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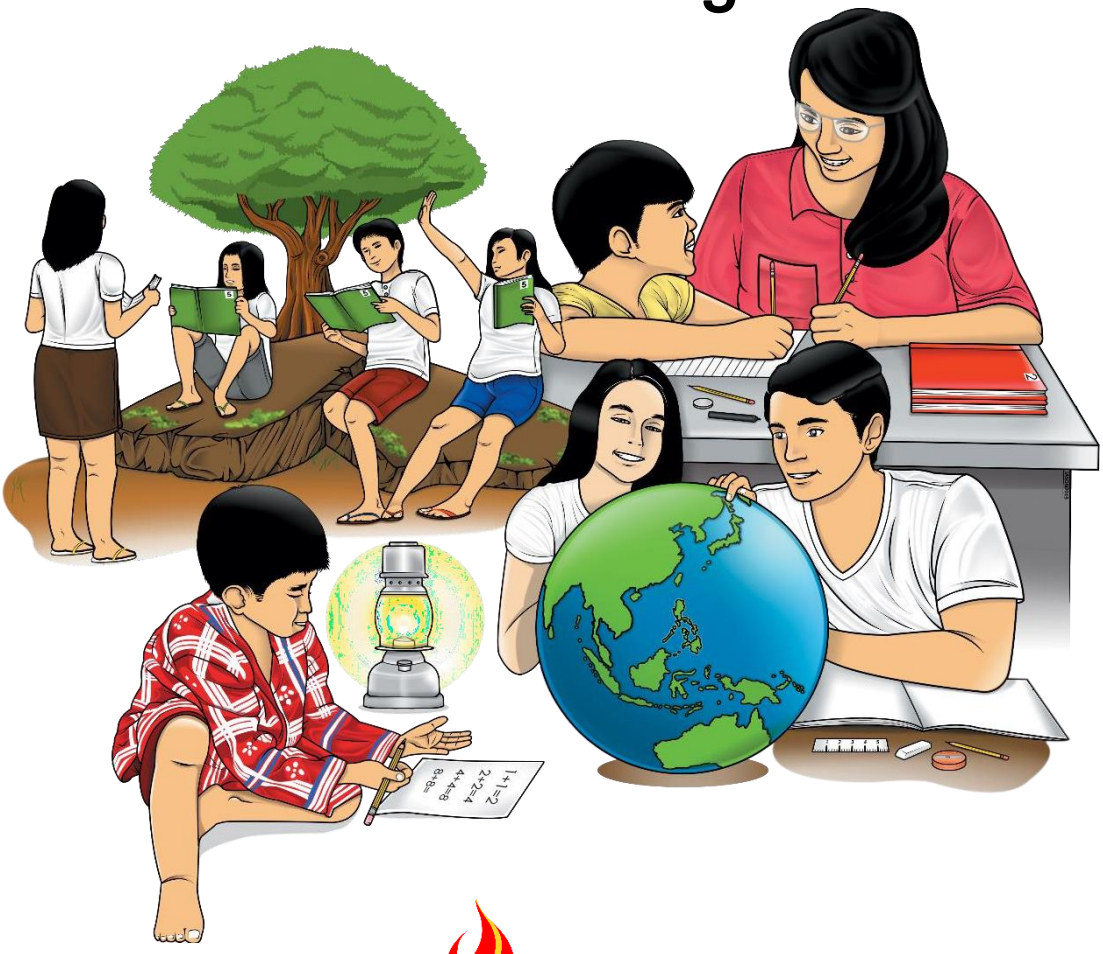
MATHEMATICS

Quarter 1 – Module 4:
Properties of Operations on the set of Integers



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Mathematics – Grade 7
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Quarter 1 – Module 4: PROPERTIES OF OPERATIONS ON SET OF INTEGERS
First Edition, 2020

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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 test 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 Teachers are also provided to the 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. 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 is here to help you master the Properties of Operations on the set of Integers. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using. Congratulations on making this far! How is your positive-negative journey on the previous module? Have you mastered the rules? This module will provide exciting activities on the Properties of the Operations on Integers. Good luck dear!

The module contains:

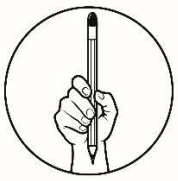
- Lesson on Properties of Operations on the set of Integers

After going through this module, you are expected to:

1. illustrate the different Properties of Operations on the set of integers;

   a. closure b. commutative c. associative d. distributive e. identity f. inverse

2. identify the properties of operations on the set of integers used in the given statement.



