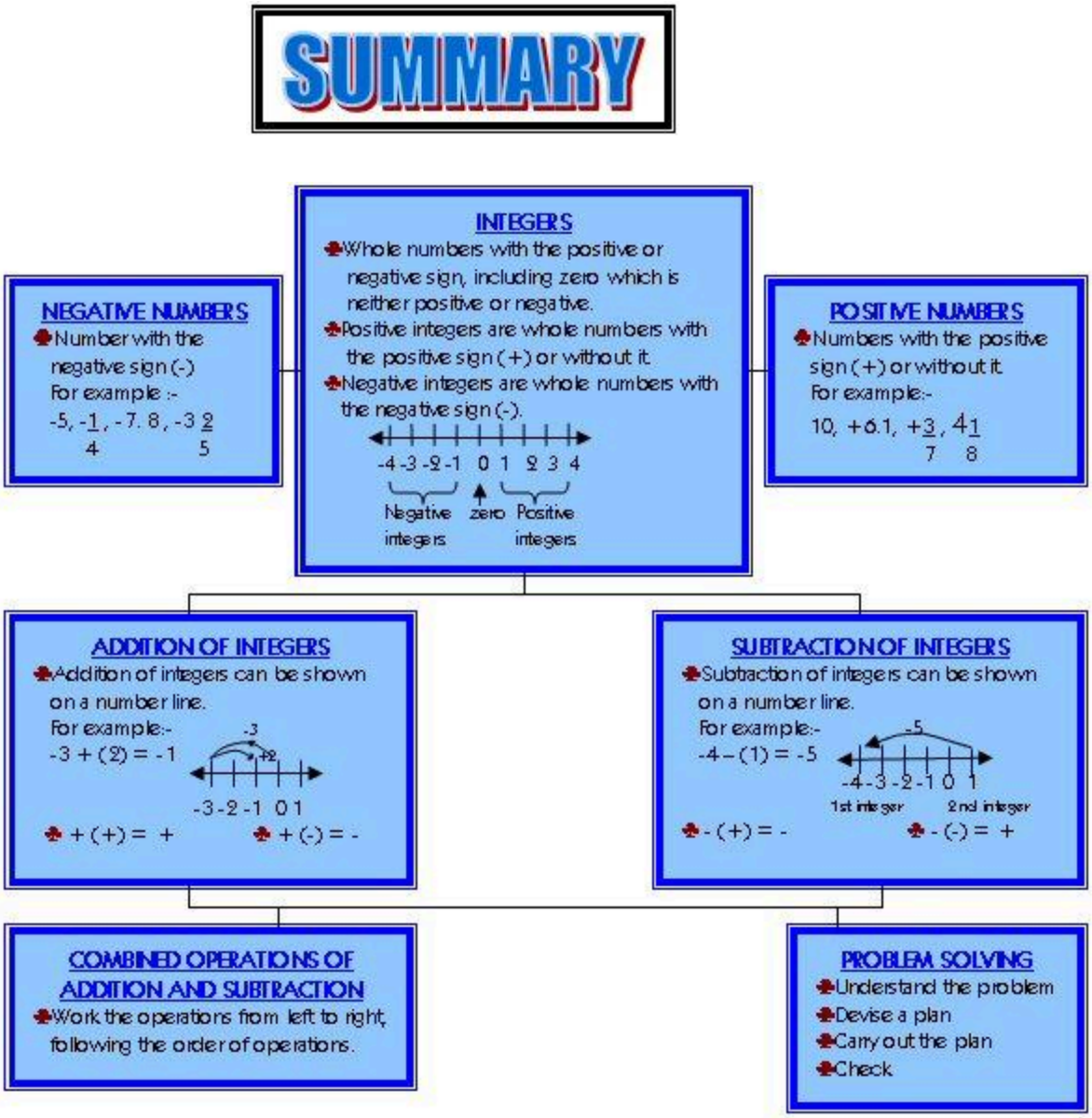
INTEGERS



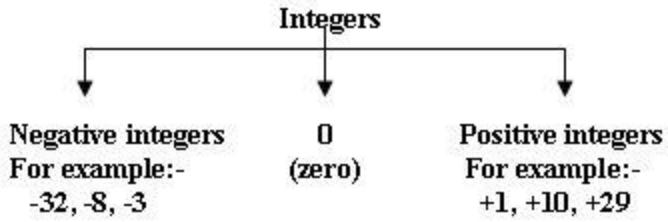
INTEGERS

A) Understanding Integers

1. An integer is a whole number with the positive

sign or negative sign, including zero which is

neither positive nor negative.



