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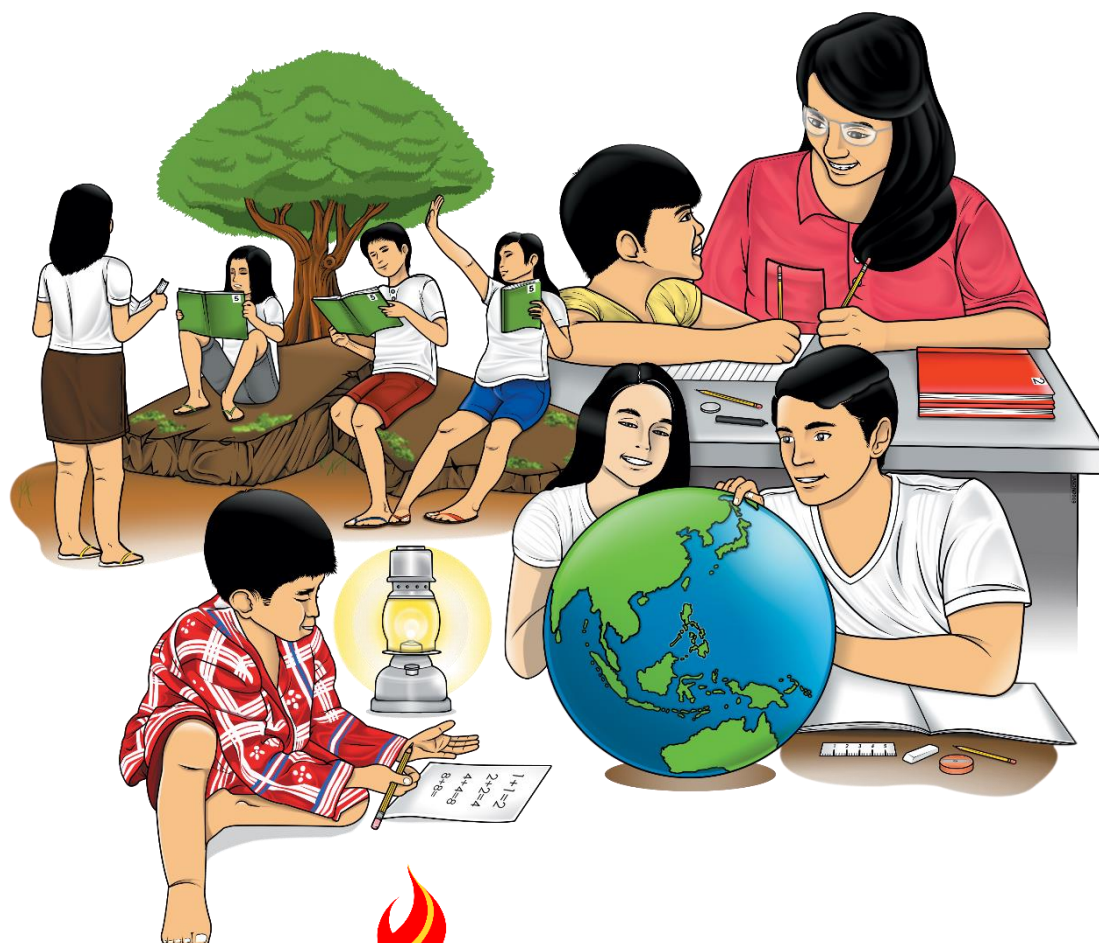# Mathematics

Quarter 3 – Module 4:
Representing Quantities in Real-life Situations Using Algebraic Expressions and Equations

ALTERNATIVE DELIVERY MODE
ADM

6

Mathematics

Quarter 3 – Module 4:
Representing Quantities in Real-life Situations Using Algebraic Expressions and Equations

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

This module was designed and written with you in mind. It was made to help you master the skills of representing quantities in real-life situations using algebraic expressions and equations. The scope of this module allows you to use it in many different learning situations. The language used recognizes your diverse vocabulary level. The lessons are arranged to follow the standard sequence of your course. However, the order in which you read them can be changed to match with the textbook you are now using.

