



CHAPTER 2 : OPERATIONS WITH INTEGERS

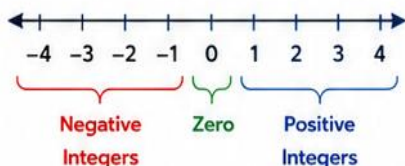


SUMMARY OF CONCEPTS

1. INTEGERS

Integers are the set of positive numbers, negative numbers and zero.

$$\mathbb{Z} = \{ \dots, -3, -2, -1, 0, 1, 2, 3, \dots \}$$



Key Idea

Integers can be represented on a number line.

2. ADDITION & SUBTRACTION OF INTEGERS

- Addition of integers follows the same rules as in Grade 6.
- Subtraction of integer a by integer b is the same as $a + (-b)$.

Using Token Model

● Green token (+1) ● Red token (-1)

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

Use zero pairs (+1 and -1) to add or remove tokens as needed.

3. MULTIPLICATION OF INTEGERS

Multiplied Numbers	Rule
$(+) \times (+) = +$	Same signs $\rightarrow$ Positive
$(-) \times (-) = +$	Same signs $\rightarrow$ Positive
$(+) \times (-) = -$	Different signs $\rightarrow$ Negative
$(-) \times (+) = -$	Different signs $\rightarrow$ Negative

Properties

- Commutative Property : $a \times b = b \times a$
- Associative Property : $a \times (b \times c) = (a \times b) \times c$
- Distributive Property : $a \times (b + c) = (a \times b) + (a \times c)$

4. DIVISION OF INTEGERS

Dividend $\div$ Divisor	Rule
$(+) \div (+) = +$	Same signs $\rightarrow$ Positive
$(-) \div (-) = +$	Same signs $\rightarrow$ Positive
$(+) \div (-) = -$	Different signs $\rightarrow$ Negative
$(-) \div (+) = -$	Different signs $\rightarrow$ Negative

Key Rules

- Division by zero is not defined.
- $a \div b = a \times \left(\frac{1}{b}\right)$, where $b \neq 0$

5. TOKEN MODEL FOR MULTIPLICATION

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

Add positive tokens repeatedly.
 $(3 \times 2 = 6)$



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

Add negative tokens repeatedly.
 $(3 \times (-2) = -6)$



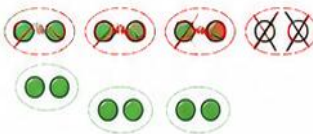
$$(-) \times (+) = -$$

Add negative tokens repeatedly.
 $((-3) \times 2 = -6)$



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

Remove negative tokens (using zero pairs). $((-3) \times (-2) = 6)$



Zero pairs: ● +1 and ● -1 together make 0 (cancel each other).

6. SPECIAL CASES

Multiplication:

$$\begin{aligned} a \times 1 &= a \\ a \times (-1) &= -a \\ (-1) \times (-1) &= 1 \\ a \times 0 &= 0 \end{aligned}$$

Division:

$$\begin{aligned} a \div 1 &= a \\ a \div (-1) &= -a \\ 0 \div a &= 0 \quad (a \neq 0) \end{aligned}$$

Remember

- Keep track of the sign.
- Magnitude is the same as for positive numbers.

7. EXPRESSIONS WITH INTEGERS

- Follow BODMAS rule.
- Multiplication and division are done from left to right.
- Use brackets to show the order clearly.



Example:

$$(-2) \times (3 + (-5)) = (-2) \times (-2) = 4$$

8. APPLICATIONS IN REAL LIFE

Temperature



If temperature drops 5°C per hour from 8°C , after 4 hours:
 $8 + (4 \times (-5)) = -12^\circ\text{C}$

Profit and Loss



Profit = positive
Loss = negative
Total = Profit + Loss

Elevator Movement



Up = positive
Down = negative
Final position =
Start + (Speed $\times$ Time)

9. IMPORTANT TAKEAWAYS

- Integers include positive numbers, negative numbers and zero.
- Addition and subtraction follow the rules using zero pairs.
- Signs in multiplication and division follow fixed rules.
- Multiplication is commutative, associative and distributive.
- Division by zero is not defined.
- Integers are used in many real-life situations like temperature, money, elevators, games and more.

