MPM 1D0

Grade 9 Academic Math
Solutions - Diagnostic Practice Test

Outstanding work Mr. S.!

Integers	Rational Numbers	Algebra	Geometry & Measurement	Problem Solving
28/28	18/18	8/8	28/28	10/10

Name: Mr. Solutions

L → losses < "less than"
G → gains > "greater than"

Part One – Integers **28 /28**

Total: 92/92

1. Evaluate each expression without using a calculator. You ***do not*** need to show your work. (15 /15)

(a) $5(-2) = -10$ ✓	**(b)** $5 \div (-2) = 3$ ✓ add negative → LOSS, G > L; $5 - 2$	**(c)** $-5 + 2 = -3$ ✓
(d) $-3 + 9 = 6$ ✓ G > L	**(e)** $-3 - (+9) = -12$ ✓ subtract a positive → LOSS; $-3 - 9$; Two losses. No gains.	**(f)** $-3 - (-9) = 6$ ✓ subtract a negative → GAIN, G > L; $-3 + 9$
(g) $-7(-8) = 56$ ✓	**(h)** $-7 - 8 = -15$ ✓	**(i)** $-42 \div (-7) = 6$ ✓
(j) $0 - 15 = -15$ ✓ L > G	**(k)** $0(-15) = 0$ ✓	**(l)** $0 \div (-15) = 0$ ✓
(m) $(-4)^2 = 16$ ✓ MEANS $(-4)(-4)$	**(n)** $-4^2 = -16$ ✓ MEANS $-4(4)$	**(o)** $-18 \div 6 = -3$ ✓

2. Evaluate each expression. You ***must*** show your work. (13 /13)

(a) $9(8-15)$

$= 9(-7)$ ✓

$= -63$ ✓

(b) $3 - 2(-4 - 9 \div 3)$

$= 3 - 2(-4 - 3)$ ✓

$= 3 - 2(-7)$ ✓

$= 3 - (-14)$ ✓

$= 3 + 14$

$= 17$ ✓

ASs comes last!

(c) $-15 - 24 \div (-8) + 5(-6)$

$= -15 - (-3) + (-30)$ ✓✓

$= -15 + 3 - 30$

$= -12 - 30$

$= -42$ ✓

(d) $\dfrac{-14 - 13 - 33 \div 11}{(7-9)(-3-2)}$

$= \dfrac{-14 - 13 - 3}{(-2)(-5)}$ ✓

$= \dfrac{-27 - 3}{10}$

$= \dfrac{-30}{10}$ ✓

$= -3$ ✓

Part Two – Rational Numbers 18/18

3. Evaluate each expression. You ***must*** show your work. (11 /11)

(a) $\frac{4}{5}+\frac{3}{5}$ $= \frac{4+3}{5}$ $= \frac{7}{5}$ ✓

(b) $\frac{7}{9}+\left(\frac{-2}{9}\right)$ $= \frac{7}{9} - \frac{2}{9}$ ✓ $= \frac{7-2}{9} = \frac{5}{9}$ ✓

(c) $\frac{1}{4}\left(\frac{2}{3}\right)$ $= \frac{1\times 2}{4\times 3}$ ✓ $= \frac{2}{12}$ $= \frac{1}{6}$ ✓

(d) $\frac{-3}{4}-\frac{1}{6}$ $= \frac{-9}{12} - \frac{2}{12}$ ✓ $= \frac{-9-2}{12}$ $= \frac{-11}{12}$ ✓

(e) $\frac{2}{3}+\frac{4}{5}$ $= \frac{10}{15} + \frac{12}{15}$ ✓ $= \frac{10+12}{15}$ $= \frac{22}{15}$ ✓

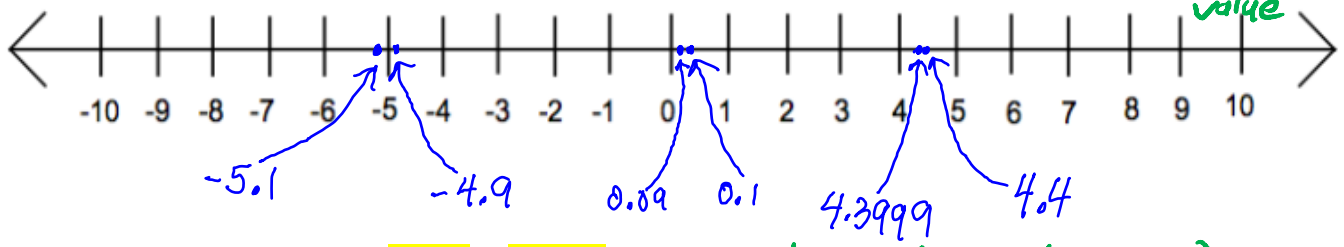
(f) $\frac{2}{15}\div\frac{5}{3}$ $= \frac{2}{\cancel{15}_{5}} \times \frac{3}{5}^{1}$ ✓✓ $= \frac{2\times 1}{5\times 5}$ $= \frac{2}{25}$ ✓

4. This question deals with number sense. (7 /7)

(a) Place each of the given numbers on the number line.