The module is divided into two lessons, namely:
- Lesson 1 – Representing Quantities in Real-life Situations Using Algebraic Expressions and Equations
- Lesson 2 – Solving Routine and Non-routine Problems Involving Different Types of Numerical Equations such as 7+9= __+6

After going through this module, you are expected to:
1. represent quantities in real-life situations using algebraic expressions and equations **(M6AL-I11e-18)** and;

1. solve routine and non-routine problems involving different types of numerical equations such as 7+9= __+6 **(M6AL-I11f-19).**

What I Know

Choose variables to represent the unknown quantities and write an algebraic expression or equation.

1. The sum of four and eight times a number is twenty.
2. The weight of Roman's father is 5 kg less than 3 times Roman's weight.
3. Twenty times a number less two
4. Three times the difference of a number and one
5. Half a number decreased by twelve
6. The difference between three and twice a number plus one
7. The product of a number and nine
8. A number divided by three is eight
9. Six less than a number is forty-five
10. Ten added to a number

Lesson 1

Representing Quantities in Real-life Situations Using Algebraic Expressions and Equations

In the previous lessons, you have learned how to define a variable in an algebraic expression and equation. This time we will focus on how to represent quantities in real-life situations using algebraic expressions and equations.

What's In

Fill in the blanks with the word/s that correctly complete/s the following statements. Choose from the word/s inside the box below. Write your answers on your answer sheet.

> Algebraic Expression
> Constant
> Numerical Expression
> Variable
> Equation

1. _____is a mathematical statement indicating that two algebraic expressions are equal; uses the symbol " **=** " .
2. _____is an expression that combines numbers and one or more operation symbols.
3. _____is any letter or symbol that represents a number.
4. _____has a fixed value that does not change.
5. _____is a mathematical phrase that uses variables, numerals, and operation symbols.

Notes to the Teacher

This contains helpful tips or strategies that will help you in guiding the learners.

What's New

Read and understand the problem below:

Glenn is a newly hired messenger in a multinational company in Makati. As trainee, he needs to wear a polo-shirt everyday. He was given a clothing allowance of ₱6,000.00. How many polo-shirts can he buy with this amount?

Study the table of prices for typical brands of polo shirts.

Brand	Price per Polo Shirt	Numerical Expression	Number of Shirts
Brand A	₱500.00	6000÷ 500	12
Brand B	₱400.00	6000÷ 400	15
Brand C	₱250.00	6000÷ 250	24
Brand D	₱300.00	6000÷ 300	20
Brand E	₱600.00	6000÷ 600	10

How to represent the above-given situation using algebraic expressions and equations?

What is It

The answer to the question depends on the brand of clothes Glen will buy. The third column gives the *numerical expression* for each brand for the number of shirts that he can buy with the money he has. Our constant is ₱6,000.00. If you do not know the price of a polo shirt, we can use variable to stand for a price. Then we can write an algebraic expression and equation for the number of shirts.

To represent the price of each brand of shirt, we make use of a variable and write an algebraic expression to represent the number of shirts that Glenn can buy for ₱6,000.00.

Let (variable):		Number of Shirts (in Algebraic Expressions)
p = the price of each Brand A shirt	-	₱6,000.00 ÷ p
q = the price of each Brand B shirt	-	₱6,000.00 ÷ q
r = the price of each Brand C shirt	-	₱6,000.00 ÷ r
s = the price of each Brand D shirt	-	₱6,000.00 ÷ s
t = the price of each Brand E shirt	-	₱6,000.00 ÷ t

The equation to get the exact number of polo-shirts per brand are listed in the third column. The variable in each algebraic equation represents the number of shirts per brand.

