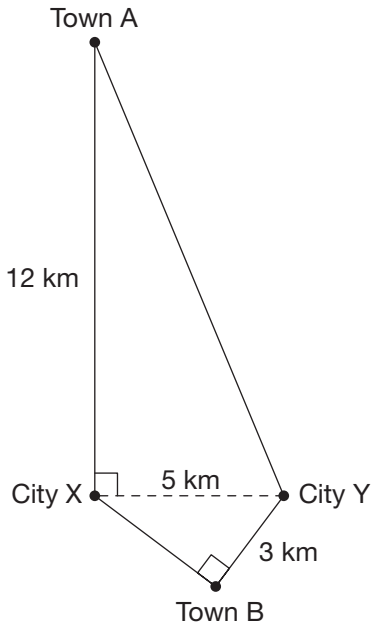
a $p^2 = r^2 - m^2$

b $p^2 = m^2 - r^2$

c $r^2 = p^2 - m^2$

d $r^2 = m^2 - p^2$

25 The 5 km of highway between City X and City Y is closed. There are two possible detour routes: one through Town A and one through Town B, as shown in the diagram below.



How much shorter is the detour through Town B than the detour through Town A?

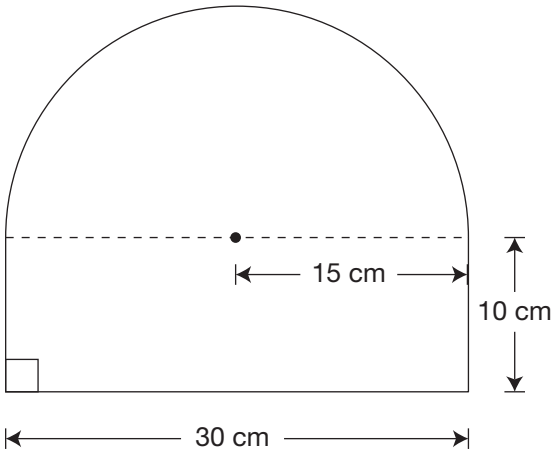
a 7 km

b 9 km

c 16 km

d 18 km

26 The sign below is made up of a rectangle and a semicircle.



Which of the following is closest to the area of the sign?

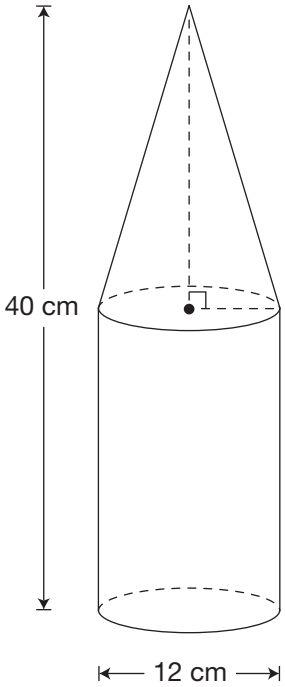
a 347 cm^2

b 653 cm^2

c 1007 cm^2

d 1410 cm^2

27 The container pictured below is made up of a cone and a cylinder. The cone and the cylinder have the same height.



Which of the following is closest to the volume of the container?

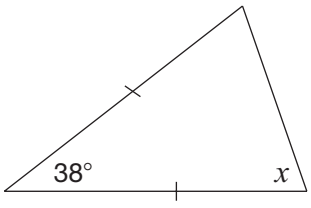
a 2261 cm^3

b 3016 cm^3

c 3393 cm^3

d 4524 cm^3

28 What is the value of x in the diagram below?



a 38°

b 71°

c 104°

d 161°

26. b 27. b 28. b

29 The sum of the interior angles of a polygon is 2700°.

How many sides does the polygon have?

a 19

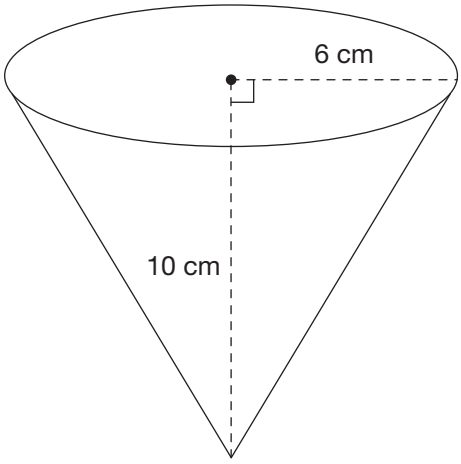
b 17

c 15

d 13

30 Coated Cones

An ice cream store offers chocolate-coated cones as shown in the diagram below.



