Grade 8 Mathematics

CBC NOTES | Terms 1, 2 and 3 - notes for 16 topics

IN EVERY TOPIC

- What you will learn, the key words and key terms explained.
- Clear notes under headings and subheadings, with labelled pictures and step-by-step procedures.
- Comparison tables, and advantages and disadvantages where methods are compared.
- Key points to remember, then multiple-choice and structured questions.
- All the answers and a glossary at the back.

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Strand 1.0 Numbers | Term 1

1.1 Integers

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

- identify integers in different situations
- represent integers on a number line in different situations
- carry out operations of addition and subtraction of integers on the number line in real life situations
- use IT or print resources for learning more on integers and for skills development
- reflect on use of integers in real-life situations

KEY WORDS

integer, positive, negative, zero, number line, opposite.

Temperatures below zero, a loss in business and floors below the ground floor all need numbers less than zero. Integers are the whole numbers and their opposites. In this topic we identify integers in real life, show them on a number line, and add and subtract them.

1. Integers in real life

Integers

The whole numbers and their opposites: ..., -3, -2, -1, 0, 1, 2, 3, ...

Integers in everyday situations

Situation	Integer
A profit of Ksh 50	+50
A loss of Ksh 30	-30
4 steps up	+4
2 floors below ground	-2
5 °C below zero	-5 °C

ZERO

Zero is neither positive nor negative. It is the starting point, such as sea level or ground level.

2. Integers on a number line

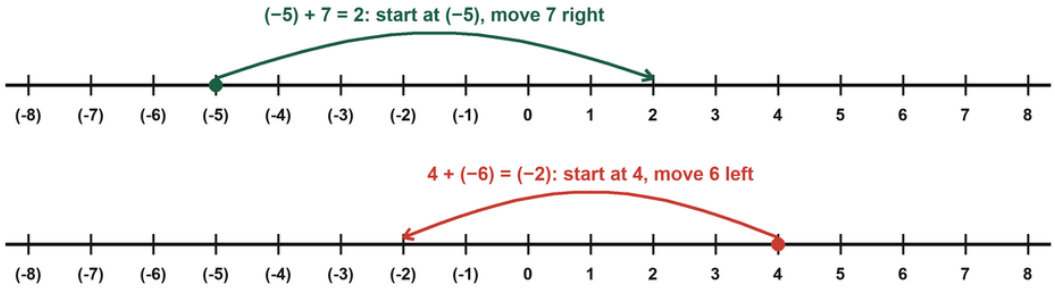
Draw a straight line, mark 0 in the middle and equal spaces on both sides. Positive integers go to the right and negative integers to the left. A number further right is greater: 2 > -5 and -3 > -8.

Ordering integers

Arrange -1, 4, -6, 7, 0 from the smallest.

On the number line, from left to right: -6, -1, 0, 4, 7.

3. Adding integers



Adding integers on the number line

Start at the first number. Adding a positive number moves right; adding a negative number moves left.

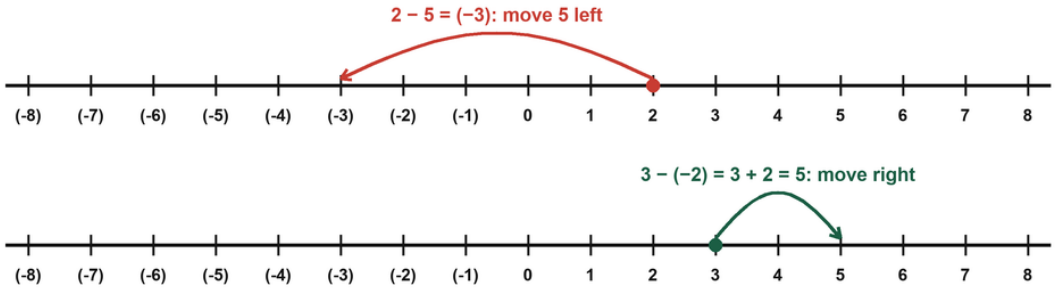
Additions

3 + 4: start at 3, move 4 right: 7.

