THINKING AND COMMUNICATING IN MATHEMATICS
INTRAMAPS TEST 2023 – 1
CYCLE IV – EIGHTH GRADE

THINKING AND COMMUNICATING USING VARIABLES AND ALGEBRAIC EXPRESSIONS
Can understand and solve linear equations in one variable to find the solution of contextualized problems.

BASIC LEVEL

1. Choose T (true) or F (false), as appropriate.

   A. To remove parentheses in an equation, the Distributive Law is applied.
   B. If n is the highest number of decimal places the coefficients of an equation have, it is advisable to multiply both sides of the equation by 10^n.
   C. An equation is an equality that compares expressions that combine numerical and literal quantities.
   D. If an equation has denominators, it is advisable to multiply both sides of the equation by the greatest common factor of the denominators.

2. Choose T (true) or F (false), as appropriate.

   A. The solutions of an equation are the values that the unknowns can take, in such a way that when they are substituted in the equation, the equality is satisfied.
   B. $2x - 5 = 7$ and $4x - 7 = 9$ are equivalent equations.
   C. The equation $7y = 12z$ has two terms and two unknowns.
   D. If two equations have the same solutions, they are called equivalent equations.

3. What is the solution of the equation?

$$-3a + 9 = 3$$

   A. $a = -1$.
   B. $a = 2$.
   C. $a = 1$.
   D. $a = -2$.

4. What is the name of the principle that states that the following equations are equivalent?

$$5x = 20$$
$$5x \cdot \frac{\mathbf{1}}{\mathbf{5}} = 20 \cdot \frac{\mathbf{1}}{\mathbf{5}}$$

   A. Distributive principle.
   B. Addition principle.
   C. Operation of like terms.
   D. Multiplication principle.

5. What is the name of the principle that states that the following equations are equivalent?

$$3x + 2 = 7x$$
$$3x + 2 - \mathbf{2} = 7x - \mathbf{2}$$

   A. Distributive law.
   B. Addition principle.
   C. Operation of like terms.
   D. Multiplication principle.

HIGH LEVEL

6. What is the solution of the following equation? *Write the process in the box.*

$$4a + 2(a - 3) = -(a - 2) - 3a$$

First, clear parentheses using the distributive law:

$$4a + 2(a - 3) = -(a - 2) - 3a$$
$$4a + 2a - \square = -a\square 2 - 3a$$

Operate like terms:

$$\square a - \square = -4a + \square$$

Add $4a$ on both sides of the equations to cancel $-4a$ on the right side:

$$\square a - \square + 4a = \square$$

Add $\square$ on both sides of the equations to cancel $-\square$ on the left side:

$$\square a + 4a = \square + \square$$
$$\square a = \square$$

Divide by 10 on both sides of the equation:

$$a = \frac{\square}{\square}$$

Simplify

$$a = \frac{\square}{\square}$$

7. Solve the following equation. Clear the fractions first. *Write the process in the box.*

$$\frac{2}{3}x - \frac{1}{2} = \frac{5}{6} + x$$

To clear the fractions, we need to multiply the Least Common Multiple of the denominators (2,3 and 6) on both sides of the equation. Since, the LCM of 2,3 and 6 is $\square$, then:

$$\square \cdot \left(\frac{2}{3}x - \frac{1}{2}\right) = \square \cdot \left(\frac{5}{6} + x\right)$$

Applying distributive law:

$$\square x - \square = \square + \square x$$

Subtract $\square x$ on both sides of the equations to cancel $\square x$ on the right side:

$$\square x - \square - \square x = \square$$

Add $\square$ on both sides of the equations to cancel $-\square$ on the left side:

$$\square x - \square x = \square + \square$$

Operate like terms:

$$\square x = \square$$

Dividing by $\square$ on both sides of the equations:

$$x = \square$$

LIVEWORKSHEETS

8. Solve the following equation. Clear the decimals first. *Write the process in the box.*

$$0.3 + 0.23x = 2.3 + 0.03x$$

To clear the decimals, we need to multiply by 10^n, where n is the highest number of decimal places that the coefficients of the equation. Since the highest number of decimal places in the coefficients is $n = 2$, then

$$10^{\square} \cdot (0.3 + 0.23x) = 10^{\square} \cdot (2.3 + 0.03x)$$

Applying distributive law:

$$\square + \square x = \square + \square x$$

Subtract $\square x$ on both sides of the equation to cancel $\square x$ on the right side:

$$\square + \square x - \square x = \square$$

Subtract $\square$ on both sides of the equation to cancel $\square$ on the left side:

$$\square x - \square x = \square - \square$$

Operate like terms:

$$\square x = \square$$

Dividing by $\square$ on both sides of the equation:

$$x = \square$$

UPPER LEVEL

9. Thomas has some money in two different bank accounts. The total amount he has in both accounts is \$1,500. The amount in the first account is four times the amount in the second account. How much money does Thomas have in the second account? *Write the process in the box.*

x: Amount of money in the first account.
y: Amount of money in the second account.

