MPM1D0/9: Review #1 For Final Exam–Basic Concepts

1. What does the word "**simplify**" ***mean*** when it is used in a mathematical sense?

2. ***Simplify*** each of the following algebraic expressions.

(a) $-9x^3+7x^3$ **(b)** $-9x^3\left(7x^3\right)$ **(c)** $\left(-9x^3\right)^2\left(7x^3-5x^2\right)$

(d) $-5x+7y-3x-9y$ **(e)** $-5x+7y-\left(3x-9y\right)$ **(f)** $-5x(7y)(3x)(-9y)$

(g) $-\left(3a^2-ab+2a\right)+4a\left(a-3b-3\right)$ **(h)** $\left(3a^2-ab+2a\right)-4a\left(a-3b-3\right)$ **(i)** $\left(-4mn^3\right)^4$

(j) $\dfrac{\left(-4mn^3\right)^4}{\left(2m^2np^3\right)^3}$ **(k)** $\dfrac{\left(3bc^5\right)^4-13b^4c^{20}}{\left(-5b^2cd^3\right)^3}$ **(l)** $\dfrac{-2a\left(x^2-y^2\right)^3}{\left(x^2-y^2\right)^2}$

3. What does the word "**solve**" ***mean*** when it is used in a mathematical sense?

4. For each equation given below, **solve** for the indicated variable. (Rearrange each formula as indicated.)

(a) $A=\pi r^2$, solve for r **(b)** $V=\pi r^2h$, solve for h **(c)** $P=2\left(l+w\right)$, solve for l

(d) $c^2=a^2+b^2$, solve for a^2 **(e)** $c^2=a^2+b^2$, solve for b^2 **(f)** $c^2=a^2+b^2$, solve for c

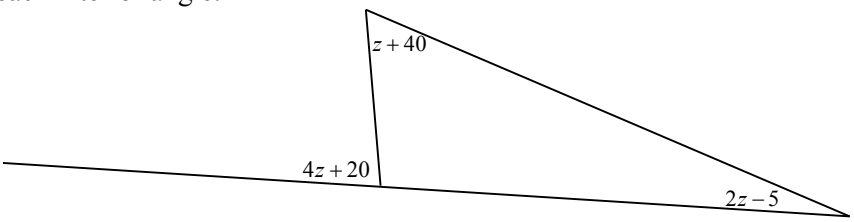
(g) $c^2=a^2+b^2$, solve for a **(h)** $F=\dfrac{9}{5}C+32$, solve for C **(i)** $y=mx+b$, solve for x

(j) $V=\dfrac{4\pi r^3}{3}$, solve for r **(k)** $A=\dfrac{h\left(a+b\right)}{2}$, solve for h **(l)** $A=\dfrac{h\left(a+b\right)}{2}$, solve for a

5. **Solve** each of the following equations. ***Check each solution***.

(a) $-5\left(2x-7\right)=-5-6\left(-5x+1\right)$ **(b)** $\dfrac{1}{3}\left(5y-7\right)-\dfrac{y}{6}=-7y+\dfrac{2}{9}$ **(c)** $-3-\dfrac{2s+5}{5}=\dfrac{s-7}{4}$

6. Find the measure of each interior angle.



7. Serge is choosing a cellphone plan and wants the lowest cost. **Cell-a-Bration** charges $12 per month plus $0.05 per minute of airtime used. **E-Phone** charges $28 per month for unlimited usage.

Determine under which conditions Serge should use Cell-a-Bration and under which conditions he should choose E-Phone.

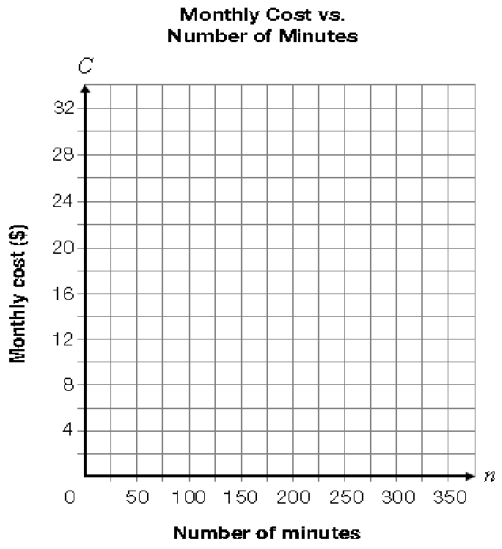
To solve this problem, follow the steps given below.