3 marks → ½ mark for each correctly placed value

4.3999 –5.1 0.09 4.4 0.1 –4.9



(b) Arrange the given numbers from ***largest*** to ***smallest***. 4 marks (½ mark each)

–1	0.31	0.4	–0.99	–1.01	–4.9	0.04	$\frac{1}{3}$
0.4	$\frac{1}{3}$	0.31	0.04	-0.99	-1	-1.01	-4.9

Part Three – Algebra 8 /8

Show all work for the questions in this section.

5. Substitute and evaluate. (3 /3)

$5t^2 - 10 \quad (t = -7)$

$= 5(-7)^2 - 10$ ✓
$= 5(49) - 10$ ✓
$= 245 - 10$
$= 235$ ✓

6. Solve the following equation. (1 /1)

$w - 9 = 19$

$\therefore w - 9 + 9 = 19 + 9$

$\therefore w = 28$ ✓

7. Write an algebraic expression that means "the product of three and a number." (2 /2)

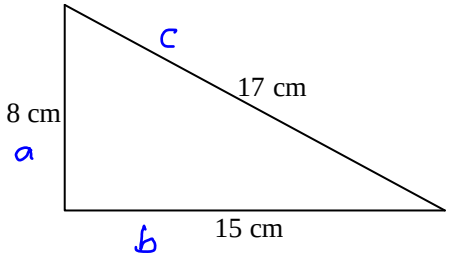
$3n$ ✓✓

8. Translate the algebraic expression $2 - x$ into words. (2 /2)

Two decreased by a number ✓ ✓

Part Four – Geometry and Measurement **28** /28

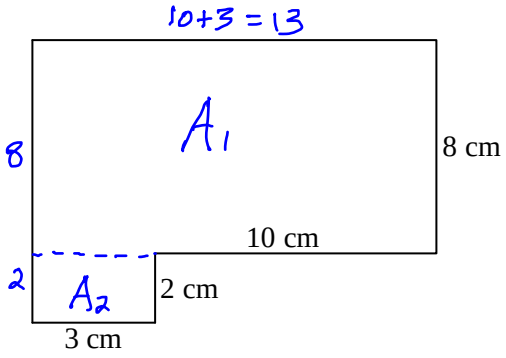
9. Show that the given triangle is a right triangle. (4 /4)



$a^2 + b^2$
$= 8^2 + 15^2$ ✓
$= 64 + 225$
$= 289$ ✓
$c^2 = 17^2$
$= 289$ ✓

Since $c^2 = a^2 + b^2$, the given triangle must be a RIGHT triangle (by the Pythagorean Theorem) ✓

10. Calculate the ***perimeter*** and ***area*** of the given shape. (5 /5)

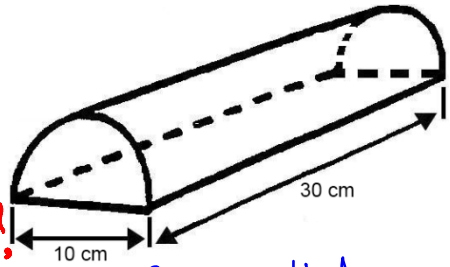


$P = 13 + 8 + 10 + 2 + 3 + 2 + 8$ ✓
$= 46$ cm ✓

$A = A_1 + A_2$
$= 13(8)$ ✓ $+ 3(2)$ ✓
$= 104 + 6$
$= 110\ cm^2$ ✓

Correct units must be stated. Otherwise, −1 mark.

11. Calculate the surface area and volume of the given shape. (7 /7)



Half of a cylinder
$r = 5$ cm
$h = 30$ cm

$A = \frac{A_{cyl}}{2} + A_{rectangle\ at\ bottom}$ (A)
$= \frac{2\pi r^2 + 2\pi rh}{2} + lw$ ✓
$\overset{*}{\approx} \frac{2(3.14)(5)^2 + 2(3.14)(5)(30)}{2} + 30(10)$ ✓
$= 849.5\ cm^2$ ✓

$V = \frac{V_{cyl}}{2}$ (V)
$= \frac{\pi r^2 h}{2}$ ✓
$\overset{*}{\approx} \frac{3.14(5)^2(30)}{2}$ ✓
$= 1177.5\ cm^3$ ✓

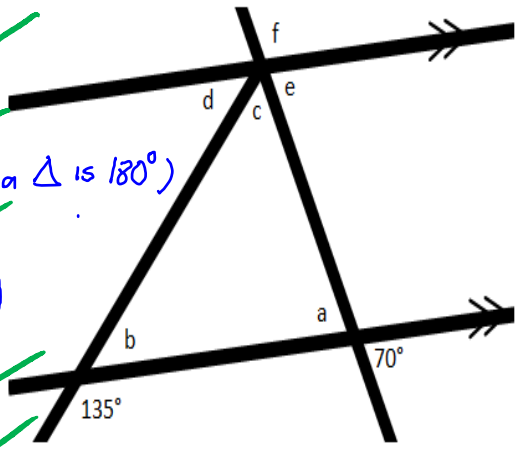
Use a scientific calculator to evaluate. Don't show steps!