What I Know

Let us check your prior knowledge about properties of operations on the set of integers by answering the questions below.

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which operation below does not change the value of any nonzero number?
   A. Adding by One
   B. Dividing by Zero
   C. Multiplying by One
   D. Multiplying by Zero

2. Which of the following properties states that changing the order of two numbers that are either being added or multiplied does not change the value?
   A. Closure property
   B. Commutative property
   C. Associative property
   D. Identity property

3. Which of the following properties states that the two integers that are added and multiplied remain as integers? The set of integers is closed under addition and multiplication
   A. Closure property
   B. Commutative property
   C. Associative property
   D. Distributive property

4. When two numbers have been added / subtracted and then multiplied by a factor, the result will be the same when each number is multiplied by the factor and the products are then added / subtracted.
   A. Closure property
   B. Commutative property
   C. Associative property
   D. Distributive property

5. Which of the following properties states that the sum of any number and 0 is the given number?
   A. Closure property
   B. Commutative property
   C. Associative property
   D. Identity property

6. Which of the following properties is used in the expression 2 (3-5) = 2(3) – 2(5)?
   A. Additive Inverse
   B. Associative Property
   C. Additive Identity
   D. Distributive Property

7. Which of the following does not illustrate Inverse Property?
   A. 5 + 8 = 8 + 5
   B. ½ (2) = 1
   C. (-9) + (9) = 0
   D. (x) + (-x) = 0

8. Which of the following does not illustrate Distributive Property?
   A. a(b – c) = ab – ac
   B. 4(x + 3) = 4x + 12
   C. 3(5 * 6) = (3* 5)6
   D. 2(7 – 5) = 14 – 10

9. Which Property of Multiplication is shown in (6 + 3) x 4 = 6(4) + 3(4)?
   A. Associative Property
   B. Commutative Property
   C. Distributive Property
   D. Inverse Property

10. Which of the following properties is used in the expression 4(1+7) = 4 + 28?
   A. Additive Inverse
   B. Associative Property
   C. Additive Identity
   D. Distributive Property

11. Which property of addition is used in (4 + 7) + 3 = 4 + (7 + 3)?
   A. Associative Property
   B. Commutative Property
   C. Distributive Property
   D. Identity Property

12. Which is an example of Identity Property of Addition?
   A. 1 + 3 = 4
   B. 2 + 4 = 4 + 2
   C. 3 + 0 = 3
   D. 5 + (6 + 3) = (5 + 6) + 3

13. Which of the following does not show the Commutative Property?
   A. a + 8 = 8 + a
   B. xy = yx
   C. m + n = n + m
   D. 3x(4) = 12x

14. Which property of addition does 5 + 0 = 5 illustrate?
    A. Commutative Property
    B. Distributive Property
    C. Identity Property
    D. Inverse Property

15. What property of integers justify 12 + 3 = 3 + 12
    A. Closure property
    B. Commutative property
    C. Identity property
    D. Inverse property

Lesson 1 Properties of Operations on the set of Integers

What's In

This module is a continuation of the concepts on the Operations on Integers. Mastering the rules in the previous module will help speed you up in completing this module.

Perform the indicated operations. Apply the rules of the Operations on Integers

1. 12 + 15 = _____
2. -21 + (-13) = _____
3. 14 + (-7) = _____
4. (-16) + 9 = _____
5. 26 - 13 = _____
6. -25 – (-11) = _____
7. 36 – (-20) = _____
8. (13) (5) = _____
9. (-8) (-6) = _____
10. (12) (-7) = _____
11. (-9) (8) = _____
12. (10) ÷ (2) = _____
13. (-18) ÷ (-3) = _____
14. (-42) ÷ (7) = _____
15. 144 ÷ (-12) = _____

What's New

Exactly!

Fill the blanks with the correct number that will make it exact.

(8 +____) +____=____+ (5 + 1)

What are the numbers?

What property is illustrated?

What is It

Throughout the discussion, assume that the numbers represented by the letters **a** and **b** are integers. Now, let us start our discussion on the different Properties.

1. Closure Property

Two integers that are added and multiplied remain as integers. The set of integers is closed under addition and multiplication.

- The **Closure Property of Addition** for real numbers states that if ***a*** and ***b*** are real numbers, then ***a*** + ***b*** is a unique real number.