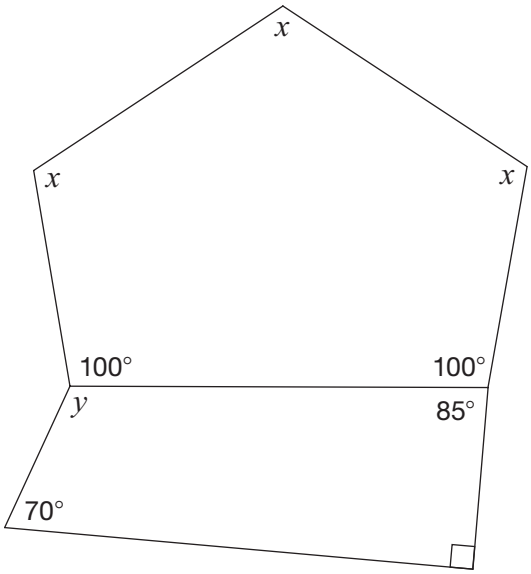
The cone is open topped, and the entire outside is coated in chocolate.

Determine the area of the surface that is coated in chocolate.

Show your work.

31 Daring Diagram

A diagram is shown below.



Complete the table below with the values of x and y. Justify your answers using geometric properties.

Value	Justification using geometric properties
$x =$ _____	
$y =$ _____	

Education Quality and Accountability Office

EQAO

2 Carlton Street, Suite 1200, Toronto ON M5B 2M9

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Sample Assessment Booklet: New Layout

Booklet 1

QUESTIONS

Grade 9 Assessment of Mathematics • Academic 2015

Follow along as your teacher reads the instructions below.

Along with this booklet, make sure you have *Answer Booklet 1* and the Formula Sheet.

You may use any space in this book for rough work for multiple-choice questions only.

Note:

The diagrams in these booklets are **not** all drawn to scale.

The use of cellphones, audio- or video-recording devices, digital music players or e-mail or text messaging devices during the assessment is prohibited.

No work in this booklet will be scored.

Education Quality and Accountability Office
EQAO

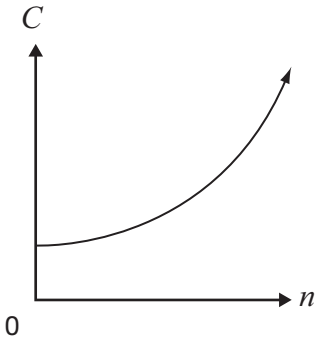
Continue to follow along as your teacher reads the directions on the cover of *Answer Booklet 1.*

Remember to write your answers in your *Answer Booklet 1*.

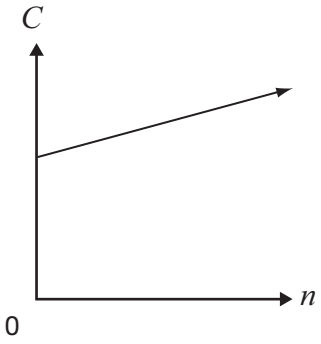
1 The total yearly cost of a museum membership is made up of a fee of $25, plus $5 per visit.

Which graph best represents the relationship between total yearly cost, C, and number of visits, n?

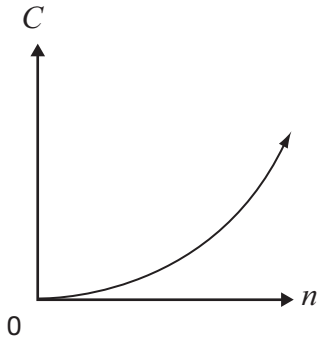
A



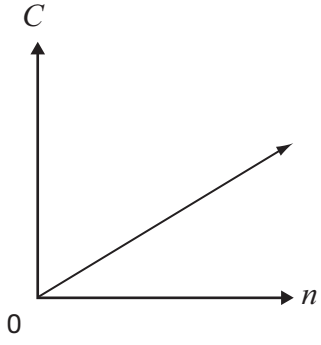
B



C



D



1. b

2 A cellphone company offers four choices for purchasing talk time.

Which of the following has the lowest cost per minute?

F 200 minutes for $24.50

G 550 minutes for $68.00

H 700 minutes for $80.25

J 850 minutes for $99.50

3 The table below shows information about the linear relationship between Ben's total savings and the number of months he saves money.

