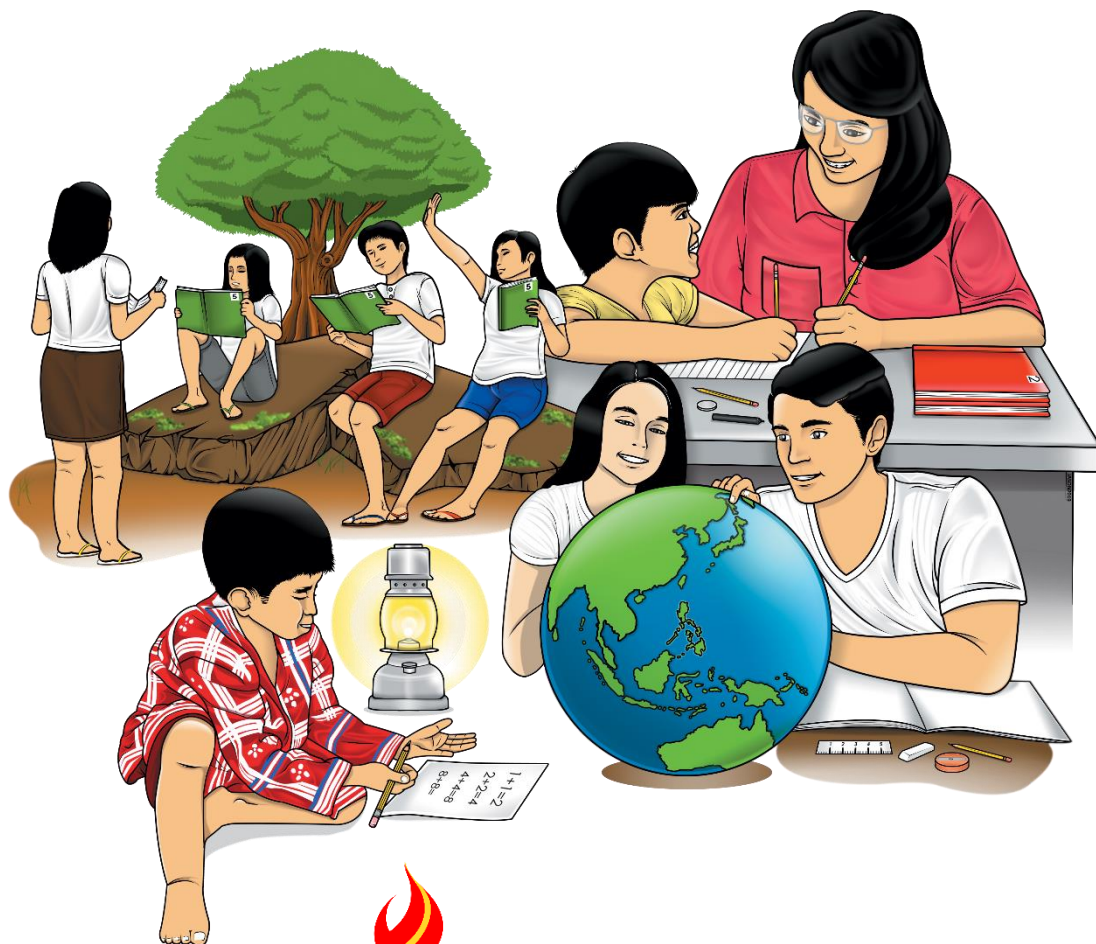**6**

Mathematics

Quarter 2 - Module 13:
Multiplying Integers

ALTERNATIVE DELIVERY MODE

ADM

Mathematics – Grade 6
Alternative Delivery Mode
Quarter 2 – Module 13: Multiplying Integers
First Edition, 2020

6

Mathematics
Quarter 2 - Module 13:
Multiplying Integers

What I Need to Know

This module was designed and written with you in mind. It is here to help you master Multiplying Integers. The scope of this module permits it to be used in many different learning situations. The language used recognizes your diverse vocabulary level as student. 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.

The module is divided into two lessons, namely:

- Lesson 1 – Multiplying Integers with Like Signs
- Lesson 2 – Multiplying Integers with Unlike Signs
- Lesson 3- Solving Routine and Non-Routine Problems Involving Multiplication of Integers

After going through this module, you are expected to:

1. describe and interpret multiplication of integers using materials such as algebra tiles, counters, chips, and cards **(M6NS-IIh-155);**
2. perform multiplication of integers **(M6NS-IIi-156);** and,
3. solve routine and non-routine problems involving multiplication of integers using appropriate strategies and tools **(M6NS-IIj-157).**

2

What I Know

A. Read and analyze the sentences below. Write the letter of your answer on your answer sheet.

   1) Which is the correct situation for $^+3$ x $^+5$?
     A. On the table, place 3 groups of 5 negative counters.
     B. On the table, place 5 groups of 3 negative counters.
     C. On the table, place 3 groups of 5 positive counters.
     D. On the table, place 3 positive and 3 negative counters.

   2) Selwyn has 8 sets of 15 positive counters. He counted all his counters. How do you write the number sentence for this situation?
     A. $^-15 + {}^+8 = N$ B. $^+8$ x $^+15 = N$
     C. $^-15 - {}^+8 = N$ D. $^-15 \div {}^+8 = N$

   3) How many counters does Selwyn have in all?
     A. 7 negative counters   B. 120 positive counters
     C. 23 negative counters   D. 120 negative counters

   4) Using your counters, what is $^+8$ x $^+3$?
     A. $^+24$ B. $^-24$
     C. $^+11$ D. $^-11$

   5) On the number line, you moved 5 units to the right three times from 0. What integer is being described?
     A. $^+15$ B. $^-8$
     C. $^-15$ D. $^+8$

B. Find the value of N by multiplying the following integers. Write your answers on your answer sheet.

   6) $^+2$ x $^+3 = N$

   7) $^-5$ x $^-2 = N$

   8) $^+9$ x $^+9 = N$

   9) $^+10$ x $^+8 = N$

   10) $^+12$ x $^+5 = N$

3

Multiplying Integers with Like Signs

Multiplication is the simplified way of repeated addition. Multiplying integers is the same as multiplying whole numbers you have done before. When we multiply 2 by 3, this gives us the product of 6. How about when we multiply ⁻2 by ⁻3 ? Do you know the answer?

In this lesson, you will learn how to multiply integers with like signs.
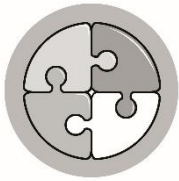
What's In

Use the illustrations below to solve for the product of the following numbers. Write your answers on your answer sheet.