> Common words translated as "="
>
> equals
>
> is, are, were, was
>
> is equal to
>
> result is
>
> yields

Brand	Price per Shirt	Equations	Number of Shirts
Brand A	₱500.00	₱6000 ÷ ₱500 = p	p = 12
Brand B	₱400.00	₱6000 ÷ ₱400 = q	r = 15
Brand C	₱250.00	₱6000 ÷ ₱250 = r	q = 24
Brand D	₱300.00	₱6000 ÷ ₱300 = s	r = 20
Brand E	₱600.00	₱6000 ÷ ₱600 = t	s = 10

So, the number of shirts Glenn can buy using his ₱6000.00 clothing allowance depends on the brand he prefers.

One of the most important skills in math that we have to acquire is the ability to translate verbal phrases or sentences to equations. Aside from the fact that this could be one of the easiest ways to get an accurate answer, it also shows a clean flow of solution which becomes understandable to many if properly presented.

To represent quantities in real-life situations and to translate verbal phrases or sentences to algebraic equations, mastery of translating word phrases to algebraic expressions is necessary.

To write algebraic expressions in a real-life situation:

- Determine which quantity in the situations is unknown and identify a variable to represent the unknown quantity.

Write the expression using a variable to represent the situation. Look for key words in figuring out what mathematical operations to be used.
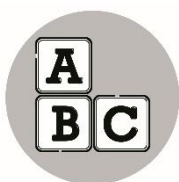
What's More

Choose a variable to represent the unknown quantities and write an equivalent algebraic expression or equation for the following statements. Write your answers on your answer sheet.

1. five more than x bananas

2. eight pesos added to z pesos

3. seven subtracted from k eggs

4. m increased by ten candies is forty candies

5. twice a number y bacteria

6. nine less than w passengers

7. p chocolates divided by six persons

8. half of k kilograms is seventy kilograms

9. twenty biscuits decreased by p biscuits equals two biscuits

10. thrice a number r rides

What I Have Learned

In representing quantities in real-life situations using algebraic expressions and equations, we make use of variables to represent unknown quantities. Mastery of translating verbal equations into letters or symbols and vice versa is necessary.

What I Can Do

Read and answer the following items. Write you answer in the separate sheet of paper.

1. Joseph bakes same number of cupcakes each day. He used 2 cups of flour in each cupcake. Write the algebraic expression to represent the number of cups of flour Joseph uses each day in baking cupcakes.

2. Melissa runs the same number of kilometers each day. Write the algebraic expression to represent the number of kilometers Melissa ran last March.

3. Rizzi makes bread each day in her bakery. Write the algebraic expression to represent the total number of breads Rizzi made in a week.

4. Daniel caught 20 fish and then ate some. Write the algebraic expression to represent the number of fish Daniel has left.

5. Emil reads the same number of books each month. Write an expression to represent the number of books Emil reads in 3 years.

Assessment

Read and answer the following items using your answer sheet. Write an algebraic expression for each item. Use the given variables to represent the unknown quantities.

1. Raymund has a weight of x kilograms. Express algebraically his weight after he gained 2.6 kilograms.

2. Salome is y years old now. Represent algebraically her age 5 years ago.

3. Sam Moises has n marbles. Represent algebraically the number of marbles that Floyd has if he has 4 less than 5 times the number of marbles Sam Moises has.

4. Express algebraically, in terms of x, the number of meters in x centimeters.

5. Helen is n years old. Helen's father is 4 years more than twice her age. Represent algebraically for the age of Helen's father.

Additional Activities

Read and express the following indicated problems. Write your answer in your answer sheet.

1. If thrice a number is increased by 11, the result is 112. Translate this to an algebraic equation.

2. Dianne saved ₱150.00 from her allowance this week. This amount is ₱50.00 more than twice the amount she saved last week. Write the algebraic equation to solve for the amount she saved last week.

3. Migs has a mass of 65 kilograms. Express algebraically his mass after he gained r kilograms.

For items 4 and 5, refer to the given problem in the box below:

Elaine bought 8 mangoes for ₱15.00 each and 5 apples for ₱12.00 each. She gave the cashier a ₱500.00 bill.

4. Write an expression for the total cost of the fruits she bought.

Write the equation for the amount of change the cashier should give her.

