5. Find the product of the following integers :

(*i*) $-3 \times (-18)$ (*ii*) $-5 \times (-500)$ (*iii*) $-1 \times (-1)$ (*iv*) $-1 \times (-879)$

(*v*) $-3 \times 2 \times 3$ (*vi*) $(-2) \times (-11) \times (-10)$ (*vii*) $25 \times (-4) \times (-2) \times (-1)$

(*viii*) $-2 \times (-3) \times (-4) \times (-5) \times 1$ (*ix*) $(-3)^2 \times 5 \times (-2)$

6. Divide : (*i*) -260 by -13 (*ii*) -58 by -2 (*iii*) 1024 by -32 (*iv*) 480 by -2

7. Find the value :

(*i*) $-48 \div (-12)$ (*ii*) $-70 \div 14$ (*iii*) $56 \div (-7)$ (*iv*) $(-35) \div 5$

(*v*) $-1476 \div 123$ (*vi*) $-1089 \div (-11)$ (*vii*) $1452 \div (-33)$

(*viii*) $-2560 \div (-32)$ (*ix*) $1856 \div (-116)$ (*x*) $-1899 \div 9$

8. Complete the following multiplication table :

→ Second Number

×	−13	−7	−3	0	3	7	13
−13							
−7							
−3							
0							
3							
7							
13							

↑ First Number

Now from the above table, answer the following :

(*i*) List the pairs of integers whose product is zero.

(*ii*) Check from the table whether $(-7) \times 3 = 3 \times (-7)$.

(*iii*) What do you observe in the row and column corresponding to 0 ?

1.3 PROPERTIES OF INTEGERS

1.3.1 PROPERTIES OF INTEGERS FOR ADDITION

Property 1 (**Closure Property of Addition**) : *The sum of two integers is also an integer, i.e. for any integers a and b, (a + b) is an integer.*

For example, $(-3) + (2) = -1$, which is an integer.

Property 2 (**Commutative Law**) : *The sum of two integers remains unchanged, if they interchange their places, i.e., $a + b = b + a$, where a and b are integers.*

For example : $(-3) + 2 = -1$

$2 + (-3) = -1$

Thus, $(-3) + 2 = 2 + (-3)$.

Property 3 (**Associative Law**) : *For any three or more integers, it does not matter which two are added first and then their sum is added to the third integer, i.e., $(a + b) + c = a + (b + c)$ where a, b and c are integers.*

For example : $(-2 + 5) + 4 = 3 + 4 = 7$

$(-2) + (5 + 4) = -2 + 9 = 7$

$\therefore \quad (-2 + 5) + 4 = (-2) + (5 + 4)$

WORKING RULES

Division of Integers

Step 1 : *Divide the absolute value of dividend by the absolute value of divisor to get the absolute value of quotient.*

Step 2 : *For the integers of like signs, the quotient is positive and in case unlike, the quotient is negative.*

Division by Zero

Let us divide 6 by 0. Now dividing 6 by 0 is the same as finding an integer which when multiplied by 0 gives 6. But, we know that zero multiplied by any integer is always zero. Therefore, there is not any integer which when multiplied by 0 gives 6.

Hence, $\mathbf{6 \div 0 = \frac{6}{0}}$ **is not defined.**

Think a Little and Say

$5 \times 0 = 0$
$7 \times 0 = 0$
Therefore, $5 \times 0 = 7 \times 0$
Hence, $5 = 7$
Is it true ?

EXAMPLE 12 : *Divide – 210 by – 15.*

SOLUTION : On dividing 210 by 15, we get 14, which is the absolute value of the quotient Since the integers – 210 and – 15 are of like signs, the quotient is positive.
Hence, $(-210) \div (-15) = \mathbf{14}$.

EXAMPLE 13 : *Divide 48 by – 3.*

SOLUTION : On dividing 48 by 3, we get 16, which is the absolute value of the quotient. Since the integers 48 and – 3 are of unlike signs, the quotient is negative.
Thus, $48 \div (-3) = \mathbf{-16}$.