Example 1: Adding two real numbers produces another real number.

$$\begin{array}{r} 15 \\ +\ 16 \\ \hline 21 \end{array}$$

The number "21" is a real number

• The **Closure Property of Multiplication** for real numbers states that if ***a*** and ***b*** are real numbers, then a × b is a unique real number.

Example 2: Multiplying two real numbers produces another real number

$$\begin{array}{r} 26 \\ \times\ 12 \\ \hline 52 \\ 26 \\ \hline 312 \end{array}$$

The number "312" is a real number.

2. Commutative Property

Changing the order of two numbers that are either being added or multiplied does not change the value.

$$\mathbf{a + b = b + a}$$

$$\mathbf{ab = ba}$$

Examples:

1. 2 + 3 = 3 + 2, since 2 + 3 = 5 and also 3 + 2 = 5.
2. (-16) +(-5) = (-5) + (-16)
3. 100 + 99 = 99 + 100
4. (2) (3) = (3) (2), since (2)(3) = 6 and also (3)(2) = 6.
5. (-4) (-15) = (-15) (-4)
6. (10) (25) = (25) (10)

Note: Subtraction and Division are not commutative.

3. Associative Property

Changing the grouping of numbers that are either being added or multiplied does not change its value.

$$\mathbf{(a + b) + c = a + (b + c)}$$

$$\mathbf{(ab)\ c = a\ (bc)}$$

Examples:

1. (2 + 3) + 4 = 2 + (3 + 4)

   Checking:

   (2 + 3) + 4 = 2 + (3 + 4)

   5 + 4 = 2 + 7

   9 = 9

2. (10 + 5) + 8 = 10 + (5 + 8)

   Checking:

   (10 + 5) + 8 = 10 + (5 + 8)

   15 + 8 = 10 + 13

   23 = 23

3. (4 x 3) x 5 = 4 x (3 x 5)

   Checking:

   (4 x 3) x 5 = 4 x (3 x 5)

   12 x 5 = 4 x 15

   60 = 60

4. (2 x 10) x 4 = 2 x (10 x 4)

   Checking:

   (2 x 10) x 4 = 2 x (10 x 4)

   20 x 4 = 2 x 40

   80 = 80

Note: Subtraction and Division are not associative.

4. Distributive Property

When two numbers have been added/subtracted and then multiplied by a factor, the result will be the same when each number is multiplied by the factor and the products are then added / subtracted.

a (b + c) = ab + ac

a (b - c) = ab - ac

Examples:

1. 2(3 + 4) = (2)(3) + (2)(4)

   Checking:

   2(3 + 4) = (2)(3) + (2)(4)

   2(7) = 6 + 8

   14 = 14

2. 5(8 - 3) = (5)(8) - (5)(3)

Checking:

5(8 - 3) = (5)(8) - (5)(3)

5(5) = 40 - 15

25 = 25

5. Identity Property

A. **Additive Identity** - states that the sum of any number and 0 is the given number. ***Zero is the additive identity***.

a + 0 = a

Examples:

1. 4 + 0 = 4
2. -10 + 0 = -10
3. 99 + 0 = 99

B. **Multiplicative Identity** - states that the product of any number and 1 is the given number, a • 1 = a. ***One is the multiplicative identity***.

a • 1 = a

Examples:

1. 12 x 1 = 12
2. -32 x 1 = -32
3. 99 x 1 = 99

6. Inverse Property

A. **Additive Inverse** - states that the sum of any number and its additive inverse is zero. ***The additive inverse of a positive number is the negative of that number***, that is

a + (-a) = 0.

And ***the additive inverse of a negative number is the positive of that number***, that is

-a + a = 0.

Examples:

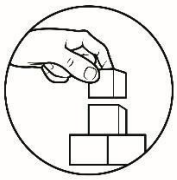
1. 9 + (-9) = 0
2. -58 + 58 = 0
3. 99 + (-99) = 0

B. **Multiplicative Inverse Property** states that the product of any number and its multiplicative inverse or reciprocal is 1. The multiplicative inverse of the number a is $\frac{1}{a}$.

$$\boldsymbol{a \cdot \frac{1}{a} = 1}$$

Examples:

1. $6 \cdot \frac{1}{6} = 1$
2. $-22 \cdot \left(-\frac{1}{22}\right) = 1$
3. $\frac{4}{7} \cdot \frac{7}{4} = \frac{28}{28} = 1$
4. $\frac{5}{8} \cdot \frac{8}{5} = \frac{40}{40} = 1$