Number of months, n	Total savings, S ($)
3	345
6	540
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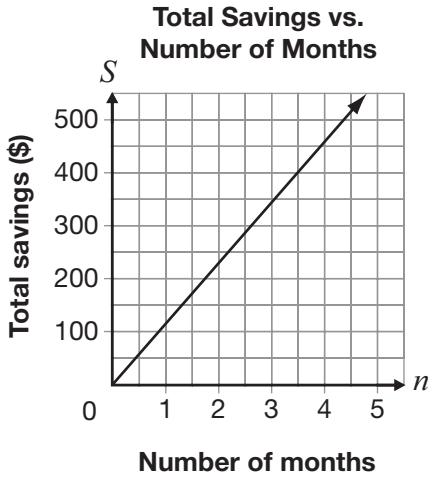
12	930

Which of the following represents this relationship?

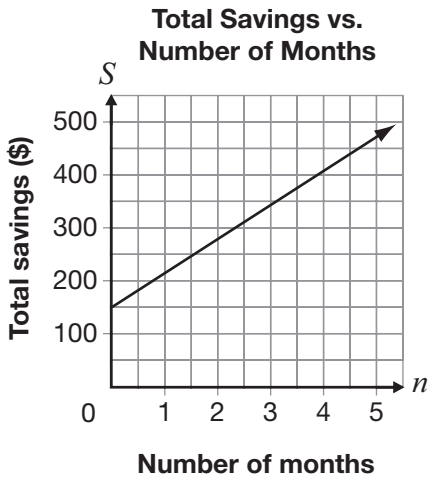
A $S = 65n + 345$

B $S = 195n + 150$

C



D



2. H 3. D

4 Jared uses the equation $C = 30n$ to determine the cost, C, in dollars, for renting a car for n days, where n is a whole number.

If Jared can spend a maximum of \$200 on the rental, which of the following describes the possible values of n?

F 7, 8, 9, ...

G 6, 7, 8, 9, ...

H 0, 1, 2, 3, 4, 5, 6

J 0, 1, 2, 3, 4, 5, 6, 7

5 What goes in the $\square$ to complete the equation below?

$$(8x^3)(\square) = 24x^{12}$$

A $3x^9$

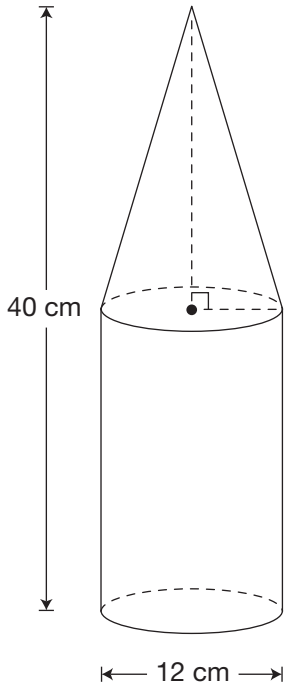
B $3x^4$

C $16x^9$

D $16x^4$

4. H 5. A

6 The container pictured below is made up of a cone and a cylinder. The cone and the cylinder have the same height.



Which of the following is closest to the volume of the container?

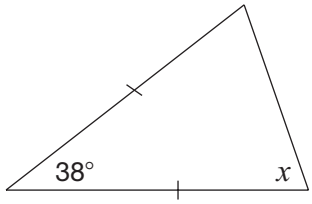
F 2261 cm^3

G 3016 cm^3

H 3393 cm^3

J 4524 cm^3

7 What is the value of x in the diagram below?



A 38°

B 71°

C 104°

D 161°

6. G 7. B

Go to *Answer Booklet 1* and complete the four open-response questions before continuing with question 12.

8 Open-Response

9 Open-Response

10 Open-Response

11 Open-Response

12 The equation of a line is $5x - 2y + 10 = 0$.

Which of the following expresses this equation in the form $y = mx + b$?

F $y = \frac{5}{2}x + 5$

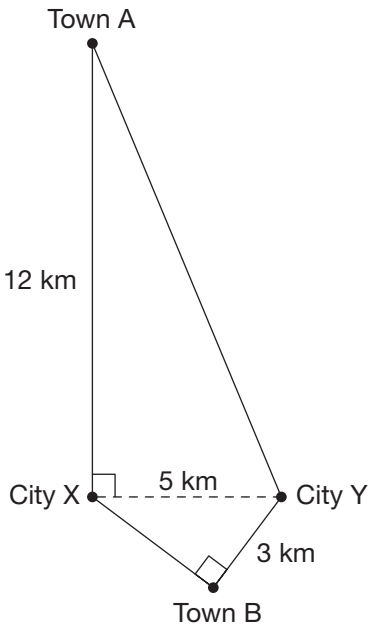
G $y = \frac{5}{2}x + 10$

H $y = -\frac{5}{2}x + 5$

J $y = -\frac{5}{2}x + 10$

12. F

13 The 5 km of highway between City X and City Y is closed. There are two possible detour routes: one through Town A and one through Town B, as shown in the diagram below.



