

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?

$$5x = 20$$

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

$$3x + 2 = 7x$$

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

- 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:

$$x = \square$$

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

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

Applying distributive law:

$$\boxed{} + \boxed{}x = \boxed{} + \boxed{}x$$

Subtract $\boxed{}x$ on both sides of the equation to cancel $\boxed{}x$ on the right side:

$$\boxed{} + \boxed{}x - \boxed{}x = \boxed{}$$

Subtract $\boxed{}$ on both sides of the equation to cancel $\boxed{}$ on the left side:

$$\boxed{}x - \boxed{}x = \boxed{} - \boxed{}$$

Operate like terms:

$$\boxed{}x = \boxed{}$$

Dividing by $\boxed{}$ on both sides of the equation:

$$x = \boxed{}$$

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,

$$\boxed{} + \boxed{}x = \boxed{}$$

Subtracting $\boxed{}$ on both sides of the equation to cancel $\boxed{}$ on the left side,

$$\boxed{}x = \boxed{} - \boxed{}$$

$$\boxed{}x = \boxed{}$$

Dividing on both sides by $\boxed{}$,

$$\frac{\boxed{}x}{\boxed{}} = \frac{\boxed{}}{\boxed{}} \\ x = \boxed{}$$

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,

$$x + \boxed{} = \boxed{} \quad \textcircled{1}$$

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

$$x = \boxed{}y$$

Replacing in equation $\textcircled{1}$,

$$\boxed{}y + y = \boxed{}$$

Operating like terms,

$$\boxed{}y = \boxed{}$$

Dividing both sides by $\boxed{}$,

$$\frac{\boxed{}y}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

$$y = \boxed{}$$

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)?

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

- 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.

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

$$= (\boxed{\quad})^2 (\boxed{\quad})^2 - 10(\boxed{\quad})(\boxed{\quad})$$
$$= \boxed{\quad} \cdot \boxed{\quad} + 10 \cdot \boxed{\quad} \cdot \boxed{\quad} = \boxed{\quad} + \boxed{\quad} = \boxed{\quad}$$

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:

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

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

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

Replacing in that value of l in (1),

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

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 _____ and their corresponding sides are _____.
- If two triangles are congruent, then their corresponding angles are _____ and their corresponding sides are _____.

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.