What's More

A. Identify the property used in each of the statements below.

1. (-7) + 0 = -7 _____
2. 6 (3 - 5) = 6(3) - 6(5) _____
3. (-8) + (-7) = (-7) + (-8) _____
4. (-13) x 1 = -13 _____
5. $-4 \times -\frac{1}{4} = 1$ _____
6. 2 x (4 x 7) = (2 x 4) x 7 _____
7. 11 + (-11) = 0 _____
8. 3(5) = 5(3) _____
9. $\frac{2}{5} \bullet \frac{5}{2} = 1$ _____
10. (-3) (5 + 9) = (-3) (5) + (-3) (9) _____

B. Rewrite the following expressions using the given property.

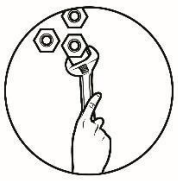
1. 8 (2 + 5)	Distributive Property	_____
2. (7 x 4) x 3	Associative Property	_____
3. 8 + 5	Commutative Property	_____
4. -4 (1)	Identity Property	_____
5. 25 + (-25)	Inverse Property	_____

What I Have Learned

To sum it up, let us complete the statements. Choose your answer from the box that best completes the statements below.

$\frac{1}{a}$	order	positive	zero
negative	factor	one	
product	additive inverse	grouping	

1. Commutative Property states that changing the_____of two numbers that are either being added or multiplied does not change the value.
2. Associative Property states that changing the_____of numbers that are either being added or multiplied does not change its value.
3. Distributive Property states that when two numbers have been added/subtracted and then multiplied by a_____, the result will be the same when each number is multiplied by the factor and the products are then added /subtracted.
4. Additive Identity Property states that the sum of any number and 0 is the given number._____is the additive identity.
5. Multiplicative Identity Property states that the product of any number and 1 is the given number, a • 1 = a._____is the multiplicative identity.
6. Additive Inverse Property states that the sum of any number and its _____ is zero.
7. The additive inverse of a positive number is the_____of that number.
8. The additive inverse of a negative number is the_____of that number.
9. Multiplicative Inverse Property states that the_____of any number and its multiplicative inverse or reciprocal is 1.
10. The multiplicative inverse of the number $\boldsymbol{a}$ is_____.



What I Can Do

Here is another activity that lets you apply what you learned about the Properties of Operations on the set of Integers.

A. Identify the properties applied in the following real-life situations:

1. Leo and Kurt ordered sausage and pepperoni on their pizza.
2. Ricky went to the supermarket and bought ice cream for 12 pesos, bread for 8pesos, and milk for 15 pesos. How much money does he owe the cashier?
3. Ross was doing his math homework while I was finishing my science reading.
4. Grace Joy has 8 notebooks and her brother has 6. If we double both number of their notebooks,how many do they now have altogether?
5. A personal driver's license number.
6. During a physical exam, Noemi's doctor checked her blood pressure, blood sugar level, and heart rate.
7. Boni first poured a bag of cement into a bucket along with some gravel, then added water to this mixture; everything will work out fine.
8. The person's thumbmark is a unique identification.
9. Jay-ar has 10 boxes of canned goods and his best friend Michelle has 5 boxes of canned goods. If we tripled their donations, what is the total number of their donations?
10. The set of even natural numbers, [2, 4, 6, 8 . . .], is closed with respect to addition because the sum of any two of them is another even natural number, which is also a member of the set.

Great work! You did a good job in applying what you have learned!

Assessment

I hope you had a good time going over this module. For you to determine how much you've learned, please answer the questions by choosing the letter of the best answer.

1. Which of the following properties is used in the expression 1 + 4 = 5?
   A. Additive Inverse
   B. Associative Property
   C. Closure Property
   D. Commutative Property

2. Which properties of addition is used in 4 + 0 = 4?
   A. Associative Property
   B. Commutative Property
   C. Distributive Property
   D. Identity Property

3. Which is an example of Inverse Property of Addition?
   A. (-5) + (5) = 0
   B. 2(-3) = (-2)(3)
   C. 3 + 0 = 3
   D. 4 + (1 + 3) = (4 + 1) + 3

4. Which of the following does not show Distributive Property?
   A. 4(2 – 7) = 4(2) – 4(7)
   B. 5(x + 3) = 5x + 15
   C. a(b + c) = a + (b + c)
   D. a(3 + 4) = 3a + 4a

