



CHAPTER 1

INTEGERS

OBJECTIVE

In this chapter the students will be able to explore :

- Multiplication and division of integers.
- Properties of integers (including identities for addition and multiplication, commutative, associative, distributive).
- Word problems on integers (all operations).

WARM UP!

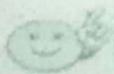
1. $(-47) + (-23) = \dots\dots\dots$
2. Subtract 14 from -81 .
3. Predecessor of -5 is $\dots\dots\dots$
4. $-|9 - 15| = \dots\dots\dots$
5. $-15 + (-8) - (-7) = \dots\dots\dots$
6. The additive inverse of -9 is $\dots\dots\dots$
7. Which is smaller?
 -150 or -130
8. $(-5) + \dots\dots\dots = (-6)$
9. Arrange in ascending order.
 $5, -3, -2, 4, 0, -12$
10. Is $-9 - (-3) = (-3) - (-9)$?

INTRODUCTION

In class VI, we have already dealt with the concept of integers, their addition and subtraction. The collection of whole number and the opposites of natural number form the set of **Integers**. Integers are denoted by I to Z. For example, $\dots -3, -2, -1, 0, 1, 2, 3, \dots$

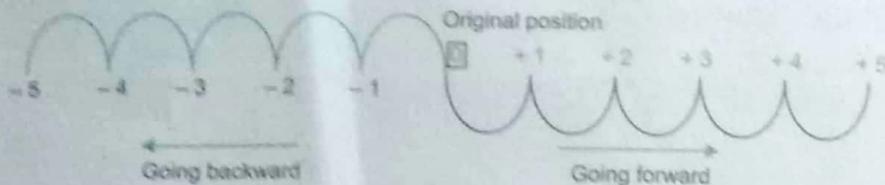
Positive and Negative Integers

Natural numbers $1, 2, 3, \dots$ are called *positive integers* the their opposites : $-1, -2, -3, \dots$ are called the *negative integers*.



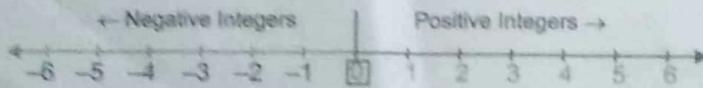
Number zero is neither positive nor negative. Integers are useful in comparing directions in

certain cases. For example, if going five steps forward is considered as $+5$, then going 5 steps backward will be considered as -5 .



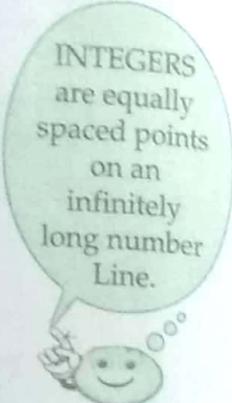
Number Line

The number line is a line marked with integers in increasing order from left to right, that extends in both directions.



For any two positions on the number line, integer on the right is greater than the integer on the left. For example :

$$-4 < -3, 3 < 4, -5 < 2, -1 < 0 \text{ and so on.}$$



Absolute Value

The numerical value of an integer regardless of its sign is called its *absolute value*.



Did you know??

Absolute value of an integer is always positive or Zero.

For example, $|-6| = 6; |6| = 6; |0| = 0.$

Thus $|x| = x$ (if x is +ve or zero) and $-x$ (if x is -ve).

The symbol used for the absolute value is '| |'.

ADDITION OF INTEGERS

Case I : When Signs are SAME

Addition of Integers of the same signs is like adding the two integers and putting the common sign with the sum.

$$17 + 12 = 29, \quad -17 + (-12) = -29$$

Case II : When Signs are DIFFERENT

Adding two integers of different signs is like subtracting the two integers and putting the sign of the bigger integer. The bigger integer is decided by ignoring the signs of both the integers.

Add the following:

Example 1 : (a) $23 + (-8) = 15$ (b) $(-27) + 9$

(Since $23 > 8$ and it has +ve sign)

(b) $(-27) + 9 = -18$

(Since $27 > 9$ and it has -ve sign)

SUBTRACTION OF INTEGERS

For subtracting one integer from the other integer, we convert the integer to be subtracted to its opposite or its negative and add them. For Example,



Example 2 : Subtract the following :

(a) -5 from -7

(b) 12 from -3

Solution : (a) $-7 - (-5) = -7 + (5)$ (Opposite of -5) $= -2$
 (b) $-3 - 12 = -3 + (-12)$ (Opposite of 12) $= -15$

PROPERTIES OF ADDITION OVER INTEGERS

1. Closure Property

If p and q are two integers then $p + q$ is also an integer. This property is called *closure property* of addition over integers.

$p + q$ is always an integer

(a) $-9 + 8 = -1$
 (b) $-3 + (-7) = -10$
 (c) $-12 + 23 = 11$ } all these sums are integers.

Thus, the set of integers is closed under addition.