Answer Key

What I Know

1. $4 + 8n = 20$
2. $3w - 5$
3. $20y - 2$
4. $3(p - 1)$
5. $\frac{x}{z} - 12$
6. $3 - 2p + 1$
7. $9n$
8. $\frac{n}{3} = 8$ or $n \div 3 = 8$
9. $n - 6 = 45$
10. $10 + n$

What's In

1. Equation
2. Numerical Expression
3. Variable
4. Constant
5. Algebraic Expression

What's More

1. $x + 5$
2. ₱8.00 + ₱z
3. $k - 7$
4. $m + 10 = 40$
5. $2y$
6. $w - 9$
7. $\frac{d}{6}$
8. $\frac{k}{2} = 70$, $k \div 2 = 70$
9. $20 - p = 2$
10. $3r$

What I Can Do

1. 5x cups of flour
2. 31 y
   (Note: The month of March has 31 days)
3. 7m
   (Note: 1 week has 7 days)
4. 20-z
5. 36r
   (Note: 1 year has 12 months; 3 years has 36 months)

Note: Learners may any letters in the alphabets to represent variable.

Assessment

1. $x + 2.6$
2. $y - 5$
3. $5n - 4$
4. $\frac{x}{100}$
5. $2n + 4$

Additional Activities

1. $3n + 11 = 112$
2. $2r + ₱50 = ₱150$
3. $65 + r$
4. $(8 \times ₱15.00)+(5 \times ₱12.00)$
5. $₱500.00 - [(8 \times ₱15.00)+(5 \times ₱12.00)]$

Note: (Answers may vary for variable (letter) that represents a number.

Lesson 2

Solving Routine and Non-routine Problems Involving Different Types of Numerical Expressions and Equations such as 7+9=__+6

In the previous lessons you have learned how to represent quantities in real-life situations using algebraic expressions and equations. This time, we will focus on how to solve routine and non-routine problems involving different types of numerical equations such as $7+9=\_\_+6$.

What's In

Translate the following word phrases into algebraic equations.

1. Twice a number is equal to six.

2. If three times a number is decreased by two, the answer is seven.

3. The ratio of a number and ten is two.

4. Half of the sum of a number and three is six.

5. The difference of seven and a number is equal to six times the number.

What's New

Read and understand the problem and verbal sentences below.

1. A number increased by 5 is 12. What is the number?

2. The sum of two numbers is 8. If the first number is 3, what is the second number?

3. Shirly is 2 years older than Eda. The sum of their ages is 20. Find their present ages.

If we let x be the unknown number, how can these sentences be translated into mathematical equations? What is the value of x?

What is It

Let's use the Four-Step-Plan to solve the word problems in the previous sections.

To solve the first problem, we follow the following steps:

Step 1: Understand

      a. Identify what is/are asked.

         Find the missing number.

      b. Identify what is/are given.

         The given data are 5 and 12

Step 2: Plan

      a. Represent the data.

         Let x be the missing number

      b. Write an equation.

         <u>A number</u> <u>increased by</u> <u>5</u> <u>is</u> <u>12</u>

            x +   5 = 12

Step 3: Solve

    a. Solve the equation

$$x + 5 = 12$$

$$x + 5 - 5 = 12 - 5 \text{ (subtract 5 in both sides)}$$

$$x + 0 = 7$$

$$x = 7$$

Step 4: Check

    a. Check the solution.

To check the solution, substitute 7 for x in the equation.

$$x + 5 = 12 \rightarrow 7 + 5 = 12$$
$$12 = 12$$

    b. Decide if the answer is reasonable.

This time, let's solve the second problem following the same steps:

The sum of two numbers is 8. If the first number is 3, what is the second number?

Step 1: Understand

    a. Identify what is/are asked.

Find the second number

    b. Identify what is/are given.

8 is the sum of the two numbers

3 is the first number

Step 2: Plan

    a. Represent the data.

Let x be the second number

    b. Write an equation.

Since, the first number is 3, then, the equation is

$$3 + x = 8.$$

Step 3: Solve

    a. Solve the equation

    To solve the equation, do this:

    $3 - \textbf{3} + x = 8 - \textbf{3}$ (subtract 3 from both sides)

      $0 + x = 5$

         $x = 5$

Step 4: Check

    a. Check the solution.