* ≈ must be used because 3.14 is an approximation of the value of π

Correct units must be stated. Otherwise, −1 mark.

12. Find the measures of each angle labelled with a letter. In each case, state your ***reasoning***. (12 /12)

Measure of Angle	*Reasoning (State Why)*
$a =$ 70° ✓	Opposite angles are equal. ("X" pattern) ✓
$b =$ 45° ✓	$b+135^\circ = 180^\circ$ ("Straight" angle) ✓
$c =$ 65° ✓	$a+b+c = 180^\circ$ (sum of interior angles of a △ is 180°) ✓ $70^\circ+45^\circ+c = 180^\circ$
$d =$ 45° ✓	Alternate angles are equal. (Z pattern) ✓
$e =$ 70° ✓	Corresponding angles are equal. (F pattern) ✓
$f =$ 110° ✓	$e+f = 180^\circ$ ✓ $\therefore 70^\circ+f = 180^\circ$ ("Straight" angle.) ✓



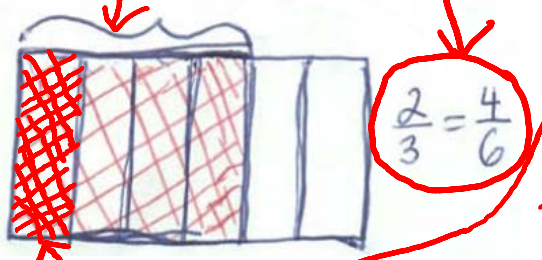
Part Five – Problem Solving 10 /10

13. Olivia and her friends together ate $\frac{2}{3}$ of a pizza. Each friend ate exactly $\frac{1}{6}$ of the ***entire*** pizza. How many people ate pizza altogether? **Hint:** A diagram is very helpful! (4 /4)

people
= (total amount of pizza eaten) ÷ (how much each person ate) ✓
$= \frac{2}{3} \div \frac{1}{6}$ ✓
$= \frac{2}{3} \times \frac{6}{1}$ ✓
$= \frac{12}{3} = 4$ ✓
∴ 4 people ate pizza altogether

OR

$\frac{2}{3}$ of the pizza was eaten



Each person ate $\frac{1}{6}$
∴ 4 people ate altogether

14. Pavani and Sania went shopping on Saturday. They bought at least one item from each of the three departments that they visited. Pavani gave the clerk $120 and she got back $11.76 change. What items did they buy? (6 /6)

Amount Spent = $120 − $11.76 = $108.24

Try all combinations of 3 of the prices that end in "8" to get totals that end in "4"

① 11.38 + 12.98 + 29.58 = 53.94 → +0.3
② 11.38 + 12.98 + 30.98 = 55.34 → +0.9
③ 11.38 + 29.58 + 30.98 = 71.94 → +0.3
④ 11.38 + 29.58 + 25.78 = 66.74 → +0.5
⑤ 11.38 + 12.98 + 25.78 = 50.14 → +0.1

} to get a total ending in ".24"

(continued on next page)

Prices all end in "8"

Prices all end in ".90"

HOUSEWARES
Dishtowels: $11.38
Curtain Rods: $12.98
Bath Mats: $29.58
CLOTHING
Shirt: $30.98
Dress: $49.90
Slacks: $39.90
TOOLS
Hammer: $17.90
Saw: $23.90
Drill: $25.78

Very challenging problem. Problem on diagnostic test will be easier.

⑥ 11.38 + 30.98 + 25.78 = 68.14 → + 0.1
⑦ 12.98 + 29.58 + 30.98 = 73.54 → + 0.7
⑧ 12.98 + 29.58 + 25.78 = 68.34 → + 0.9
⑨ 12.98 + 25.78 + 30.98 = 69.74 → + 0.5
⑩ 29.58 + 30.98 + 25.78 = 86.34 → + 0.9

} To get a total ending in ".24"

What Needs to be Added to get a Total Ending in ".24"	Can this be done using prices ending in "0.9" without exceeding a total of $108.24?
0.1 ✗	9(0.9) = 8.1 → 9 prices needed → total too high ✗
0.3 ✗	7(0.9) = 6.3 → 7 prices needed → total too high ✗
0.5 ✗	5(0.9) = 4.5 → 5 prices needed → total too high ✗
0.7 ✓	3(0.9) = 2.7 → 3 prices needed → possible ✓
0.9 ✓	1(0.9) = 0.9 → only 1 price needed → possible ✓

Therefore, we only need to consider combinations ②, ⑦, ⑧ and ⑩

⑦ 73.54 → too high → adding any 3 prices ending in ".90" gives a total > 108.24

⑩ 86.34 → too high because 86.34 + 17.90 = 104.24 < 108.24
and 86.34 added to any of the others gives a total much larger than 108.24

② 55.34 → too low because 55.34 + 49.90 = 105.24 < 108.24

⑧ 68.34 + 39.90 = 108.24 This one works!!

Conclusion:

Housewares	Curtain Rod	$12.98
	Bath Mat	$29.58
Clothing	Slacks	$39.90
Tools	Drill	+$25.78
		$108.24