7

Mathematics

Quarter 1 - Module 2:
Absolute Value and Operations on Integers

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MATHEMATICS 7
Quarter 1 - Module 2: Absolute Value and Operations on Integers
Second Edition, 2021

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Mathematics

Quarter 1 - Module 2:
Absolute Value and Operations on Integers

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DEPARTMENT OF EDUCATION

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.

Target

Integers or signed numbers are commonly established in real life. In different walks of life, we often used integers. Like, loss is represented as negative number while gain is denoted as positive number in accountancy; going north or going south are represented as positive and negative, respectively, in navigation.

This module will provide you with information and activities that will help you extend your understanding with the directed numbers.

After going through this module, you are expected to:

Learning Competency:

1. represent the absolute value of a number on a number line as the distance of a number from 0. (M7NS-Ic-1)
2. perform fundamental operations on integers. (M7NS-Ic-d-1)

Learning Objectives:

1. Define and determine absolute value of a number.
2. Enumerate the rules on operations of integers.
3. Find the sum of integers and solve problems involving addition of integers.
4. Find the difference of integers and solve problems involving subtraction of integers.
5. Find the product of integers and solve problems involving multiplication of integers.
6. Find the quotient of two integers and solve problems involving division of integers.

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Before going on, check how much you know about this topic.

PRE – ASSESSMENT

***Directions*:** Read carefully each statement below. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which of the of the following represents the distance of the integer from zero in the number line?

   A. Absolute value
   B. Additive inverse
   C. Integer
   D. Magnitude

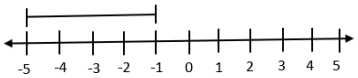
2. What is the equivalent of |–63|?

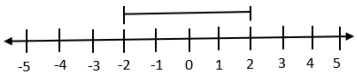
   A. –63 B. –53 C. 53 D. 63

3. Which of the following illustrates the absolute value of –4?

   A. 

   B. 

   C. 

   D. 

4. What is the sum of –8 and 3?

   A. –11 B. –5 C. 5 D. 11

5. What is the sum of 7, –12, and 8?

   A. 27 B. 20 C. 15 D. 3

6. What must be added to 12 to get 4?

   A. – 16 B. – 8 C. 8 D. 16

7. What is the difference of 10 and – 8?

   A. –80 B. –18 C. 18 D. 80

8. What must be subtracted from –12 to obtain –8?

   A. – 5 B. – 4 C. – 3 D. – 2

9. What is the product of –7 and – 5?

   A. – 35 B. – 12 C. 12 D. 35

10. What signed number must be multiplied to 8 to get –32?

    A. – 40 B. – 4 C. 4 D. 40

11. Divide –20 by –5.

    A. – 15 B. – 4 C. 4 D. 15

12. How many words can an encoder type in 10 minutes if he can type 40 word in a minute?

    A. 30 B. 50 C. 400 D. 500

13. What is the result if you find the altitude covered by the artistic diver who dives from the 5 m high diving board and touches the pool floor with a depth of 3 m.