2. Commutative Property

If p and q are integers then

$p + q = q + p$

(a) $7 + (-12) = -5$ and $-12 + 7 = -5$

Thus $7 + (-12) = -12 + 7$

(b) $-13 + (-2) = -15$ and $-2 + (-13) = -15$

Thus $-13 + (-2) = -2 + (-13)$

This means in whichever order we add the integers, the sum remains the same.

3. Associative Property

If p, q and r are integers then

$(p + q) + r = p + (q + r)$

(a) $(-7 + 3) + (-15) = -4 + (-15) = -19$

$-7 + [3 + (-15)] = -7 + (-12) = -19$

Thus $(-7 + 3) + (-15) = -7 + [3 + (-15)]$

This means grouping or order in addition does not matter.

4. Additive Property of 0

If p is any integer then

$p + 0 = 0 + p = p$

$-5 + 0 = -5$

0 is called the Additive Identity



5. Additive Inverse

If p is any integer, then there exists an integer $(-p)$ such that

$p + (-p) = 0$

$(-p)$ is called the opposite or negative or additive inverse of p .

$5 + (-5) = 0,$

-5 is additive inverse of 5

or 5 is additive inverse of -5

Did you know??

The sum of any integer and its opposite is always equal to zero.



PROPERTIES OF SUBTRACTION

1. Closure Property

If p and q are two integers then

$p - q$ is also an integer

(a) $-17 - (-2) = -17 + 2 = -15$

(b) $-25 - (-30) = -25 + 30 = 5$

The set of integers is closed under subtraction.

2. Commutative Property

(a) $-2 - (-5) = -2 + 5 = 3$

$-5 - (-2) = -5 + 2 = -3$

Thus $-2 - (-5) \neq -5 - (-2)$

If p and q are two integers then

$p - q \neq q - p$

Commutative Property of subtraction does not hold true in integers.

3. Associative Property

(a) $(-12 - 3) - 5 = -15 - 5 = -20$

$-12 - (3 - 5) = -12 - (-2) = -12 + 2 = -10$

Thus $(-12 - 3) - 5 \neq -12 - (3 - 5)$

If p, q and r are three integers, then

$(p - q) - r \neq p - (q - r)$

Associative Property of subtraction does not hold true in integers.

4. Property of Zero

If p is any integer then

$p - 0 = p$

0 is the identity element of subtraction in integers.

Example 3 : Write down a pair of integers whose

(a) sum is -5

(b) difference is -3

(c) difference is 2

(d) sum is 0

Solution :

(a) $(-2) + (-3) = -5$ or $(-7) + 2 = -5$

(b) $(-5) - (-2) = -3$ or $(-1) - 2 = -3$

(c) $(-9) - (-11) = 2$ or $4 - 2 = 2$

(d) $(-4) + 4 = 0$ or $5 + (-5) = 0$

NOTE : There can be more pairs in these examples.

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Example 4 : From the sum of -32 and 91 , subtract -421

Solution : First find the sum of -32 and 91

$$-32 + 91 = 59$$

Now, subtract -421 from 59

$$59 - (-421) = 59 + 421 = 480$$

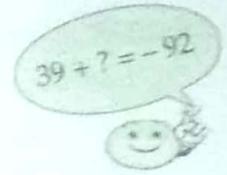
Example 5 : Sum of two integers is -92 . If one integer is 39 , find the other.

Solution : Sum of two integers = -92

One integer = 39

Second integer = $-92 - 39$

$$= -131$$



Example 6 : By suitable groupings, evaluate

(a) $-43 + (-57 + 23)$

(b) $203 + [-72 + (-3)]$

Solution :

