What Is This Module About?

We deal with numbers almost every day. We deal with numbers when we shop, transact business or make measurements. Even the simplest people deal with numbers every day.

You must have learned about whole numbers and fractions. In this module, we will discuss about whole numbers with positive (+) and negative (–) signs. Whole numbers consist of 0 and the set of counting or natural numbers (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 . . .). When you place a positive (+) or a negative (–) sign before the counting numbers, these numbers become positive or negative integers. The set of integers consist of the set of positive and negative numbers including 0. In this module, you will also learn how to perform arithmetic operations, like addition, subtraction, division and multiplication of integers.

This module is divided into four lessons:

Lesson 1 – *Plus or Minus*

Lesson 2 – *Addition and Subtraction of Integers*

Lesson 3 – *Multiplication and Division of Integers*

Lesson 4 – *Working with Integers*

What Will You Learn From This Module?

After studying this module, you should be able to:

- differentiate between positive and negative integers;
- arrange positive and negative integers in **ascending** (from smallest to largest) and **descending** (from largest to smallest) orders;
- demonstrate accuracy in adding, subtracting, multiplying and dividing integers; and
- solve word problems involving addition, subtraction, multiplication and division of integers.

Let's See What You Already Know

Before you start reading this module, answer the questions below. This will give you an idea of how much you know about the topics we will discuss.

A. Identify whether each of the following represents a positive or a negative integer.

1. 1°C below 0
2. 15% increase in grade
3. 10000 ft. above sea level
4. ₱100 profit
5. ₱15.00 discount

B. Arrange the following integers in ascending order.

1. –6, –4, –1, 0, –3
2. +1, +6, +8, +3, +5
3. +4, +3, –10, –11, +1
4. –8, +8, –5, –6, +4
5. +9, –10, +6, –3, –2

C. Arrange the following integers in descending order.

1. +8, –4, –6, –2, +3
2. +10, –11, –13, +8, +9
3. –15, +5, +8, –11, –10
4. +6, +9, –14, –12, +1
5. –10, +3, –4, +4, –3

D. Perform the indicated operation. Write your answer in the box provided.

1. (+24) + (+12) = ☐
2. ☐ + (+50) = +100
3. $\begin{array}{r} +15 \\ -(-13) \\ \hline \square \end{array}$
4. $\begin{array}{r} +10 \\ -(+25) \\ \hline \square \end{array}$
5. (+36) ÷ (+9) = ☐

6. $(-8) \times (+5) = \square$

7. $-16 - (-12) = \square$

8. $+20 + (-25) = \square$

9. $(+6) \times (-4) = \square$

10. $(+28) \div (-4) = \square$

11. $(-42) \div (-7) = \square$

12. $(-6) \times (+6) = \square$

13. $(+27) \div (-3) = \square$

14. $(+24) + (+10) + (+6) = \square$

15. $(+75) - (-75) = \square$

E. Solve the following problems.

1. Mang Juan deposits ₱1000.00 in a rural bank every month. Find the total amount of his deposits in a year.

2. Enrico, a mountain climber, is 45 meters (m) away from the top of a mountain. Melvin is 15 m below him. The mountain is 75 m high. How many meters away is Melvin from the base of the mountain?

3. The total number of enrollees in NFE classes in the district of Concepcion is 1495. Five years ago the total number of enrollees was 1215. How much was the increase in the number of enrollees in five years?

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 39 to find out.

If all your answers are correct, very good! This shows that you already know much about the topic. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This means that this module is for you. It will help you understand important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may go now to the next page to begin Lesson 1.

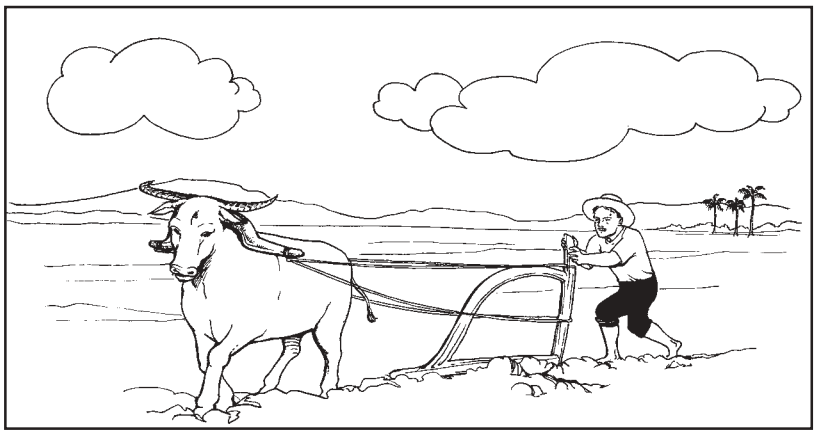
Plus or Minus

Welcome to Lesson 1.

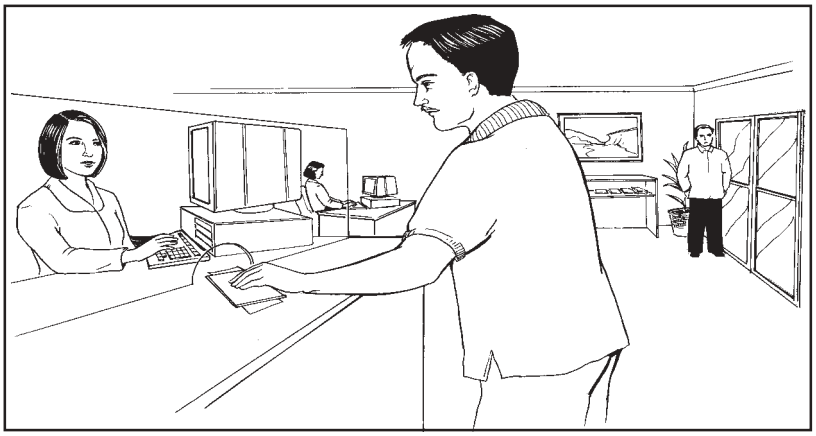
After studying this lesson, you should be able to:

- differentiate between positive and negative integers; and
- arrange positive and negative integers in ascending or descending order.