(a) Write an equation for each cell phone company. The equation should relate C, the cost per month, to n, the number of minutes used.

(b) Carefully plot the graph of each equation.

(c) Find the point of intersection of the two graphs.

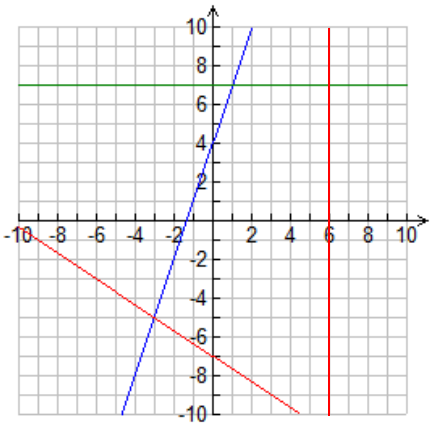
(d) Draw your conclusions.



8. Find the equation, ***in slope, y-intercept form***, of the line that passes through the points $(-4,-6)$ and $(-1,-1)$.

9. Find an equation, ***in standard form***, of the line with slope $-\frac{3}{7}$ and y-intercept -9.

10. For each line shown at the right,



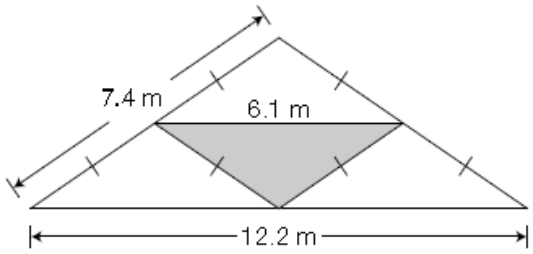
- **(a)** Determine the slope.
- **(b)** Determine the intercept(s).
- **(c)** Write the equation of each line in slope, y-intercept form.
- **(d)** Write an equation of each line in standard form.

11. Consider the line defined by the equation $7x-5y+35=0$.

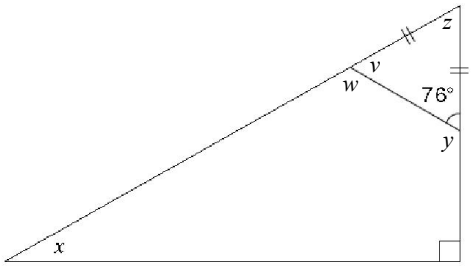
- **(a)** Determine the intercepts of the line. Use the intercepts to sketch a graph of the line.
- **(b)** Rewrite the equation in ***slope-y-intercept form***. Use the slope and y-intercept to sketch a graph of the line.
- **(c)** Which method made it easier to sketch the graph of the line? Explain.
- **(d)** Find the equation, ***in slope, y-intercept form***, of the line passing through $(-5,7)$ and ***parallel*** to the given line.
- **(e)** Find the equation, ***in slope, y-intercept form***, of the line passing through $(-5,7)$ and ***perpendicular*** to the given line.
- **(f)** Find the equation, ***in slope, y-intercept form***, of a line having the same y-intercept as the given line and ***perpendicular*** to it.

12. Shown below is a portion of the frame of the roof of a small house. This portion consists of four isosceles triangles.

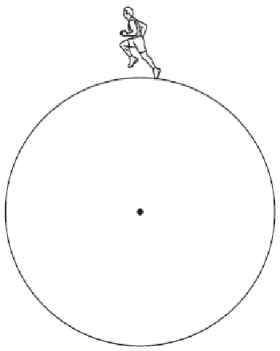
- **(a)** Calculate the ***perimeter*** and ***area*** of the shaded interior triangle.
- **(b)** Calculate the ***total area*** of the portion of the frame shown.



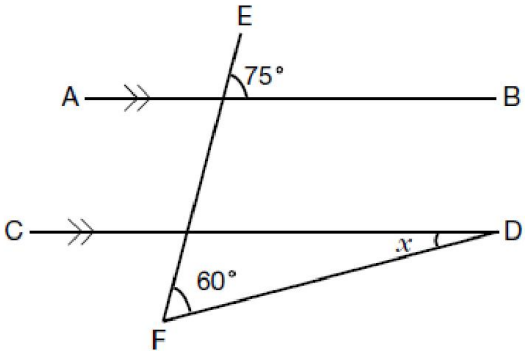
13. Calculate the values of v, w, x, y and z. Explain your reasoning.



14. Tim runs ***five laps*** of a circular track, covering a distance of 400π metres altogether. What is the distance from the track to the centre?



