MATH

VARIABLES IN EQUATION
Hi my dear learner! Did you learn something in your previous lesson in algebraic expression? Hope you enjoy studying and answering the given exercises. It’s nice to know that you are learning well. Congratulations for the great effort and time you gave in studying all the lessons in the learning modules given to you. Here is another module about variables in equations. This will be the last topic for you to learn in Grade 6 and I’m sure that you will really feel great after learning this lesson.

Let’s Learn This

After learning this module, you are expected to have a full understanding on algebraic expression and equation.

Specifically you should be able to:

❌ Give the meaning of equation
❌ Simplify expression by combining like terms
❌ Find a number solution to the expression
Let’s Try This

A. Simplify each of the expression by combining like terms. Follow the order of operations.

Example: \(3m+5m = 8m, 5p+2y-3p = 5p-3p+2y = 2p+2y,\)
\(8p+2p-7q = 10p-7q\)

1. \(6a + 59 = \) ______________________
2. \(7x – 5x = \) ______________________
3. \(9 + 2 + x = \) ______________________
4. \(3p + 5 – 2p = \) ______________________
5. \(4t + 3 – 2t + 6 = \) ______________________
6. \(7a + 2a + 3b = \) ______________________

B. Put the known terms together on one side and the unknown terms on the other side of the equation.

Examples: \(2x + 4 = 20 \quad 2x = 20 – 4, \quad 3a – 8 = 10 \quad 3a = 10 + 8\)

7. \(4b + 7 = 41 \) ________________
8. \(7a + 5 = 54 \) ________________
9. \(5 + 8y = 77 \) ________________
10. \(4a + 35 = 51 \) ________________
Read and solve this problem:

A basket is full of fruits with bananas and mangoes. The bananas are 3 times the number of mangoes. How many of each kind of fruits are there, if there are 20 fruits in the basket?

The number of mangoes is unknown, so let us represent n for mangoes.

\[ n = \text{number of mangoes} \]

The bananas are 3x the number of mangoes, so if n is number of mangoes; the number of banana is 3n.

\[ 3n = \text{number of bananas} \]

Add the number of mangoes and bananas and we will have the total number of fruits. Since the total number of fruits is 20, therefore, the equation will be:  

\[ 3n + n = 20 \]
Let’s find the solution to variable \( n \) is the equation, \( 3n + n = 20 \).

\[
3n + n = 20 \quad \rightarrow \text{simplify } 3n + n. \text{ They are two like terms, so we can add to get } 4n.
\]

\[
4n = 20 \quad \rightarrow \text{we know } 4n \text{ means } 4 \times n.
\]

\[
n = 20 \div 4 \quad \rightarrow \text{to get the value of } n, \text{ divide } 20 \text{ by } 4.
\]

\[
n = 5 \quad \rightarrow \text{the solution to variable } n \text{ in the equation } 3n + n = 20 \text{ is } 5.
\]

\( n \) is the number of mangoes, so there are 5 mangoes.

\( 3n \) is the number of bananas, so there are 15 bananas.

To check, given the value \( n = 5 \), let’s evaluate \( 3n + n \).

\[
3n + n = 3(5) + 5 = 15 + 5 = 20, \text{ then } 20 = 20
\]

Therefore the value of the variable \( n \) in \( 3n + n = 20 \) IS 5. Let us find the value of the variable in another equation. Solve for variable \( x \) in \( 5x - 3x = 24 \).

\[
5x - 3x = 24 \quad \rightarrow 5x \text{ and } 3x \text{ are two like terms, so we can subtract to get } 2x.
\]

\[
2x = 24 \quad \rightarrow \text{to find the value of } x, \text{ divide } 24 \text{ by } 2.
\]

\[
X = 24 \div 2
\]

\[
X = 12
\]
To check, let us evaluate $5x - 3x$, given $x = 12$

$5x - 3x = 5(12) - 3(12) = 60 - 36 = 24$, then $24 = 24$

Therefore, $12$ is the solution to the equation $5x - 3x = 24$.

When we add or subtract like terms, add or subtract the number part of the terms, while the variable remains the same. The number part of a term is called the **coefficient of $5x$ is 5 and the variable is $x$.**

Other expressions have unlike terms like $4x + 2y$ and $5x + 3$. The unlike terms of $4x + 2y$ are $4x$ and $2y$. We cannot add or subtract unlike terms. $8x$ and $2$ are unlike terms, so we cannot add $8x + 2$.

Study these other examples of finding solution to equations:

1. Find the solution to variable $x$ in the equation, $x + 3 = 19$.

   $$x + 3 = 19 \quad \text{transpose 3 to the other side of the equation using the inverse operation}$$

   $$x = 19 - 3$$

   $${x = 16}$$

   To check, evaluate $x + 3$, given $x = 16$

   $$x + 3 = 16 + 3 = 19 \quad \text{the result is 19, therefore 16 is the value of x in } x + 3 = 19.$$
2. Find the solution to $9x - 3 = 15$.

$$9x - 3 = 15 \quad \text{transpose 3 to the other side of the equation using the inverse operation}$$

$$9x = 15 + 3$$

$$9x = 18 \quad \text{to find the value of } x, \text{ divide } 18 \text{ by } 9.$$  

$$X = 18 \div 9$$

$$X = 2$$

To check, evaluate $9x - 3$, given $x = 2$.