Are you ready?



A farmer tilling land



The farmer deposits his earnings regularly.

Let's Read

Mang Fred is a poor man. But through hard work and diligence, he was able to save ₱35000 in the bank. He bought a piece of land for ₱30000. He used the remaining ₱5000 to buy fertilizers, pesticides and other materials. He usually earns ₱8000 every harvest time. For five consecutive years, he has had the biggest harvest in their barangay. He was given the "Most Outstanding Farmer" award. His colleagues were happy for him but they were also sorry for themselves because they suffered losses almost every year. They have had to resort to loans to finance their farming and family expenses.

Let's Think About This

Would you like to be a farmer like Mang Fred in the future? Why/Why not?

_____

If you were in his place, what would you do to help your colleagues become successful too?

_____

What should they do in order to have a bountiful harvest every year and need not resort to loans for their family and farming expenses?

_____

_____

_____

_____

In practical terms, the positive aspects or happenings in our daily life include among others, the gains in business endeavors and the awards or merits we receive.

The negative aspects include, among others, the failures we encounter in life, the losses we suffer in business and the demerits we receive.

In the story of Mang Fred, which can be considered as the positive aspects?

There are terms or words that connote positive or negative aspects. Examples of these are:

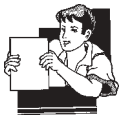
Negative	**Positive**
down	up
decrease	increase
below	above
withdrawal	deposit
backward	forward
lower	raise

Let's Try This

Identify whether each is positive or negative.

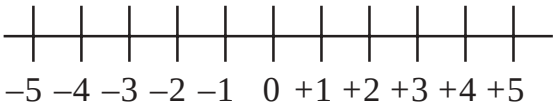
1. ₱ 500 deposit _____
2. 850 m above sea level _____
3. two hours late _____
4. 15°C rise in temperature _____
5. 10% increase in tuition _____
6. ₱250 withdrawal _____
7. ₱100 savings _____
8. 1500 m below sea level _____
9. 15 inches below the top _____
10. ₱ 100 interest _____

Compare your answers with those given in the *Answer Key* on page 40.

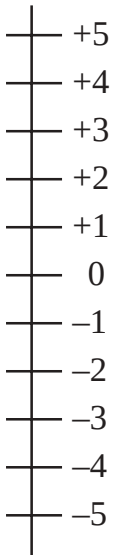


Let's Learn

Integers can be shown on a **number line.** This number line may be drawn horizontally and vertically.



Horizontal number line



Vertical number line

The number line shows that all numbers to the right of zero in the horizontal number line or above zero in the vertical number line are positive numbers. All numbers to the left of zero or below zero are negative numbers. Zero is neither positive nor negative. The numbers to the right of zero are greater than the numbers to

the left of zero. Zero is also greater than any negative number. So, integers become higher in value as you move to the right or upward on the number line. They become lower in value as you move to the left or downward on the number line.

What do we call the numbers to the right of or above zero on the number line?

_____

What about the numbers to the left of or below zero on the number line?

_____

Do they have the same value? Is +3 equal to –3 and –10 equal to +10? Why?

_____

Is zero a positive or a negative number?

Which is greater?

a. 0 or – 8 _____

b. 0 or –10 _____

c. 0 or +6 _____

d. 0 or –15 _____

Compare your answers with mine.

- The numbers to the right of 0 on the number line are called positive integers.
- The numbers to the left of 0 on the number line are called negative integers.
- No. Positive integers are greater than negative integers. So, +3 is greater than –3 and +10 is greater than –10. This is because an integer is higher in value the farther it is to the right on the number line and it is lower in value the farther it is to the left on the number line.
- Zero is neither positive nor negative.
- a. 0

  b. 0

  c. +6

  d. 0

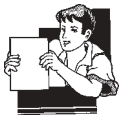
Let's Review

Write the integer which has a lower value in the first column and the one with a higher value in the second column. The first one has already been done for you.

1. +3 and –6
2. –8 and +4
3. –1 and –10
4. +8 and –15
5. +6 and –4
6. +9 and –12
7. –25 and +5
8. –18 and 0
9. +11 and –24
10. +14 and +30

–6	+3

Compare your answers with those in the *Answer Key* on page 40.



Let's Learn

Points that are equally distant from 0 but are located on opposite sides of it, such as +1 and –1, +2 and –2, +3 and –3, +4 and –4 and so on are called **opposites.** That is, +1 is the opposite of –1, +2 is the opposite of –2, +3 is the opposite of –3, +4 is the opposite of –4 and so on.

Let's Try This

Identify the opposite of each given integer.

1. +3 _____
2. –9 _____
3. +14 _____
4. –10 _____
5. +4 _____
6. –18 _____
7. +25 _____

8. –13 _____
9. +84 _____
10. –105 _____

Compare your answers with those in the *Answer Key* on page 40.

Let's See What You Have Learned

Arrange the following integers in the order indicated.