(a) $-43 + (-57 + 23)$

$$= [-43 + (-57)] + 23 \quad \text{(Using Associative Property)}$$

$$= -100 + 23$$

$$= -77$$

(b) $203 + [-72 + (-3)]$

$$= 203 + [(-3 + (-72))] \quad \text{(Using Commutative Property)}$$

$$= [(203 + (-3)) + (-72)] \quad \text{(Using Associative Property)}$$

$$= 200 + (-72)$$

$$= 128$$

EXERCISE : 1.1

1. Fill in the blanks to make the statements true :

(a) $-10728 + \underline{\hspace{2cm}} = 237 + (-10728)$

(b) $-17 + (13 + 18) = (-17 + 13) + \underline{\hspace{2cm}}$

(c) $12345 + \underline{\hspace{2cm}} = 12345$

(d) $-9753 + 0 = \underline{\hspace{2cm}}$

(e) $-369 + \underline{\hspace{2cm}} = 0$

2. Write down a pair of integers whose

(a) sum is -4

(b) difference is -7

(c) sum is 5

(d) sum is 0

3. By suitable groupings evaluate the following :

(a) $-17 + (-83 + 127)$

(b) $924 + (7965 + 76)$

(c) $1083 + [6239 + (-83)]$

(d) $(-96 + 529) + (-4)$

4. Sum of two integers is -231 . If one of the integers is -335 , find the other.

5. What should be added to -936 to obtain -543 ?

6. Subtract the sum of -93 and -572 from the difference of -531 and -721

7. Fill in the blanks :

(a) Additive inverse of -85 is

(b) $| -56 | + | -5 | - | -3 | = \text{input}$

(c) $7 - \text{input} = 15$

(d) $- (-8) = 12$

8. Compare the following (using $>$, $<$ or $=$) :

(a) $(-6) + (-4)$ $(-6) - (-4)$

(b) $(-5) + 6 + (-3)$ $12 - 7 + (-2)$

(c) $15 - 21 + 8$ $-15 + 21 + 8$

(d) $24 - (-4) + (-8)$ $-13 - (-5) + 16$



MULTIPLICATION OF INTEGERS

To find the product of two integers of

(i) Same sign

Find the product of the values irrespective of their signs and give a positive sign to their product.

$3 \times 12 = 36$

$(-5) \times (-12) = 60$

$(-13) \times (-2) = 26$

$(-7) \times (-9) = 63$

$(+) \times (+) = (+)$

$(-) \times (-) = (+)$



(ii) Different signs

Find the product of the values irrespective of their signs and give a negative sign to their product.

$3 \times (-12) = -36$

$(-5) \times 12 = -60$

$5 \times (-12) = -60$

$(-3) \times 12 = -36$

$(+) \times (-) = (-)$

$(-) \times (+) = (-)$



Now let us consider some examples.

Example 7 : Evaluate :

(a) $(-27) \times 8$

(b) $7 \times (-13)$

(c) $(-6) \times (-15)$

(d) $0 \times (-3)$

Solution :

(a) $(-27) \times 8 = -(27 \times 8) = -216$

(b) $7 \times (-13) = -(7 \times 13) = -91$

(c) $(-6) \times (-15) = 6 \times 15 = 90$

(d) $0 \times (-3) = 0$

(Since the two integers are of unlike signs)

(Since the two integers are of like signs)

(Since one of the integers is zero)

Example 8 : Evaluate :

(a) $(-3) \times (-2) \times 5$;

(b) $7 \times (-3) \times (-8) \times (-4)$.

Solution :

(a) $(-3) \times (-2) \times 5 = [(-3) \times (-2)] \times 5$
 $= 6 \times 5 = 30$

(b) $7 \times (-3) \times (-8) \times (-4)$
 $= [(7) \times (-3)] \times [(-8) \times (-4)]$
 $= -21 \times 32 = -672$



REMEMBER!!

If there are even number of negative integers in the product, the result is a **POSITIVE INTEGER**.

Odd number of negative numbers in the product results in **NEGATIVE NUMBER**.

PROPERTIES OF MULTIPLICATION OF INTEGERS

1. Closure Property

If p and q are two integers then $p \times q$ is always an integer.

(a) $7 \times 8 = 56$ is an integer

(b) $5 \times (-7) = -35$ is an integer

(c) $(-3) \times (-12) = 36$ is an integer

(d) $0 \times -2 = 0$ is an integer

The set of integers is closed over multiplication.



2. Commutative Property

If p and q are two integers then

$$p \times q = q \times p$$

i.e. in whichever order we multiply the integers the product remains the same.

(a) $(-8) \times 9 = -72, 9 \times (-8) = -72$

Thus $-8 \times 9 = 9 \times (-8)$

(b) $12 \times -7 = -84, (-7) \times 12 = -84$

Thus $12 \times (-7) = (-7) \times 12$

Thus multiplication is commutative over integers.

3. Associative Property

If p, q and r are three integers then

$$p \times (q \times r) = (p \times q) \times r$$

i.e. in whichever way we group the integers, the product remains the same.

(a) $8 \times [(-9 \times -3)] = 8 \times 27 = 216$

$[8 \times (-9)] \times (-3) = -72 \times (-3) = 216$

Thus $8 \times [-9 \times (-3)] = [(8 \times -9)] \times -3$

(b) $-5 \times (-3 \times 8) = -5 \times (-24) = 120$

$[(-5) \times (-3)] \times 8 = 15 \times 8 = 120$

Thus $-5 \times (-3 \times 8) = [(-5) \times (-3)] \times 8$

Thus multiplication is associative over integers.

4. Multiplicative Identity

If p is any integer then

$$p \times 1 = 1 \times p = p$$

$(-8) \times 1 = 1 \times (-8) = -8$

$10 \times 1 = 1 \times 10 = 10$

1 is called the multiplicative identity.