1) 6 x 3 = _____

2) 4 x 4 = _____

3) 9 x 3 = _____

4) 5 x 4 = _____

5) 7 x 5 = _____

4
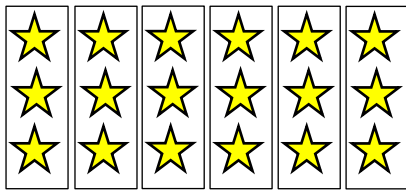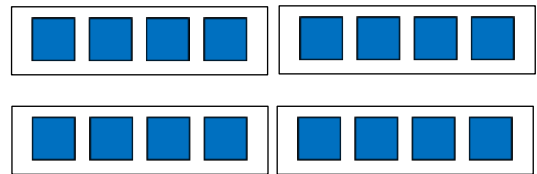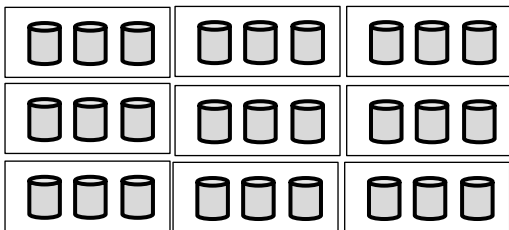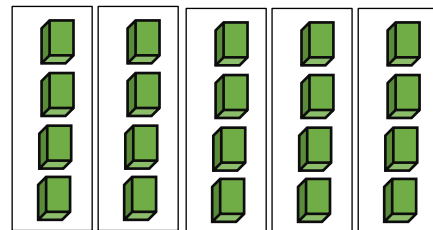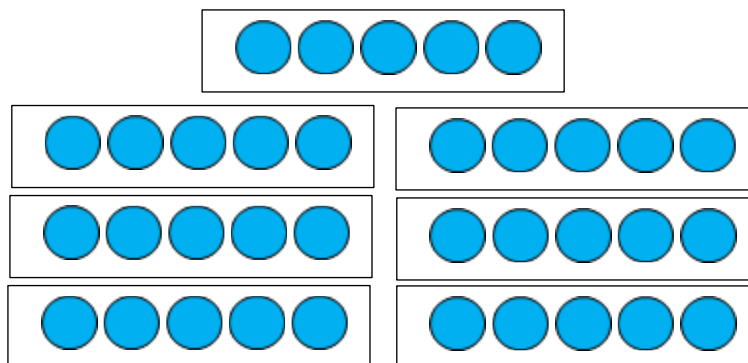
What's New

Read and study the problem below.

> The temperature rises 3°C constantly each hour from 7:00 a.m. to 1:00 p.m. What is the total increase in temperature during this duration?

What is It

To solve the problem, let us analyze the given situations.

➢ Rise or increase in temperature is represented by the integer positive 3 ($^+3$).
➢ From 7:00 a.m. to 1:00 p.m. is a 6-hour period. Six-hour period is represented by the integer positive six ($^+6$).
➢ Since it increases 3 degrees every hour for 6 hours, we will use the multiplication operation.

Therefore our equation will be $^+6$ x $^+3$ = N

To perform the multiplication operation using counters, follow the suggested steps below:

Step 1: Determine the number of sets that you will be making.
Your first factor tells the number of sets.
Draw 6 boxes on the table that will represent the number of sets.
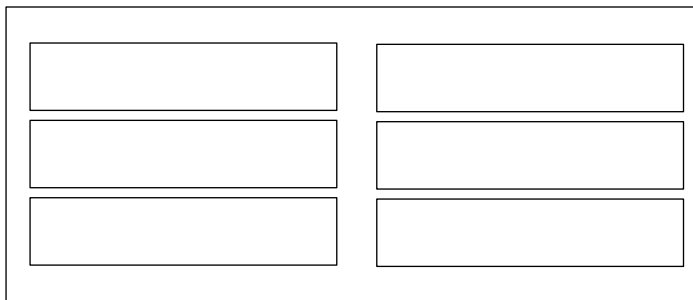
Step 2: Identify the number of counters to be placed in every set.
Your second factor tells the number of counters in every set.
Use 3 positive counters.
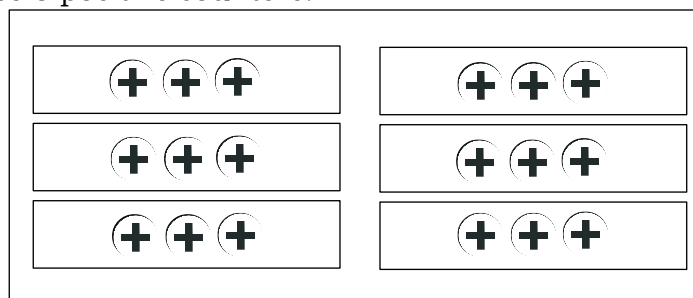
5

Step 3: Perform the operation and write your answer.

Multiplication is also repeated addition. It means that you have to get the total number of counters in all sets.
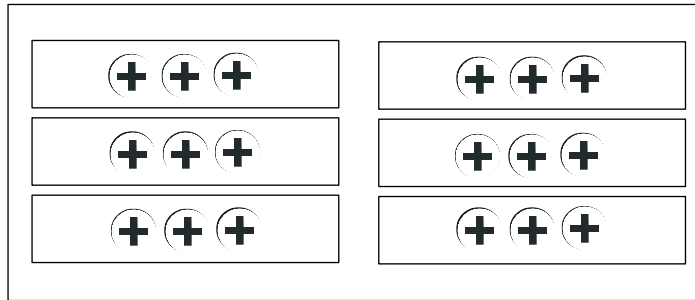
How many sets are there? (6)
How many counters in every set? (3)
$^+3 + {}^+3 + {}^+3 + {}^+3 + {}^+3 + {}^+3$
How many counters do you have in all on the table? (18 positive counters)
Do these counters have the same sign? (Yes)
What is the sign? (Positive)
Therefore, if you multiply $^+3$ by $^+6$ you will get a product of $^+18$

$$^+6 \text{ x } {}^+3 = {}^+18$$

We can also visualize $^+6$ x $^+3$ using a number line.

Step 1. Going back to the problem, since the temperature increases constantly by 3 degrees every hour, move 3 units to the right of 0. See illustration below.
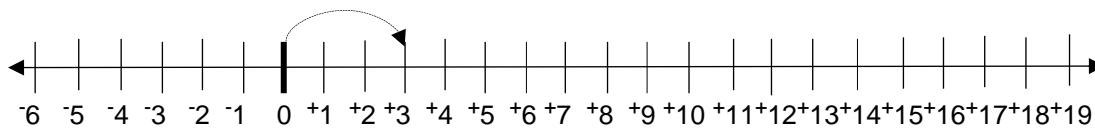
Step 2. Move again 3 units to the right. Continue the process until the 6th time. See illustration below.
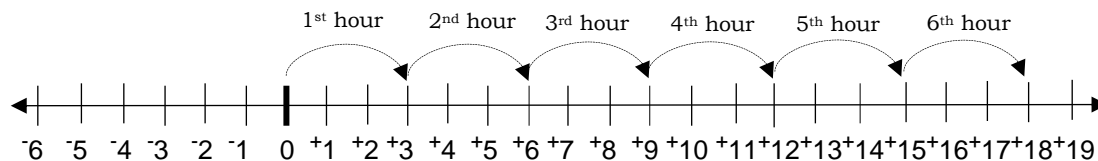
The number of loops on the number line (6 loops) represents the number of hours and the units in each loop (3 units) represent the increase in the temperature per hour.

On the first hour, the temperature increased by 3 degrees. After the second hour, the recorded increase in the temperature was 6 degrees. The temperature constantly increased by 3 degrees so after the sixth hour, there was a recorded increase in the temperature of 18 degrees.

Eighteen degrees increase in the temperature is represented by the integer $^+18$
Therefore, $^+6$ x $^+3$ = $^+18$.

6

How about if we multiply ⁻6 x ⁻3. Do you know the answer?