2. Positive and negative numbers include decimals

and fractions.

For example :-

(a) Positive numbers : +12, 8.5, + $1\frac{1}{2}$

(b) Negetive numbers : -15, - 3.6, - $3\frac{3}{4}$

3. Positive integers can be written without the '+' sign.

For example :-

+4 is usually written as 4.

Worked Example 1

$+8, 4\frac{1}{2}, -5, 0, 6.3, -2, -4.5, 18, -2\frac{1}{2}$

From the numbers above, list all the

(a) integers,

(b) positive integers,

(c) negative integers.

Solution

(a) - 5, -2, 0, +8 and 18

(b) +8 and 18

(c) -5 and -2

B) Representing Integers on Number Lines

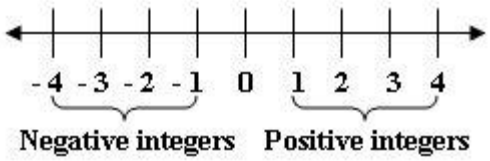
1. Integers can be represented on either a horizontal

or a vertical number line.

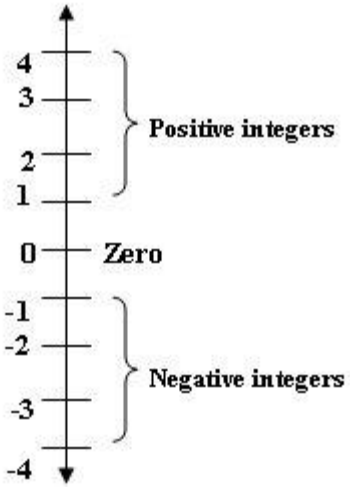
2. Normally, a horizontal number line is used.

For example :-

(a) Horizontal number line



(c) Vertical number line

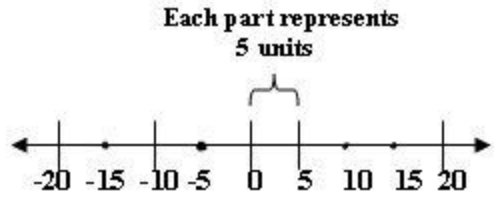


Worked Example 2

Draw a number line and mark the following numbers :-

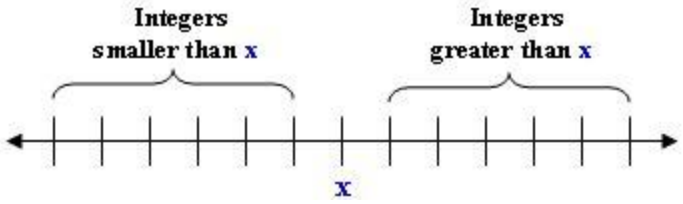
- 15 , - 5, 10, 15

Solution



C) Comparing the Value of Two Integers

We can use the number line to compare the values of integers. A given integer, x, is greater than all the integers on its left but smalller than all the integers on its right.

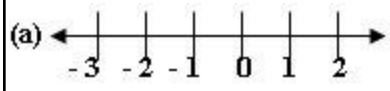


Worked Example 3

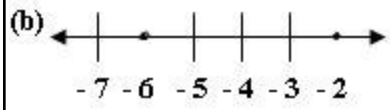
In each of the following pairs of integers, state the integer that is greater in value.

(a) - 3, 2 (b) - 6, - 3

Solution



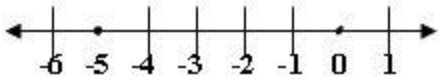
2 is on the right of -3.
Therefore, 2 is greater than -3.



