

MATHEMATICS • CLASS 9

CHAPTER 3

The World of Numbers

NCERT SOLUTIONS



EXERCISE SET 3.1 — EARLY NUMBERS

Q1. LOTHAL TRADE

15 copper ingots for every 2 spice bags.

For 12 bags:

$$12 \div 2 = 6 \text{ groups}$$

$$6 \times 15 = 90 \text{ ingots}$$



Final answer: 90 copper ingots.

Q2. ISHANGO BONE PATTERN

11, 13, 17, 19 are all prime numbers: each has exactly two factors, 1 and itself.

The next three primes after 19 are 23, 29, 31.

11 → 13 → 17 → 19 → 23 → 29 → 31

Final sequence extension: 23, 29, 31.

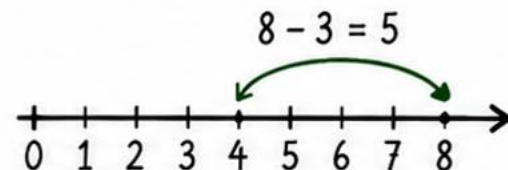
Q3. CLOSURE UNDER SUBTRACTION

Natural numbers are NOT closed under subtraction.

Examples:

$$8 - 3 = 5, \text{ a natural number;}$$

$$3 - 8 = -5, \text{ not a natural number.}$$



Therefore one counterexample is enough to show non-closure.

Final answer: No.

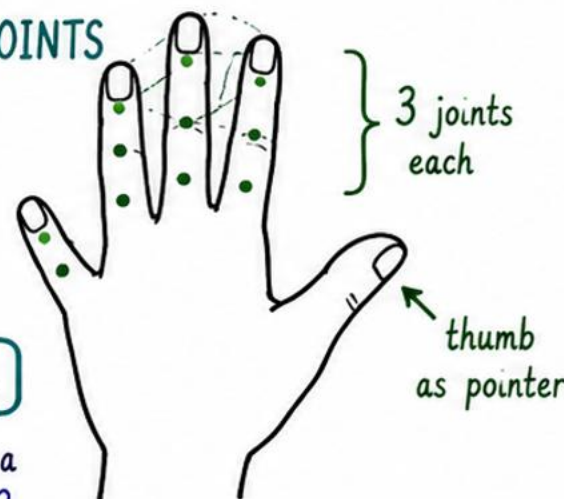
Q4. COUNTING ON FINGER JOINTS

Use the thumb as a pointer and count the 3 joints on each of the other 4 fingers:

$$4 \times 3 = 12$$

Final answer: 12 counts on one hand.

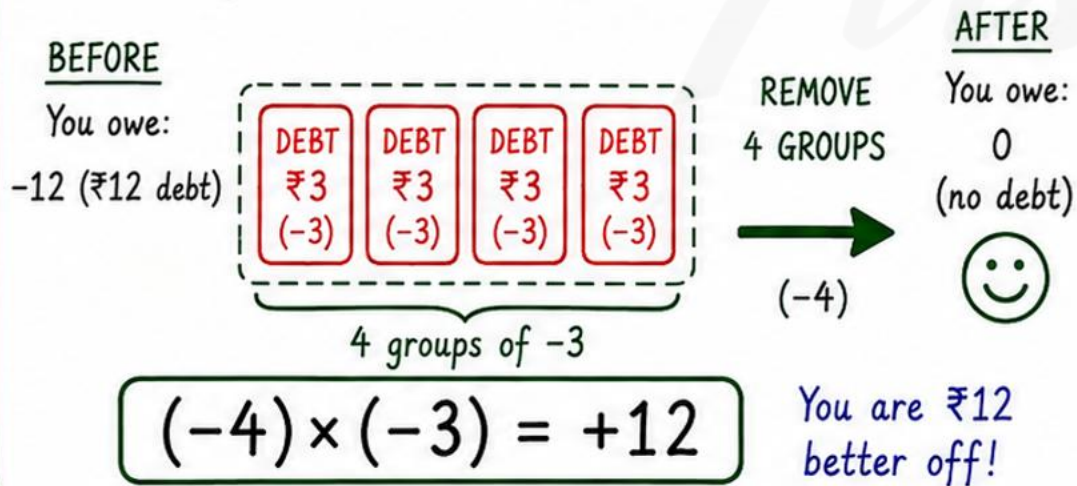
Connection: one full hand-count gives a group of 12, which matches a base-12 counting system.



THINK AND REFLECT – WHY $(-)\times(-)=(+)$

① IDEA 1 – DEBT REMOVAL

- A debt of ₹3 is represented by -3 .
- Four such debts are -12 in total.
- The first minus in -4 means “remove four groups”.
- Removing four debts of ₹3 makes you ₹12 better off.