A. −15 m B. −8 m C. 8 m D. 15 m

14. Which of the following is true in the division of integers.

A. The quotient always follows the sign of the dividend.

B. The quotient of two integers with different signs is negative.

C. When dividing two positive integers, the quotient is negative.

D. When dividing two negative integers, the quotient is also negative.

15. The answer of Mark to the problem (−1) (−2) (3) is − 6. Is he correct? Why?

A. Yes, because there are more negative numbers.

B. No, because −1 x (−2) is 2 and 2 x (3) is equal to 6.

C. No, because in the rule, multiply only two numbers.

D. Yes, because the product 2 and 3 is 6, then multiply this by −1.

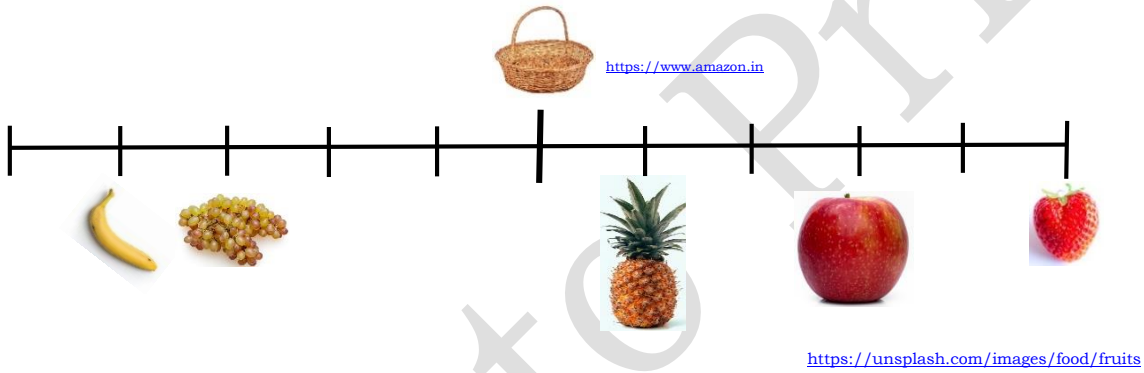
Lesson 1: Absolute Value of a Number

Jumpstart

Let us determine how far each fruit is from the basket as the center of the number line.

Activity 1: Put Me in the Basket

Determine how many bars apart is the fruit from the basket.



https://www.amazon.in

https://unsplash.com/images/food/fruits

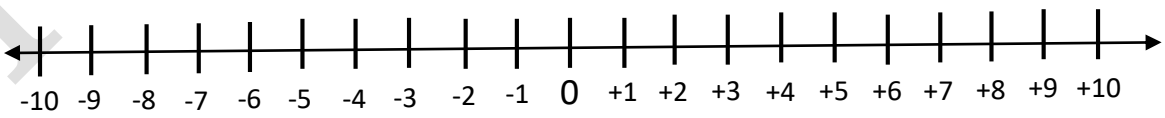
1. _____ 2. _____ 3. _____ 4. _____ 5. _____

Process Questions:

1. What fruit is nearest to the basket?
2. Which fruit is the farthest?
3. Give two fruits which have the same distance from the basket.

Activity 2: My Magnitude

Using the number line, determine the distance of the integers from zero.



1. –3 2. +4 3. -9 4. -4 5. +9

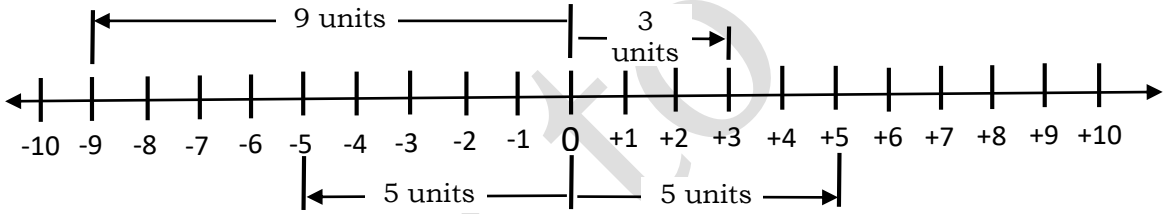
Process Questions:

1. What two integers have the same distance from zero?
2. Consider +4 and –9, which number is farther from zero?
3. Is –4 nearer to zero than +4? Why?
4. How can you determine the distance of an integer from zero?

If you know how to determine the distance of a number from zero, then it is easier for you to determine the absolute value of a number.

Discover

Consider the number line below.



On the number line:

there are 9 units from 0 t0 –9.

there are 3 units from 0 to 3.

there are 5 units from 0 to –5.

there are 5 units from 0 to 5.

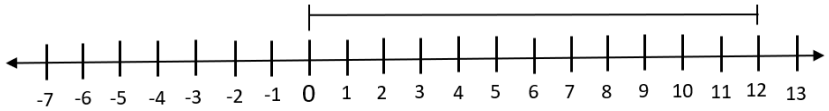
The number of units from zero to any integer represents the **absolute value** of the integer. Thus, the absolute value of –9 is 9. This is indicated as $|-9| = 9$ and read as "the absolute value of –9 is 9". Also, $|3| = 3$.