A. In ascending order

1. –12, +4, –13, +8 _____
2. +12, +9, –15, –10 _____
3. –8, +3, –20, –14 _____
4. +6, +9, –11, –25 _____
5. –18, –7, +12, +5 _____

B. In descending order

1. 0, +4, – 20, +6 _____
2. +15, –9, –26, +8 _____
3. –16, –8, +20, +3 _____
4. – 4, +15, +6, –22 _____
5. +6, 0, +12, –23 _____

C. Give the opposite of each of the following.

1. decrease of ₱ 100 _____
2. three floors up _____
3. lost by 20 points _____
4. 150 m above sea level _____
5. 20% profit _____
6. +16 _____
7. –35 _____
8. +98 _____
9. –28 _____
10. +105 _____

Compare your answers with those in the *Answer Key* on page 41. Did you get all the answers right? If you did, that's very good. If you did not, go back to the parts of the lesson you did not understand very well and answer the activity again before proceeding to the next lesson.

Let's Remember

- A **number line** is a horizontal or vertical line where all integers are plotted.
- Zero is called the **origin** on a number line.
- All the numbers to the right of 0 on a horizontal line and above 0 on a vertical line are called **positive integers.** They are all greater than 0 and all the negative integers. Their values increase the farther they are to the right on a horizontal number line or the higher they are on a vertical number line.
- All the numbers to the left of 0 or below 0 are called **negative integers.** They are all less than 0 and all the positive integers. Their values decrease the farther they are to the left on a horizontal number line or the lower they are on a vertical number line.
- Points that are equally distant from 0 but are located on opposite sides of it are called **opposites.**

Addition and Subtraction of Integers

In Lesson 1, you learned about positive and negative integers. You also learned that the value of an integer increases the farther it is to the right of or above 0. It also decreases the farther it is to the left of or below 0. In this lesson, you will learn how to add and subtract integers.

After studying this lesson, you should be able to:

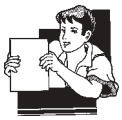
- follow the steps in adding and subtracting integers with like and unlike signs;
- add and subtract integers with accuracy; and
- apply your knowledge of adding and subtracting integers in solving daily life problems.

Let's Think About This

Consider a series of games, each game consisting of two rounds, which Joy played on a machine. Here is a record of her point scores:

Game	Points Each Round	Net Score
1	*Round 1:* Won 3 points	(+3) + (+5) = +8
	Round 2: Won 5 points	
2	*Round 1:* Won 7 points	(+7) + (–4) = +3
	Round 2: Lost 4 points	
3	*Round 1:* Lost 6 points	(–6) + (+3) = –3
	Round 2: Won 3 points	
4	*Round 1:* Lost 5 points	(–5) + (–4) = –9
	Round 2: Lost 4 points	
5	*Round 1:* Broke even	0 + (+3) = +3
	Round 2: Won 3 points	
6	*Round 1:* Lost 4 points	(–4) + 0 = –4
	Round 2: Broke even	

So, how do you add integers with like signs? How about integers with unlike signs? Read the following to learn more about this.



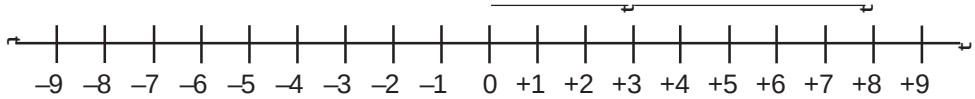
Let's Learn

Let us illustrate how to add positive numbers using the number line.

Refer to Game 1. Let us add (+3) and (+5) (read as "positive 3 plus positive 5").

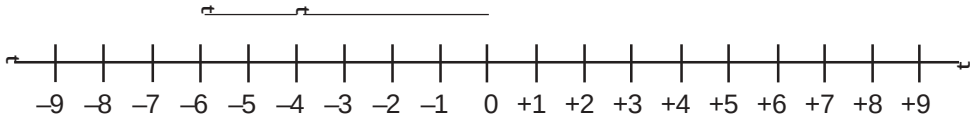
Using the number line below, start with 0, move 3 units to the right to indicate +3.

Then starting from +3, move 5 more units to the right to add +5. You then stopped at +8. So, from the number line, we can see that if we add +3 and +5, we get +8.



Let's have another example. Let us add (–4) and (–2) (read as "negative 4 plus negative 2").

Again, using the number line below, we start from 0 and move 4 units to the left to indicate –4. Then from –4, we count 2 units to the left again to add –2 and we get –6.



From this we have come up with the following rule in adding two numbers with the same sign:

Rule 1: To add two numbers with like signs (both positive or negative) find the sum of their absolute values and retain the common sign.

Let's recall what **absolute value** of a number means.

EXAMPLE The absolute value of +4 which is denoted as $|+4|$ is equal to 4 or $|+4| = 4$; the absolute value of –4, denoted as $|-4|$, is equal to 4 or $|-4| = 4$.

So, the absolute values of the following numbers are:

a. $|-5| = 5$

b. $|-2| = 2$

c. $|8| = 8$

d. $|20| = 20$

e. $|-15| = 15$

Let's apply Rule 1 in adding numbers with the same sign.

EXAMPLE 1 (+8) + (+9) = _____

STEP 1 Get the absolute values of the signed numbers.

$|+8| = 8$

$|+9| = 9$

STEP 2 Add the absolute values.

8 + 9 = 17

STEP 3 Prefix the common sign, which is positive (+), in the sum.

(+8) + (+9) = +17

So, the answer is +17.

Let's have another example.

EXAMPLE 2 (–8) + (–6) = _____

STEP 1 Get the absolute values of the signed numbers.

$|-8| = 8$

$|-6| = 6$

STEP 2 Add the absolute values.

8 + 6 = 14

STEP 3 Prefix the common sign, which is negative (–), in the sum.

–8 + –6 = –14

So, the answer is –14.

Let's have some more practice.

Try adding the following integers:

a. (–4) + (–2) =

b. (+5) + (+6) =

c. (+20) + (+15) =

d. (–15) + (–5) =

e. (–25) + (–10) =

Check your answers with my answers below:

a. (–4) + (–2) = –6

b. (+5) + (+6) = +11

c. (+20) + (+15) = +35

d. (–15) + (–5) = –20

e. (–25) + (–10) = –35

I bet your answers are all correct. Congratulations!