15. Determine the value of x. Explain your reasoning.



16. Several relations are given below.

(a) Identify the independent and dependent variables for each relation.

(b) Determine whether the relation is linear or non-linear.

(c) **Challenge:** Write an equation that relates the dependent variable to the independent variable.

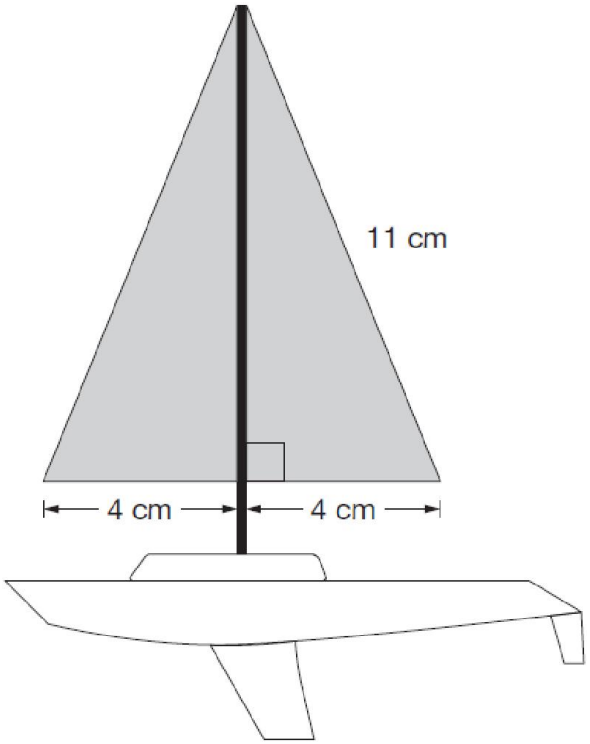
x	y
1	$\frac{1}{3}$
2	$\frac{2}{3}$
3	1
4	$\frac{4}{3}$

x	y
0	5
5	7
10	10
15	14

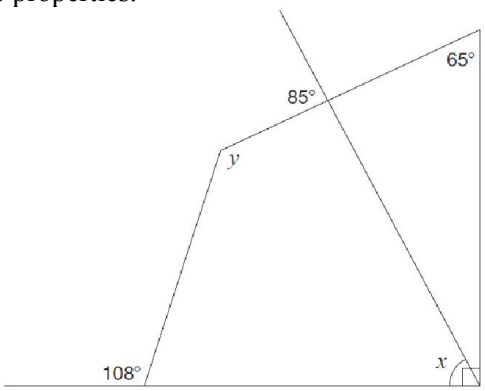
x	y
1	2
2	4
3	8
4	16

x	y
0	$\frac{1}{2}$
5	$\frac{1}{4}$
10	$\frac{1}{6}$
15	$\frac{1}{8}$

17. Calculate the area of the sails of the toy sailboat. Explain your reasoning.



18. Determine the values of x and y. Justify your answers using geometric properties.



Angle measure	Justification
$x =$ _____	
$y =$ _____	

19. Explain each of the following. Include diagrams in your explanations.

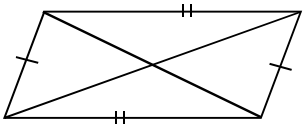
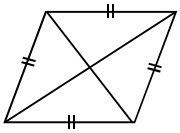
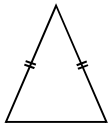
(a) The ***surface area*** of a rectangular prism with length l, width w and height h is given by the equation $A = 2lw + 2lh + 2wh = 2(lw + lh + wh)$. Explain how this formula was developed.

(b) The ***surface area*** of a right circular cylinder with radius r and height h is given by the equation $A = 2\pi r^2 + 2\pi rh$. Explain how this formula was developed.

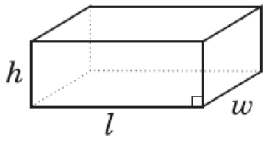
(c) The ***surface area*** of a right circular cone with radius r and slant height s is given by the equation $A = \pi r^2 + \pi rs$. Explain how this formula was developed.

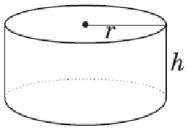
(d) The ***volume*** of a right circular cylinder with radius r and height h is given by the equation $A = \pi r^2 h$. Explain how this formula was developed.

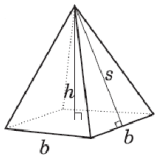
20. Name each shape. State as many properties as possible for each one.

21. Given a ***constant (fixed) surface area***, what dimensions would optimize (maximize) the volume of each of the following shapes?







