Grade 9 Academic Math
Unit 2 – Practice Test – Solving Equations

Mr. Nolfi

Beautifully done Mr. S. !

KU	APP	TIPS	COM
25/25	28/28	16/16	10/10

Victim: _Mr. Solutions_

Modified True/False (3 KU)

Indicate whether each statement is *true* or *false*. If false, ==change== the underlined part to make the statement true.

1. T/F __F ✓__ The algebraic expression $x - 7$ represents seven more than a number. **Change:** ✓ _seven less_

   ✓ = ½ mark

2. T/F __F ✓__ $x = 2$ is the solution to the equation $4x - 8 = 10 - 2x$. **Change:** _$x = 3$_ ✓

3. T/F __F ✓__ "Four more than triple a number is 12" can be modelled as $4n + 3 = 12$. **Change:** _$3n + 4 = 12$_ ✓

Multiple Choice (6 KU)

For questions 4 to 9, select the best answer. Write the letter of your choice in the provided blank space.

4. __c ✓__ Which is the correct solution for $x + 7 = -4$?

   (a) $x = 3$ (b) $x = -3$ (c) $x = -11$ (d) $x = 0$

5. __d ✓__ $y = -2$ is the correct solution for which equation?

   (a) $3y + 1 = 5$ (b) $2y - 5 = 1$ (c) $4y + 8 = -4$ (d) $y - 3 = -5$

6. __c ✓__ The perimeter of a rectangle is 45 m. If the length is four times the width, ==what is the length==?

   $10x = 45$

   (a) 36 m   (b) 4.5 m   (c) 18 m   (d) 9 m

7. __d ✓__ The distance, d, in kilometres, a spaceship travels in t hours is given by the formula $d = 50000t$. How long will it take the spaceship to travel 150000 km?

   (a) 30 h   (b) 300 h   (c) 0.3 h   (d) 3 h

8. __c ✓__ By which number would you multiply both sides of the equation $\dfrac{x-1}{4} + \dfrac{2x+2}{6} = \dfrac{x+1}{12}$ to eliminate all the fractions?

   (a) 4   (b) 6   (c) 12   (d) 2

9. __c ✓__ Matthew and Jonathan compete on the same pizza-eating team. Matthew has eaten ==10 more slices than Jonathan== and ==together, they have eaten 50 slices==. How many slices has Jonathan eaten?

   (a) 5   (b) 60   (c) 20   (d) 500

10. Solve each of the following equations. Wherever required, *show the operation that is performed to each side*.

(a) $-6a - 5 = -2$ **(3 KU)**

$\therefore -6a - 5 + 5 = -2 + 5$ ✓

$\therefore -6a = 3$

$\therefore \dfrac{-6a}{-6} = \dfrac{3}{-6}$ ✓

$\therefore a = -\dfrac{1}{2}$ ✓

(b) **(4 KU)**

$\therefore -7s - 7 = -s + 18$

$\therefore -7s - 7 + s = -s + 18 + s$ ✓

$\therefore -6s - 7 = 18$ $\to \dfrac{-6s}{-6} = \dfrac{25}{-6}$ ✓

$\therefore -6s - 7 + 7 = 18 + 7$ $\therefore s = -\dfrac{25}{6}$ ✓

$\therefore -6s = 25$

(c) $-6(y-3) + 11 = -(12 - 2y)$ **(5 KU)**

$\therefore -6y + 18 + 11 = -12 + 2y$ ✓

$\therefore -6y + 29 - 2y = -12 + 2y - 2y$ ✓

$\therefore -8y + 29 = -12$

$\therefore -8y + 29 - 29 = -12 - 29$ ✓

$\therefore -8y = -41$ $\to \dfrac{-8y}{-8} = \dfrac{-41}{-8}$ ✓

$\therefore y = \dfrac{41}{8}$ ✓

(d) $\dfrac{4(x-1)}{5} = -7$ **(4 KU)**

$\therefore \dfrac{5}{1}\left(\dfrac{4(x-1)}{5}\right) = 5(-7)$ ✓

$\therefore 4(x-1) = -35$

$\therefore 4x - 4 = -35$ $\to \dfrac{4x}{4} = \dfrac{-31}{4}$ ✓

$\therefore 4x - 4 + 4 = -35 + 4$ $\therefore x = -\dfrac{31}{4}$ ✓

$\therefore 4x = -31$

11. Solve the following equation showing all steps. Then check your solution to verify that it is correct. **(10 APP)**

$$\dfrac{3q}{2} - \dfrac{q+2}{4} = 12 - \dfrac{2q+3}{3}$$

$\therefore \dfrac{12}{1}\left(\dfrac{3q}{2}\right) - \dfrac{12}{1}\left(\dfrac{q+2}{4}\right) = 12(12) - \dfrac{12}{1}\left(\dfrac{2q+3}{3}\right)$