QUICK REFERENCE



MULTIPLICATION RULE

$$\begin{aligned} (+) \times (+) &= + \\ (-) \times (-) &= + \\ (+) \times (-) &= - \\ (-) \times (+) &= - \end{aligned}$$

DIVISION RULE

$$\begin{aligned} (+) \div (+) &= + \\ (-) \div (-) &= + \\ (+) \div (-) &= - \\ (-) \div (+) &= - \end{aligned}$$

DISTRIBUTIVE LAW

$$\begin{aligned} a \times (b + c) \\ &= a \times b + a \times c \end{aligned}$$

ASSOCIATIVE LAW

$$\begin{aligned} a \times (b \times c) \\ &= (a \times b) \times c \end{aligned}$$

COMMUTATIVE LAW

$$a \times b = b \times a$$

ZERO PAIR

+1 and -1 make 0.



Key to Success: Understand $\rightarrow$ Practice $\rightarrow$ Observe Patterns $\rightarrow$ Apply in Real Life



OPERATION WITH INTEGERS

WORKSHEET-1

Section A: MCQs(Part-1) ($10 \times 1 = 10$ marks)

1. Which of the following is the greatest integer?
(a) -2 (b) -7 (c) 0 (d) -1
2. On a number line, the integer -4 is located:
(a) 4 units to the right of 0 (b) 4 units to the left of 0 (c) between 0 and 4 (d) at 4
3. A coin starts at -3 on a number line. Its first movement is $+11$ units. If the final position of the coin is $+5$ then the second movement is _____.
(a) -19 (b) $+3$ (c) $+19$ (d) None of these.
4. How many pairs of opposite integers are there between -4 and 5 ?
(a) 4 (b) 5 (c) 3 (d) None of these
5. The temperature at 5 PM was 5°C . If the drop in temperature takes place by 2°C every hour. At What time the temperature is dropped by 16°C ?
(a) 12 PM (b) 1 AM (c) 11 AM (d) 1 PM
6. The weather report suggested that your city's temperature increased from -10°C to 20°C . What is the rise in temperature?
(a) 20°C (b) -20°C (c) -30°C (d) 30°C
7. The sum of two integers is zero only when:
(a) Both are positive (b) Both are negative
(c) Two integers with same magnitude and opposite sign (d) Both are non - zero
8. How many integers are their between -2 and 6 .
(a) 7 (b) 8 (c) 9 (d) 10
9. Which rule is used in $(-5)(18 + (-6)) = (-5 \times 18) + (-5 \times -6)$?
(a) Commutative property (b) Associative property
(c) Distributive property (d) Identity property
10. Which of the following gives a positive value.
(a) $4 \times (-3)$ (b) $(-6) \times 3$ (c) $(-5) \times 0$ (d) $(-9) \times (-10)$

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. State True or False.

(a) When a fixed positive integer is multiplied by consecutive negative integers, the product increases by a constant amount.

(b) If a negative integer is subtracted from a positive integer, then we move to the right side on the number line.

2. Find $(+7) - (+18)$ using token model.

3. If $47 - 56 + 14 - 8 + 2 - 8 + 5 = -4$, then find the value of $\frac{47 - 56 + 14 - 8 + 2 - 8 + 5}{-47 + 56 - 14 + 8 - 2 + 8 - 5}$ without calculating the full expression.

4. Find the values of the expression: $(-5) \times (18 + (-3))$.

5. Write a positive and a negative integer whose Sum is - 5 and difference is 7.

6. An exam has +4 marks for each correct answer and -2 mark for each wrong answer. If Riya answered 25 questions correctly and 15 wrongly then find her total marks.

7. Mt. Everest, the highest peak in Asia, is 29,028 feet above sea level. The Dead Sea is 1,312 feet below sea level. What is the level difference between these two places?

8. Andrew has deposited ₹ 5500 and has withdrawn ₹ 4800 two times consecutively. Find the amount in his account.

9. Find the sum of all integers from - 149 to 150 without performing any actual calculations.

10. Represent the following integers on a number line: -5 , -2 , 0 , 3 .

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. The temperature recorded in a city on Monday is 50°C . If the temperature increases by 10°C on Tuesday and falls by 11°C on Wednesday. Find the temperature recorded on Wednesday. Did the temperature on Wednesday fall/ rise from Monday and by how much. Show your answer.

12. If a submarine is at -240 m and every hour it rises by 40 m, then what will be its new position after 4 hour. If it doesn't reach the sea level, then how much more time it required to reach the sea level.