    To check the solution, substitute 5 for x in the equation.

    $3 + x = 8 \rightarrow 3 + 5 = 8$

         $8 = 8$

    b. Decide if the answer is reasonable.

To solve the word problem in item number 3, we consider the following steps:

Step 1: Understand

    a. Identify what is/are asked.

        The ages of Shirly and Eda

    b. Identify what is/are given.

        Shirly is 2 years older than Eda and

        sum of their ages is 20

Step 2: Plan

    a. Represent the data.

    Let x – be the age of Eda

    $x + 2$ – be the age of Shirly

    b. Write an equation.

    $(x+2) + x = 20$

Step 3: Solve

    a. Solve the equation

$$(x+2) + x = 20$$
$$2x + 2 = 20$$
$$2x = 20 - 2$$
$$2x = 18$$
$$x = 18 \div 2$$
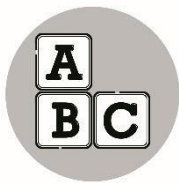$$x = 9 \text{ (age of Eda)}$$

To solve Shirly's age,

$$x + 2 = 9 + 2 = 11$$

Therefore, Shirly is 11 years old and Eda is 9 years old.

Step 4: Check

    a. Check the solution.

Decide if the answer is reasonable.

What's More

Read and solve the following problem. Write your answer in your answer sheet.

1. Eight more than a number is 14. Find the number.

2. A number decreased by 12 is 9. Find the number.

3. Twenty subtracted from Walter's age is 24. Find Walter's age.

4. Ten more than twice Jose's age is 64. Find Jose's age.

5. If a number is increased by 15, the result is the same as two times the number.

What I Have Learned

In solving routine and non-routine problems involving different types of numerical equations such as 7+9= __+6, follow the four-step plan that will help us organize the given information so that we can write an equation that will enable us to solve the problem.

Step 1: Understand
  a. Identify what is/are asked.
  b. Identify what is/are given.

Step 2: Plan
  a. Represent the data.
  b. Write an equation.

Step 3: Solve
  a. Solve the equation

Step 4: Check
  c. Check the solution.

Decide if the answer is reasonable.

What I Can Do

Read and solve the following word problems. Write your answers in your answer sheet.

1. Samantha is y years old now. What is Samantha's age if her age 5 years from now is 17?

2. Aki is g centimeter tall. Pierre's height is 4 less than thrice the height of Aki. The difference between Aki's height when subtracted from Pierre's height will result to 240 centimeters. How tall is Aki?

3. In three years, the price of a new model of an S6 – model phone will be six more than twice its current price. If the projected price of the new S6 phone is ₱ 40,000.00. What is its current price?

4. Benjie is 6 years old. Ruel is 5 years more than thrice Benjie's age. How old is Ruel?

5. Five friends share a box of pencils. Each receives 4 pencils. Find the number of pencils in the box.

Assessment

Solve the following problems following the Four Step Plan "Understand, Plan, Solve and Check Process". Write your answer in your answer sheet.

1. Helen is 13 years old, Helen's father is 6 years more than twice her age. How old is Helen's father?

2. Edna is 155 cm tall. Lilia's height is 10 cm less than twice Edna's height. How tall is Lilia?

3. Roman is 25 kilograms. His father is 5 kg less than 3 times Roman's weight. What is the weight of Roman's father?

4. Francis is ten years old. Ben is twice as old as Francis. What is the age of Ben?

5. Aning is five years old. My age is six years more than thrice her age. How old am I?

Additional Activities

Read and translate the following word problems into algebraic equation. Write your answer in your answer sheet.

1. The sum of three numbers is 20. Two of these numbers are 9 and 6. What is the value of the third number.

2. Alfredo is 5 years older than John, and Maria is 4 years younger than John. If the sum of their ages is 34, how old is John?

3. Find the dimensions of a rectangle if the length is 7 inches more than the width and the perimeter is 54 inches.

4. The area of a rectangle garden is 64 square meters. If the length is 4 times the width, what are the dimensions of the garden?