5. Which property of addition does (-x) + x = 0 illustrate?
   A. Commutative Property
   B. Distributive Property
   C. Identity Property
   D. Inverse Property

6. Which of the following does not illustrate Associative Property?
   A. 4(5 x 3) = 4(5) x 4(3)
   B. 2(3 x 7) = (2 x 3)7
   C. 5 + (3 + 8) = (5 + 3) + 8
   D. None of the above

7. Which of the following states that the sum of any number and 0 is the given number?
   A. Additive Identity Property
   B. Additive Inverse Property
   C. Multiplicative Identity Property
   D. Multiplicative Inverse Property

8. Which of the following does not illustrate Multiplicative Identity Property?

   A. $\left(\frac{3}{4}\right)\left(\frac{4}{3}\right) = 1$

   B. (-9) (1) = -9

   C. $\frac{1}{2} = \left(\frac{1}{2}\right)(1)$

   D. (m)(1) = m

9. Which Property is shown in (-x) + (-1) = (-1) + (-x)?
   A. Associative Property
   B. Commutative Property
   C. Distributive Property
   D. Inverse Property

10. What is the additive inverse of x?

   A. $\frac{1}{x}$

   B. –x

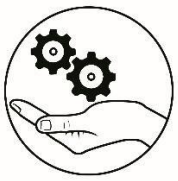
   C. x^{-1}

   D. 1

For numbers 11- 15, rewrite the following expressions using the given property.

11. 5a – 3a	Distributive Property	_____
12. (8x) y	Associative Property	_____
13. (-9) + 3	Commutative Property	_____
14. 12(1)	Identity Property	_____
15. 17 + (-17)	Inverse Property	_____

Good Job! You did well on this module! Keep going!



Additional Activities

A. Identify the Properties being described below.

1. When three or more numbers are multiplied, the product is the same regardless of the order of the multiplicands. _____

2. Multiplying any number by zero yields to zero . _____

3. Adding 0 to any number leaves it unchanged. _____

4. The multiplicative inverse of x is $\frac{1}{x}$ so that $x(\frac{1}{x}) = 1$. _____

5. When two numbers are added, the sum is the same regardless of the orders of the addends. _____

B. Fill in the blanks with integer/s to make the equation correct and determine what property was used to solve each equation.

1. $6(____ + 3) = 0$ _____
2. $\frac{3}{4} + ____ = 0$ _____
3. $-5 + 0 = ____$ _____
4. $(-8 + 8) + 5 = ____$ _____
5. $5(a + 7) = 5a + ____$ _____

Answer Key

What's More

1.Additive Identity

2.Distributive

3.Commutative

4.Multiplicative Identity

5.Multiplicative Inverse

6.Associative

7.Additive Inverse

8.Commutative

9.Multiplicative Inverse

10.Distributive

B. 1. 8 (2 + 5) = 8 (2) + 8 (5)
2. (7 x 4) x 3 = 7 x (4 x 3)
3. 8 + 5 = 5 + 8
4. 4 (1) = 4
5. 25 + (25) = 0

What's In

1. 27
2. 34
3. 7
4. 7
5. 13
6. 14
7. 56
8. 65
9. 48
10. 84
11. 72
12. 5
13. 6
14. 6
15. 12

What I Know

1. C
2. B
3. A
4. D
5. D
6. D
7. A
8. C
9. C
10. D
11. A
12. C
13. D
14. C
15. B

Additional Activities

1. Associative Property
2. Zero Property
3. Additive Identity
4. Multiplicative Inverse
5. Commutative Property

B.

1. 3 Additive Inverse , Zero Property
2. 3/4 Additive Inverse Property
3. 5 Additive Identity Property
4. 5 Additive Inverse, Additive Identity Property
5. 35 Distributive Property

What can I do

1. Commutative Property
2. Associative Property
3. Commutative Property
4. Distributive Property
5. Identity Property
6. Commutative Property
7. Associative Property
8. Identity Property
9. Distributive Property
10. Closure Property

What have I learned

1. Order
2. Grouping
3. Factor
4. Zero
5. one
6. additive inverse
7. negative
8. positive
9. product
10. $\frac{1}{a}$

Assessment

1. C
2. D
3. A
4. C
5. D
6. A
7. A
8. A
9. B
10. B
11. a (5 – 3)
12. 8(xy)
13. 3 + (-9)
14. 12(1)=12
15. 17+(-17)=0

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