

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.

- 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:

$$x = \square$$

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?

$$5x = 20$$

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

- 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?

$$3x + 2 = 7x$$

$$3x + 2 - 2 = 7x - 2$$

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:

$$x = \square$$

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 $\square$,

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

$$x = \square$$

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 $\square$,

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

$$y = \square$$

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.
- An algebraic expression is a mathematical statement involving only numbers.
 - The expression xy^{-2} is a monomial.
 - The polynomials of two terms are called binomials.
 - In the expression $7x^2$, 2 is the coefficient of the monomial.
12. Choose T (true) or F (false), as appropriate.
- The degree of the expression $6x + 7x^2$ is 2.
 - In the expression $8x^2 + 6xy + 12z$, the variables are x , y and z .
 - If a monomial has two or more variables, the degree of the monomial is the product of the exponents of those variables.
 - 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)?

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

- 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.

$$\begin{aligned} x^2y^2 - 10xy &= \\ &= (\boxed{})^2 (\boxed{})^2 - 10(\boxed{})(\boxed{}) \\ &= \boxed{} \cdot \boxed{} + 10 \cdot \boxed{} \cdot \boxed{} = \boxed{} + \boxed{} = \boxed{} \end{aligned}$$

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:

$$\boxed{} = 2l + 2w \quad (1)$$

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

$$l = \boxed{}w + \boxed{}$$

Replacing in that value of l in (1),

$$\begin{aligned} \boxed{} &= 2(\boxed{}w + \boxed{}) + 2w \\ \boxed{} &= \boxed{}w + \boxed{} + 2w \\ \boxed{} - \boxed{} &= \boxed{}w + \boxed{}w \\ \boxed{} &= \boxed{}w \\ \boxed{} &= \boxed{}w \\ \boxed{} &= \boxed{}w \\ \boxed{} &= w \end{aligned}$$

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 $\boxed{}$ and their corresponding sides are $\boxed{}$.
- If two triangles are congruent, then their corresponding angles are $\boxed{}$ and their corresponding sides are $\boxed{}$.

HIGH LEVEL

18. $\triangle ABC$ and $\triangle XYZ$ 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 $\triangle ABC$ and $\triangle XYZ$, indicating the criterion that can be applied.

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