$\therefore 18q - 3(q+2) = 144 - 4(2q+3)$ ✓

$\therefore 18q - 3q - 6 = 144 - 8q - 12$ ✓

$\therefore 15q - 6 = 132 - 8q$ ✓

$\therefore 15q - 6 + 8q = 132 - 8q + 8q$ ✓

$\therefore 23q - 6 = 132$

$\therefore 23q - 6 + 6 = 132 + 6$ ✓

$\therefore 23q = 138$

$\therefore \dfrac{23q}{23} = \dfrac{138}{23}$ ✓

$\therefore q = 6$ ✓

Left-hand Side	Right-hand Side
$\dfrac{3q}{2} - \dfrac{q+2}{4}$	$12 - \dfrac{2q+3}{3}$
$= \dfrac{3(6)}{2} - \dfrac{6+2}{4}$	$= 12 - \dfrac{2(6)+3}{3}$
$= \dfrac{18}{2} - \dfrac{8}{4}$	$= 12 - \dfrac{12+3}{3}$
$= 9 - 2$	$= 12 - \dfrac{15}{3}$
$= 7$ ✓	$= 12 - 5$
	$= 7$ ✓

← COM mark lost if not stated.

Since L.H.S. = R.H.S.,

$q = 6$ is the solution.

12. The surface area of a cylinder with radius r and height h is found using the formula $A = 2\pi r^2 + 2\pi rh$.

(a) *Solve* for h in terms of r. **(3 APP)**

$A = 2\pi r^2 + 2\pi rh$

$\therefore A - 2\pi r^2 = 2\pi r^2 + 2\pi rh - 2\pi r^2$ ✓

$\therefore A - 2\pi r^2 = 2\pi rh$

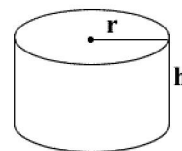$\therefore \dfrac{A - 2\pi r^2}{2\pi r} = \dfrac{2\pi rh}{2\pi r}$ ✓

$\therefore \dfrac{A - 2\pi r^2}{2\pi r} = h$ ✓

(b) A cylinder has a surface area of 200 m² and a radius of 5 m. Use the formula that you developed in **(a)** to calculate the height of the cylinder. **(2 APP)**

$A = 200, \ r = 5$

$\therefore h = \dfrac{200 - 2\pi(5)^2}{2\pi(5)}$ ✓

$\doteq 1.37$ ✓

Use a calculator. DON'T! show steps

13. Shown at the right is a shape known as a *square prism*. Its volume can be found using the formula $V = x^2 h$.

(a) Rearrange the formula to isolate x. (That is, solve for x in terms of h and V.) **(3 APP)**.

$V = x^2 h$

$\therefore \dfrac{V}{h} = \dfrac{x^2 h}{h}$ ✓

$\therefore \dfrac{V}{h} = x^2$
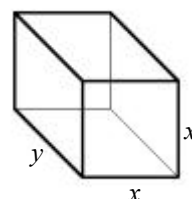
$\therefore \sqrt{\dfrac{V}{h}} = \sqrt{x^2}$ ✓

$\therefore x = \sqrt{\dfrac{V}{h}}$ ✓

(b) Given that $h = 5$ and $V = 200$, use the equation that you obtained in **(a)** to solve for x. **(2 APP)**

$x = \sqrt{\dfrac{200}{5}}$ ✓

$= \sqrt{40}$

$\doteq 6.3$ ✓

14. Brian is a doghouse "salesperson." He is paid $12.75 per hour worked *plus* $50.00 per doghouse sold.

(a) Complete the following table by writing an *algebraic expression* for the amount earned in each case. **(3 APP)**

Quantity	Variable Representing Quantity	Amount Earned…
Number of Hours Worked	t	… for working t hours $12.75t$ ✓
Number of Doghouses Sold	n	… for selling n doghouses $50n$ ✓
Total Earnings ($)	E	… in total $12.75t + 50n$ ✓

(b) How much would Brian earn for working for 40 hours and selling 15 doghouses? **(2 APP)** $t = 40, \ n = 15, \ E = ?$

$E = 12.75t + 50n$

$= 12.75(40) + 50(15)$ ✓

$= 1260$ ✓

Brian would earn $1260.
✳COM mark lost for not stating conclusion

(c) How many doghouses must Brian sell to earn $1368.75 for 25 hours of work? **(3 APP)** $E = 1368.75, \ t = 25, \ n = ?$