> The absolute value of a number is the distance between the number and zero on the number line without any regard to its sign. It is represented by two bars (| |). The absolute value of a number is a non-negative number.

The absolute value of –5 is 5, Likewise, the absolute value of positive 5 is equal to 5. Thus, numbers with the same magnitude but different signs are **opposite numbers**. The opposite of a number is also called the **additive inverse**.

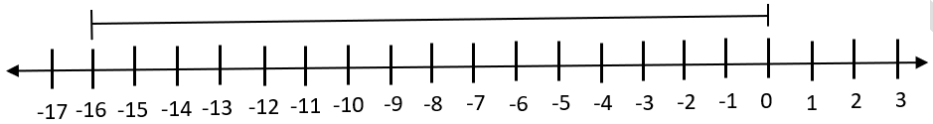
Some other examples are:

The absolute value of 12 is 12 or $|12| = 12$. In number line, it is represented as:

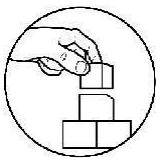


It can be also express without absolute value symbol as, "the number 12 is 12 unit from zero."

The absolute value of −16 is 16 or $|-16| = 16$. It is presented in the number line below.



It can be stated as "the number −16 is 16 units from zero."



Explore

Activity 3:

Determine the absolute value of each number.

1. |29| 2. |–12| 3. |58|

Activity 4: Represent the absolute value of the number on the number line.

1. |7|
2. |–5|
3. |–9|
4. |3|

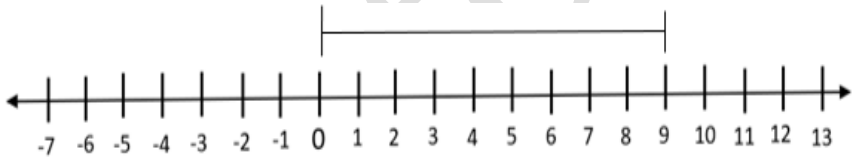
Deepen

Activity 5: Determine whether the statement is TRUE or FALSE.

1. $|30| > |-43|$
2. $|25| = |-25|$
3. $|-16| < 10$
4. $|-33| = |22|$
5. $|89| < |-91|$

Activity 6: Identify what is being asked in each item.

1. Give two numbers whose absolute value is 27.
2. Identify the integers with 32 units from zero.
3. Express $|-19| = 19$ without the absolute value symbol.
4. Write an expression to describe $|94| = 94$.
5. Express the figure as an absolute value of a number.



Lesson 2: Operation of Integers

Jumpstart

The four fundamental operations are addition, subtraction, multiplication, and division. Addition and multiplication are the main operations while subtraction and division are inverse operations.

Recall the operations of whole numbers by answering the activity that follows.

Activity 7: Perform the indicated operation.

1.	2.	3.	4.
4 786	9 652	6 328	$6\overline{)2\,568}$
+ 5 225	– 1 875	X 4	

Discover

Colored counters and number lines help us illustrate operations of integers.

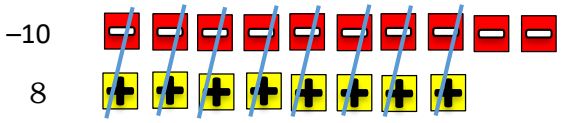
Addition of Integers

Consider  as positive counter and  as negative counter. Solve the problem that follows using these counters.

Problem: Mike borrows ₱ 10.00 and then pays ₱ 8.00. What was the result?

Solution:

A. Borrowing ₱ 10.00 is represented by 10 negative counters and paying ₱ 8.00 is represented by 8 positive counters.



Eight negative counters and eight positive counters add up to 0, leaving 2 negative counters. So, –10 + 8 = –2. Mike still owes ₱ 2.00.