Answer Key

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Assessment

1. Step 1: Understand
   a. Identify what is/are asked.
   Find the age of Helens father
   b. Identify what is/are given.
   Helen is 13 yrs old
   Her father's age is 6 yrs more than twice her age

   Step 2: Plan
   a. Represent the data.
   Let x – Age of Helen's father
   b. Write an equation.
   x = 6 + 2(13)

   Step 3: Solve
   6 + 2 (13) = x
   6 + 26 = x
   32 = x

   Step 4: Check
   a. Check the solution.
   6 + 2 (13) = 32
   6 + 26 = 32
   32 = 32

   Answer: Helen's father is 32 years old

2. Step 1: Understand
   a. Identify what is/are asked.
   The height of Lilia
   b. Identify what is/are given.
   Edna's height is 155 cm
   Lilia's height is 10 cm less than twice Edna's height

   Step 2: Plan
   a. Represent the data.
   Let x – Lilia's height
   b. Write an equation.
   (2 x 155) − 10 = x

   Step 3: Solve
   (2 x 155) − 10 = x
   310 − 10 = x
   300 = x

   Answer: Lilia's height is 300 cm

   Step 4: Check
   a. Check the solution.
   6 + 2 (13) = 32
   6 + 26 = 32
   32 = 32

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What I Know

1. x = 64

2. x = 6

3. m = 80

4. c = 135

5. a = 150

What's In

1. 2n = 6

2. 3p − 2 = 7

3. n:10 = 2

4. $\frac{1}{2}(n + 3) = 6$ / $\frac{n+3}{2} = 6$

5. 7 − a = 6a

What's More

1. 6
2. 21
3. 44
4. 27
5. 15

What I Can Do

1. 12 yrs old

2. 118 cm

3. ₱19,997.00

4. 23 years old

5. 20 pencils

Additional Activities

1. 5
2. 11 years old
3. 10
4. 4m x 16m

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3. Step 1: Understand
   a. Identify what is/are asked.
      Mass of Roman's father
   b. Identify what is/are given.
      Roman's mass is 25 kg
      His father is 5 kg less than 3 times
      Roman's mass

Step 2: Plan
   a. Represent the data.
      Let x = Mass of Roman's father
   b. Write an equation.
      $(3 \times 25) - 5 = x$

Step 3: Solve
   $(3 \times 25) - 5 = x$
   $75 \quad - 5 = x$
   $\qquad 70 = x$

Answer: 70 kg is the mass of Roman's father

Step 4: Check
   a. Check the solution.
      $(3 \times 25) - 5 = 70$
      $75 \quad - 5 = 70$
      $\qquad 70 = 70$

4. Step 1: Understand
   a. Identify what is/are asked.
      Age of Ben
   b. Identify what is/are given.
      Francis' age is 10 yrs old
      Ben's age is twice as old as Francis

Step 2: Plan
   c. Represent the data.
      Let x – Ben's age
   d. Write an equation.
      $2 \times 10 = x$

Step 3: Solve
   $2 \times 10 = x$
   $2 \times 10 = 20$

Answer: Ben is 20 years old

Step 4: Check
   a. Check the solution.
      $2 \times 10 = 20$
      $\qquad 20 = 20$

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5. Step 1: Understand
   a. Identify what is/are asked.
      My age
   b. Identify what is/are given.
      Aning is 5 yrs old
      My age is 6 yrs more than thrice
      Aning's age

Step 2: Plan
   a. Represent the data.
      Let x = my age
   b. Write an equation.
      $6 + (3 \times 5) = x$

Step 3: Solve
   $6 + (3 \times 5) = x$
   $6 + \quad 15 \quad = x$
   $\qquad 21 \quad = x$

Answer: I am 21 years old

Step 4: Check
   a. Check the solution.
      $6 + (3 \times 5) = 21$
      $6 + \quad 15 \quad = 21$
      $\qquad 21 \quad = 21$

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References

Most Essential Learning Competencies (MELC) in Mathematics 6

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