The total amount of money he has in the two accounts is given by $x + y$. So,

$$x + \square = \square \quad (1)$$

Since the amount of money he has in the first account is four times the amount in the second account, then

$$x = \square y$$

Replacing in equation (1),

$$\square y + y = \square$$

Operating like terms,

$$\square y = \square$$

Dividing both sides by $\square$,

$$\frac{\square y}{\square} = \frac{\square}{\square}$$

$$y = \square$$

10. A car rental company charges a flat fee of \$30 plus an additional \$10 per day for renting a car. If the total cost to rent a car for a certain number of days is \$160, how many days was the car rented for? *Write the process in the box.*

x: Number of days rented.

To write the equation we have to take into account that the flat fee is a constant, because does not depend on the number of days. While \$10 has to be multiplied by the number of days. We have to add both result in order to get the cost for renting a car. So,

$$\square + \square x = \square$$

Subtracting $\square$ on both sides of the equation to cancel $\square$ on the left side,

$$\square x = \square - \square$$

$$\square x = \square$$

Dividing on both sides by $\square$,

$$\frac{\square x}{\square} = \frac{\square}{\square}$$

$$x = \square$$

THINKING AND COMMUNICATING IN A SPECIFIC NUMERICAL SYSTEM
Can understand algebraic expressions and generalize their operations in different contexts.

BASIC LEVEL

11. Choose T (true) or F (false), as appropriate.

A. An algebraic expression is a mathematical statement involving only numbers.
B. The expression xy^{-2} is a monomial.
C. The polynomials of two terms are called binomials.
D. In the expression $7x^2$, 2 is the coefficient of the monomial.

12. Choose T (true) or F (false), as appropriate.

A. The degree of the expression $6x + 7x^2$ is 2.
B. In the expression $8x^2 + 6xy + 12z$, the variables are x, y and z.
C. If a monomial has two or more variables, the degree of the monomial is the product of the exponents of those variables.
D. The degree of $\sqrt[3]{7}\,x^4$ is 3.

HIGH LEVEL

13. Which of the following options correctly orders the following algebraic expression by the grade of its terms (from highest to lowest)?

LIVEWORKSHEETS

$$2x - 5x^2y + 3x^2y^3 - 1$$

A. $5x^2y + 3x^2y^3 - 1 + 2x.$
B. $-1 + 2x + 5x^2y + 3x^2y^3.$
C. $3x^2y^3 + 5x^2y + 2x - 1.$
D. $5x^2y + 3x^2y^3 + 2x - 1.$

14. Evaluate the expression $x^2y^2 - 10xy$ for $x = -3$ and $y = 2$. What is the numeric value of the expression? *Write the process in the box.*

$x^2y^2 - 10xy =$

$= (\square)^2(\square)^2 - 10(\square)(\square)$
$= \square \cdot \square + 10 \cdot \square \cdot \square = \square + \square = \square$

UPPER LEVEL

15. The perimeter of a rectangle is 24 units, and its length is 3 units more than twice its width. What is the width of the rectangle? *Write the process in the box.*

The perimeter of a rectangle of length l and width w is

$$P = 2l + 2w$$

In this rectangle, the perimeter (P) is 24:

$$\square = 2l + 2w \quad (1)$$

Since the length is 3 units more than twice the width,

$$l = \square w + \square$$

Replacing in that value of l in (1),

$$\square = 2(\square w + \square) + 2w$$
$$\square = \square w + \square + 2w$$
$$\square - \square = \square w + \square w$$
$$\square = \square w$$
$$\frac{\square}{\square} = \frac{\square w}{\square}$$
$$\square = w$$

THINKING AND COMMUNICATING SPATIAL PROPERTIES USING GEOMETRIC SYSTEMS
Can recognize and apply the criteria for similarity and congruence of triangles to solve contextualized problems.

BASIC LEVEL

16. Complete the sentences.

- Based on their angles, the triangles are classified into acute, obtuse and _____.
- Based on their sides, the triangles are classified into equilateral, isosceles and _____.

17. Choose the option that correctly completes the sentences.

- If two triangles are similar, then their corresponding angles are [ ] and their corresponding sides are [ ].
- If two triangles are congruent, then their corresponding angles are [ ] and their corresponding sides are [ ].

HIGH LEVEL

18. ΔABC and ΔXYZ are given with the following information:

- $\angle A \cong \angle X.$
- $\angle B \cong \angle Y.$
- $\overline{AB} \cong \overline{XY}.$

Based on the given information, determine the relationship between ΔABC and ΔXYZ, indicating the criterion that can be applied.

A. $\Delta ABC \sim \Delta XYZ$ by ASA similarity criterion.
B. $\Delta ABC \cong \Delta XYZ$ by ASA congruence criterion.
C. $\Delta ABC \sim \Delta XYZ$ by SAS similarity criterion.
D. $\Delta ABC \cong \Delta XYZ$ by SAS congruence criterion.

UPPER LEVEL

19. A triangle has side lengths of 7 cm, 11 cm, and 9 cm. Determine which of the following options correctly identifies another triangle that is similar to the given triangle.

A. Side lengths of 8 cm, 12 cm, and 10 cm.
B. Side lengths of 23 cm, 33 cm, and 36 cm.
C. Side lengths of 28 cm, 44 cm, and 36 cm.
D. Side lengths of 35 cm, 55 cm, and 54 cm.

LIVEWORKSHEETS