The multiplication sentence above means that there are 6 negative sets of 3 negative counters in every set. Take note that you have negative number of sets in this challenge.

Step 1: Determine the number of sets that you will be making.
Your first factor tells the number of sets.
Draw 6 boxes on the table that will represent the number of sets.
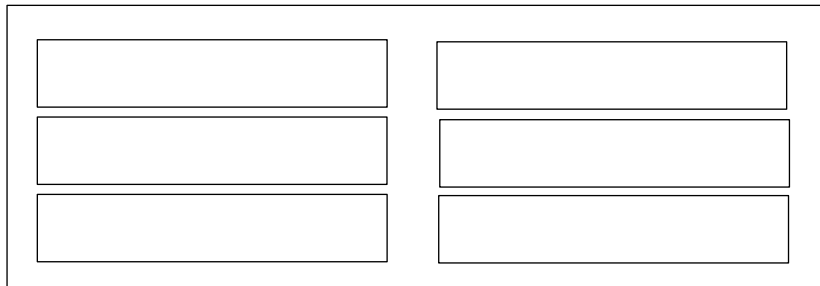
However, in this item we have negative number of sets. Negative 6 is the opposite of positive 6. It means that whatever the total number of counters in 6 positive sets is the same number of counters in the 6 negative sets.

Step 2: Identify the number of counters to be placed in every set.
Your second factor tells the number counters in every set.

Put 3 negative counters in every box.
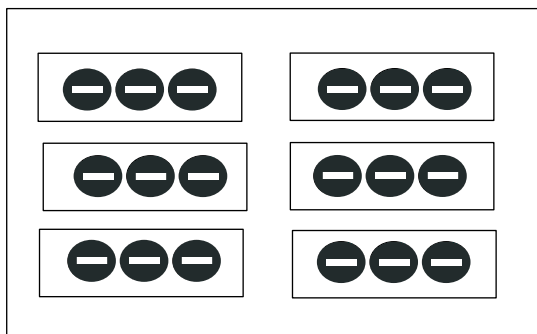
Step 3: Perform the operation and write your answer.
To illustrate the 6 negative sets, you need to flip to the opposite side all your 6 positive sets to show their opposite. In this case. you cannot flip your box drawing so you just **flip to the opposite side all the counters in every set**. If you flip the counters, the negative side of the counter will become positive. See the following illustration.

7

<div style="text-align: center;">
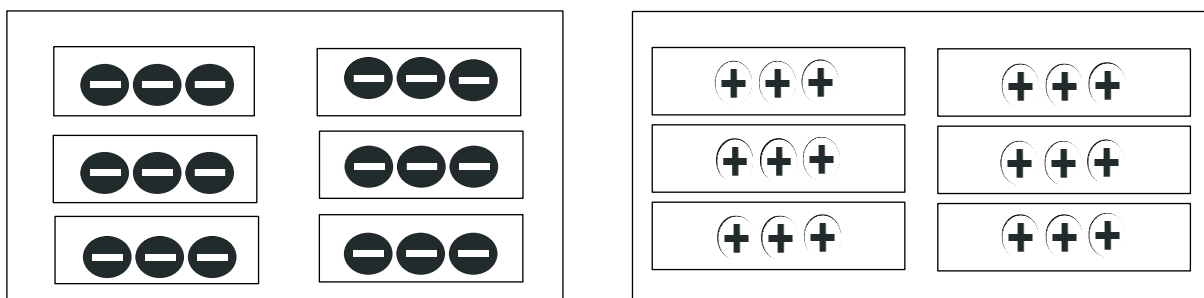
| ⁻3 + ⁻3 + ⁻3 + ⁻3 + ⁻3 + ⁻3
This illustration is for 6
negative sets of counters
before you flip. | | ⁺3 + ⁺3 + ⁺3 + ⁺3 + ⁺3+ ⁻3
This illustration is for 6
negative sets of counters
after you flipped. |

</div>

Notice that your negative counters in 6 negative sets after you flipped change to its their opposite sign which is positive. This is how to illustrate negative set or group.
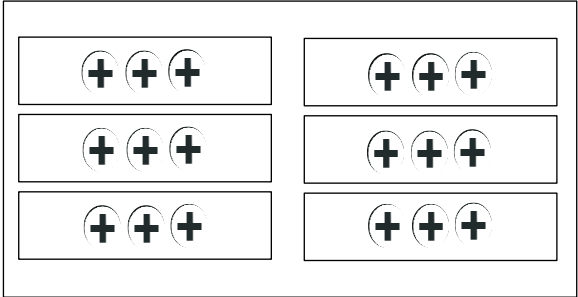
How many sets are there? (6)
How many counters in every set? (3)
How many counters do you have in all on the table? (18 counters)
⁺3 + ⁺3 + ⁺3 + ⁺3 + ⁺3 + ⁺3 = 18
Do these counters have the same sign? (Yes)
What is the sign after you flipped the counters? (Positive)
Therefore, if you multiply ⁻6 by ⁻3 you will get the product of ⁺18.

⁻6 x ⁻3 = ⁺18

Remember: In multiplying, if your first factor which represents the number of **groups/sets is negative**, you need to **flip to the opposite side all the counters in each set** to illustrate the opposite of positive set/group which is the negative group.

Here is another example for you to study.

What is the product of ⁻5 x ⁻7?
Do the following steps.
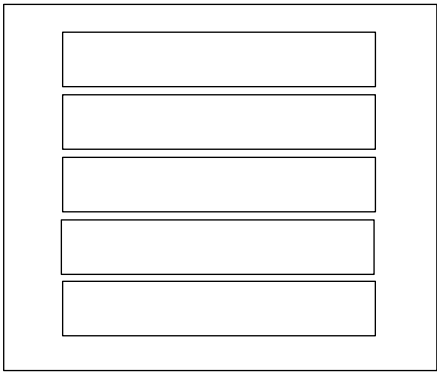
Step 1. Draw 5 boxes (5 sets).
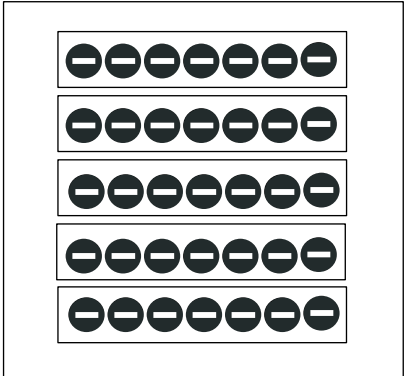
Step 2. Put 7 negative counters in every box.