EXAMPLE 14 : *(– 36) ÷ (– 9) = ?*
Multiple Choice Question
(a) 4 *(b) – 4* *(c) 9* *(d) – 9*

SOLUTION : We have, $-36 \div (-9) = \frac{-36}{-9} = \mathbf{4}$

So, the option **(a)** is correct, which is the required answer, *i.e.* answer **(a)**.

Assignment 1.2

1. Multiple Choice Questions (MCQ) Choose the correct option.

(*i*) $(-25) \div 0 = ?$
(*a*) – 25 (*b*) 0 (*c*) not defined (*d*) 25

(*ii*) The group of integers, whose product is – 42, is
(*a*) (– 6, – 7, – 1) (*b*) (7, – 6) (*c*) (6, 7, – 1) (*d*) All of these

2. Find the following products using the pattern given in this book :
(*i*) -3×2 (*ii*) $4 \times (-5)$ (*iii*) -4×4

3. Find the following products using the pattern given in this book :
(*i*) $-3 \times (-2)$ (*ii*) $-4 \times (-5)$ (*iii*) $-1 \times (-2)$

4. Multiply :
(*i*) – 9 and 8 (*ii*) – 15 and – 15 (*iii*) 0 and – 27 (*iv*) – 3, 5, 7 and – 1
(*v*) 0 and 0 (*vi*) – 2, – 5, – 10, 2 and 4 (*vii*) – 14, – 2, – 1 and – 1
(*viii*) 999, – 1 and – 10

5. Calculate and verify using the associative law :
(*i*) $10 \times [(-5) \times (-6)]$ (*ii*) $[(-5) \times (-3)] \times (-4)$

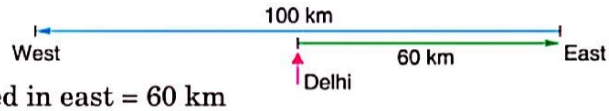
6. Calculate and verify using distributive law over addition :
(*i*) $-5 \times [6 + (-3)]$ (*ii*) $4 \times [3 + 8]$ (*iii*) $8 \times [(-3) + 2]$
(*iv*) $-6 \times [(-5) + (-15)]$ (*v*) $(-1) \times [-4 + 6]$ (*vi*) $456 \times [101 + (-1)]$

7. Find x in the following :
(*i*) $3 \times [(-6) + x] = 3 \times (-6) + 3 \times 10$ (*ii*) $-18 \times [(-7) + 3] = (-18) \times x + (-18) \times 3$
(*iii*) $x \times [6 + (-8)] = 15 \times 6 + (-8) \times 15$ (*iv*) $6 \times [-5 + x] = 6 \times (-5) + 6 \times 7$
(*v*) $-19 \times [4 + (-2)] = -19 \times 4 + (-19) \times x$
(*vi*) $8 \times [(-7) + (-5)] = x \times (-7) + x \times (-5)$

1.4 WORD PROBLEMS

EXAMPLE 21 : *A man travelled 60 km to the east of Delhi and then 100 km to the west of it. How far from Delhi was he finally ?*

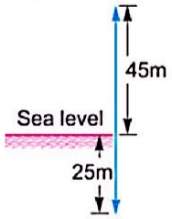
SOLUTION : Take travelling in the east as positive and travelling in the west as negative.



Therefore, the distance travelled in east = 60 km
and the distance travelled in west = – 100 km
∴ the relative distance = 60 km + (– 100) km = – 40 km
Hence, the man is **40 km west of Delhi.**

EXAMPLE 22 : Multiple Choice Question *A place is 45 m above the sea level and another place is 25 m below the sea level. The difference in the levels between the two places is*
(*a*) *20 m* (*b*) *70 m* (*c*) *25 m* (*d*) *45 m*

SOLUTION : Take the distance above the sea level as positive (+) = 45 m
Take the distance below the sea level as negative (–) = – 25 m
Thus, the difference in levels = 45 m – (– 25 m) = **70 m**
So, the option (***b***) is correct, which is the required answer, *i.e.* answer (***b***).



EXAMPLE 23 : Multiple Choice Question *Sum of two integers is 18. If one of them is – 5, the other integer will be*
(*a*) *23* (*b*) *24* (*c*) *25* (*d*) *26*

SOLUTION : Let the other integer be x.
Therefore, $-5 + x = 18$ or $x = 18 + 5$ or $x = 23$
Hence, the required integer is **23**.
So, the option (***a***) is correct, which is the required answer, *i.e.* answer (***a***).