- 3 is in the right of –6.
Therefore, -3 is greater than -6.

Worked Example 4

State the integer with the smaller value : - 5 or 0



-5 is on the left of 0.

Therefore, -5 is less than 0.

D) Arranging Integers in Order

1. In increasing order, the integers are arranged from the smallest to the largest.

For example :-

- 8, -5, -1, 0, 3, 7, 10

Value increasing

2. In decreasing order, the integers are arranged from the largest to the smallest.

For example :-

10, 8, 6, 4, 0, -4, -6, -9

Value decreasing

Worked Example 5

(a) Arrange the integers -6, 2, -1, +4, 0, - 2 in increasing order.

(b) Arrange the integers 3, 0, 5, - 5, 6, - 4 in decreasing order.

Solution

(a) - 6, - 2, -1, 0, 2, +4

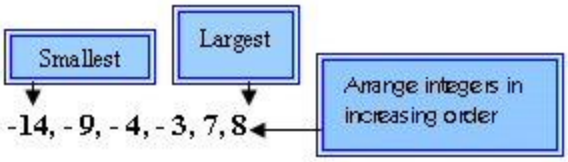
(b) 6, 5, 3, 0, - 4, - 5

E) Determining the Largest Integer or the Smallest Integer

Worked Example 6

Determine the largest integer and the smallest integer in the following : 8, - 3, - 14, - 9, - 4, 7

Solution

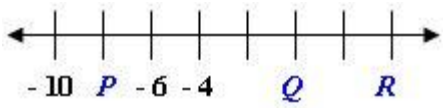


Therefore, 8 is largest integer and – 14 is the smallest integer.

F) Completing a Sequence of Integers

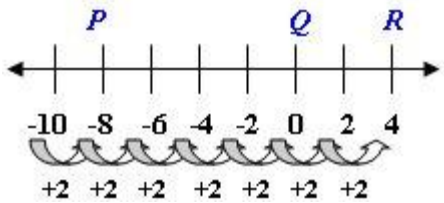
To complete a sequence of integers, it is necessary to identify the pattern of the sequence.

Worked Example 7



State the integers that are represented by the letters *P*, *Q* and *R* on the number line above.

Solution



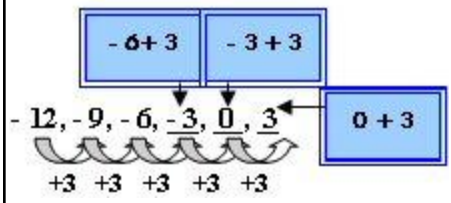
Therefore, *P* = -8, *Q* = 0, *R*= 4

Worked Example 8

Complete the following sequence of integers.

- 12, - 9, - 6, __, __, __

Solution



G) Using Positive and Negative Integers in Real- life Situations

Positive and negative integers can be used in

the following contexts in real-life situations.

(a) An increase or a decrease in value

For example :-

(i) +RM100 represents an increase of Rm100

in price whereas -RM50 represents a decrease

of RM50 in price.

(ii) +60 sen represents a profit of 60 sen whereas

- 30 sen represents a loss of 30 sen.

(iii) +4 kg represents a mass gain of 4 kg whereas

- 6 kg represents a mass loss of 6 kg.

(b) A value which is either greater than or less than

zero.

For example :-

(i) +5°C represents 5^0C more than 0^0C whereas

- 2^0C represents 2^0C less than 0^0C.

(ii) As 0 m is the sea level, +3 m represents 3 m above sea level whereas -10 m below sea level.

(c) A positive or a negative direction (i.e.opposite directions)

For example :-

(i) If +8 km represents 8 km to the east, then -7 km represents 7 km to the west.

(ii) If a lift which moves 4 floors upwards is represented by +4, then a lift which moves downwards is represented by - 3.

Worked Example 9

Use positive or negative integers to represent the following.