To add two numbers with unlike signs, we use the following rule.

Rule 2: To add two numbers with unlike signs, find the difference between their absolute values and copy the sign of the addend with the greater absolute value.

Let us illustrate Rule 2 using Example 3 below:

EXAMPLE 3 (–5) + (+7) = _____

STEP 1 Get the absolute values of the signed numbers.

$|-5| = 5$

$|+7| = 7$

STEP 2 Find the difference of their absolute values.

7–5 = 2

STEP 3 Prefix to the difference the sign of the addend with the greater absolute value.

(–5) + (+7) = +2

addend with the greater value

Let's have another example:

EXAMPLE 4 (+3) + (–8) = _____

STEP 1 Get the absolute values of the signed numbers.

$|+3| = 3$

$|-8| = 8$

STEP 2 Find the difference of their absolute values.

8 – 3 =5

STEP 3 Prefix to the difference the sign of the addend with the greater absolute value.

(+3) + (–8) = –5

addend with the greater absolute value

Let's Remember

To add positive and negative numbers, apply:

Rule 1: To add two numbers having the same sign, find the sum of their absolute values and prefix to the sum the common sign.

Follow these steps:

STEP 1 Get the absolute values of the signed numbers.

STEP 2 Add the absolute values.

STEP 3 Prefix the common sign.

Rule 2: To add two numbers with unlike signs, find the difference of their absolute values and prefix to the difference the sign of the addend with the greater absolute value.

Follow these steps:

STEP 1 Get the absolute values of the signed numbers.

STEP 2 Find the difference of their absolute values.

STEP 3 Prefix to the difference the sign of the addend with the greater absolute value.

Let's Review

Add the following integers.

1. (–3) + (–5) = _____
2. (+6) + (–12) = _____
3. (–9) + (+4) = _____
4. (+8) + (–10) = _____
5. (–15) + (+7) = _____
6. (–12) + (–16) = _____
7. (–14) + (–7) = _____
8. (+10) + (+15) = _____
9. (+19) + (+ 4) = _____
10. (–15) + (–12) = _____

Compare your answers with those given in the *Answer Key* on page 41 of this module.

You are now ready to do subtraction of integers.

In subtracting integers, we follow this rule:

> Change the sign of the subtrahend, then proceed as in addition of integers using Rule 1 or Rule 2, where applicable.

Let us apply the rule in the following example:

EXAMPLE 1 (+8) – (+5) = _____

Let's do it step by step:

STEP 1 Change the sign of the subtrahend.

In the example, the subtrahend is +5.

So, we change its sign from positive to negative, thus it becomes –5.

STEP 2 Proceed as in addition.

(+8) + (–5)

STEP 3 Recall Rule 2 in addition of integers which says, "To add two numbers with unlike signs, find the difference of their absolute

values and prefix to the difference the sign of the addend with the greater absolute value."

So in this step, we get the absolute values of the signed numbers:

$$|+8| = 8$$

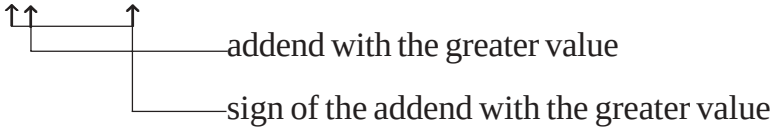
$$|-5| = 5$$

STEP 4 Find the difference of their absolute values.

$8 - 5 = 3$

STEP 5 Prefix to the difference the sign of the addend with the greater absolute value:

$+8 -5 = +3$



So, $(+8) - (+5) = +3$.

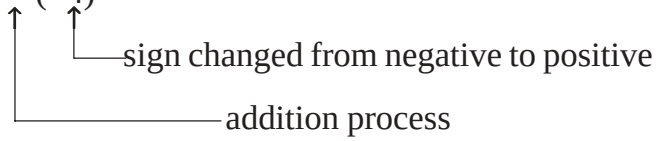
Here's another example:

EXAMPLE 2 $(-7) - (-4) =$ _____

Let's do it step by step again.

STEP 1 Change the sign of the subtrahend, then proceed as in addition.

$(-7) + (+4) =$



STEP 2 Get the absolute values of the signed numbers.

$$|-7| = 7$$

$$|+4| = 4$$

STEP 3 Find the difference of the absolute values.

$7 - 4 = 3$

STEP 4 Prefix to the difference the sign of the addend with the greater absolute values.

$-7 + 4 = -3$

sign of the addend with the greater absolute value

So, (–7) – (–4) = –3.

Let's have another example.

EXAMPLE 3 (+9) – (–2) = _____

STEP 1 Change the sign of the subtrahend, then proceed as in addition.

(+9) + (+2) =

STEP 2 Get the absolute values of the signed numbers.

$|+9| = 9$

$|+2| = 2$

STEP 3 In this case, we will apply Rule 1 which says, "To add two numbers having the same sign, find the sum of their absolute values and prefix to the sum the common sign."

9 + 2 = +11

So, (+9) – (–2) = +11.

Let's have some more practice.

Try doing the following exercises:

1. (–2) – (–12) = _____
2. (–9) – (+25) = _____
3. (+35) – (–15) = _____
4. (–28) – (+8) = _____
5. (+6) – (+10) = _____

Check your answers with my answers below:

1. (–2) – (–12) = +10
2. (–9) – (+25) = (–9) + (–25) = –34
3. (+35) – (–15) = (+35) + (+15) = +50

4. $(-28) - (+8) = (-28) + (-8) = -36$

5. $(+6) - (+10) = (+6) + (-10) = -4$

Did you get all the answers right? If you did, congratulations!