5. Property of Zero

If p is any integer then

$$p \times 0 = 0 \times p = 0$$

$0 \times (-3) = (-3) \times 0 = 0$

$0 \times 5 = 5 \times 0 = 0$

6. Distributive Property of Multiplication over Addition

If p, q and r are three integers

$$p \times (q + r) = p \times q + p \times r$$

(a) $-3 \times (-2 + 6) = -3 \times 4 = -12$

$-3 \times (-2) + (-3) \times 6 = 6 + (-18) = -12$

Thus $-3 \times (-2 + 6) = (-3) \times (-2) + (-3) \times 6$

(b) $7 \times [(-5) + (-2)] = 7 \times (-7) = -49$
 $7 \times (-5) + 7 \times (-2) = -35 + (-14) = -49$
 Thus $7 \times [-5 + (-2)] = 7 \times (-5) + 7 \times (-2)$

7. Multiplicative Inverse

Multiplicative inverse of an integer p such that $p \neq 0$ is $\frac{1}{p}$

Did You Know??



1 and (-1) are the only integers whose Multiplicative Inverse is the number itself!

$$p \times \frac{1}{p} = \frac{1}{p} \times p = 1$$

Multiplicative Inverse is also called RECIPROCAL.



(i) Multiplicative inverse of 5 is $\frac{1}{5}$

(ii) Multiplicative inverse of -8 is $\frac{1}{-8}$ or $\frac{-1}{8}$

Example 9 : Find the following products :

- (a) $(-40) \times 30$ (b) $(-5) \times (-12) \times 8$ (c) $(-6) \times (-15) \times (-3)$

Solution : (a) $(-40) \times 30 = -(40 \times 30) = -1200$

(b) $(-5) \times (-12) \times 8 = +(5 \times 12) \times 8$
 $= 60 \times 8 = 480$

(c) $(-6) \times (-15) \times (-3) = (-6) \times (-15) \times (-3)$
 $= 90 \times (-3) = -270$

Example 10: Simplify using distributive properties

(a) $7 \times (-2) + 7 \times 12$ (b) $(-8) \times (-3) + (-8) \times (-17)$

(c) $-5 \times (40 - 3)$ (d) -6×99

Solution : (a) $7 \times (-2) + 7 \times 12 = 7 \times [(-2) + 12] = 7 \times 10 = 70$

(b) $(-8) \times (-3) + (-8) \times (-17) = (-8) \times [(-3) + (-17)] = (-8) \times (-20) = 160$

(c) $-5 \times (40 - 3) = -5 \times 40 - 5 \times (-3) = -200 + 15 = -185$

(d) $-6 \times 99 = -6 \times (100 - 1) = -6 \times 100 - 6 \times (-1) = -600 + 6 = -594$

Example 11: Use convenient groupings and find the value of

(i) $(-15) \times (-17) \times (-20)$ (ii) $(-3) \times 40 \times (-20)$

(iii) $(-4) \times (-6) \times (-25) \times (-30)$

Solution : (i) $(-15) \times (-17) \times (-20) = [(-15) \times (-20)] \times (-17) = 300 \times -17 = -5100$

(ii) $(-3) \times 40 \times (-20) = -3 \times [40 \times (-20)] = -3 \times (-800) = 2400$

(iii) $(-4) \times (-6) \times (-25) \times (-30) = [(-4) \times (-25)] \times [(-6) \times (-30)]$
 $= 100 \times 180 = 18000$

Example 12: Find the value of

(a) $|(-3) \times (-5) \times (-6)|$

(b) $|(-7) \times 2| \times |-12|$

Solution : (a) $|(-3) \times (-5) \times (-6)|$

(b) $|(-7) \times 2| \times |-12|$

$= |15 \times -6|$

$= |-14| \times |-12|$

$= |-90| = 90$

$= 14 \times 12 = 168$



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Example 13: In a test containing 20 questions, 3 marks are given for every correct answer and (-1) mark is given for every incorrect answer.

- (i) Reena attempts all questions but only 11 of her questions are correct. What is her total score?
 (ii) Manish also attempts all questions but only gets 7 of his answers correct. What is his total score?

Solution :

(i) Marks given for 1 correct answer	= 3
Marks given for 11 correct answers	= $3 \times 11 = 33$
Marks for an incorrect answer	= -1
Number of incorrect answers	= $20 - 11 = 9$
Marks for 9 incorrect answers	= $-1 \times 9 = -9$
Reena's total score	= $33 + (-9) = 24$
(ii) Marks given for 7 correct answers	= $3 \times 7 = 21$
Number of incorrect answers	= $20 - 7 = 13$
Marks given for 13 incorrect answers	= $-1 \times 13 = -13$
Manish's total score	= $21 + (-13) = 8$

EXERCISE : 1.2

1. Multiply the following integers :

(a) 6 by 80

(b) (14) by (-9)

(c) 0 by (-126)

(d) (-25) by 12

(e) (-48) by (-50)