② IDEA 2 – KEEP THE NUMBER PATTERN

Keep the second factor as -3 . Change the first factor step by step and watch the answers.

$3 \times (-3) = -9$	→ start
$2 \times (-3) = -6$	→ increases by 3
$1 \times (-3) = -3$	→ increases by 3
$0 \times (-3) = 0$	→ increases by 3
$(-1) \times (-3) = +3$	→ increases by 3 again
$(-2) \times (-3) = +6$	→ increases by 3 again

As the first factor decreases by 1 each time, each answer increases by 3.

Therefore, the pattern forces a negative times a negative to be positive.

THE RULE

Same signs



positive product

Different signs



negative product

★ A negative multiplier reverses the direction; reversing a negative gives a positive.

EXERCISE SET 3.2 – INTEGERS

Q1. LADAKH TEMPERATURE

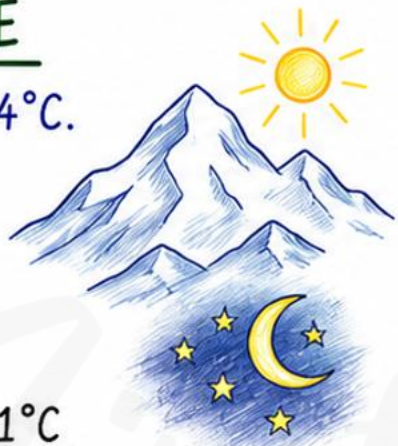
At noon in Ladakh, the temperature is 4°C .
It drops by 15°C by midnight.
What is the temperature at midnight?

Noon temperature = 4°C

Drop in temperature = 15°C

Midnight temperature = $4 - 15 = -11^{\circ}\text{C}$

Final answer: -11°C .



Q2. TRADER'S FINANCES

A trader starts with a loan of ₹850.

He earns a profit of ₹1200.

He then incurs a loss of ₹450.

What is his final financial standing?

Loan (debt) = $-\text{₹}850$

Profit = $+\text{₹}1200$

Loss = $-\text{₹}450$

$$-850 + 1200 - 450 = 350 - 450 = -100$$

Final standing: $-\text{₹}100$, meaning a debt of ₹100.

Q3. CALCULATE

Evaluate the following expressions.

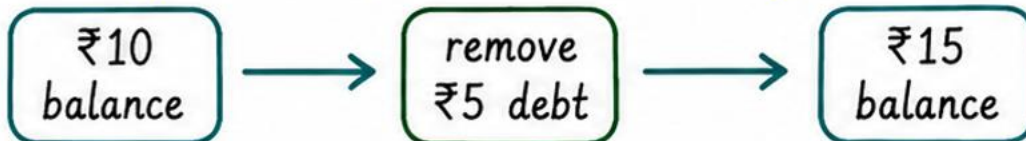
(i)	$(-12) \times 5$	$= -60$
(ii)	$(-8) \times (-7)$	$= +56$
(iii)	$0 - (-14)$	$= 0 + 14 = 14$
(iv)	$(-20) \div 4$	$= -5$

Q4. WHY SUBTRACTING A NEGATIVE ADDS

Suppose your balance is ₹10 and a debt of ₹5 is cancelled.

$$10 - (-5) = 10 + 5 = 15.$$

Removing a debt improves the balance by ₹5.



Final rule: $a - (-b) = a + b$

THINK AND REFLECT — WHY $q \neq 0$

DEFINITION: A rational number has the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

① IDEA 1 — DIVISION MEANS EQUAL GROUPS

- Use $\frac{12}{3} = 4$:

12 objects can be divided into 3 equal groups,
4 in each.



- For $\frac{12}{\cancel{0}}$, we would be asking for 0 groups.
There is no number of objects per group
that can make 12.

② IDEA 2 — CHECK BY MULTIPLICATION

- If $\frac{12}{\cancel{0}} = x$, then division would mean $0 \times x = 12$.
- But $0 \times x = 0$ for every number x , never 12.
- So $\frac{12}{\cancel{0}}$ is undefined.

IMPORTANT COMPARISON:

$\frac{0}{5}$ ✓ = 0 is defined,
because $5 \times 0 = 0$.

$\frac{5}{\cancel{0}}$ is undefined.

$\frac{0}{\cancel{0}}$ is also undefined
because it does not
give one unique value.

★ FINAL ANSWER: q cannot be zero because division by zero is undefined.

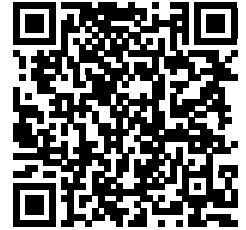


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