Addition of Integers with the Same Signs

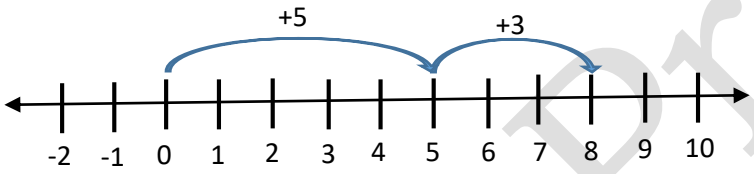
Aside from using signed counters to illustrate the addition of integers, it can also show in the number line.

Example 1: Show the process of addition using a number line.

a. 5 + 3 b. –4 + (–7)

Solutions: a. 5 + 3

The addends, 5 and 3, are both positive. Move 5 units to the right from zero and another 3 units to the same direction.

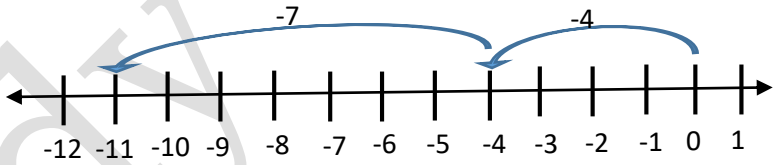


Thus, 5 + 3 = 8.

b. –4 + (–7)

Add their absolute value |–4| + |–7| = 4 + 7 = 11.

Use the common sign in the answer since negative numbers suggest movements to the left of zero.



Thus, –4 + (–7) = –11.

These examples suggest the rule of adding integers with the same signs.

Rule of Adding Integers with the Same Sign

In adding integers with common sign, combine the absolute value of the integers and use the common sign in the answer.

Note that signed number is enclosed in a parenthesis when written after an operation.

Example 2: Add the integers.

a. –26 + (–45) b. 123 + 437 + 306 c. –78 + (–34) + (–51)

Solutions:

Use the rule of adding signed numbers for convenience.

a. –26 + (–45) = –71 — add the absolute values of -26 and -45; 26 and 45, respectively, then copy the common sign (–).

b. 123 + 437 + 306 = 866 — combine the three positive integers.

c. –78 + (–34) + (–51) = –163 — add the absolute values of the numbers, 78, 34, and 51, and affix the same sign on the answer.

Addition of Integers with Unlike Signs

Let us visualize the addition of two integers with different signs.

Example 3: Eric withdrawn an amount of ₱ 800.00 in his bank account. After a few days, he deposited ₱ 1 200.00. How much was added to his original savings after the two transactions?

Solution 1:

A withdraw of ₱ 800.00 is represented by –800.

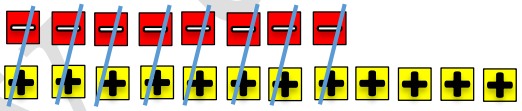
A deposit of ₱ 1 200. 00 is represented by 1 200.

Let each counter represent ₱ 100.00

–800

\+ 1 200

400



So, –₱800 + ₱ 1 200 = ₱ 400

Solution 2:

Let us apply the concept of absolute value in the problem.

The absolute values of the numbers are:

|–800| = 800 and |1 200| = 1 200.

The difference between the absolute values is 400. Since the positive integer has a greater absolute value, the sign of the answer is Positive

–₱ 800 + ₱ 1 200 = ₱ 400

The example suggests the rule on adding two integers with different signs.

Rule of Adding Integers with Different Signs

To add integers with different signs, subtract the smaller absolute value from the larger absolute value and apply the sign of the integer with a greater absolute value.

Example 4: Apply the rule in adding integers with different signs.

a. 62 + (–47) b. –95 + 72 c. –23 + (–30) + 47

Solutions:

a. 62 + (–47) = 15 Subtract the absolute values, 62 and 47. Since 62 has a greater absolute value, then the answer is positive. Therefore, the answer is 15.

b. –95 + 72 = –23 Subtract the absolute values, 95 and 72. Since –95 has a greater absolute value, then the answer is –23.

c. –23 + (–30) + 47

–23 + (–30) = –53 Apply addition of integers with the same sign.

