

Division of Integers

Rule ① For dividing one integer by the other, the two having unlike signs, we divide their values regardless of their signs and give a minus sign to the quotient.

E.g. → $(-48) \div 12$
 $= \frac{-48}{12} = -4$

$$144 \div (-16)$$

$$= \frac{144}{-16} = -9$$

Rule ② For dividing one integer by the other having like signs, we divide their values regardless of their signs and give a plus sign to the quotient.

E.g. → $98 \div 14$
 $= \frac{98}{14} = 7$

$$(-90) \div (-15)$$

$$= \frac{+90}{+15} = 6$$

Rule ③ Modulus of an Integer

The modulus of an integer a denoted by $|a|$ is defined as

$$|a| = \begin{cases} a & \text{if } a \text{ is positive or zero} \\ -a & \text{if } a \text{ is negative} \end{cases}$$

Thus, $|6| = 6$

$$|-6| = -|-6| = 6$$

E.g. → $\frac{0}{69} = 0$

When 0 is divided by any nonzero number, then the quotient is 0

②

$$\therefore \underline{0 - 69 = 0}$$

Distance Between the Two Points

Let A and B be two points at distances a and b respectively from the origin. Then, we define $AB = |a - b|$

E.g. → An elevator descends into a mine shaft at the rate of 6m/min. If the descent starts from 20m above the ground level. How long will it take to reach -370m?

Solution Let the point O denote the ground level

$$\text{Then, } OA = 20\text{m}$$

$$OB = -370\text{m}$$

$$\begin{aligned} \therefore AB &= |OA - OB| \\ &= |20 - (-370)| \\ &= |20 + 370| \\ &= 390\text{m} \end{aligned}$$

$$\therefore \text{distance covered} = 390\text{m.}$$

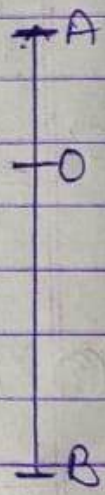
$$\text{Rate of descent} = 6\text{m/min}$$

$$\text{Time taken} = \frac{390}{6} \text{ min}$$

$$= 65 \text{ min}$$

$$= 1 \text{ hr } 5 \text{ min.}$$

Hence, elevator took 1 hour 5 minutes to reach -370m.



3

Properties of Division of Integers

(1) If a and b are integers then $(a \div b)$ is not necessarily an integer.

E.g. →

- 16 and 5 are both integers but $16 \div 5$ is not an integer
- (-9) and 13 are both integers but $-9 \div 13$ is not an integer.

(2) If a is an integer and $a \neq 0$ then $a \div a = 1$.

E.g. →

- $16 \div 16 = 1$
- $(-8) \div (-8) = 1$

(3) If a is an integer, then $a \div 1 = a$

E.g. →

- $7 \div 1 = 7$
- $-3 \div 1 = -3$

(4) If a is an integer, and $a \neq 0$ then $0 \div a = 0$ but $(a \div 0)$ is not meaningful.

E.g. →

- $0 \div 6 = 0$
- $0 \div (-4) = 0$
- $6 \div 0$ is meaningless.

(5) If a, b, c are integers, then $(a \div b) \div c \neq a \div (b \div c)$ unless $c = 1$.
Thus, division on integers is not associative.

E.g. → Let $a = -8$ $b = 4$ $c = -2$

$$(a \div b) \div c = (-8 \div 4) \div (-2)$$
$$= -2 \div (-2) = 1$$

4

$$\begin{aligned} a \div (b \div c) &= (-8) \div (4 \div (-2)) \\ &= (-8) \div (-2) \\ &= 4 \end{aligned}$$

$$\therefore (a \div b) \div c \neq a \div (b \div c)$$

(6) If a, b, c are nonzero integers and $a > b$ then

(i) $(a \div c) > (b \div c)$, if c is positive

(ii) $(a \div c) < (b \div c)$, if c is negative

E.g. \rightarrow (i) $27 > 18$ and 9 is positive

$$\therefore \frac{27}{9} > \frac{18}{9}$$

(ii) $27 > 18$ and (-9) is negative

$$\therefore \frac{27}{-9} < \frac{18}{-9}$$

EXERCISE

(1) Divide:

(a) 65 by -13

(b) -76 by 19

(c) -150 by 25

(d) -105 by -21

(e) 0 by -31

(f) -28 by -23

(g) -84 by 21

(h) -132 by 12

(i) -72 by -18

(j) -36 by -1

(k) -63 by 63

(l) -8 by 1

(2) Fill in the blanks -

(a) $72 \div () = -4$

(b) $39 \div () = -1$

(c) $() \div 25 = 0$

(d) $-36 \div () = -4$

(5)

- (e) $(\quad) \div (-1) = 36$ (f) $(\quad) \div 1 = -37$
(g) $1 \div (\quad) = -1$ (h) $(\quad) \div -2 = 72$
(i) $(\quad) \div (-4) = 24$ (j) $(-1) \div (\quad) = -1$

Some Extra Questions

- (1) $6 - (-8) = ?$
- (2) $-9 - (-6) = ?$
- (3) By how much does 2 exceed -3 ?
- (4) What must be subtracted from (-1) to get (-6) ?
- (5) How much less than (-2) is (-6) ?
- (6) On subtracting 2 from (-1) , we get?
- (7) By how much does (-3) exceed (-5) ?
- (8) What must be subtracted from -3 to get -9 ?
- (9) On subtracting 6 from (-5) , we get?
- (10) On subtracting (-13) from (-8) we get?
- (11) $(-36) \div (-9) = ?$
- (12) $0 \div (-5) = ?$
- (13) $(-8) \div 0 = ?$
- (14) The sum of two integers is 6. If one of them is -3 , find the other.
- (15) The sum of two integers is (-4) . If one of them is 6, find the other.
- (16) The sum of two integers is 14. If one of them is -8 , find the other.
- (17) $(-15) \times 8 + (-15) \times 2 = ?$
- (18) $(-12) \times 6 - (-12) \times 4 = ?$
- (19) $(-27) \times (-16) + (-27) \times (-14) = ?$
- (20) $30 \times (-23) + 30 \times 14 = ?$
- (21) $(?) \div (-18) = -5$