Let's Remember

To subtract signed numbers, we follow these steps:

STEP 1 Change the sign of the subtrahend, then proceed as in addition of signed numbers.

STEP 2 If the numbers have the same sign, find the sum of their absolute values and prefix to the sum the common sign.

If the two numbers have unlike or different signs, find the difference of their absolute values and prefix to the difference the sign of the addend with the greater absolute value.

Let's See What You Have Learned

Perform the indicated operations.

1. $(+24) + (+12) =$ ☐

2. $+15$
   $-(-13)$
   ☐

3. -68
   $-(-24)$
   ☐

4. $(-24) + (24) =$ ☐

5. $-19 +$ ☐ $= 0$

6. $+85$
   $+(+24)$
   ☐

7. $\square - (-25) = +60$

8. $\square - (-25) = +50$

9. $-74 - (+24) = \square$

10. $\square + (+53) = +87$

Did you get them all? Congratulations! If you missed some, review your computations. You have to be accurate with your answers. The *Answer Key* is on page 42.

Multiplication and Division of Integers

You have learned how to add and subtract positive and negative integers in Lesson 2. Now, you will learn how to multiply and divide positive and negative integers.

Let's Study and Analyze

An NFE facilitator is planning to organize NFE classes in all the barangays of General Tinio. She's planning to organize two classes each in all the nine barangays. How many classes does she have to organize?

$9 \times 2 = 18$

18 classes shall have to be organized in all the nine barangays of General Tinio.

Using these numbers for our examples, let's multiply step by step.

$(+9) \times (+2) =$ _____

$(–9) \times (–2) =$ _____

STEP 1 Multiply the multiplicand by the multiplier.

$9 \times 2 = 18$

STEP 2 Prefix the positive sign if the integers have the same sign.

$(+9) \times (+2) = +18$
$(–9) \times (–2) = +18$

So, positive × positive = positive
negative × negative = positive

Let's have some more examples.

$(+6) \times (+5) =$

$(–6) \times (–5) =$

My work:

STEP 1 $6 \times 5 = 30$

STEP 2 (+6) × (+5) = +30
(–6) × (–5) = +30

Your work:

Multiply the following. Follow the steps.

(+3) × (+8) = _____

(–3) × (–8) = _____

STEP 1 3 × 8 = ☐

STEP 2 (+3) × (+8) = ☐

(–3) × (– 8) = ☐

Let's Review

Multiply the following. Follow the steps.

1. (–4) × (–9) =
2. (+6) × (+5) =
3. (–7) × (–4) =
4. (–9) × (–6) =
5. (+8) × (+5) =

Compare your answers with those given in the *Answer Key* on page 42.

Let's Remember

To multiply integers with the same sign, we follow these steps:

1. Multiply the multiplicand by the multiplier.
2. Prefix the positive sign.

Now, let's multiply integers with different signs.
Study these examples:

(+5) × (– 4) = –20

(– 5) × (+4) = –20

Let's do it step by step.

(+5) × (–4) = _____

(–5) × (+4) = _____

STEP 1 Multiply the multiplicand by the multiplier.

5 × 4 = 20

STEP 2 Prefix the negative sign if the integers have different signs.

(+5) × (–4) = –20

(–5) × (+4) = –20

So, positive × negative = negative
negative × positive = negative

Very easy, isn't it? Let's have some more examples.

My work:

(–7) × (+4) =

(+7) × (–4) =

STEP 1 7 × 4 = 28

STEP 2 (–7) × (+4) = –28
(+7) × (–4) = –28

Your work:

Multiply the following. Show the steps.

(+3) × (–9) =

(–3) × (+9) =

STEP 1 3 × 9 = ☐

STEP 2 (+3) × (–9) = ☐

(–3) × (+9) = ☐

Let's Try This

Multiply the following. Follow the steps indicated earlier.

1. (–5) × (+6) =
2. (+8) × (–4) =
3. (+6) × (–6) =
4. (–7) × (+3) =
5. (+4) × (–9) =

Compare your answers with those in the *Answer Key* on page 42.

Let's Remember

To multiply integers with different signs, we follow these steps:

1. Multiply the multiplicand by the multiplier.
2. Prefix the negative sign.

Let's Review

Multiply the following. Follow the steps. Write your answers inside the boxes.

1. (–8) × (+5) = ☐
2. (+17) × (+3) = ☐
3. (–20) × (–5) = ☐
4. (+25) × (–5) = ☐
5. (–10) × (+6) = ☐
6. 64 × (–4) = ☐
7. –18 ×(+9) = ☐
8. –15 ×(–4) = ☐

9. $\begin{array}{r} -56 \\ \times(-3) \\ \hline \square \end{array}$

10. $\begin{array}{r} -96 \\ \times(-2) \\ \hline \square \end{array}$

The *Answer Key* is on pages 42 and 43.

Did you get all of them right? Very good! If not, check your computations.

Let's Remember

To multiply integers, we follow these steps:

1. Multiply the multiplicand by the multiplier.
2. Prefix the positive sign if the integers have the same sign. Prefix the negative sign if the integers have different signs.

Division of Integers

Division is the inverse or opposite of multiplication. We shall now study how to divide positive and negative integers.

Here are some examples:

(–8) ÷ (–2) = _____

(+8) ÷ (+2) = _____

Let's divide step by step.

STEP 1 Divide the dividend by the divisor.

8 ÷ 2 = 4

STEP 2 Prefix the positive sign if the integers have the same sign.

(–8) ÷ (–2) = +4

(+8) ÷ (+ 2) = +4

So, positive ÷ positive = positive

negative ÷ negative = positive

Let's have other examples.