2. Simplify the following :

(a) $(-7) \times (-4) \times (10)$

(b) $(-2) \times (14) \times (-6) \times (-1)$

(c) $(-18) \times (-10) \times (-2) \times 3$

(d) $(21) \times (-5) \times (9890) \times 0$

(e) $(8) \times (-5) \times (-6) \times 4$

(f) $(-12 - 5) \times 100$

(g) $(-5 + 4) \times 48$

3. Verify the following :

(a) $14 \times [6 + (-2)] = [14 \times 6] + [14 \times (-2)]$

(b) $-21 \times [(-3) + (-7)] = [(-21) \times (-3)] + [(-21) \times (-7)]$

4. Multiply 8 by -1 and state whether the product is the additive inverse of 8 or not.

5. Determine the integer whose product with (-1) is

(a) -15

(b) 29

(c) 0

6. Fill in the blank spaces to make the following statements true :

(a) _____ $\times (-35) = (-35) \times 28$

(b) $(-27) \times (-62) = \text{_____} \times (-27)$

(c) $(-82 \times 27) \times \text{_____} = (-82) \times (27 \times 71)$

(d) $[(-72) \times (-51)] \times (-35) = (-72) \times [\text{_____} \times (-35)]$

7. In each of the following, fill in the boxes, to make the statements true :

(a) $15 \times (14 + 32) = 15 \times \text{[]} + \text{[]} \times (32)$

(b) $(-7) \times [(-8) + 2] = \text{[]} \times (-8) + (-7) \times \text{[]}$

(c) $(-12) \times [(-20) + \text{[]}] = (-12) \times \text{[]} + (-12) \times (-5)$

(d) $\text{[]} \times [(-5) + (-3)] = (24) \times (-5) + \text{[]} \times (-3)$

8. Evaluate the following mentally :

(a) $9 \times (-8)$

(b) $5 + [(-5) \times (-5)]$

(c) $(-8) \times (-8)$

(d) $6 \times (-7) \times (-1) \times (-1)$

(e) $0 \times (-20 + 9)$

9. Using convenient grouping, evaluate :

(a) $(-6) \times (-13) \times (-50)$

(b) $(-2) \times (-16) \times (-50)$

(c) $(-4) \times 63 \times 25 \times (-3)$

(d) $(-4) \times 53 \times 50$

10. Simplify using distributive property :

(a) $(-9) \times 42 + (-9) \times 8$

(b) $(-13) \times 23 + (-13) \times (-3)$

(c) $13 \times (-63) + (-3) \times (-63)$

(d) $49 \times (-43) + 49 \times (-7)$

(e) $(99) \times (-28) + (-28)$

(f) $(-92) \times 18 + (-8) \times 18$

(g) -12×98

(h) -17×104

(i) $-9 \times (60 - 3)$

(j) $-11 \times (30 + 2)$

(k) -24×99

11. In a test containing 25 questions, 4 marks are given for every correct answer, -2 marks for every incorrect answer and 0 for questions which were not attempted.

(i) Aman gets 7 correct and 5 incorrect answers. What is his score?

(ii) Heena gets 8 correct answers and did not attempt 7 questions. What is her total score?

(iii) Raju gets 6 incorrect questions and did not attempt 4 questions. What is his total score?



DIVISION OF INTEGERS

To find the quotient of two integers of

(i) Same sign

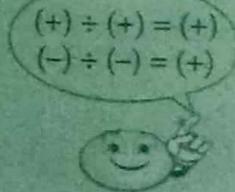
Divide the absolute values of the two integers and write the positive sign with the quotient.

$(-10) \div (-2) = 5$

$21 \div 7 = 3$

$(-30) \div (-6) = 5$

$30 \div 6 = 5$



(ii) Different signs

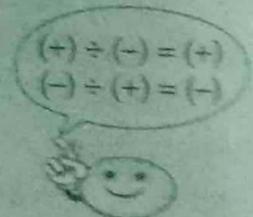
Divide the absolute values of the two integers and write the negative sign with the quotient.

$(-10) \div 2 = -5$

$10 \div (-2) = -5$

$(-30) \div 5 = -6$

$30 \div (-5) = -6$



Example 14: Evaluate :

(a) $125 \div 25$

(b) $48 \div (-12)$

(c) $(-150) \div (-15)$

(d) $(-26) \div 13$

Solution :

(a) $125 \div 25 = 5$

(b) $48 \div (-12) = -(48 \div 12) = -4$

(c) $(-150) \div (-15) = +(150 \div 15) = 10$

(d) $(-26) \div 13 = -(26 \div 13) = -2$

(Integers have like signs)

(Integers have unlike signs)

(Integers have like signs)

(Integers have unlike signs)

PROPERTIES OF DIVISION OF INTEGERS

1. Closure Property

If p and q are two integers then

$p \div q$ is not necessarily an integer

$-6 \div 2 = -3$ is an integer

But $-15 \div 2 = \frac{-15}{2}$ is not an integer

Thus, Closure Property of Division does not hold good in integers.