<div style="text-align: center;">8</div>
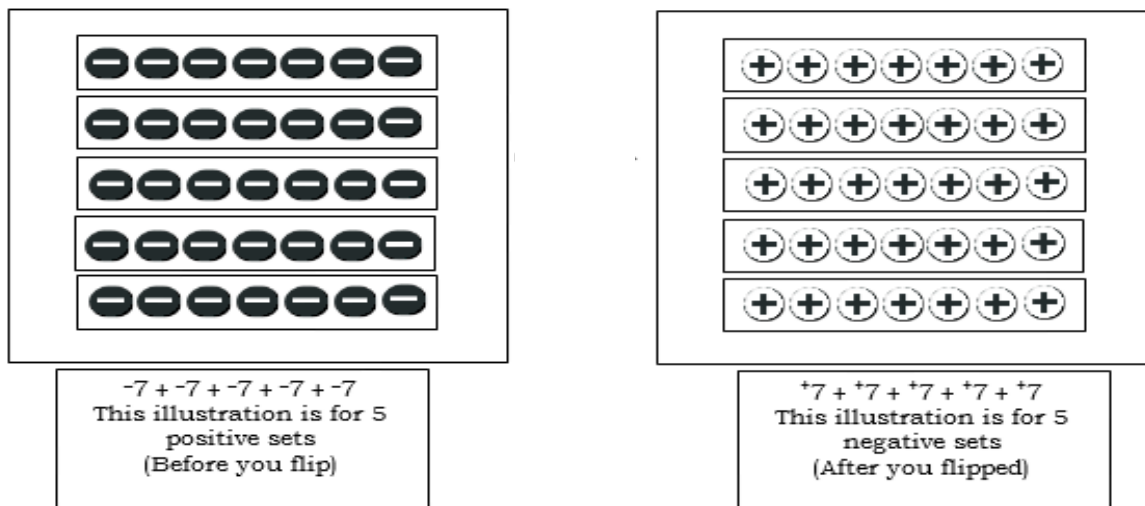
Step 3. Flip to the opposite side all the counters in every set to illustrate 5 negative sets.
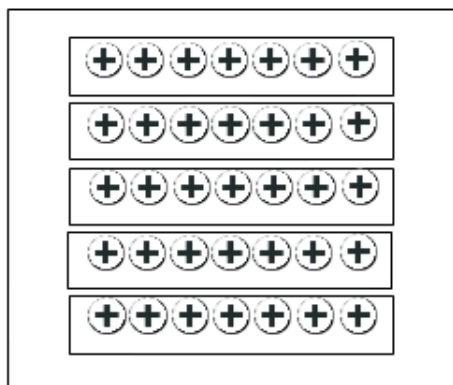
Step 4. Count the total number of counters and follow the sign (⁺35)

Therefore, ⎡ ⁻5 x ⁻7 = ⁺35 ⎤

Now that you already have the idea on how to multiply integers with like signs using number line and counters, this time you will learn the rules in multiplying integers with unlike signs.

Multiplying integers is just like multiplying whole numbers. The difference is that we also multiply the signs of the factors to be the sign of the product. Below are the rules in multiplying integers with like signs:

➢ *Rule1. The product of two positive integers (**+**) x (**+**) is **positive (+)**.*
   Example: (⁺6) x (⁺5) = (⁺30)

➢ *Rule2. The product of two negative integers (-) x (-) is **positive (⁺).***
   Example: (⁻9) x (⁻3) = (⁺27)

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Point to Remember

In short, the product of two integers having the same sign is positive.

Study more examples below.

What is the product of ⁻10 x ⁻5 ?
Since the two factors are negative integers, the product will be solved by applying rule #2. So, ⁻10 x ⁻5 = ⁺50.
How about multiplying ⁺25 x ⁺4, what is the product?
⁺25 and ⁺4 are all positive integers. So, the product is ⁺100 by applying rule #1.
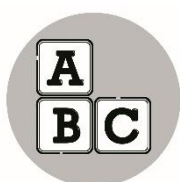
What's More

A. Use your counters to solve for the product of the following integers. Write your answers on your answer sheet.
  1) ⁻7 x ⁻4 = N
  2) ⁺12 x ⁺2 = N
  3) ⁺9 x ⁺3 = N

B. Fill-in the squares by multiplying the integers in the circles on both sides of the square. Write the product on your answer sheet. An example is given for you.

Example:

⁺3 x ⁺5 = ⁺15

⁺5 x ⁺2 = ⁺10

⁺5 — ⁺15 — ⁺10 — ⁺3 — ⁺6 — ⁺2

⁺2 x ⁺3 = ⁺6

4)

(⁻9)
a   b
(⁻20) — c — (⁻15)

5)
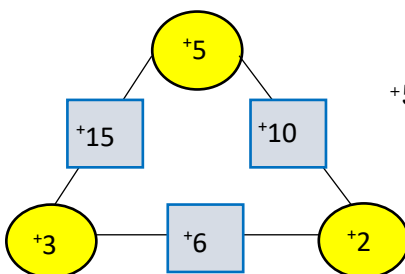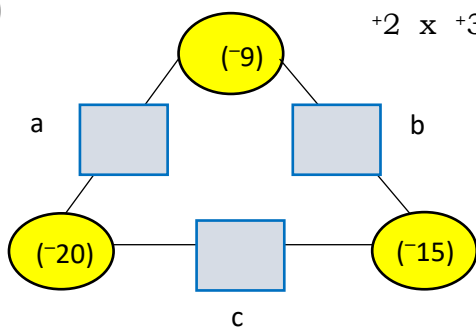
(⁺50)
a   b
(⁺11) — c — (⁺5)
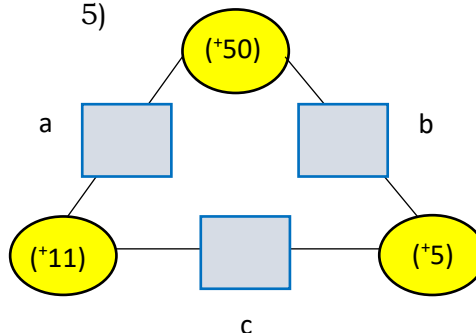
What I Have Learned

In multiplying integers with like signs,

- the product of two positive integers is positive (+) x (+) = (**+**).
- the product of two negative integers is positive (-) x (-) = (**+**).

Point to Remember

* The product of two integers having the same sign is positive.

What I Can Do

A. Use a number line to solve for the product of the integers below. Write your answers on your answer sheet

1) $^+3$ x $^+9$ = _____
2) $^+4$ x $^+4$ = _____

B. Multiply the given integers. Write your answers on your answer sheet.

3) The product of $^+12$ and $^+4$ and is _____.

4) $^-40$ when multiplied to $^-4$ is equal to _____.

5) $^-25$ x $^-4$ is equal to _____.

C. Solve the problem below. Show the solution on your answer sheet and label your final answer.

The teacher gives an additional 5 points for those who can present a Math trivia in her class. Ron had presented 3 trivia to the class. How many extra points did he get?

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Assessment

A. Read and analyze the sentences below. Write the letter of your answer on your answer sheet.

1) Which number sentence will give you a positive product?
   A. $^-18$ x $^-6$ = N
   B. $^-12$ x $^+2$ = N
   C. $^+6$ x $^-2$ = N
   D. all choices are correct

2) On the number line, you moved 3 units twice to the right of 0. What integer is being described?
   A. $^+6$
   B. $^-5$
   C. $^-6$
   D. $^+5$

3) Rey has 7 sets of 9 positive counters. He counted all his counters. How many positive counters does Rey have altogether?
   A. 63
   B. 2
   C. 16
   D. 16

4) In multiplication problems, when do you flip to the other side your counters?
   A. If the given counters in every set are negative.
   B. If the given set/group is negative.
   C. If the given counters in every set are positive.
   D. If the given set/group is positive.

5) What is the sign of the product if you have 5 negative sets of 9 negative counters in every set?
   A. negative
   B. positive
   C. either positive or negative
   D. positive and negative

B. Find the value of N by multiplying the following integers. Write your answers on your answer sheet.

6) $^-32$ x $^-2$ = N

7) $^+15$ x $^+3$ = N

8) $^+3$ x $^+31$ = N

9) $^+5$ x $^+7$ = N

10) An integer multiplied by $^-7$ gives the product of positive 91. What is the integer?