(a) A temperature rise of 18^0C

(b) 800 m below sea level

(c) A loss of RM70

Solution

(a) +18^0C (c) -RM70

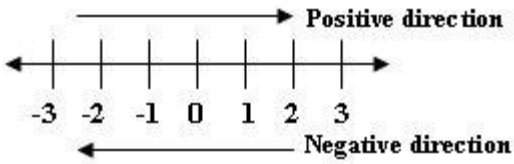
(b) - 800 m

ADDITION AND SUBTRACTION OF INTEGERS

A) Addition of integers

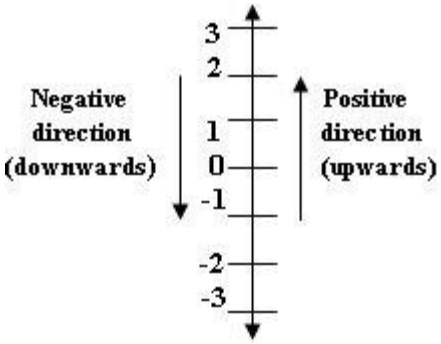
1. For a horizontal number line, the direction from left to right indicates the positive direction while the direction from right to left indicates the negative direction.

For example :-



2. For a vertical number line, and upward direction indicates the positive direction indicates the negative direction.

For example :-



3. We can add two or more integers using a number line.

(a) When adding a positive integer, we move in the positive direction on the number line.

(b) When adding a negative integer, we move in the negative direction on the number line.

(c) Zero is usually taken as the starting point.

Worked Example 10

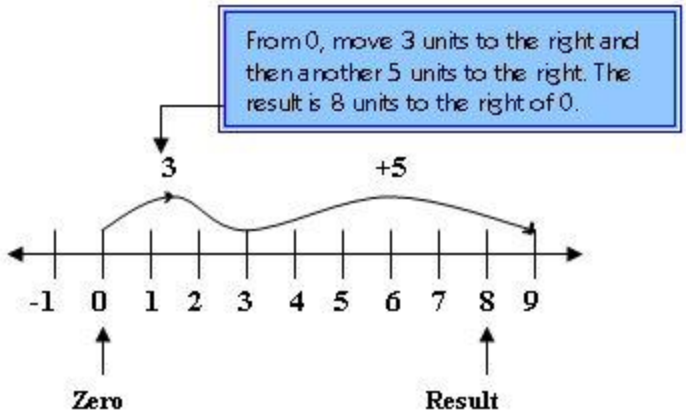
Solve the following by using the number lines.

(a) 3 + (+5) **(c) - 2+ (- 5)**

(b) - 6 + 4 **(d) 3 + (- 5)+(+8)**

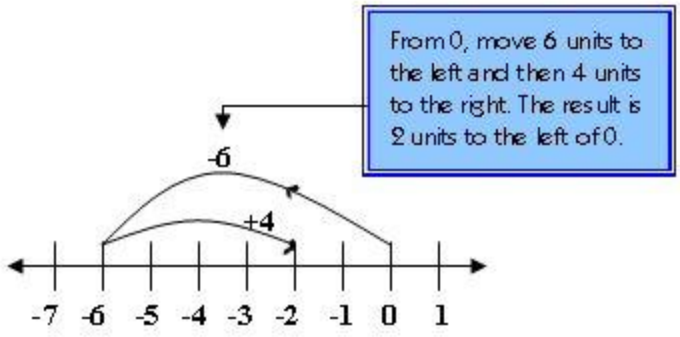
Solution

(a)



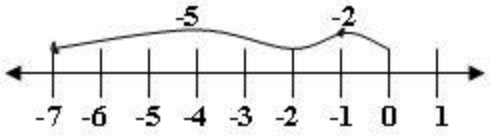
Therefore, - 6 + 4 = - 2

(b)



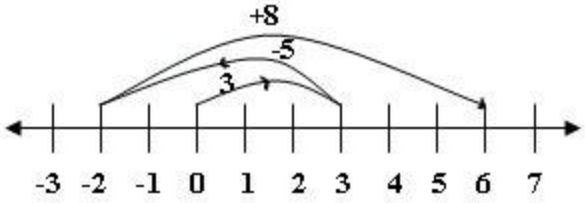
Therefore, - 6 + 4 = - 2

(c)



Therefore, $-2 + (-5) = -7$

(d)



Therefore, $3 + (-5) + (+8) = -2 + (+8)$

$= +6$

$= 6$

Worked Example 11

Solve each of the following.