2. Commutative Property

If p and q are two integers then

$$p \div q \neq q \div p$$

(i) $(-16) \div (-4) = 4$, $(-4) \div (-16) = \frac{-4}{-16} = \frac{4}{16} = \frac{1}{4}$

Thus $(-16) \div (-4) \neq (-4) \div (-16)$

(ii) $-20 \div 5 = -4$, $5 \div (-20) = \frac{5}{-20} = \frac{-5}{20} = \frac{-1}{4}$

Thus $(-20) \div 5 \neq 5 \div (-20)$

Thus, Commutative Property of division does not hold true in integers.

3. Associative Property

If p , q and r are two integers then

$$p \div (q \div r) \neq (p \div q) \div r$$

(i) $-18 \div (-6 \div 3) = -18 \div (-2) = 9$
 $[-18 \div (-6)] \div 3 = 3 \div 3 = 1$

Thus $-18 \div (-6 \div 3) \neq [-18 \div (-6)] \div 3$

(ii) $-20 \div [10 \div (-5)] = -20 \div (-2) = 10$

$$(-20 \div 10) \div (-5) = -2 \div (-5) = \frac{2}{5}$$

Thus $-20 \div [10 \div (-5)] \neq (-20 \div 10) \div (-5)$

Associative Property of division does not hold true in integers.

4. Property of One

If p is any integer then

$$p \div 1 = p$$

(i) $-7 \div 1 = -7$

(ii) $10 \div 1 = 10$

5. Property of Zero

If p is any integer then

$$0 \div p = 0$$

$p \div 0$ is not defined.

$$0 \div (-2) = 0$$

$$0 \div (-10) = 0$$

$(-2) \div 0$ is not defined

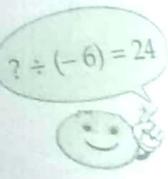
$(-10) \div 0$ is not defined

Division by 'zero' is not defined.



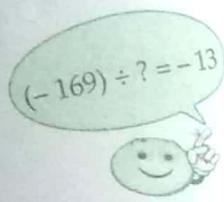
Example 15: What should be divided by -6 to obtain 24?

Solution : Quotient = 24, Divisor = -6
 According to the question,
 Integer $\div (-6) = 24$
 Integer = $24 \times (-6) = -144$
 The required number is -144



Example 16: By what number should -169 be divided to obtain -13?

Solution : Quotient = -13, Dividend = -169
 According to the question,
 $-169 \div \text{Integer} = -13$
 Integer = $-169 \div (-13) = 13$
 The required number is 13



Example 17: Fill in the blanks :

- (i) $\square \div (-4) = 14$ (ii) $35 \div \square = (-5)$ (iii) $-240 \div \square = (-12)$

Solution :

(i) $\square \div (-4) = 14$ (ii) $35 \div \square = (-5)$
 $\square = 14 \times (-4)$ $35 \div (-5) = \square$
 $\square = -56$ or $\square = -7$

(iii) $-240 \div \square = (-12)$
 $-240 \div (-12) = \square$
 $20 = \square$

EXERCISE : 1.3

1. Evaluate :

(a) $(-84) \div (-2)$	(b) $(714) \div (-7)$	(c) $(-192) \div (-3)$	(d) $(-270) \div (-9)$
(e) $(-13) \div 0$	(f) $0 \div (225)$	(g) $(-125) \div (-25)$	(h) $1728 \div (-12)$
2. Write each of the following in simplest form :

(a) $\frac{-126}{-3}$	(b) $\frac{-195}{-15}$	(c) $\frac{-288}{32}$	(d) $-12 \div [(-1) + 3]$
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3. Fill in the blanks :

(a) $\underline{\hspace{2cm}} \div (-6) = -12$	(b) $\underline{\hspace{2cm}} \div (-9) = 63$	(c) $\underline{\hspace{2cm}} \div (-24) = 0$
(d) $-603 \div \underline{\hspace{2cm}} = 67$	(e) $543210 \div \underline{\hspace{2cm}} = 543210$	
4. Divide :

(a) - 84 by 12	(b) 1088 by -64	(c) -1628 by -4
----------------	-----------------	-----------------
5. If the quotient obtained on dividing an integer by -7 be -9, find the integer.
6. What should be divided by -12 to obtain -15?
7. By what number should -135 be divided to obtain 9?
8. By what number should - 192 be divided to obtain - 24?

WORD PROBLEMS

The purpose of learning different types of numbers and their computation is to apply the knowledge thus gained in dealing with our day to day problems.

After having learnt integers and their properties, let us now solve some word problems by applying the properties already learnt.

Example 18: The entries in the pass book of Anita indicate :

Balance as on 1.4.2006 = ₹ 7500

Amount deposited on 10.4.2006 = ₹ 2500

Amount withdrawn on 28.4.2006 = ₹ 6000

Find her balance in the account after last transaction.