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Additional Activities

A. Guess the magic words by finding the product of the mathematical expressions below. Write the letter corresponding to the correct answer for each mathematical expression in the box. Do this on your answer sheet. The first one is done for you.

I								
$^+5$ x $^+3$	$^+10$ x $^+3$	$^-8$ x $^-6$	$^-3$ x $^-6$	$^+11$ x $^+9$	$^-15$ x $^-4$	$^+5$ x $^+4$	$^+8$ x $^+8$	$^-6$ x $^-9$
1	2	3	4	5	6	7	8	9

A. $^+20$ I. $^+15$ R. $^+5$

B. $^-30$ L. $^+30$ S. $^-40$

E. $^+99$ M. $^+60$ T. $^+64$

G. $^+16$ O. $^+48$ U. $^-99$

H. $^+54$ P. $^-48$ V. $^+18$

B.   Solve the following problems. Show your solutions on your answer sheet.

1)   Maricar deposits ₱15 000 in the bank every month. How much did she deposit after 6 months?

2) Marie saves ₱7 daily from her school allowance. How much will she save after five class days?

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Answer Key

What's In

1. 18
2. 16
3. 18
4. 20
5. 35

What I Can Do

A.
1. +27
2. +16

B.
3. +48
4. +160
5. +100

C.
15 points

Additional Activities

A.
I LOVE MATH

B.
1. ₱90 000
2. ₱35

What I Know

A.
1. C
2. B
3. B
4. A
5. A

B.
6. +9
7. +10
8. +81
9. +80
10. +60

What's More

A.
1. +28
2. +24
3. +27

B.
4. a. +180
   b. +135
   c. +300
5. a. +550
   b. +250
   c. +55

Assessment

A.
1. A
2. A
3. A
4. B
5. B

B.
6. +64
7. +45
8. +93
9. +35
10. -13

What I Know

A. Read and analyze the sentences below. Write the letter of your answer on your answer sheet.

1) Gerwin has 12 negative counters in each of the 4 sets. How many negative counters did Gerwin use in all?
   A. 58   B. 3
   B. 48   D. 8

2) What is the correct number sentence for the illustration below?

   A. $^+2$ x $^-4$ = N   B. $^+2$ x $^+4$ = N
   C. $^+2$ x $^+2$ = N   D. $^+4$ x $^+4$ = N

3) The product of a negative and a positive integer is _____.
   A. positive   B. negative
   C. cannot be determined   D. positive and negative

4) Which number sentence will give you a negative product?
   A. $^-9$ x $^-9$ = N   B. $^-8$ x $^+2$ =N
   C. $^+5$ x $^+4$ =N   D. $^+3$ x 0 = N

5) What integer is being described if you move 3 units to the left of 0 four times?
   A. $^-3$ B. $^+3$
   C. -12   D. $^+12$

B. Find the value of N by multiplying the following integers. Write your answers on your answer sheet.

6) $^-10$ x $^+8$ = N

7) $^+12$ x $^-5$ = N

8) $^-50$ x $^+3$ = N

9) $^+25$ x $^-2$ = N

10) $^+8$ x $^-6$ = N

15

Lesson 2

Multiplying Integers with Unlike Signs

In the previous lesson, you learned how to multiply integers with like sign. This time, you will learn how to multiply integers with unlike signs.
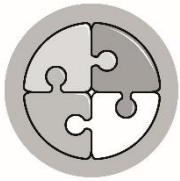
What's In

Give the product of the following integers. Write your answers on your answer sheet.

1) $^+12$ x $^+2$ = _____

2) $^-20$ x $^-4$ = _____

3) $^-9$ x $^-4$ = _____

4) $^+5$ x $^+8$ = _____

5) $^-10$ x $^-5$ = _____

What's New

Study this problem.

> Jonas was told by his boss to place the boxes of goods in the basement of the establishment where he is working in. To hasten his way down the 15-step stair, he descended 2 steps of the stairs at a time. Where is Jonas now after his 4th step?

What is It

This type of problem can be solved using multiplication.

Before introducing the rule in multiplying integers with unlike signs, we will first visualize this using counters and number line.

To visualize multiplication of integers using counters, we have to consider first the situations in the problem.

➢ Descending two steps at a time is represented by the integer negative two ($^-$2).

➢ Fourth step is represented by the integer positive four ($^+$4).

Our equation to the problem will be $\boxed{^+4 \ \ x \ ^-2= N}$

To visualize $^+4$ x $^-2$ using counters, follow these steps below.

Step 1: Determine the number of sets that you will be making.
Your first factor tells the number of sets.
Draw 4 boxes on the table that will represent the number of sets.
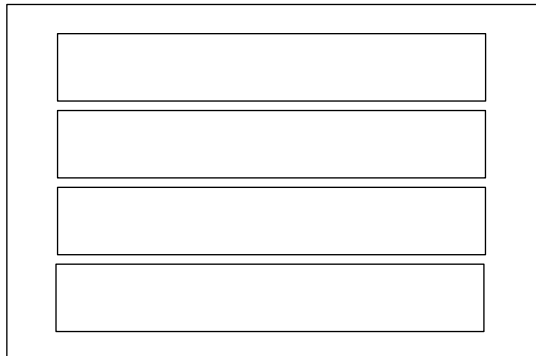
Step 2: Identify the number of counters to be placed in every set.
Your second factor tells the number of counters in every set.
Put 2 negative counters in every box.
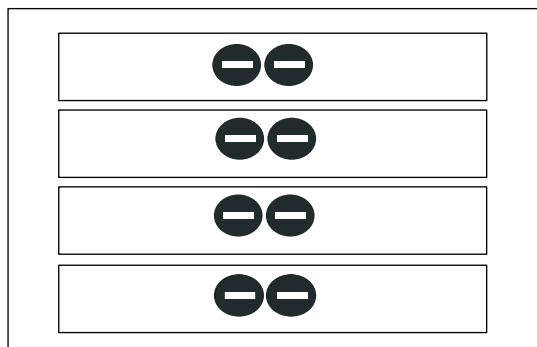
17

Step 3: Perform the operation and write your answer.

Multiplication is also repeated addition. It means that you have to get the total number of counters in all sets.
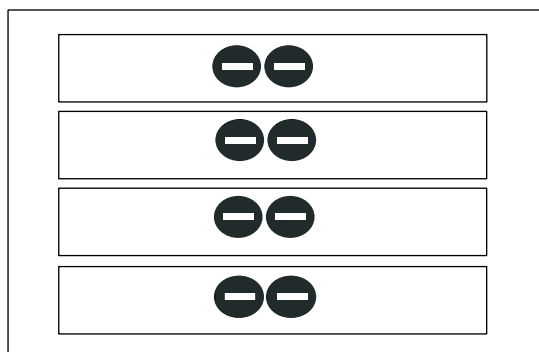
How many sets are there? (4)
How many counters in every set? (2)
$^-2 + ^-2 + ^-2 + ^-2$
How many counters do you have in all on the table? (8 counters)
Do these counters have the same sign? (Yes)
What is the sign? (Negative)
Therefore, if you multiply $^-2$ by $^+4$ you will get the product of $^-8$.

$$^+4 \times ^-2 = ^-8$$

We can also visualize $^+4 \times ^-2 = N$ using a number line.