$1368.75 = 12.75(25) + 50n$

$\therefore 1368.75 = 318.75 + 50n$

$\therefore 1368.75 - 318.75 = 318.75 + 50n - 318.75$

$\therefore 1050 = 50n$

$\therefore n = 21$

Brian must sell 21 doghouses.
✳

15. Naquan is saving nickels and dimes in a jar. The jar contains 10 more nickels than dimes and altogether, the value of the coins is $16.25. How many nickels and dimes are in the jar? **(8 TIPS)**

Coin	Value of One Coin	Number of Coins		Value of Coins
Dime	$0.10	d	→ Not relevant to solving this problem	$0.10d$
Nickel	$0.05	$d + 10$ ✓		$0.05(d+10)$ ✓
Total	N/A	$d + d + 10$		$16.25

Nickel = 5¢ = $0.05

Dime = 10¢ = $0.10

$$\left(\begin{array}{c}\text{Value of}\\\text{dimes}\end{array}\right) + \left(\begin{array}{c}\text{Value of}\\\text{nickels}\end{array}\right) \text{ is } 16.25$$

$$0.10d + 0.05(d+10) = 16.25 \checkmark\checkmark$$
$$\therefore 0.10d + 0.05d + 0.5 = 16.25 \checkmark$$
$$\therefore 0.15d + 0.5 - 0.5 = 16.25 - 0.5 \checkmark$$
$$\therefore \frac{0.15d}{0.15} = \frac{15.75}{0.15} \checkmark$$
$$\therefore d = 105 \checkmark$$
$$\therefore d + 10 = 115$$

Conclusion ✳
There are 105 dimes and 115 nickels in the jar.

Check
$105(0.10) + 115(0.05) = 10.5 + 5.75$
$= 16.25$

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16. The chessboard shown at the right has a diagonal length of 50 cm.

   (a) Find the **area** of each small square on the chessboard. **(Hint:** The Pythagorean Theorem) **(5 TIPS)**
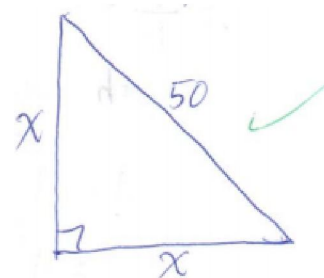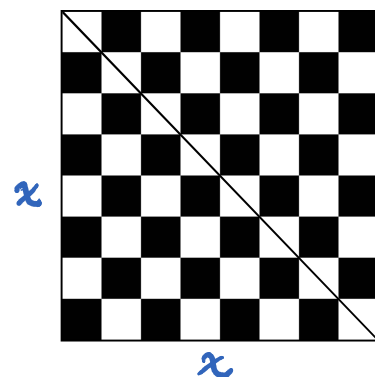
Let x represent the length of one side of the chessboard. Then, by the Pythagorean Theorem,
$$x^2 + x^2 = 50^2 \checkmark$$
$$\therefore 2x^2 = 2500 \checkmark$$
$$\therefore x^2 = 1250 \checkmark$$

Now x^2 is the area of the entire chessboard, which means that the area of the chessboard must be 1250 cm². Since there are 64 squares in all, the area of a single square must be $\frac{1250}{64} = 19.53125$ cm². ✓

   (b) Suppose that the squares on the chessboard were arranged in a single row. This would form a very long and "skinny" rectangle. Find the perimeter of the rectangle. **(3 TIPS)**

64 squares altogether

$8x$ — $\frac{x}{8}$
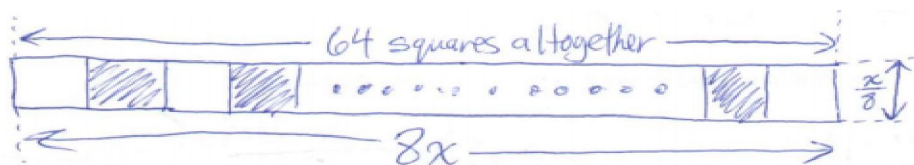
$$P = 2(8x) + 2\left(\frac{x}{8}\right)$$
$$= 16x + \frac{x}{4} \checkmark$$

$$\frac{2}{1}\left(\frac{x}{8}\right) = \frac{2x}{8_4} = \frac{x}{4}$$

From 16(a) we know that $x^2 = 1250$.

Therefore, $x = \sqrt{1250}$.

$\therefore P = 16(\sqrt{1250}) + \frac{\sqrt{1250}}{4}$

$\doteq 574.5 \text{ cm}$

* The perimeter of the rectangle is about 574.5 cm.