(+12) ÷ (+4) = _____

(–12) ÷ (–4) = _____

My work:

STEP 1 $12 \div 4 = 3$

STEP 2 $(+12) \div (+4) = +3$

$(-12) \div (-4) = +3$

Your work:

Divide the following. Follow the steps.

$(-16) \div (-8) =$ _____

$(+16) \div (+8) =$ _____

STEP 1 $16 \div 8 =$ ☐

STEP 2 $(-16) \div (-8) =$ ☐

$(+16) \div (+8) =$ ☐

Let's Review

Divide the following. Follow the steps.

1. $(-16) \div (-4) =$
2. $(+27) \div (+9) =$
3. $(-32) \div (-8) =$
4. $(+18) \div (+6) =$
5. $(-40) \div (-5) =$

Compare your answers with those in the *Answer Key* on page 43.

Let's Remember

To divide integers with the same sign, we follow these steps:

1. Divide the dividend by the divisor.
2. Prefix the positive sign.

Let's divide integers with different signs.

Here are some examples:

(+18) ÷ (–3) =

(–18) ÷ (+3) =

Let's divide step by step.

STEP 1 Divide the dividend by the divisor.

18 ÷ 3 = 6

STEP 2 Prefix the negative sign if the integers have different signs.

(+18) ÷ (–3) = –6

(–18) ÷ (+3) = –6

So, positive ÷ negative = negative

negative ÷ positive = negative

Got it? Let's proceed. Let's have some other examples.

My work:

(–24) ÷ (+8) = _____

(+24) ÷ (–8) = _____

STEP 1 24 ÷ 8 = 3

STEP 2 (–24) ÷ (+8) = –3

(+24) ÷ (–8) = – 3

Your work:

Divide the following. Follow the steps.

(+32) ÷ (–4) = _____

(–32) ÷ (+4) = _____

STEP 1 32 ÷ 4 = ☐

STEP 2 (+32) ÷ (–4) = ☐

(–32) ÷ (+4) = ☐

Let's Try This

Divide the following. Follow the steps.

1. (–18) ÷ (+9) =
2. (+25) ÷ (–5) =
3. (–36) ÷ (+4) =
4. (–63) ÷ (+7) =
5. (+54) ÷ (–9) =

Compare your answers with those in the *Answer Key* on page 43.

Are all your answers correct? If so, very good! If you missed some, check your computations.

Let's Remember

To divide integers with different signs, we follow these steps:

1. Divide the dividend by the divisor.
2. Prefix the negative sign to the answer.

Let's Review

Divide the following. Follow the steps. Write your answers inside the box.

1. (–14) ÷ (–7) = ☐
2. (+15) ÷ (–3) = ☐
3. (+25) ÷ (+5) = ☐
4. (+35) ÷ (–7) = ☐
5. (+42) ÷ (–6) = ☐

6. $-9 \overline{)-18}$ ☐

7. $+8 \overline{)+56}$ ☐

8. $-5 \overline{)+45}$ ☐

9. $-8 \overline{)+64}$ ☐

10. $+6 \overline{)+48}$ ☐

Got all of them right? Very good!

If you missed some items, just refer to the *Answer Key* on page 44.

I'm very sure the next lesson would be much easier for you.

Let's Remember

To divide integers, we follow these steps:

1. Divide the dividend by the divisor.
2. Prefix the positive sign if the integers have the same sign.
3. Prefix the negative sign if the integers have different signs.

Let's See What You Have Learned

Perform the indicated operations.

1. $(+3) \times (-15) =$ _____
2. $(+48) \div (+12) =$ _____
3. $(-25) \times (-2) =$ _____
4. $(-36) \div (+4) =$ _____
5. $(+8) \times (+13) =$ _____
6. $(-105) \div (-5) =$ _____

Compare your answers with those in the *Answer Key* on page 44.

LESSON 4

Working With Integers

You have learned how to add, subtract, multiply and divide integers. With the knowledge you acquired, I'm very sure this lesson will be very easy for you.

This lesson will show you step by step how to solve word problems involving addition, subtraction, multiplication and division of integers.

Read on to find out more.

Let's Read

Mrs. Cruz stays on the ninth floor of the Silangan Hotel. She visited a friend and so she went six floors down. On what floor is she now?

Analyze the problem or situation and answer the following questions.

1. Where does Mrs.Cruz stay?_____
   On what floor?_____
2. Why did she go down from her room?_____
   By how many floors?_____
   On what floor is her friend staying?_____
3. On what floor is Mrs. Cruz now?_____

Compare your answers with mine. Determine how close your answers are to my answers.

- Mrs. Cruz stays on the ninth floor of the Silangan Hotel.
- She visited a friend so she went six floors down from her room. So, from the ninth floor, she went six floors down.

  To know where her friend is staying we shall use the process of addition.

  $+9 + (-6) = \boxed{3}$

  Her friend is staying on the third floor. Why?

  In adding integers with unlike signs, we subtract the smaller number from the bigger number and prefix the sign of the number with greater value. The bigger number is 9, it has a + sign. The answer is +3 or 3.
- Mrs. Cruz is now on the third floor where her friend whom she visited is staying.

Did you get the right answers? If yes, very good! If not, don't worry. I'll show you how to solve word problems. Don't forget the different rules to follow in adding, subtracting, multiplying and dividing positive and negative integers with like and unlike signs.

So, if we will solve this problem step by step, it will be like this.

STEP 1 Find out the given facts.

The given facts:

Mrs. Cruz stays on the 9th floor.

She went 6 floors down.

STEP 2 Find what is asked in the problem.

On what floor is Mrs. Cruz now?

STEP 3 Determine the operation to be used.