Consider 0 as the floor on the upper ground.

Step 1
From 0, move two units to the left since the situation says that Jonas descended 2 steps of the stairs at a time (Jonas'1st step). See Illustration below.
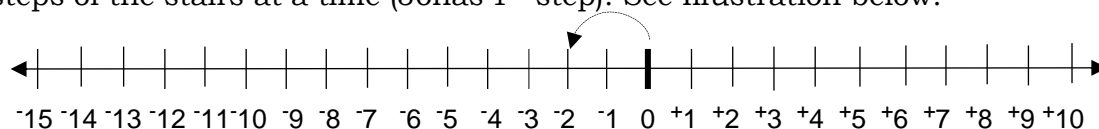
Step 2
Move again two units to the left (Jonas' 2nd step). Continue the process until his 4th step. See the illustration below.
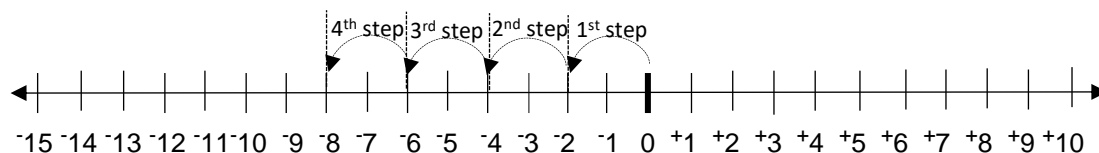
On his first step going down the basement, he is on the second stair. On his second step, he is on the 4th stair. On his third step, he is on the 6th stair and on his fourth step, he is on the 8th stair.

Therefore, after his fourth step, Jonas is on the 8th stair going down and this can be represented by the integer $^-8$.

Hence, $\boxed{^+4 \times ^-2 = ^-8}$

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How about if our equation is $^-4 \times {}^+2$ = N. Do the answers vary? Find out by doing the steps below.

Step 1: Determine the number of sets that you will be making.
Your first factor tells the number of sets.
Draw 4 boxes on the table that will represent the number of sets.
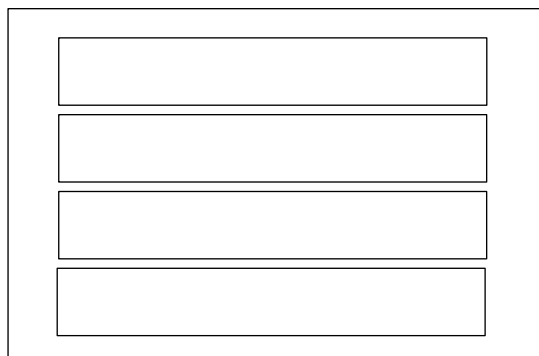
However, in this item we have negative number of sets. Negative 4 is the opposite of positive 4. It means that whatever the total number of counters in 4 positive sets is the same number of counters in the 4 negative sets.

Identify the number of counters to be placed in every set.
Your first factor tells the number counters in every set.
Put 2 positive counters in every box.
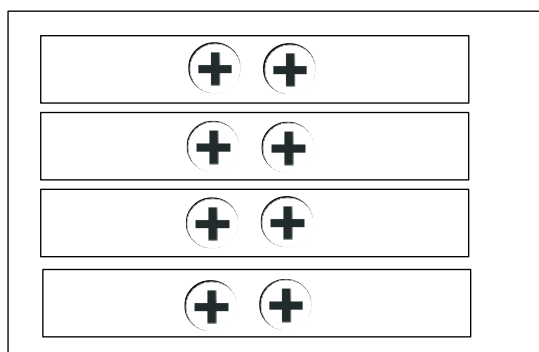
Step 3: Perform the operation and write your answer.
To illustrate the 4 negative sets, you need to flip to the opposite side all your 4 positive sets to show their opposite. In this case, you cannot flip your box drawing so you just **flip to the opposite side all the counters in every set**. If you flip the counters, the positive side of the counter will become negative or vice versa. See the illustration below.

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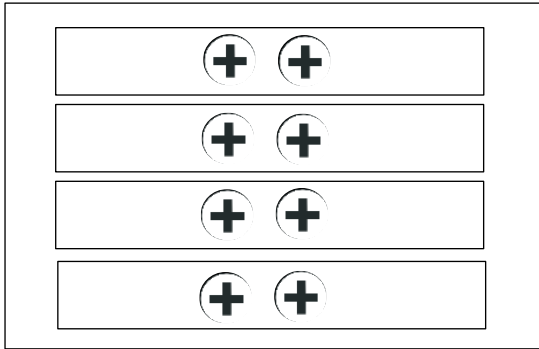
$$^+2 + {}^+2 + {}^+2 + {}^+2$$

This illustration is for 4 positive sets (before you flip)
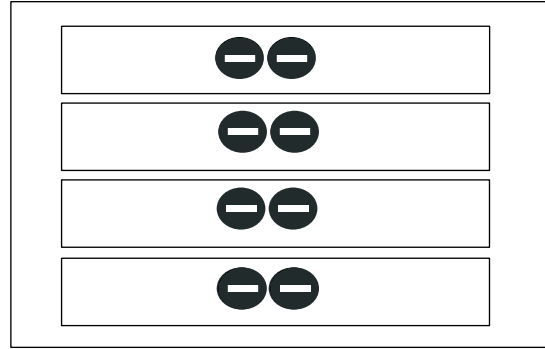
$$^-2 + {}^-2 + {}^-2 + {}^-2$$

This illustration is for 4 positive sets (after you flipped)
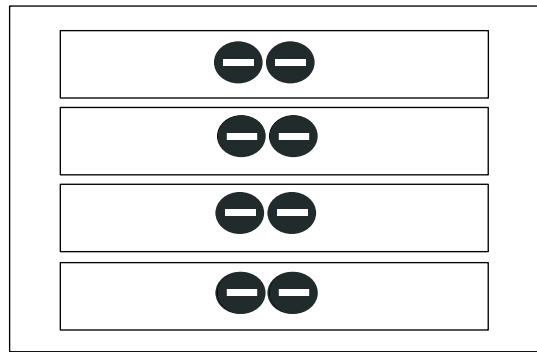
How many counters do you have in all on the table? (8 counters)
Do these counters have the same sign? (Yes)
What is the sign after you flipped the counters? (Negative)
Therefore, if you multiply ⁻4 by ⁺2 you will get the product of ⁻8.

$$^-4 \times {}^+2 = {}^-8$$

Study additional example below.

$$^+3 \times {}^-8 = N$$
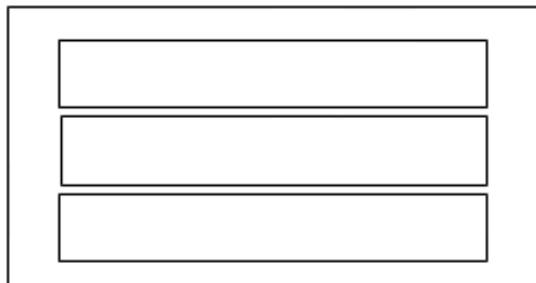
Step 1: Draw 3 boxes to illustrate the number of sets (3 sets).
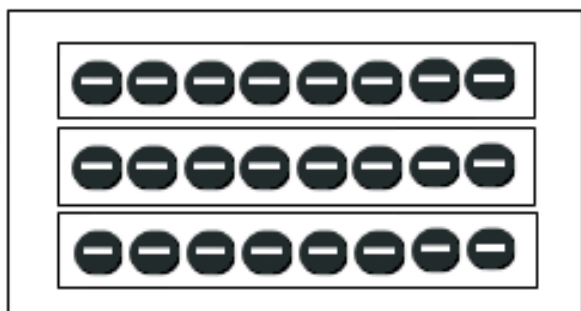
Step 2: Place 8 negative counters in each set.