VERIFICATION
$-5 + 23 = 18$

EXAMPLE 24 : *The product of the two integers is – 300. If one integer is 25, find the other integer.*

SOLUTION : Let the other integer be x.
So, $25 \times x = -300$
or $x = \dfrac{-\cancel{300}^{12}}{\cancel{25}_{1}} = -12$
Hence, the required integer is **– 12.**

(*iv*) We have, $-15 = -1 \times 15, -15 = 1 \times (-15), -15 = 3 \times (-5)$,
$-15 = -3 \times 5, -15 = -3 \times 5 \times 1$,
$-15 = 3 \times (-5) \times 1, -15 = 3 \times 5 \times (-1), -15 = (-3) \times (-5) \times (-1)$
Hence, the groups of integers having the product –15 are
(–1, 15), (1, – 15), (3, – 5), (– 3, 5), (– 3, 5, 1), (3, – 5, 1), (3, 5, –1), (– 3, – 5, –1)

Is Division Commutative or Distributive ?

Can $5 \div 2$ and $2 \div 5$ be equal ? No.
Thus, we can say that *division is not commutative.*
Can we think about some other properties for division ?

For example : Can $15 \div (3 + 5)$ and $(15 \div 3) + (15 \div 5)$ be the same value ?
Obviously not. Hence, we cannot apply the distributive law of division over addition.

EXAMPLE 19 : *$0 \div (-10)$ is equal to*
Multiple Choice Question
(a) 10 *(b) 0* *(c) – 10* *(d) undefined*

SOLUTION : We have, $0 \div (-10) = \dfrac{0}{-10} = \mathbf{0}$

So, the option **(*b*)** is correct, which is the required answer, *i.e.* answer **(*b*)**.

EXAMPLE 20 : *Verify whether the following is/are 'True' or 'False' :*
(i) $-62 \div (-62) = 1$ *(ii) $(-35) \div 1 = 35$* *(iii) $-4 \div (-1) = -4$*
(iv) $0 \div (-5) = 0$ *(v) $-1 \div (-5) = 5$* *(vi) $6 \div (-3) = -3 \div 6$*

SOLUTION : (*i*) $-62 \div -62 = \dfrac{-62}{-62} = 1$. Hence, the given statement is **True**.

(*ii*) $-35 \div 1 = -35$, hence the given statement is **False**.

(*iii*) $-4 \div (-1) = 4$, hence the given statement is **False**.

(*iv*) $0 \div (-5) = 0$, hence the given statement is **True**.

(*v*) $-1 \div (-5) = \dfrac{-1}{-5} = \dfrac{1}{5}$, hence the given statement is **False**.

(*vi*) $6 \div (-3) = \dfrac{6}{-3} = -2$ and $-3 \div 6 = \dfrac{-3}{6} = \dfrac{-1}{2}$

$\therefore \quad 6 \div (-3) \neq -3 \div 6$, hence the given statement is **False**.

Assignment 1.3

1. Multiple Choice Questions (MCQ) Choose the correct option.

(*i*) Closure property does not hold good in integers for
(*a*) addition (*b*) multiplication (*c*) subtraction (*d*) division

(*ii*) In integers, 1 is the identity for
(*a*) multiplication (*b*) division (*c*) subtraction (*d*) addition

2. Which of the following statements is/are 'True' or 'False' ?
(*i*) $5 \times (-3) = (-3) \times 5$ (*ii*) $545 \times 0 = 545$
(*iii*) $-3 \times [4 + (-6)] = -3 \times 4 - (-3) \times (-6)$
(*iv*) $-7 \times 1 = 7$ (*v*) $(-5) \times (-2)$ is an integer

3. Find the product of the following using some quicker groupings :
(*i*) $235 \times 99 + 235 \times 1$ (*ii*) $(235 \times 499) \times 0$ (*iii*) $27 \times (-8) + 27 \times (-10)$