Answers

1. The word "**simplify**" means to write an algebraic expression in the simplest possible form.

2. (a) $-2x^3$, (b) $-63x^6$, (c) $567x^9 - 405x^8$, (d) $-8x - 2y$, (e) $-8x + 16y$, (f) $945x^2y^2$, (g) $a^2 - 11ab - 14a$, (h) $-a^2 + 11ab + 14a$, (i) $256m^4n^{12}$, (j) $\dfrac{32n^9}{m^2p^9} = 32m^{-2}n^9p^{-9}$, (k) $\dfrac{68c^{17}}{-125b^2d^9} = -\dfrac{68}{125}b^{-2}c^{17}d^{-9}$, (l) $-2a\left(x^2 - y^2\right) = -2ax^2 - 2ay^2$

3. The word "**solve**" means to find the value of the unknown (in an equation) or to write an equation that expresses the value of one variable in terms of the other(s).

4. (a) $r = \sqrt{\dfrac{A}{\pi}}$, (b) $h = \dfrac{V}{\pi r^2}$, (c) $l = \dfrac{P - 2w}{2}$, (d) $a^2 = c^2 - b^2$, (e) $b^2 = c^2 - a^2$, (f) $c = \sqrt{a^2 + b^2}$, (g) $a = \sqrt{c^2 - b^2}$, (h) $C = \dfrac{5}{9}(F - 32)$, (i) $x = \dfrac{y - b}{m}$, (j) $r = \sqrt[3]{\dfrac{3V}{4\pi}}$, (k) $h = \dfrac{2A}{a + b}$, (l) $a = \dfrac{2A}{h} - b = \dfrac{2A - bh}{h}$,

5. (a) $x = \dfrac{23}{20}$ (b) $y = \dfrac{46}{153}$ (c) $s = -\dfrac{45}{13}$

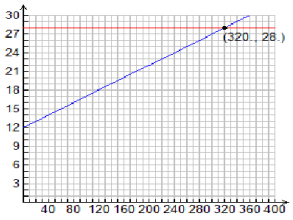
6. $z = 15°$

The measures of the interior angles are:

$z + 40° = 55°$
$2z - 5° = 25°$
$180° - 55° - 25° = 100°$

7. **Cell-a-Bration:** $C = 0.05n + 12$
E-Phone: $C = 28$

For fewer than 320 minutes, Cell-a-Bration is a better deal. For more than 320 minutes, E-Phone is a better deal.



8. $y = \dfrac{5}{3}x + \dfrac{2}{3}$

9. $3x + 7y + 63 = 0$

10. (a) $-2/3$, 3, 0, undefined
(c) $y = -\dfrac{2}{3}x - 7$, $y = 3x + 4$, $y = 0x + 7$, not possible
(d) $2x - 3y + 21 = 0$, $3x - y - 4 = 0$, $0x + y - 7 = 0$ or $y = 7$, $x + 0y - 6 = 0$ or $x = 6$

11. (a) x-int: -5, y-int: 7, (b) $y = \dfrac{7}{5}x + 7$, (d) $y = \dfrac{7}{5}x + 14$, (e) $y = -\dfrac{5}{7}x + \dfrac{24}{7}$, (f) $y = -\dfrac{5}{7}x + 7$

12. (a) $P = 13.5$ m, $A \doteq 6.4$ m^2 (b) $P = 27$ m, $A \doteq 25.6$ m^2

13. $v = 76°$, $w = y = 104°$, $z = 28°$, $x = 62°$

14. 40 m

15. $x = 15°$

16. Only the first (leftmost) one is linear. The others are non-linear. For all the relations, x is independent and y is dependent.
Equations: $y = \dfrac{1}{3}x$, $y = \dfrac{1}{50}x^2 + \dfrac{3}{10}x + 5$, $y = 2^x$, $y = \dfrac{1}{\dfrac{2}{5}x + 2}$

17. About 41 cm^2. (Use the Pythagorean Theorem to calculate the height of the triangle.)

18. $x = 60°$, $y = 133°$

19. See notes for unit 6 (academic), unit 5 (AP) at www.misternolfi.com

20. **Parallelogram:** opposite sides are parallel and have the same length, the diagonals bisect each other (cut each other in half)
Rhombus: same as parallelogram, diagonals intersect at 90°
Isosceles Triangle: base angles are equal

21. **Cube:** $l = w = h$
Cylinder: $h = 2r = d$ (height = diameter)
Pyramid: $b = h$ (base = height)