Step 3: Count the total number of counters in 3 sets and follow the sign. There are 24 negative counters, ⁻24.

Therefore, | ⁺3 x ⁻8 = ⁻24 |

Rule in Multiplying Integers with Unlike Signs

To multiply integers with unlike signs, multiply as whole numbers and consider the signs of the factors. Thus, the product of negative and positive integers is always a **negative** *integer.*

    In symbol: (+) x (-) = (-)   or   (-) x (+) = (-)

Example: ⁺5 x ⁻4 = N
Step 1: Multiply like whole numbers.

$$\begin{array}{r} {}^{+}5 \\ \times\ {}^{-}4 \\ \hline 20 \end{array}$$ } **factors with unlike signs**

Step 2: Affix the negative sign (-) to the product following the rule that multiplying integers with unlike signs will have a negative sign in the answer.

$$\begin{array}{r} {}^{+}5 \\ \times\ {}^{-}4 \\ \hline {}^{-}20 \end{array}$$

Study more examples below.

1) What is the product of ⁺10 x ⁻6 ?
   Solution: ⁺10 x ⁻6 = ⁻60
2) When you multiply ⁻6 x ⁺3 , what is the product?
   Solution: ⁻6 x ⁺3 = ⁻18
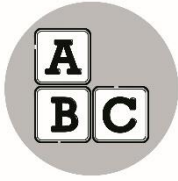
What's More

A. Use your counters to solve for the product of the following integers. Write your answers on your answer sheet.
1) ⁻8 x ⁺3 =
2) ⁺10 x ⁻2 =

B. Find the product. Show the solutions on your answer sheet.
3) ⁻7 x ⁺5 =
4) ⁺4 x ⁻6 =
5) ⁻8 x ⁺9 =

What I Have Learned

In multiplying positive and negative integers, the product is always a negative integer.

In symbol: **(+) x (-) = (-)**   or   **(-) x (+) = (-)**

What I Can Do

A. Give the product of the given integers using number line or counters. Write your answers on your answer sheet.
1)   ⁻5 x ⁺6 = _____.
2)   The product of ⁻12 and ⁺3 is _____.

B. Solve by applying the rule in multiplying integers with unlike signs. Write your answers on your answer sheet.
3)   ⁻10 when multiplied to ⁺4 is equal to _____.
4)   When you multiply ⁺25 and ⁻2 the product is _____.
5)   ⁺15 x ⁻4 is equal to _____.

C. Solve the problem below. Show your solution on your answer sheet and label your final answer.

Jed reported that the coldest day on record in his province was 3 times colder than yesterday's temperature which is ⁻2°C. What was the temperature of the coldest day in Jed's province?

Assessment

A. Read and analyze the situations below. Write the letter of your answer on your answer sheet.

1) What is the product if you multiply $^-6$ by $^+12$?

    A. $^+72$ B. $^-72$
    C. $^+6$ D. $^-2$

2) Rain has 5 positive sets of 5 negative counters. How many counters does Rain have in all?

    A. 10 negative counters   B. 10 positive counters
    B. 25 negative counters   C. 25 positive counters

3) What number sentence describes the illustration below?

    A. $^+5 \times ^-2 = ^-10$ B. $^+2 \times ^+5 = ^+10$
    C. $^-2 + ^+5 = ^+3$ D. $^+2 + ^-5 = ^-3$

4) How many negative counters will you use if you want to make 6 sets of 4 negative counters in each set?

    A. 20   B. 10
    C. 18   D. 24

5) You moved 8 units to the left of 0 twice. What is the integer?

    A. 0   B. $^+16$
    C. $^-16$ D. $^+8$

B. Find the value of N by multiplying the following integers. Show your solutions on your answer sheet.

6) $^+8 \times ^-6 = N$

7) $^+12 \times ^-2 = N$

8) $^+5 \times ^-10 = N$

9) $^-15 \times ^+3 = N$

C. Solve the problem below. Show your solution and write your answer on your answer sheet.

10) Jake filled his car with 18 liters of gasoline. After 2 hours of driving at a constant speed, the gasoline in his meter reads 12 liters. How many liters of gasoline were consumed in an hour of driving?

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Additional Activities

A. Find the missing integers. Write your answers on your answer sheet.

    1) ___ x $^+8$ = $^-32$

    2) $^+10$ x ___ = $^-50$

    3) $^-7$ x $^+8$ = ___

    4) $^+8$ x $^-3$ = ___

    5) ___ x $^+9$ = $^-36$

B. Solve the following problems. Show the solutions on your answer sheet and label your final answers.

    6) From sea level, a submarine descends 45 feet per minute. Where is the submarine in relation to sea level after 10 minutes it started descending?

    7) What integer must be multiplied to $^+4$ in order to get the product of $^-24$?

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What's In	What I Can Do	Additional Activities
A. 1. +24 2. +80 3. +36 4. +40 5. +50	A. 1. −30 2. −36 B. 3. −40 4. −50 5. −60 C. 6. − 6 °C	A. 1. −4 2. −5 3. −56 4. −24 5. −4 B. 6. 450 feet below sea level 7. −6

What I Know	What's More	Assessment
A. 1. B 2. A 3. B 4. C 5. C B. 6. −80 7. −60 8. −150 9. −50 10. −48	A. 1. −24 2. −20 B. 3. −35 4. −24 5. −72	A. 1. B 2. B 3. A 4. D 5. C B. 6. −48 7. −24 8. −50 9. −45 C. 3 liters

What I Know

Read, analyze and solve the problems below. Show your solutions and write your answers on your answer sheet.

1. A fruit vendor reported losses of ₱25 each day for one week. What was the loss for one week?
2. At the beginning, Len has 10 points in the game. She gained 3 points in each of the 3 succeeding rounds. What is her score at the end of the game?
3. If you add 10 to an integer and then divide the result by ⁻5, the answer you get is ⁻80. What is the integer?
4) Jazz is tossing a regular die. If the number that appears is even, he will gain 3 times the number that appears. If it is odd, he will lose 8 times the number that appears.
   Here is the result of his game.

   1st trial- 3   2nd trial- 1   3rd trial- 6

   If you are going to add his scores, what is it?

5) What factors of ⁺12 will give us the sum of ⁻7?

Lesson **3**	**Solving Routine and Non-Routine Problems Involving Multiplication of Integers**

In the previous lessons, you have learned how to visualize multiplication of integers using number line and counters as well as multiplication of integers applying the rules in multiplying integers with like and unlike signs. In this lesson, you will learn how to solve routine and non-routine problems involving multiplication of integers.

What's In

Read and study the problem below.