4. Verify whether the following is/are 'True' or 'False' :
(*i*) $-16 \div (-1) = -13$ (*ii*) $-15 \div 0 = 0$
(*iii*) $0 \div (-11) = -11$ (*iv*) $-19 \div 19 = -1$

SOLUTION : We have, $12 - [7 - \{16 - (18 - \overline{6 + 3 - 12})\}]$

$= 12 - [7 - \{16 - (18 + 3)\}] = 12 - [7 - \{16 - 21\}]$

$= 12 - [7 - \{-5\}] = 12 - [7 + 5] = 12 - 12 = \mathbf{0}$

So, the option **(b)** is correct, which is the required answer, *i.e.* answer **(b)**.

Power of Integer

Multiplying an integer a by n times means that

$\underbrace{a \times a \times a \times \ldots \times a}_{n \text{ times}} = a^n$, where a is *base* and n is *exponent/power*.

EXAMPLE 6 : *Solve :*

(i) $(-2)^4$ *(ii)* $(-5)^5$

Solution : *(i)* $(-2)^4 = (-2) \times (-2) \times (-2) \times (-2) = \mathbf{16}$

(ii) $(-5)^5 = (-5) \times (-5) \times (-5) \times (-5) \times (-5) = \mathbf{-3125}$

ASSIGNMENT 1.1

1. Multiple Choice Questions (MCQ) Choose the correct option.

(i) The value of $|-3| + |-2| + |-6|$ is

(a) -7 *(b)* 5 *(c)* -1 *(d)* 11

(ii) The value of $(-2)^2 \times (-3)^3 \times (-1)^3$ is

(a) -72 *(b)* 72 *(c)* 108 *(d)* -108

2. Find sum of the following :

(i) -11 and -11 *(ii)* -6 and 6 *(iii)* 7 and -17

(iv) -11 and 5 *(v)* -8 and -13

3. Subtract :

(i) -7 from -3 *(ii)* -6 from 6 *(iii)* 2 from 15

(iv) -18 from -8 *(v)* -11 from -6 *(vi)* -4 from 12

4. Simplify :

(i) $|-5|+|5|$ *(ii)* $-|5| + |5|$

5. Simplify :

(i) $(-5)^6$ *(ii)* $(-3)^2 \times (-2)^2 \times (-1)^3$

(iii) $(-4)^2 \times (10)^4$ *(iv)* $(-1)^{27} \times (-1)^{53} \times (-1)^4$

6. Simplify :

(i) $5 \times [25 + \{(-4) \times (16 - 8 \div 2)\}]$ *(ii)* $(11 - 5) \times [12 + \{3 + \overline{11 - 14}\}]$

1.2 MULTIPLICATION AND DIVISION OF INTEGERS

1.2.1 MULTIPLICATION OF INTEGERS

We know that multiplication is a simpler form of repeated addition.

(i) $6 \times 3 = \underbrace{6 + 6 + 6}_{3 \text{ times}} = 18$ *(ii)* $3 \times 6 = \underbrace{3 + 3 + 3 + 3 + 3 + 3}_{6 \text{ times}} = 18$

(iii) $-6 \times 3 = \underbrace{(-6) + (-6) + (-6)}_{3 \text{ times}} = -18$

CHAPTER-END EXERCISES

Section A

I. MULTIPLE CHOICE QUESTIONS (MCQ)

For each question, there are four Options, out of which one is correct. Choose the correct one :

1. A student is asked to simplify the expression given below using BODMAS rule.
$-12-(10\div5)+5-(-2\times3+5)+6-\{(-2\times3)+1+\overline{3-5}\}$
The part of the expression that the student has to simplify first is
(a) $(10\div5)$ (b) (-2×3) (c) $(-2\times3+5)$ (d) $\overline{3-5}$