Process to be used: Addition

STEP 4 Write down the number sentence.

$+9 + (-6) =$ _____

STEP 5 Solve the problem.

$$\begin{array}{r} 9 \\ +\ -6 \\ \hline \boxed{3} \end{array}$$

The answer is 3.

Mrs. Cruz is on the 3rd floor now.

Did you have an easy time following the steps? I'm sure you did.

Let's have another example.

My work:

Nida's garment factory produces 350 T-shirts every day. It is closed on Saturdays and Sundays. How many T-shirts does it produce in one week?

STEP 1 Given facts:

Nida's garment factory produces 350 T-shirts every day.

The factory is closed on Saturdays and Sundays.

STEP 2 Question asked:

How many T-shirts does it produce in one week?

STEP 3 Process to be used:

Multiplication

STEP 4 Number sentence:

350 × 5 = _____

STEP 5 Solve:

350 × 5 = 1750

The answer is 1750.
1750 T-shirts are produced in one week, excluding Saturday and Sunday.

Let's Solve

A helicopter is 2500 meters above sea level. Directly below it is a submarine 1850 meters below sea level. How far is the helicopter from the submarine?

STEP 1 Given facts:

A helicopter is 2500 meters above sea level.
A submarine is 1850 meters below sea level.

STEP 2 Question asked:

How far is the helicopter from the submarine?

STEP 3 Process to be used:

Subtraction

STEP 4 Number sentence:

+2500 meters – (–1850) = _____

STEP 5 Solve:

+2500 meters
+ (+1850) meters
4350 meters

The answer is 4350 meters.

The helicopter is 4350 meters away from the submarine.

Let's Remember

In solving word problems, follow these steps:

1. Find out the given facts.
2. Find out what is asked in the problem.
3. Determine the operation to be used.
4. Write down the number sentence.
5. Solve the problem.

Let's See What You Have Learned

Solve the following problems. Follow the steps in solving problems.

1. The water tank of Mang Peter was full with 10000 liters of water on Monday morning. He used 1500 liters that day. How much water was left on Tuesday?

2. From his home, Arnel drove 15 kilometers to the east then 12 kilometers to the south to arrive at his uncle's house. How far is Arnel's house from his uncle's?

3. Anita, a telephone operator, receives 45 calls every working day. How many calls does she receive in a 6-working day week?

4. A waiter has to cut 5 cakes into equal slices to serve 60 persons. Into how many slices should he cut each cake?

5. The temperature in Manila is 32°C while the temperature in Baguio is 18°C. What is the drop or rise in temperature if you travel from:

   a. Manila to Baguio?

   b. Baguio to Manila?

Compare your answers with those in the *Answer Key* on pages 44 and 45.

Let's Sum Up

In this module you learned the following:

- All positive integers and zero are greater than any negative integer.
- To add integers with the same sign, we add the addends and prefix the common sign.

  Examples:

$$\begin{array}{r} +2 \\ +(+4) \\ \hline +6 \end{array} \qquad \begin{array}{r} -2 \\ +(-5) \\ \hline -7 \end{array}$$

- To add numbers with unlike signs, we subtract the smaller number from the bigger number and we prefix the sign of the bigger number to the answer or sum.

  Examples:

$$\begin{array}{r} +3 \\ +(-8) \\ \hline -5 \end{array} \qquad \begin{array}{r} +7 \\ +(-5) \\ \hline +2 \end{array}$$

- In subtracting integers, we follow these steps:

  1. Change the sign of the subtrahend.
  2. Proceed as in addition.

3. Prefix to the answer or difference the sign of the greater number if they have different signs.

   Prefix to the answer or difference the common sign if they have the same sign.

- To multiply integers with the same sign, multiply the multiplicand with the multiplier and prefix the positive sign to the product.
- To multiply integers with different or unlike signs multiply the multiplicand with the multiplier and prefix the negative sign to the product.
- To divide integers with the same sign, divide the dividend by the divisor and prefix the positive sign to the quotient.
- To divide integers with different signs, divide the dividend by the divisor and prefix the negative sign to the quotient.

What Have You Learned?

A. Identify whether the following integers are arranged in their ascending or descending order.

1. 1, 5, 7, 9, 10
2. 7, 5, 3, 0, –1
3. –2, –4, –5, –6, –7
4. –1, 0, 4, 5, 8
5. 9, 5, 4, 0, –2

B. Perform the indicated operations.

1. (+18) + (+18) =
2. (+75) – (+25) =
3. $\begin{array}{r} +15 \\ -(-13) \\ \hline \end{array}$
4. $\begin{array}{r} +20 \\ -(+35) \\ \hline \end{array}$
5. (+6) × (–3) =
6. (+28) ÷ (–2) =
7. (+75) – (–50) =

8. $(+20) + (+10) + (+5) =$

9. $(+45) \div (-9) =$

10. $(+10) \times (-3) =$

C. Solve the following problems:

1. In a fire station in the municipality of San Juan, there are only 50 fire extinguishers available. Since there are 90 firemen now employed in the station, how many fire extinguishers more are needed so that each fireman will have one fire extinguisher?

2. A cattle owner has 150 heads of cattle in his ranch. He decided to sell 65 heads of cattle to a meat dealer. How many heads of cattle are left?

3. Ditas originally has ₱10000.00 in her savings account. She withdrew the following amounts in 3 days: day 1—₱2000.00; day 2 —₱5000.00; day 3 —₱1650.00. How much money was left in Dita's savings account?

Compare your answers with those in the *Answer Key* on page 45. If you got everything right, congratulations! You have learned a lot from this module. If you missed some items, review the parts you did not understand very well.