–53 + 47 = –6 Subtract the absolute values, 53 and 47. Since –53 has a greater absolute value, then sign of the answer is negative.

Therefore, –23 + (–30) + 47 = –6

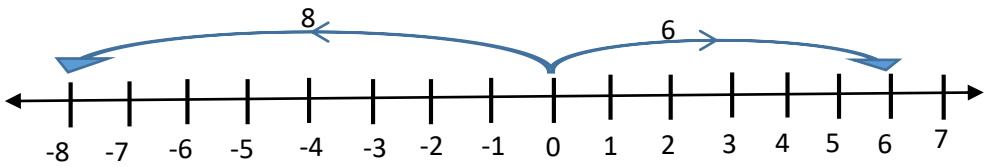
Subtraction of Integers

Let us visualize the process of subtracting integers using the problem below.

Problem: Two fishing boats from a small island cruise at opposite directions. One cruises to west 8 km while the other is 6 km east of the island for fishing. How far apart are the two-fishing boat?

Solution:

To find distance of the two fishing boats, we represent 8 km west as –8 and 6 km east as +6.



Based on the illustration, the distance of the boat in the west from the boat in the east is 14 km, that is 6 + 8 = 14. This is the same as obtaining the difference of 6 and –8.

Thus; 6 + 8 = 6 – (–8)

14 = 14

Subtracting –8 has the same effect as adding 8. We state this observation as a rule subtracting integers.

Rule of Subtracting Integers

To find the difference between two signed numbers, add the additive inverse (or the opposite) of the subtrahend to the minuend.

Example 5:

Find the difference.

a. 36 – (+23)
b. 84 – (–28)
c. – 45 – (–65)
d. – 56 – (+18)

Solution:

a. 36 – (+23)

36 + (–23) = 13 — change 23 with its additive inverse which is –23 and apply rule in adding integers. Note: you may directly subtract two positive numbers.

b. 84 – (–28)

84 + (+28) = 112 — the opposite of – 28 is 28. When 28 is added to 84 the sum is 112.

c. – 45 – (–65)

– 45 + (+65) = 20 — after changing –65 with its additive inverse, follow the rule of addition of integers.

d. – 56 – (+18)

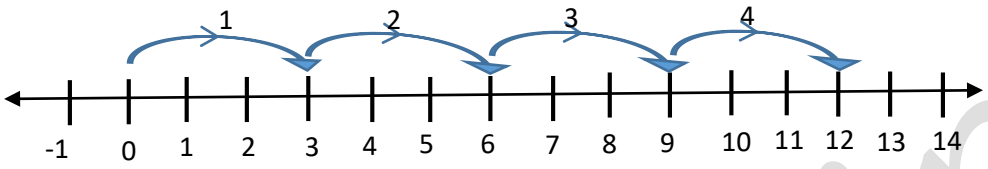
– 56 + (–18) = –74 — the opposite of 18 is –18. Add –18 from –56 to get –74.

Multiplication of Integers

In elementary Math, we learned that multiplication is repeated addition.

$3 \times 4 = 3 + 3 + 3 + 3 = 12.$

This can be shown in the number line as illustrated below.



Problem: The Grade 7 teacher arranged the armchairs in his class even though learning is delivered through distant learning. It was arranged in 8 rows with 6 seats each. How many armchairs are there in the room?

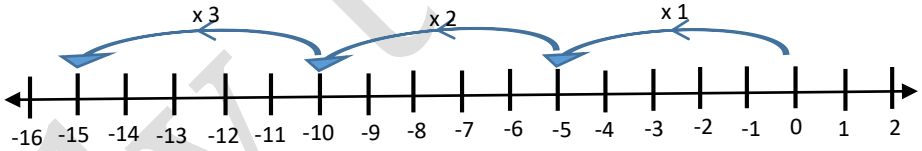
Solution: The problem can be solved by multiplying the 8 by 6. Thus, there are 48 armchairs in the room.