13. Arrange the following integers in ascending order: $-12, 7, -3, 0, -8, 5$. Find the sum of all these integers

14. Evaluate: $(9) \times (-77) + (-9) \times 23$.

15. Fill in the blanks using the rule of signs:

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

(b) $(-48) \div (\underline{\hspace{2cm}}) = 8$

(c) $\underline{\hspace{2cm}} \times (-7) = 63$

16. A class of 30 students participated in a quiz. For every correct answer $+3$ marks are awarded and for every wrong answer -1 mark is given. Rahul got 15 correct and 5 wrong answers. Priya got 12 correct and 8 wrong answers. Who scored more and by how many marks?

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. Arrange the expressions given below in increasing order.

(a) $(-348) + (-1064)$

(b) $348 - (-1064)$

(c) $348 \times (-1064)$

(d) $(-348) - (-1064)$

(e) $(-348) \times (-1064)$

(f) 348×964

18. On Monday, the temperature in Shimla was -3°C . Each day for the next 5 days, the temperature dropped by 2°C . What was the temperature on Saturday? Also represent the daily temperatures on a number line.

19. A shopkeeper earns a profit of ₹5 by selling one pen and incurs a loss of ₹2 per eraser. In a particular month, he incurs a total loss of ₹10. If he sold 20 pens, how many erasers did he sell?

20. In a test, $(+4)$ marks are given for every correct answer and (-2) marks are given for every incorrect answer.

(a) Anita answered all the questions in the test. She scored 40 marks even though 15 of her answers were correct. How many of her answers were incorrect? How many questions are in the test?

(b) Anil scored (-10) marks even though he had 5 correct answers. How many of his answers were incorrect? Did he leave any questions unanswered?

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. A Shopkeeper

A shopkeeper records his daily profit/loss (in ₹) for 6 days of a week:

Monday: +₹350, Tuesday: -₹120, Wednesday: +₹280, Thursday: -₹95, Friday: +₹430,
Saturday: -₹175

- (a) Find the total profit or loss for the week.
- (b) Find the average daily profit/loss.
- (c) On which days did he face losses? What is the total loss?

22. Mountain Expedition

A team of mountaineers is climbing Mount Everest. The base camp is at 5,364 m above sea level. Camp I is 660 m above base camp. Camp II is 500 m above Camp I. The Dead Zone starts 1,000 m above Camp II. However, after a snowstorm, the team had to descend 820 m from Camp II to set up a rescue camp.

- (i) Taking base camp as 0, represent the positions of Camp I and Camp II as integers.
- (ii) How far is the Dead Zone from the base camp (in integer terms)?
- (iii) Write and evaluate the integer expression for the rescue camp's position relative to base camp.
- (iv) The team climbs back from the rescue camp to reach the peak, which is 3,682 m above Camp II. Write the total journey from base camp to peak as an integer sum.

Self Assessment:

I understood all the concepts

☐ Yes

☐ No

I need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts

☐ Yes

☐ No

He/She need more practice

☐ Yes☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment:

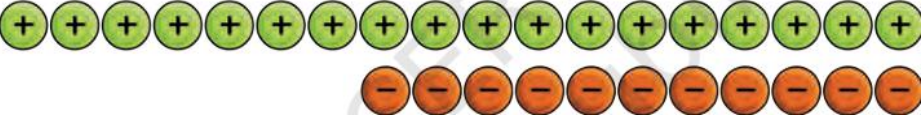
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Answers of Worksheet-1:

Q	1	2	3	4	5	6	7	8	9	10
ANS	d	b	d	c	b	d	c	a	c	d
Q	11	12	13	14	15	16	17	18	19	20
ANS	a	b	b	a	c	a	b	c	b	a

Answers of Worksheet-2:

Q	1	3	4	5	6
ANS	(a) False (b) True	-1	-75	1 and - 6	70
Q	7	8	9	10	11
ANS	30340 feet	- ₹ 4100	0	Representation on number line	49°C 1°C
Q	12	13	14	15	16
ANS	2 hr	-12, -8, -3, 0, 5, 7 -11	-900	(a) - (b) - 6 (c) -9	40 28 12
Q	17	18	19	20	
ANS	(e), (a), (b), (c), (f), (d)	-13°C	55	(a) Number of incorrect answers=10 Total questions in the test = 25 questions. (b) incorrect answers =15 He did not leave any question unanswered.	
Q	21	22			
ANS	+ ₹660, + ₹110 Total loss = - ₹ 390	+ 660 m, + 1160 m + 2160 340 m = 4502 m			

Q No	Answers
12	We have 7 positives and we need 11 more. So we need to put in 11 zero pairs  We can now remove 18 positives.  So, $7 - 18 = -11$.