(a) - 9 + (+5) **(c) - 6 + (- 2)**

(b) + 7 + (- 5)

Solution

(a) $-9 + (+5) = -9 + 5$

$= -4$

(b) $+7 + (-5) = +7 - 5$

$= +2$

$= 2$

(c) $-6 + (-2) = -6 - 2$

$= -8$

B) Problem Solving involving Addition of Integers

Worked Example 12

A submarine which is 9 km below sea level moves up 3 km. What is the position of the submarine now ?

Solution

1. Understand the problem

Given information :

The submarine is 9 km below sea level.

It moves up 3 km.

Find : Final position of the submarine

2. Devise a plan

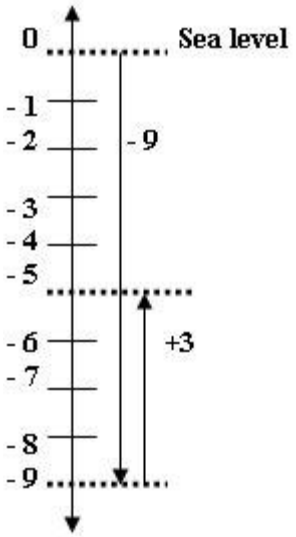
Use addition.

3. Carry out the plan

- 9 + 4 = - 5

Therefore, the submarine is 5 km below sea level now.

4. Check



C) Subtraction of Integers

1. Subtraction of integers is to find the difference between two integers.

2. We can use a number line to find the difference between two integers.

3. The difference can be determined by counting the number of units to be moved from the second integer to the first integer. The direction of the movement will determine the '+' or '_' sign in the answer.

Worked Example 13

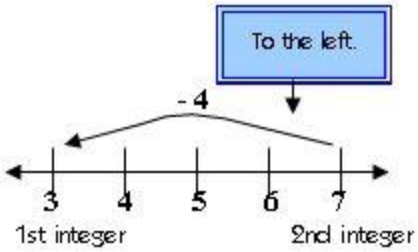
Solve the following by using number line.

(a) 3 - 5 (c) - 2 - 4

(b) 8 - (+4) (d) 0 - (- 7)

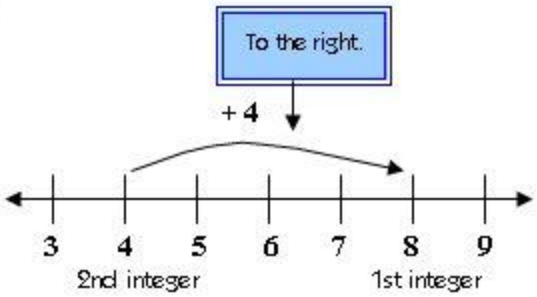
Solution

(a)



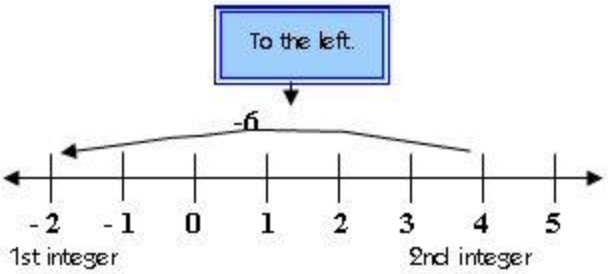
Therefore, 3 – 5 = - 4

(b)



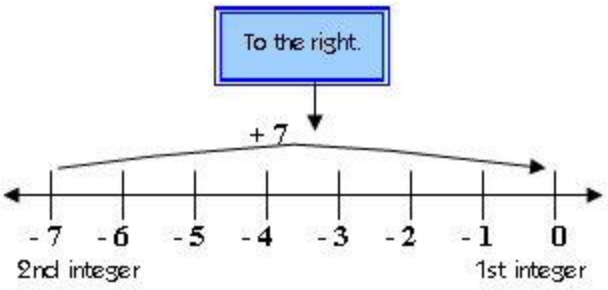
Therefore, 8 – (+4) = +4 = 4

(c)