Solution : We know that depositing a sum is positive and withdrawal is negative. Then given information can be written as :

Balance on 1.4.2006 = ₹ 7500

Amount deposited on 10.4.2006 = ₹ 2500

Amount withdrawn on 28.4.2006 = ₹ 6000

∴ Remaining balance = ₹ (7500 + 2500 - 6000)

= ₹ (10000 - 6000) = ₹ 4000

Example 19: A shopkeeper earns a profit of ₹ 1 by selling a pen and incurred a loss of 30 paise per pencil by selling the pencils of old stock.

(i) He incurs a loss of ₹ 9 in a month on selling 30 pens. How many pencils did he sell in this period?

(ii) In the next month, on selling 15 pens, he earns neither a profit nor a loss. How many pencils did he sell?

Solution :

(i) Profit earned by selling 1 pen = ₹ 1

Profit earned by selling 30 pens = ₹ 30 (or + ₹ 30)

Total loss = ₹ 9 (or - ₹ 9)

Profit earned + Loss incurred = Total loss

∴ + ₹ 30 + Loss incurred = - ₹ 9

Loss incurred = - ₹ 9 - ₹ 30 = - ₹ 39 = -3900 paise

Loss on a pencil = -30 paise

Number of pencils = Loss incurred ÷ Loss on a pencil

= -3900 ÷ -30

= 130 pencils

(ii) Profit earned by selling 15 pens = ₹ 15 (or + ₹ 15) (or + 1500 paise)

Profit or Loss = ₹ 0.

Thus profit earned + Loss incurred = 0

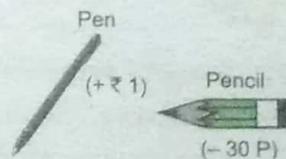
1500 paise + loss = 0

Loss = -1500 paise

Loss on a pencil = -30 paise

Number of pencils = (-1500) ÷ (-30)

= 50



Example 20: The product of two integers is -144 . One of the integers is 9 . Find the other integer

Solution : Product of two integers = -144

One integer = 9

\therefore Other integer = $(-144) \div 9 = -(144 \div 9) = -16$

$9 \times ? = -144$



EXERCISE : 1.4

1. The entries in the pass book of Kunal are as under :

Balance as on 1.3.2006 = ₹ 15000

Amount deposited on 4.3.2006 = ₹ 3000

Amount withdrawn on 20.3.2006 = ₹ 2500

Find his balance in the account after the last transaction.

2. A plane is flying at the height of 2000 m above the sea level. A submarine is floating exactly below it at 1500 m below the sea level. What is the vertical distance between them?
3. The product of two integers is 234 . One of the integers is -9 . Find the other integer.
4. The product of two integers is -504 . If one of the integers is -8 , find the other integer.
5. A shopkeeper earns a profit of ₹ 3 per pen sold and a loss of ₹ 1 per pencil sold.
 - (a) The shopkeeper sells 52 pens and 23 pencils in a day. What is his profit or loss?
 - (b) What is the number of pens he must sell so as to have neither profit nor loss if the number of pencils sold are 102 ?



TO SUM UP

1. Integers are collection of numbers formed by whole numbers and their negatives.
2. Properties of Addition and subtraction of integers :
 - (a) Closure property of addition holds good over integers.
 - (b) Addition over integers is commutative.
 - (c) Addition over integers is associative.
 - (d) Zero is the additive identity of integers.
 - (e) Closure property of subtraction holds good over integers.
 - (f) Subtraction of integers is not commutative.
 - (g) Subtraction of integers is not associative.
 - (h) Zero is the identity element of subtraction in integers.
3. When two integers of like signs are multiplied then the product is a positive integer.
4. When two integers of unlike signs are multiplied then the product is a negative integer.
5. The absolute value of the product of two or more integers is equal to the product of their absolute values.
6. When more than two integers are multiplied then the product is :
 - (a) a positive integer, if the number of integers with minus sign is even and
 - (b) negative if the number of integers with minus sign is odd.

7. Properties of Multiplications of integers :

(a) Closure property of multiplication holds good over integers.

(b) Multiplication over integers is commutative.

(c) Multiplication is associative over integers.

(d) In integers, multiplication distributes over addition.

(e) If an integer is multiplied by 1, then the result is the same number *i.e.*, 1 is the multiplicative identity.

(f) If an integer is multiplied by 0, then the product is always 0.

8. The quotient of two integers with like signs is positive.

9. The quotient of two integers with unlike signs is negative.

10. Properties of Division of Integers :

(a) Closure property, commutative property and associative property of division do not hold good in integers.

(b) Division by zero is not defined.

(c) If a is an integer then $a \div 1 = a$ whereas $1 \div a$ is not always an integer.