$$9x - 3 = 9(2) - 3 = 18 - 3 = 15 \quad \text{the result is 15, therefore 2 is the solution to the equation } 9x - 3 = 15.$$  

3. Find the value of the variable in $6n + 2n + 5 = 29$.

$$6n + 2n + 5 = 29 \quad \text{add like terms 6n and 2n to get 8n.}$$

$$8n + 5 = 29 \quad \text{transpose 5 to the other side of the equation using the inverse operation.}$$

$$8n = 29 - 5$$

$$8n = 24 \quad \text{to find the value of } n, \text{ divide } 24 \text{ by } 8.$$  

$$n = 24 \div 8$$

$$n = 3$$

To check, evaluate $6n + 2n + 5$, given $n = 3$.

$$6(3) + 2(3) +5 = 18 + 6 + 5 = 29$$
The result is 29, therefore 3 is the value of n in \(6n + 2n + 5 = 29\).

Notice that we put the known term on one side of the equation and the unknown on the other side. The term with variable, \(8n\) is the unknown and the known terms are 5 and 29.

An equation has two sides separated by the = symbol. When we transpose terms from one side of the equation to the other side, we use the inverse operation.

Like for example \(9x - 3 = 15\), transpose 3 to the other side, it becomes \(9x = 15 + 3\), likewise \(8n + 5 = 29\) becomes \(8n = 29 - 5\).

Let’s Do This

A. Put the known terms together on one side and the unknown terms on the other side of the equation.

Examples: \(3x + 6 = 30 \quad 3x = 30 - 6; \quad 69 = 12 + 9 \quad 69 - 9 = 12\)

1. \(2b + 10 = 12\) \hspace{1cm} _________________
2. \(8 + 5x = 41\) \hspace{1cm} _________________
3. \(6c - 42 = 12\) \hspace{1cm} _________________
4. \(3n = 60 + n\) \hspace{1cm} _________________
5. \(7a + 5 = 54\) \hspace{1cm} _________________

B. Find for the solution of each equation.

6. \(x + 15 = 23\) \hspace{1cm} _________________
7. \(6x - 8 = 10\) \hspace{1cm} _________________
8. \[ 4b - 12 = 24 \]

A. Simplify each of equation by combining like terms. Follow the order of operation.

1. \[ 2x + 9x - 3 - 5x = 6x - 3 \]
2. \[ 5n - 3n + 6 - 3 = \]
3. \[ 9y + 20 - 5 + 6 = \]
4. \[ 12a - 2a + 5 = \]
5. \[ 12y + 8 - 2y + 6 = \]

B. Write an algebraic equation and solve the equation.

During the council meeting, the number of women is 2 times the number of men. How many women and men attended the meeting if there were 30 people present?

Let’s Remember This

An algebraic expression is any combination of numbers constant and variables with operations such as addition, subtraction, multiplication or division.

To evaluate an expression means to find a number solution to the expression, given the value of the variables.

To simplify an expression means to make it simple or shorter by combining like terms in the expressions.
Let’s Test Ourselves

A. Solve for the variable in each equation.
1. $3x + 8 = 32 \quad x = _____$
2. $5n - 28 = 22 \quad n = _____$
3. $2c - 16 = 26 \quad c = _____$
4. $5a - 3a = 9 + 3 \quad a = _____$
5. $9p + 3p = 43 - 19p \quad p = _____$

B. Find the solution to each equation.
6. $9x + 3 = 48 \quad$ _________________
7. $3b + 14 = 29 \quad$ _________________
8. $4n - 10 = 38 \quad$ _________________

Let’s Consider This

- If you got 6-8, congratulations!! You made it and you are now ready to take higher Mathematics.
- If you got 4-5, answer the next exercise.
- If your score is 3 and below, you need to review the whole module.
A. Simplify each expression. Follow the rules from the order of operation.

1. $8x + 9 - 3 + 2x$

2. $12 - 2 \times 5 + 3y + y$

3. $9a - 3a \times 2 + 6a - 9$

4. $7 + 9 \times 3 + 5n - 3n$

5. $36c + 11c - 9c + 4d$

Let’s Enrich Ourselves
Let’s Try This

A.
1. 11a
2. 2x
3. 11 + x
4. 1p + 5 or p + 5
5. 2t + 9
6. 9a + 3b

B.
7. 4b = 41 - 7
8. 7a = 54 - 5
9. 8y = 77 - 5
10. 4a = 51 - 35

Let’s Do This

A.
1. 2b = 12 - 10
2. 5x = 41 - 8
3. 6c = 12 + 42
4. 3n - n = 60
5. 7a = 54 - 5

B.
6. 8
7. 3
8. 9

Let’s Do More

A.
1. 6x - 3
2. 2n + 3

Let’s Test Ourselves

A.
1. x = 8
2. n = 10
3. c = 21
4. a = 6
5. p = 2

B.
6. 5
7. 5
8. 12

Let’s Enrich Ourselves

A.
1. 10x + 6
2. 2 + 4y
3. 9a - 9
4. 34 + 2n
5. 38c + 4d

Answer Key
3. $9y + 21$
4. $10a + 5$
5. $10y + 14$