During the vacation, Arkin gained 3 kilograms while his friend CJ gained twice as much as the number of kilograms gained by Arkin. If they are both 29 kilograms before, what is their total weight now?

What is It

To solve the problem, we are going to follow Polya's steps in problem solving.

1. **Understand**
   - What is asked in the problem?

     Arkin and CJ's total weight.
   - What facts are needed to solve the problem?

     29 kilogams- Arkin and CJ's weight before

     3 kilograms - gained by Arkin

     Twice as much as the number of kilograms gained by Arkin (3 x 2) - gained by CJ

2. **Plan**
   - What operation/s is/are needed to solve the problem?

     addition and multiplication
   - What is the number sentence?

     $$\left\{ (29 + 3) + \left[29 + (3 \times 2) \right] \right\} = N$$

3. **Solve**

   First perform the innermost operation.

   $$(29 + 3) + \left[29 + 6 \right] = N$$

   $$32 + 35 = N$$

   $$67 = N$$

   Arkin and CJ weigh 67 kilograms in all.

4. **Check and Look Back**

   32 - 3 = 29 - Arkin's initial weight

   35 – (3x2) = N

   35- 6   = 29 - CJ's initial weight

   The first problem presented is an example of a routine problem. Routine problems are types of problems wherein you can easily identify the solution to solve them. After reading the situation, the solver clearly sees the method/process to be used and the answer to the problem.

Here is another problem that will challenge you more.

Read and analyze the problem below. Then, study the solution.

> Carla weighed a bag of rice. Then she added five kilograms of rice into the bag
> but took thrice of what she added thereafter. Now the bag weighed 10
> kilograms. How much did the bag of rice weigh at the start?

In order to solve the problem, we have to consider the steps:

1. **Understand**
   - What is asked in the problem?

     The weight of the bag of rice at the start.
   - What facts are needed to solve the problem?

     five kilograms of rice - added into the bag of rice

     thrice the amount of what was added – amount of rice taken from

     the bag 10 kilograms - amount of rice left in the bag

2. **Plan**
   - Strategy: Working Backward Strategy will help you solve the problem.

     In working backward strategy, we will start with the output or final result to
     the input or missing given by reversing all operations used.

     If we translate our problem into mathematical equation, originally it is

     $\boxed{}$ + 5 – (3 x 5) = 10

3. **Solve**

   Using the backward strategy, our equation becomes

   $\boxed{}$ = 10 + (3 x 5) – 5

   Step 1: Multiply positive 3 by positive 5.

   $\boxed{}$ = 10 + (3 x 5) – 5

   $\boxed{}$ = 10 + 15 – 5

   Step 2: Add positive 10 to positive 15.

   $\boxed{}$ = 10 + 15 – 5

   $\boxed{}$ = 25 – 5

   Step 3: Subtract positive 5 from positive 25.

   $\boxed{}$ = 25 – 5

   $\boxed{}$ = 20

   Therefore, the bag of rice weighs 20 kilograms at the start.

4. Check: To check, substitute positive 20 which is the output when you used the working backward strategy to the input in the original equation. Then, evaluate.

$\boxed{20}$ + 5 – 15 = 10

25 – 15 = 10

10 = 10

The second problem presented is an example of a non-routine problem. Non-routine problems are unfamiliar problems wherein the solver has no readily available solution to them. The method/process and the answer are not clearly seen at first glance. Non-routine problems can be solved using different strategies such as Guess and Check, Using Models, Acting Out, Logical Reasoning, Working Backwards and others.

This problem uses working backward strategy.
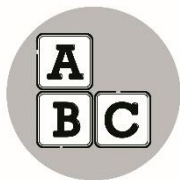
What's More

Read, analyze and solve the problems below. Show your solutions and write your answers on your answer sheet.

1) A test has 25 questions. The pupil gets 3 points if the answer is correct and losses 2 points if the answer is wrong. A pupil got 5 wrong answers. How many points did the pupil lose?

2) In your first year of owning a business, you made a ₱50,000 profit. The next year, your profit was 3 times more than your first year. What is your total profit in 2 years?

3) Vince read 15 pages of a book on the first day. The next day, he read three times more than the first day. How many pages did he read in two days?

What I Have Learned

Routine problems are problems having readily available solutions. The methods/processes can easily be identified. We can solve routine problems using Polya's steps in problem solving as follows:
1. Understand
2. Plan
3. Solve
4. Check and Look Back

Non-routine problems are problems that do not have readily available procedure to solve them. Non-routine problems can be solved using different strategies such as Guess and Check, Using Models, Acting Out, Logical Reasoning, Working Backwards and others.

What I Can Do

Read, analyze and solve the problems below. Show your solutions and write your answers on your answer sheet.

1) Cris adds 2 tablespoons of sugar in each cup of his mixtures. If he has 8 cups of mixtures, how many tablespoons of sugar will he use?
2) After a day of selling *baluts,* Fred counted the remaining *baluts* in the tray. He remembered that in the morning, he was able to sell half of the total number of *baluts* he sells. In the afternoon, he was able to sell 15 pieces and sold twice of them at night. If he has 130 pieces of *balut* left, how many *baluts* does he have at the start?
3) An integer is divided by $^-8$ and then $^-25$ is added to the quotient. The result is $^+71$. Find the integer.

Assessment

Read, analyze, and solve the problems below. Show your solutions and write your answers on your answer sheet.

1) Mike's team lost 15 points against their opponent in each of the 4 games they played. Find the total number of points Mike's team lost.
2) Jamilla spends ₱25 for her one-way fare in going to church every Sunday to attend mass. If she goes to church every Sunday for a month, how much will she spend in all for her two-way fare?
3) What factors of $^-20$ will give you the sum of $^-1$?
4) A faucet is left slightly open and leaks 5 liters every hour. How many liters of water will the faucet leak after 3 hours if it is left that way?
5) Solve for the value of N in the given equation below.
   $N \div {}^+2 - {}^-5 + {}^+8 = {}^+9$

Additional Activities

Read, analyze and solve the problems below. Show your solutions and write your answers on your answer sheet.

1) Shine withdraws an amount of ₱5 000 every month for her food allowance. How much was withdrawn after a year?
2) Crystal religiously saves ₱800 every time she receives her salary. If the company she's working in gives the salary every 15 days, how much will Carla save after 9 months?
3) What two integers will give you the product of $^+30$?
4) On his first day of biking, Eros traveled 4 kilometers. On the second day, he traveled thrice as much as the number of kilometers on the first day. On the third day, he traveled twice as much as he traveled on the second day. How many kilometers did Eros travel in all?
5) What integer should be placed inside the box to make the equation true?

$$\boxed{} \div {}^-10 + {}^-8 - {}^+3 = {}^-13$$

Answer Key

Additional Activities	What I Can Do	What's In
A. 1. ₱60 000 2. ₱14 400 3. answers may vary 4. 40 km 5. +20	A. 1. 16 2. 350 3. -768	1. +24 2. +80 3. +36 4. +40 5. +50
Assessment A. 1. 60 points 2. ₱200 3. -5 and +4 4. 15 liters 5. -8	**What's more** A. 1. loss of 10 2. ₱250 000 3. 60	**What I Know** A. 1. ₱175 2. 19 points 3. +390 4. +450 5. -4, -3

Reference

- DepEd Most Essential Learning Competencies (MELC) in Mathematics for Grade 6