2. The value of $(-2)^5\times(-3)^2\times(-1)^7$ is
(a) -288 (b) 288 (c) -298 (d) 298

3. Which of the following is a correct statement ?
(a) $-5<-4$ (b) $-5>-4$ (c) $-5=-4$ (d) None of these

4. The additive inverse of -12 is
(a) -12 (b) 0 (c) 12 (d) 1

5. On subtracting -13 from -5, we get
(a) 18 (b) -8 (c) 8 (d) -18

6. The sum of two integers is -16. If one of them is 16, then the other is
(a) 32 (b) -32 (c) 0 (d) -1

7. Which of the following is true ?
(a) $12\div(-1)=12$ (b) $-12\div1=12$ (c) $-12\div(-1)=12$ (d) $12\div1=-12$

8. If $x=2$, $y=-1$ and $z=-2$, the value of $x(y+z)$ is
(a) -6 (b) 6 (c) -2 (d) 2

9. Temperature of a place is $-24°C$. If it is increased by $11°C$, the final temperature in the place is
(a) $-35°C$ (b) $13°C$ (c) $-13°C$ (d) $35°C$

10. Population in a city was 8,60,000. In the next year, if it is increased by 14,000 more than one-tenth of the previous population, the present population in the city is
(a) 8,88,000 (b) 9,60,000 (c) 9,40,000 (d) 8,74,000

II. TRUE / FALSE

1. Let a, b be two non-zero integers and $a\div b\neq b\div a$. It shows that commutative property is not satisfied with respect to division in integers.

2. $(-5)^4$ is a –ve integer.

3. If the exponent of a negative integer is even, then the value is positive.

4. The distributive property of division over addition holds good in integers.

5. The collection of integers is commutative under division.

6. The collection of integers is closed under multiplication.

7. $(-5)\times(-2)$ is an integer.

8. The difference between the smallest positive integer and the greatest negative integer is 2.

9. The additive inverse of the greatest negative integer is + 1.

10. Every positive integer is less than 0 and every negative integer is greater than 0.

EXAMPLE 25 : *A freezing system starts cooling the room at the rate of 4°C per hour. If at the beginning, the temperature of the room is 30°C, find the number of hours it takes to lower down the room temperature to – 2°C.*

SOLUTION : Total temperature to be lowered down

= Final temperature – Initial temperature = – 2°C – 30°C = – 32°C

Rate of cooling = 4°C per hour

∴ number of hours required

$$= \frac{-32}{-4} \quad [\textit{Negative sign (–) indicates the temperature has lowered down.}]$$

$$= \frac{\cancel{32}^{8}}{\cancel{4}} = \mathbf{8\ hours}$$

ASSIGNMENT 1.4

1. Multiple Choice Questions (MCQ) Choose the correct option.

(*i*) An object is 36 m above the sea level and another object is 36 m below the sea level. The difference in the levels between the two objects is
(*a*) 72 m (*b*) 0 (*c*) – 72 m (*d*) 1 m

(*ii*) The product of two integers is 128. If one integer is – 4, then the other one is
(*a*) – 32 (*b*) 32 (*c*) 36 (*d*) – 36

(*iii*) A gardener plans to plant 630 trees in 21 rows each containing the same number of trees. How many trees will be there in each row ?
(*a*) 30 (*b*) 40 (*c*) 50 (*d*) 68

2. A five-storey building has two floors in basement and three floors above the ground. Total height of the building from basement is 30 m and each floor is of the same height. One person is standing on the lowest basement and another is standing at the roof of the top floor. Find at what distances both persons are standing from the ground ?

3. A six-storey building has 36 m height. A monkey can climb 3 m in one jump. In how many jumps would the monkey reach at the top of the building ?

4. The height of a particular tree is increasing at the rate of 10 cm per month. What would be height of the tree after 5 years if its present height is 10 m ?

[Assuming the growth of the tree is uniform.]

5. Ramesh deposited ₹ 5000 in his bank account on Tuesday and withdrew ₹ 2500 on Wednesday. Next day (on Thursday), he again deposited ₹ 1500. What was his balance on Thursday ?

6. A person gained ₹ 1000 in one transaction and lost ₹ 1200 in another transaction. Did the person gain or lose during the whole transaction and by how much ?

7. The sum of two integers is –250. If one integer is 100, find the other one.

8. The difference between two integers is –25. If one integer is 45, find the other one.

9. The product of two negative integers is 400. If one integer is – 10, find the other integer.

10. An A.C. cools the room at the rate of 5°C per hour. What would be the final temperature of the room after 6 hours, if the initial temperature of the room is 40°C ?