Example 6: Multiply and illustrate the process using a number line.

a. $5 \times (-3)$ b. $-5 \times (-3)$

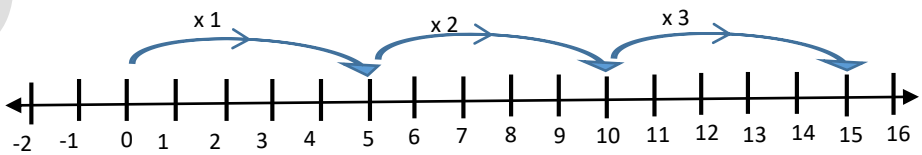
Solutions:

a. $5 \times (-3)$ means "3 jumps of 5 units to the left".



Therefore, $5 \times (-3) = -15$

b. Since $5 \times (-3)$ was presented in the figure above as "3 jumps of 5 units to the left", then $-5 \times (-3)$ means "the same jumps to the opposite direction of it.



Therefore: $-5 \times (-3) = -15$

Notice that two examples suggest the rule of multiplying integers.

Rule of Multiplying Integers

The product of two integers with the same sign is positive.

The product of two integers with different signs is negative.

Example 7: Multiply the integers using the rules

a. 15 x (–4) b. – 8 x (–7) x 3 c. – 23 x (–17) x (–1)

Solutions:

a. 15 x (–4) = –60 the product of a positive integer and a negative integer is negative. Thus, the answer is –60.

b. – 8 x (–7) x 3

– 8 x (–7) = 56 step 1: multiply the first two integers. Since they are both negative, then the sign of the product is positive which is 56.

56 x 3 = 168 step 2: multiply the third integer with product obtained in step 1. Therefore, the product is 168.

c. – 23 x (–17) x (–1)

– 23 x (–17) = 391 step 1: multiply the first two integers. Since they are both negative, then the product is 391.

391 x (–1) = –391 step 2: multiply the third integer with product obtained in step 1. The integers have unlike signs. So, the product is –391.

Division of Integers

Division was introduced as the inverse operation of multiplication in primary grades. It gives the idea of how many times the dividend contains the divisor.

Problem: Every police trainee in Regional Training Center I (RTC I) were given 100 merit points upon arrival. In every crave misconduct made, a trainee gets 2 demerits. After 10 demerits for such actions, the trainee will be spilled out from the training center. How many chances were given to the trainees?

Solution: Demerits of 10 and 2 can be represented as –10 and –2, respectively. A trainee was given 5 chances before he/she will be spilled out from the training center.

So, $-10 \div -2 = 5$

The following statements are correct since division is the inverse of multiplication.

a. $\frac{15}{3} = 5$ since 5 x 3 = 15

b. $\frac{-15}{-3} = 5$ since 5 x –3 = –15

c. $\frac{-15}{3} = -5$ since –5 x 3 = –15

d. $\frac{15}{-3} = -5$ since –5 x -3 = 15

These statements can be stated as the rule of dividing signed numbers. In examples (a), the two numbers are both positive and the answer is positive. Likewise, the answer in example (b) is also positive as the two numbers being divide are both negative. While examples (c) and (d) have negative answers upon dividing two numbers with different signs.

Rule in Dividing Integers

The quotient of two integers with the same signs is positive.

The quotient of two integers with different signs is negative.

Example 8: Find the quotient

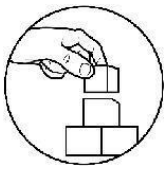
a. $-279 \div 9$ b. $264 \div -11$ c. $-312 \div -13$

Solution:

a. $-279 \div 9 = -31$ when a negative number is divided by a positive number, the quotient is negative.

b. $264 \div -11 = -24$ the quotient is negative since the two number have different signs.

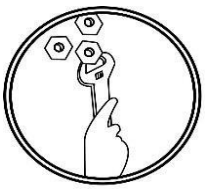
c. $-312 \div -13 = 24$ the two numbers being divided are both negative, so, the quotient is positive.