Sharpen Your Mind

I. Multiple Choice Questions

Choose the correct alternative :

- $\underline{\hspace{2cm}} + -53 = -1$
 (a) 53 (b) -53 (c) 1 (d) -1
- When $\underline{\hspace{2cm}}$ is multiplied by -4 , we get 48
 (a) 12 (b) -12 (c) -192 (d) 192
- $0 + -50 = \underline{\hspace{2cm}}$
 (a) -50 (b) 50 (c) 0 (d) not possible.
- What must be subtracted from -9 to get -5 ?
 (a) 4 (b) 14 (c) -4 (d) -14
- By how much does -15 exceed -21 ?
 (a) 6 (b) -6 (c) -16 (d) 16
- $25 \times (-5) \times (-4) \times (-20) = \underline{\hspace{2cm}}$
 (a) 1000 (b) $-10,000$ (c) -1000 (d) $10,000$
- $15 \times 101 - 15 = \underline{\hspace{2cm}}$
 (a) -1500 (b) 101 (c) 150 (d) 1500
- $-16 - (-12) = \underline{\hspace{2cm}}$
 (a) -28 (b) 28 (c) 4 (d) -4
- $(-12) \times (-1) \times (-2) = \underline{\hspace{2cm}}$
 (a) 24 (b) -24 (c) -14 (d) 14
- Negative of a negative integer is
 (a) negative (b) positive (c) 0 (d) none.

II. Fill in the Blanks

- $-107 + \underline{\hspace{2cm}} = 237 + (-107)$
- $-92 + 0 = \underline{\hspace{2cm}}$
- Additive inverse of -85 is $\underline{\hspace{2cm}}$
- $24 - (-4) + (-8) \underline{\hspace{2cm}} -13 - (-5) + 16$ (use $>$, $<$ or $=$)
- $(-82 \times 27) \times \underline{\hspace{2cm}} = (-82) \times (27 \times 71)$
- $-12 \times [(-20) + \underline{\hspace{2cm}}] = -12 \times \underline{\hspace{2cm}} + (-12) \times (-5)$
- $\underline{\hspace{2cm}} + (-6) = (-12)$
- $\underline{\hspace{2cm}} + (-9) = 63$
- $-84 + 12 = \underline{\hspace{2cm}}$
- $35 + \underline{\hspace{2cm}} = -5$

III. True or False

- The product of two integers is always greater than the sum of two integers.
- $(-1) \times (-2) \times (-3) \times \dots \times (-10)$ is a positive integer.
- $0 \times (-3) \times (-2)$ is a positive integer.

4. $q + 0 = 0$ for all integral values of q
5. $0 + p = 0$ for all integral values of p
6. $p \div (q + r) = (p \div q) \div r$ for all integers p, q and r
7. $q + 1 = q$
8. $(-13) \times 5$ is a whole number.
9. 1 is the additive identity of integers.
10. The product of 4 negative integers is negative.

IV. Match the Following

Column A

- (a) $a \div (-a)$
- (b) $a \times (-1)$
- (c) $-a \div (-1)$
- (d) $a \div 0$
- (e) $-3 \times -6 \times 0$

Column B

- (a) $-a$
- (b) 0
- (c) -1
- (d) a
- (e) not defined

Chapter Assessment

M.M. : 30 marks

SECTION A : Short Answer Questions (2 marks)

5 × 2 = 10 marks

1. Evaluate : $(-4) \times (-5) \times (-6) \times (2)$
2. Find the product using suitable property. $(-300) \times 49 + (-300)$
3. Divide : $(-1024) \div 8$
4. Simplify : $-12 \times (-5) - 27 \div 9$
5. Which integer multiplied by -3 gives the product -36 ?

SECTION B : Short Answer Questions (3 marks)

4 × 3 = 12 marks

1. Solve using distributive property -69×103
2. Simplify : $65 \div (-13) + (-72) \div (-8)$
3. The product of two integers is -437 if one integer is 23, find the other.
4. The temperature of a city at 12 noon was 16°C . Every hour it decreases by 3°C . What will be temperature at 5 p.m.?

SECTION C : Long Answer Questions (4 marks)

2 × 4 = 8 marks

1. In a class test of 15 questions 4 marks are given for every correct answer and (-2) marks for every incorrect answer and no marks are given for questions that are not attempted.
 - (i) Daksh attempts all questions but only 10 of his answers are correct. What is his score?
 - (ii) Satvik gets only 4 answers correct. What will be his score, if he did not attempt 8 questions at all?
2. A shopkeeper earns a profit of ₹ 1 by selling a pencil and incurs a loss of 20 paise by selling an eraser.
 - (i) In a given day, he incurs an overall loss of ₹ 10. On this day, he sold 35 pencils. How many erasers were sold on this day?
 - (ii) Next day, he earned a profit of ₹ 25. On this day, he sold 100 erasers. How many pencils did he sell?