(-5) + 7: start at -5, move 7 right: 2.

4 + (-6): start at 4, move 6 left: -2.

4. Subtracting integers



Subtracting integers on the number line

Subtractions

2 - 5: start at 2, move 5 left: -3.

(-1) - 4: start at -1, move 4 left: -5.

3 - (-2): subtracting a negative is the opposite move, so 3 + 2 = 5.

REMEMBER

Subtracting a negative number is the same as adding its opposite.

5. Combined operations and real life

With only + and -, work from left to right.

Working left to right

5 - 8 + 4 = (-3) + 4 = 1

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

A trader's week

Profit Ksh 300 on Monday, loss Ksh 450 on Tuesday, profit Ksh 200 on Wednesday.

300 - 450 = -150; then -150 + 200 = 50.

Overall: a profit of Ksh 50.

KEY POINTS TO REMEMBER

- Integers are whole numbers and their opposites; zero is neither positive nor negative.
- On a number line, numbers increase to the right.
- Adding a positive moves right; adding a negative moves left.
- Subtracting a negative is the same as adding its opposite: 3 - (-2) = 5.
- With only + and -, work from left to right.

CHECK YOURSELF: MULTIPLE CHOICE

Choose the correct answer: A, B, C or D. The answers are at the back.

1. Work out (-7) + 10.

A. -17 B. -3

C. 3 D. 17

2. Work out 6 - (-3).

A. 9 B. 3

C. -3 D. -9

3. Which integer is the greatest?

A. -8 B. -3

C. -5 D. -10

4. The temperature was -4 °C at dawn and rose by 9 °C. What was the new temperature?

A. -13 °C B. -5 °C

C. 13 °C D. 5 °C

5. Work out 4 - 9 + 2.

A. 15 B. 3

C. -7 D. -3

ANSWER THESE

1. Arrange in order from the smallest: 3, -7, 0, -2, 5, -4. (2 marks)

2. Work out: (a) (-6) + 11 (b) 2 - 8 (c) (-3) - (-7). (3 marks)

3. A lift starts on floor 2, goes down 5 floors, then up 7 floors. On which floor does it stop? (2 marks)

4. A business made a loss of Ksh 600 in January, a profit of Ksh 1,100 in February and a loss of Ksh 250 in March. Find the overall result. (3 marks)

Strand 1.0 Numbers | Term 1

1.2 Fractions

WHAT YOU WILL LEARN

By the end of this topic you should be able to:

- work out reciprocal of fractions in different situations
- carry out combined operations on fractions in different situations
- promote use of fractions in real-life situations

KEY WORDS

fraction, numerator, denominator, reciprocal, mixed number, order of operations.

Fractions are everywhere: half a kilogram of sugar, three-quarters of a tank, two-thirds of a harvest. In this topic we work out reciprocals of fractions, use them to divide, and carry out combined operations on fractions in the correct order.

1. Reciprocals

Reciprocal

The number that multiplies with a given number to give 1. For a fraction, swap the numerator and denominator.

Finding reciprocals

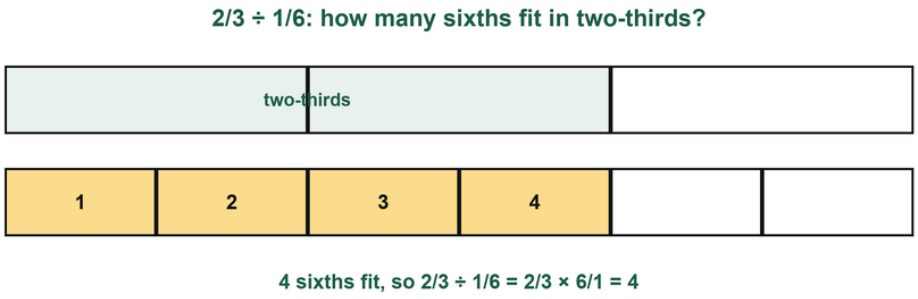
Number	As a fraction	Reciprocal
2/3	2/3	3/2
5	5/1	1/5
2¼	9/4	4/9

CHECK

A number times its reciprocal is always 1: 2/3 × 3/2 = 6/6 = 1.