How much shorter is the detour through Town B than the detour through Town A?

A 7 km

B 9 km

C 16 km

D 18 km

14 Which of the following shows data from a non-linear relation?

F

n	P
1	8
2	5
3	2
4	−1

G

n	P
5	3.25
10	4.00
15	4.75
20	5.50

H

n	P
2	8
4	$8\frac{1}{3}$
6	$8\frac{2}{3}$
8	9

J

n	P
3	25
6	16
9	9
12	4

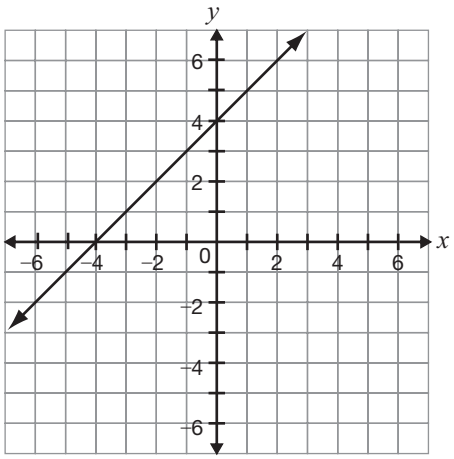
13. D 14. J

15 Consider the line represented by the equation $y = 3x + 2$.

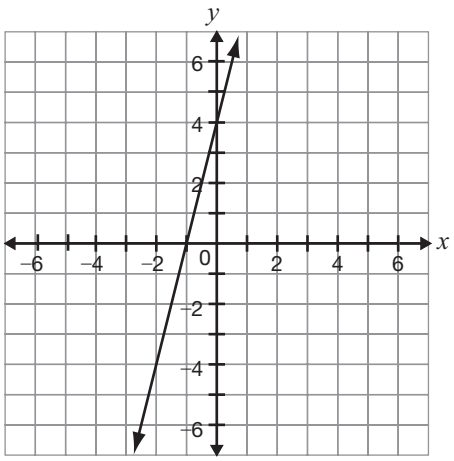
A new line is formed by decreasing the slope and increasing the y-intercept.

Which of the following could be the graph of the new line?

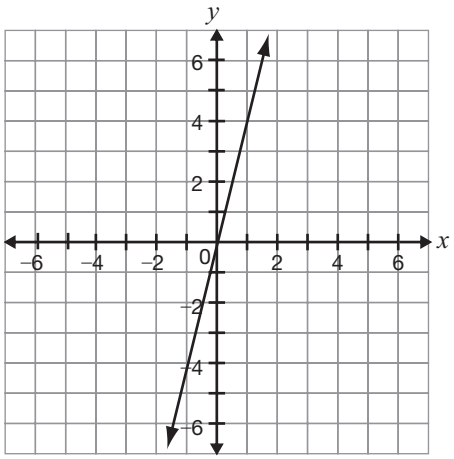
A



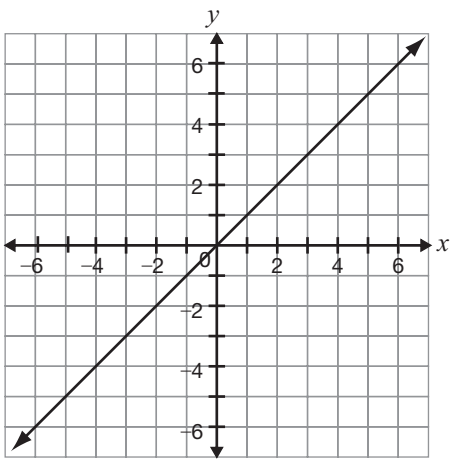
B



C



D



15. A

16 The sum of the interior angles of a polygon is 2700°.

How many sides does the polygon have?

F 19

G 17

H 15

J 13

17 Gertrude sells shoes.

Her total pay each week is made up of a base salary and a commission of 15% of her sales that week.

One week, her total pay is $167.50 and she has $850 in sales.

Which equation below represents the relationship between her total pay, P, each week and sales, s?

A $P = 15s$

B $P = 40 + 0.15s$

C $P = 850 + 0.15s$

D $P = 167.50 + 0.15s$

18 What is the value of x in the equation

$$-4(2x - 1) = 36?$$

F -4

G $-\frac{35}{8}$

H $-\frac{37}{8}$

J -5

16. G 17. B 18. F

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