Explore

Activity 8: Perform the indicated operation

1. 37 + (–21)
2. 648 – (–142)
3. –56 – (–17)
4. 80 + 45 + (–102)
5. –21 – 8 + (–15)
6. 9 x (–10)
7. 5 x (–7) x (–3)
8. $-423 \div 9$
9. $-225 \div -15$
10. –37 x (–2)



Deepen

Activity 9: Select two situations and answer then explain it briefly.

1. What number must be added to –23 to get – 5?
2. For what value of x and y will x – y = 0?
3. When m = –5, which of these is the largest?
   a. m + m b. (m)(m) c. $\frac{m}{m}$
4. Carlo is wondering why (–2) (–2) (–2) = –8. How will you explain the answer to him?

Rubric score for each situation selected

Score	Description
5	Gives correct answer with a clear/sufficient explanation.
4	Gives correct answer but with unclear/insufficient explanation
3	Gives answer but wrong explanation
2	Gives answer without explanation
1	Gives wrong answer

Gauge

***Directions*:** Read carefully each statement below. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which of the following represents the distance of the integer from zero in the number line?

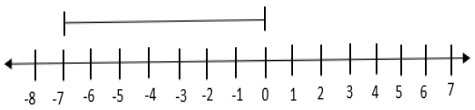
   A. Absolute value
   B. Additive inverse
   C. Integer
   D. Magnitude

2. What is the equivalent of |–638|?

   A. –738 B. –638 C. 638 D. 738

3. Which of these represents the absolute value of –7?

   A. 

   C. 

   C. 

   D. 

4. What is the sum of –10 and –5?

   A. –15 B. –5 C. 5 D. 15

5. What the sum of 7, –12, and – 8?

   A. – 27 B. – 20 C. – 15 D. – 13

6. What must be added to 9 to get – 4?

   A. – 13 B. – 5 C. 5 D. 13

7. What is the difference of 16 and – 4?

   A. – 20 B. – 12 C. 12 D. 20

8. What must be subtracted from – 12 to obtain 32?

   A. – 54 B. – 44 C. – 34 D. – 24

9. What is the product of 8 and – 5?

   A. – 40 B. – 13 C. 13 D. 40

10. What signed number must be multiplied to – 12 to get 36?

    A. – 24 B. – 3 C. 3 D. 24

11. Divide –50 by –10.

    A. – 5 B. – 10 C. 5 D. 10

12. A cliff diver successfully dives from 15-m cliff above sea level and submerge 8 meters below sea level before he come out to surface. Find the altitude covered by the diver.

A. – 23 m B. – 7 m C. 7 D. 23

13. To be qualified as an encoder, one must be able to type at least 45 words per minute. Zoe Zeph encoded 660 within 12 minutes. How many words does she type in a minute? Is she qualified for the job?

A. No, because she only type 40 words in a minute.

B. Yes, she types an average of 55 words per minute.

C. No, she types less than the required number of words per minute.

D. Yes, it does not matter if she types more than or less than 45 words.

14. The answer of Mark to the problem (–1) (–2) (–3) is 6. Is he correct? Why?

A. Yes, because 1 x 2 x 3 is equal to 6.

B. No, because –1 x (–2) is 2 and 2 x (–3) is equal to – 6.

C. No, because it is not possible to multiply three negative numbers.

D. Yes, because the product of integers with the same sign is positive.

15. Which of the following is ***NOT*** true in the division of integers.

A. The quotient always follows the sign of the dividend.

B. When dividing two positive integers, the quotient is positive.

C. The quotient of two integers with different signs is negative.

D. When dividing two negative integers, the quotient is positive.

References

Books

Nivera, Gladys C. (2013), Grade 7 Mathematics Patterns and Practicalities, Makati City, Don Bosco Press

Bernabe, Julieta G. (2009), Elementary Algebra Textbook for First Year, Quezon City, SD Publications, Inc.

Villano, Ma. Luisa V., et.al (2012), 21st Century Mathematics, Quezon City, Phoenix Publishing House, Inc.

Links

https://www.aplustopper.com>fundamental-operations

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