Therefore, – 2 – 4 = - 6

(d)



Therefore, 0 – (- 7) = + 7 = 7

<u>Worked Example 14</u>

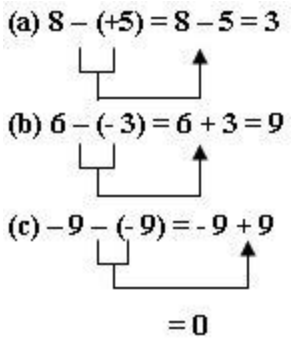
Find the value of each of the following.

(a) 8 - (+5)

(b) 6 - (- 3)

(c) - 9 - (- 9)

Solution



Worked Example 15

Find the value of each of the following.

(a) 30 - (+18) - (- 6)

(b) - 21 - (- 7) - (- 13)

Solution

(a) 30 - (+18) - (- 6) = 30 - 18 + 6

= 12 + 6

= 18

(b) - 21 - (- 7) - (- 13) = - 21 + 7 + 13

= - 14 + 13

= -1

D) Problem Solving involving Subtraction of Integers

A submarine is 8 m below sea level. An eagle is 3 m

above sea level directly above the submarine. What

is the distance between the submarine and the eagle?

Solution

1. Understand the problem

Given information :

A submarine is 8 m below sea level.

An eagle is 3 m above sea level.

Find : Distance between the submarine

and the eagle

2. Devise a plan

Use subtraction.

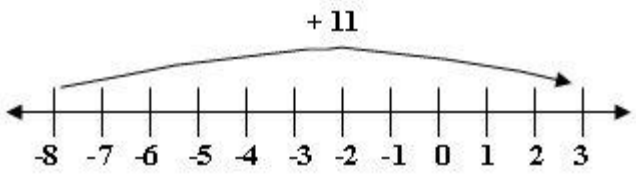
3. Carry out the plan

3 - (- 8) = 3 + 8 = 11

Therefore, the distance between the submarine

and the eagle is 11 m.

4. Check



E) Combined Operations of Addition and Subtraction of Integers

Worked Example 17

Find the value of each of the following.

(a) 25 - (+30) + (- 12)

(b) - 12 - (- 26) + (- 15)

Solution

(a) 25 - (+30) + (- 12)

= 25 - 30 - 12

= - 5 - 12

= - 17

(b) - 12 - (- 26) + (- 15)

= - 12 + 26 - 15

= 14 - 15

= - 1

F) Problem Solving involving Addition and Subtraction of Integers

Worked Example 18

A diver at 7 m below sea level swam up 3 m. A turtle at that moment was 2 m below sea level. What was the distance between them when the turtle was directly above the diver?

Solution

1. Understand the problem

Given information :

The diver was 7 m below sea level at first.

He swam up 3 m.

The turtle is 2 m below sea level.

Find : Distance between the diver and the turtle.

2. Devise a plan

Use addition and subtraction.

3. Carry out the plan

(- 7 + 3) - (-5) = (- 7 + 3) + 5

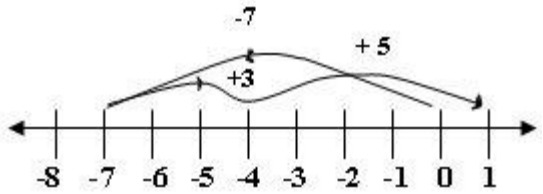
= - 4 + 5

= 1

Therefore, the distance between the diver and

the turtle was 1 m.

4. Check



Dictionary

- Integer – *Integer*
- Negative number – *Nombor negatife*
- Positive number – *Nombor positif*
- Negative integer – *Integer negative*
- Positive integer – *Integer positif*
- Inverse - *Songsangan*
- Like signs – *Tanda serupa*
- Unlike signs – *Tanda tak serupa*