Answer Key

A. Let's See What You Already Know *(pages 2–4)*

A. 1. –1°C — negative integer

2. +15% — positive integer

3. +10000 — positive integer

4. +₱100 — positive integer

5. –₱15.00 — negative integer

B. 1. –6, – 4, –3, –1, 0

2. +1, +3, +5, +6, +8

3. –11, –10, +1, +3, +4

4. –8, –6, –5, +4, +8

5. –10, –3, –2, +6, +9

C. 1. +8, +3, –2, –4, –6

2. +10, +9, +8, –11, –13

3. +8, +5, –10, –11, –15

4. +9, +6, +1, –12, –14

5. +4, +3, –3, –4, –10

D.

1.	+36	6.	–40	11.	+6
2.	+50	7.	–4	12.	–36
3.	+28	8.	–5	13.	–9
4.	–15	9.	–24	14.	+40
5.	+4	10.	–7	15.	+150

E. 1. ₱12000.00 – amount of money that Mang Juan deposited in a year

2. Melvin is 15 meters away from the base of the mountain.

3. 280 — population increase in five years of NFE classes in the District of Concepcion

B. Lesson 1

Let's Try This (page 7)

1. positive
2. positive
3. negative
4. positive
5. positive
6. negative
7. positive
8. negative
9. negative
10. positive

Let's Review (page 9)

1.	–6	+3
2.	–8	+4
3.	–10	–1
4.	–15	+8
5.	–4	+6

6.	–12	+9
7.	–25	+5
8.	–18	0
9.	–24	+11
10.	+14	+30

Let's Try This (pages 9–10)

1. –3
2. +9
3. –14
4. +10
5. –4
6. +18
7. –25
8. +13
9. –84
10. +105

Let's See What You Have Learned (page 10)

A. 1. –13, –12, +4, +8
2. –15, –10, +9, +12
3. –20, –14, –8, +3
4. –25, –11, +6, +9
5. –18, –7, +5, +12

B. 1. +6, +4, 0, –20
2. +15, +8, –9, –26
3. +20, +3, –8, –16
4. +15, +6, –4, –22
5. +12, +6, 0, –23

C. 1. increase of ₱100
2. three floors down
3. won by 20 points
4. 150 m below sea level
5. 20% loss
6. –16
7. +35
8. –98
9. +28
10. –105

C. Lesson 2

Let's Review (page 17)

A. 1. –8
2. –6
3. –5
4. –2
5. –8
6. –28
7. –21
8. +25
9. +23
10. –27

Let's See What You Have Learned (pages 20–21)

1. +36
2. +28
3. –44
4. 0
5. +19
6. +109
7. +35
8. +25
9. –98
10. +34

D. Lesson 3

Your Work (page 23)

STEP 1 24

STEP 2 +24
+24

Let's Review (page 23)

1. +36
2. +30
3. +28
4. +54
5. +40

Your Work (page 24)

STEP 1 27

STEP 2 –27
–27

Let's Try This (page 25)

1. –30
2. –32
3. –36
4. –21
5. –36

Let's Review (pages 25–26)

1. –40
2. +51

3. +100
4. –125
5. –60
6. –256
7. –162
8. +60
9. +168
10. +192

Your Work (page 27)

STEP 1 2

STEP 2 +2
+2

Let's Review (page 27)

1. +4
2. +3
3. +4
4. +3
5. +8

Your Work (page 28)

STEP 1 8

STEP 2 –8
–8

Let's Try This (page 29)

1. –2
2. –5
3. –9
4. –9
5. –6

Let's Review (pages 29–30)

1. +2
2. –5
3. +5
4. –5
5. –7
6. +2
7. +7
8. –9
9. –8
10. +8

Let's See What You Have Learned (page 30)

1. –45
2. +4
3. +50
4. –9
5. +104
6. +21

E. Lesson 4

Let's See What You Have Learned (pages 35–36)

1. + (10000) liters
   – (+1500) liters

   +8500 liters of water was left on Tuesday.

   In subtracting integers, change the sign of the subtrahend then proceed as in addition.

2. +15 km — east
   +(+12) km — south
   ---
   27 km

   Arnel is 27 km away from his uncle's house.

   To add integers with the same sign, add addends and prefix the common sign.

3. +45 calls a day
   × (+6) working days
   ---
   270 calls a week

   Anita receives 270 calls in a 6-working day week.

   To multiply integers with the same sign, multiply the multiplicand by multiplier and prefix the common sign.

4. (+60) ÷ (+5) = (+12)

   Each of the 5 cakes should be cut into 12 slices to serve 60 persons.

   To divide integers with the same sign, the dividend by the divisor and prefix the positive sign.

5. a. (+18°C) – (+32°C) = (+18°C) + (– 32°C) = –14°C

   b. (+32°C) – (+18°C) = (+32°C) + (– 18°C) = +14°C

   The drop in temperature from Manila to Baguio is 14°C.

   The rise in temperature from Baguio to Manila is 14°C.

   In subtracting integers, change the sign of the subtrahend and proceed as in addition.

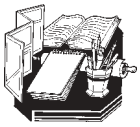
F. What Have You Learned? *(pages 37–38)*

A. 1. ascending
   2. descending
   3. descending
   4. ascending
   5. descending

B.

1.	36	6.	–14
2.	50	7.	+125
3.	+28	8.	+35
4.	–15	9.	–5
5.	–18	10.	–30

C. 1. 40 more fire extinguishers are needed.
   2. 85 heads of cattle are left.
   3. ₱1350.00 is the amount of money left in Dita's savings account.



References

Sia, Lucy O., et al. *21st Century Mathematics: Second Year.* Quezon City: Phoenix Publishing House, Inc. Reprinted 2000.

Capitulo, F. M. *Algebra: A Simplified Approach.* Manila: National Bookstore, 1989.