

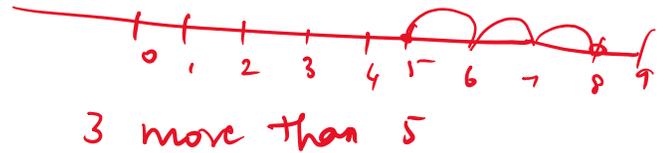
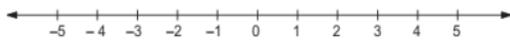
INTEGERS

neg, whole

Q: Indicate the following using '+' or '-' sign:

- | | |
|--|--|
| (i) A gain of ₹ 600 +600 | (ii) A loss of ₹ 800 -800 |
| (iii) 7°C below the freezing point | (iv) Decrease of 9 |
| (v) 2 km above sea level +2 | (vi) 3 km below sea level |
| (vii) A deposit of ₹ 200 +200 | (viii) A withdrawal of ₹ 300 -300 |

REPRESENTATION OF INTEGERS ON THE NUMBER LINE

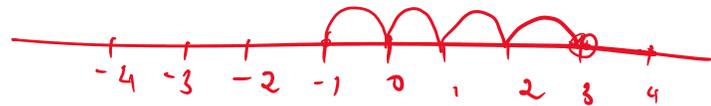


ORDERING OF INTEGERS

- For example: (i) $4 > 3$ and $-4 < -3$;
 (ii) $7 > 4$ and $-7 < -4$;
 (iii) $9 > 5$ and $-9 < -5$.

Thus, if a and b are two integers such that $a > b$, then $-a < -b$.
 Similarly, if a and b are integers such that $a < b$, then $-a > -b$.

- Q: Using the number line, write the integer which is:
 (i) 3 more than 5
 (ii) 4 more than -1
 (iii) 5 less than 3
 (iv) 2 less than -3



ABSOLUTE VALUE OF AN INTEGER *The absolute value of an integer is the numerical value of the integer regardless of its sign.*

- The absolute value of -2, written as $|-2|$, is 2.
 The absolute value of -5, written as $|-5|$, is 5.
 The absolute value of 5, written as $|5|$, is 5.
 The absolute value of 0, written as $|0|$, is 0.

$|-10| = 10$ $|-100| = 100$
 $|5| = 5$

Q: Find the value of

- | | | | |
|------------------|----------------------|---------------------|-----------------------|
| (i) $ -9 $ | (ii) $ -36 = 36$ | (iii) $ 0 = 0$ | (iv) $ 15 $ |
| (v) $- -3 = -3$ | (vi) $7 + -3 = 10$ | (vii) $ 7 - 4 = 3$ | (viii) $8 - -7 = 1$ |

Write the following integers in the increasing order:

Q:

(i) 5, -7, -2, 0, 8

(ii) -23, 12, 0, -6, -100, -1

-100, -23, -6, -1, 0, 12

(iii) -17, 15, -363, -501, 165

(iv) 21, -106, -16, 16, 0, -2, -81

OPERATIONS ON INTEGERS

ADDITION OF INTEGERS We have learnt how to add two whole numbers on the number line. We shall extend the same method for addition of integers, using the number line.

RULES FOR ADDITION OF INTEGERS

RULE 1 *If two positive integers or two negative integers are added, we add their values regardless of their signs and give the sum their common sign.*

Q:

Add the following integers:

(i) +27 and +19

(ii) -42 and -35

46

-77

Q:

Add: (i) -36 + 19

(ii) 49 + (-27) = 49 - 27 = 22

PROPERTIES OF ADDITION ON INTEGERS

(i) CLOSURE PROPERTY OF ADDITION *The sum of two integers is always an integer.*

EXAMPLES

(i) 3 + 5 = 8, and 8 is an integer.

(ii) 3 + (-8) = -5, and -5 is an integer.

(iii) (-3) + (-9) = -12, and -12 is an integer.

-2 + 2 = 0

(ii) COMMUTATIVE LAW OF ADDITION *If a and b are any two integers then a + b = b + a.*

(i) (-3) + 8 = 5, and 8 + (-3) = 5.

$\therefore (-3) + 8 = 8 + (-3)$.

-13, -22

-13 + (-22) = -35

-22 + (-13) = -35

5 + (-3) = 2

RHS, -3 + 5 = 2

(iii) ASSOCIATIVE LAW OF ADDITION *If a, b, c are any three integers then (a + b) + c = a + (b + c).*

a = 2, b = -1, c = 3

EXAMPLE

Consider the integers -5, -7 and 3.

We have: $[(-5) + (-7)] + 3 = (-12) + 3 = -9$.

And, $(-5) + [(-7) + 3] = (-5) + (-4) = -9$.

LHS: $(a+b)+c = (2+(-1))+3$

(iii) ASSOCIATIVE LAW OF ADDITION If a, b, c are any three integers then $(a + b) + c = a + (b + c)$.

$a = 2, b = -1, c = 3$

EXAMPLE Consider the integers $-5, -7$ and 3 .
 We have: $[(-5) + (-7)] + 3 = (-12) + 3 = -9$.
 And, $(-5) + [(-7) + 3] = (-5) + (-4) = -9$.
 $\therefore [(-5) + (-7)] + 3 = (-5) + [(-7) + 3]$.

LHS : $(a+b) + c = (2 + (-1)) + 3$
 $= 1 + 3 = 4$ ✓

(iv) If a is any integer then $a + 0 = a$ and $0 + a = a$.

EXAMPLES (i) $8 + 0 = 8$ (ii) $(-3) + 0 = -3$ (iii) $0 + (-5) = -5$

RHS $a + (b + c) = 2 + (-1 + 3)$
 $= 2 + 2 = 4$ ✓

REMARK 0 is called the additive identity.

(v) The sum of an integer and its opposite is 0 .
 Thus, if a is an integer then $a + (-a) = 0$.
 a and $-a$ are called opposites or negatives or additive inverses of each other.

$5 + (-5) = 0$
 $1 /$

EXAMPLE $3 + (-3) = 0$ and $(-3) + 3 = 0$.
 Thus, the additive inverse of 3 is -3 .
 And, the additive inverse of -3 is 3 .

$-12 = 12$
 -12