2. Dividing fractions

To divide by a fraction, multiply by its reciprocal.



How many sixths are in two-thirds?

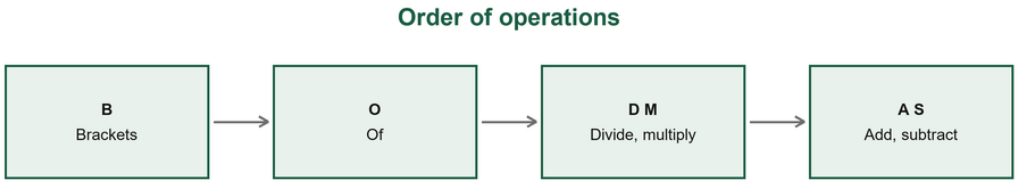
Divisions

3 ÷ ¼ = 3 × 4 = 12 (12 quarter-kilogram packets from 3 kg).

2/3 ÷ 4/5 = 2/3 × 5/4 = 10/12 = 5/6.

1½ ÷ ¾ = 3/2 × 4/3 = 12/6 = 2.

3. Order of operations



The order of operations

Following the order

½ + 1/3 of ¾: "of" first: 1/3 of ¾ = ¼; then ½ + ¼ = ¾.

(2/3 - 1/6) ÷ ¼: brackets first: 4/6 - 1/6 = 3/6 = ½; then ½ ÷ ¼ = 2.

¾ - ½ ÷ 2: division first: ½ ÷ 2 = ¼; then ¾ - ¼ = ½.

(1½ + 2/3) of 6/13: 9/6 + 4/6 = 13/6; then 13/6 × 6/13 = 1.

4. Fractions in real life

Shopping

Rice costs Ksh 160 per kg. Wanjiru buys 2½ kg.

Cost = 160 × 5/2 = Ksh 400.

A harvest

A farmer harvested 36 bags of maize, sold 2/3 and kept ¼ of the rest for seed.

Sold: 2/3 × 36 = 24 bags. Rest: 36 - 24 = 12 bags.

Seed: ¼ × 12 = 3 bags.

5. Common errors

- Turn mixed numbers into improper fractions before multiplying or dividing.
- Take the reciprocal of the second fraction only (the divisor).
- Work out "of" before division, multiplication, addition and subtraction.
- Always simplify the final answer.

KEY POINTS TO REMEMBER

- The reciprocal of a/b is b/a; a number times its reciprocal is 1.
- To divide by a fraction, multiply by its reciprocal.
- Order: Brackets, Of, Division and Multiplication, Addition and Subtraction.
- Change mixed numbers to improper fractions first.
- Simplify the final answer.

CHECK YOURSELF: MULTIPLE CHOICE

Choose the correct answer: A, B, C or D. The answers are at the back.

1. What is the reciprocal of 2 1/3?

A. 3/7 B. 7/3

C. 1/3 D. 3/2

2. Work out 3/5 ÷ 9/10.
A. 27/50 B. 3/2
C. 2/3 D. 1/3

3. Work out ½ + ¼ of 2/3.
A. ½ B. 2/3
C. ¼ D. 1/3

4. How many ¼ kg packets can be filled from 5 kg of sugar?
A. 5 B. 10
C. 15 D. 20

5. Which operation is done FIRST in 2/3 + ½ × 4/5?
A. Either B. Addition
C. Multiplication D. Neither

ANSWER THESE

1. Write the reciprocal of: (a) 4/9 (b) 7 (c) 1 3/5. (3 marks)

2. Work out 2¼ ÷ 1½. (2 marks)

3. Work out (¾ + 1/8) × 2/7. (3 marks)

4. A tank holds 120 litres. 3/8 of the water is used for cooking and 1/3 of the remainder for washing. How many litres are left? (4 marks)

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