Grade 9 Mathematics

Term 1 - 51 complete lesson plans

Ready to teach, in the KICD lesson-plan format | 40-minute lessons | PDF and editable Word

ABOUT THIS PACK

51 complete, ready-to-teach Grade 9 Mathematics lesson plans for Term 1, covering integers, cubes and cube roots, indices and logarithms, compound proportions and rates of work, matrices and equations of a straight line.

TOPICS IN THIS PACK

Topic	Name	Lessons
1.1	Integers	5
1.2	Cubes and cube roots	5
1.3	Indices and logarithms	6
1.4	Compound proportions and rates of work	12
2.1	Matrices	8
2.2	Equations of a Straight Line	15

INSIDE EVERY LESSON PLAN

- The specific learning outcomes, key inquiry question, core competencies, values and PCIs, and the resources needed.
- A timed lesson flow: what the teacher does and what the learners do, from introduction to summary.
- The key content (a worked example, notes or a practical with its expected results), then four practice questions with the answers for the teacher.
- The common mistake to watch for, and ideas for learners who need support and for those ready for more.
- A four-level CBC assessment rubric (EE, ME, AE, BE), homework, and a blank reflection space to fill in after teaching.

A TASTE OF LESSON 1

Adding and subtracting integers

By the end of the lesson, the learner should be able to: a) add and subtract integers using a number line; b) state the rules for adding and subtracting signed numbers

> **Using the number line**
> Start at (-4) and move 7 steps to the right (adding a positive): (-4) + 7 = 3.
> Adding a negative is moving left: 5 + (-9) = (-4). Subtracting a positive is also moving left: (-3) - 5 = (-8).

You also receive this pack as an editable Word file, so you can change any lesson to suit your class before you print it. Lessons follow the order of the KICD curriculum design.

CONTENTS

No.	Lesson	Topic	Page
1	Adding and subtracting integers	1.1 Integers	4
2	Multiplying and dividing integers	1.1 Integers	7
3	Combined operations on integers	1.1 Integers	10
4	Integers in real life	1.1 Integers	13
5	Integer games, IT and review	1.1 Integers	16
6	Cubes by multiplication	1.2 Cubes and cube roots	19
7	Cubes from mathematical tables and calculators	1.2 Cubes and cube roots	22
8	Cube roots by the factor method	1.2 Cubes and cube roots	25
9	Cube roots from tables and calculators	1.2 Cubes and cube roots	28
10	Cubes and cube roots in real life	1.2 Cubes and cube roots	31
11	Index form: base and index	1.3 Indices and logarithms	34
12	Generating the laws of indices: multiplication and division	1.3 Indices and logarithms	37
13	More laws: power of a power, zero and negative indices	1.3 Indices and logarithms	40
14	Applying the laws of indices	1.3 Indices and logarithms	43
15	Powers of 10 and common logarithms	1.3 Indices and logarithms	46
16	Using tables and calculators for logarithms	1.3 Indices and logarithms	49
17	Dividing a quantity into proportional parts	1.4 Compound proportions and rates of work	52
18	Proportional parts as fractions	1.4 Compound proportions and rates of work	55
19	Relating and combining ratios	1.4 Compound proportions and rates of work	58
20	Increasing and decreasing in a given ratio	1.4 Compound proportions and rates of work	61
21	Direct proportion	1.4 Compound proportions and rates of work	64
22	Inverse proportion	1.4 Compound proportions and rates of work	67
23	Compound proportion: the ratio method	1.4 Compound proportions and rates of work	70
24	More compound proportion problems	1.4 Compound proportions and rates of work	73
25	Rates of work: working together	1.4 Compound proportions and rates of work	76
26	Rates of work: pipes and tanks	1.4 Compound proportions and rates of work	79

27	Rates of work: part of a job and sharing payment	1.4 Compound proportions and rates of work	82
28	Proportions and rates of work in real life	1.4 Compound proportions and rates of work	85
29	What a matrix is	2.1 Matrices	88
30	The order of a matrix	2.1 Matrices	91
31	The position of elements	2.1 Matrices	94
32	Compatibility for addition and subtraction	2.1 Matrices	97
33	Adding matrices	2.1 Matrices	100
34	Subtracting matrices	2.1 Matrices	103
35	Matrices for real data: stock and sales	2.1 Matrices	106
36	Matrices in real life	2.1 Matrices	109
37	Gradient as steepness	2.2 Equations of a Straight Line	112
38	Positive, negative, zero and undefined gradients	2.2 Equations of a Straight Line	115
39	Gradient from two points	2.2 Equations of a Straight Line	118
40	Gradient from two points: practice with negative coordinates	2.2 Equations of a Straight Line	121
41	Equation of a line through two points	2.2 Equations of a Straight Line	124
42	Equation through two points: more practice	2.2 Equations of a Straight Line	127
43	Equation from a point and a gradient	2.2 Equations of a Straight Line	130
44	Point and gradient: practice and problems	2.2 Equations of a Straight Line	133
45	Writing equations in the form y = mx + c	2.2 Equations of a Straight Line	136
46	Interpreting y = mx + c	2.2 Equations of a Straight Line	139
47	Interpreting y = mx + c in real situations	2.2 Equations of a Straight Line	142
48	The x- and y-intercepts	2.2 Equations of a Straight Line	145
49	Drawing lines using intercepts	2.2 Equations of a Straight Line	148
50	Straight lines in real life	2.2 Equations of a Straight Line	151
51	Equations of straight lines: review	2.2 Equations of a Straight Line	154

ELIMU254

Adding and subtracting integers

Strand 1.0 Numbers > Sub-strand 1.1 Integers | Lesson 1 of 5 | 40 minutes

SCHOOL	TEACHER	DATE
CLASS / STREAM	TIME	ROLL (B / G)

SPECIFIC LEARNING OUTCOME(S)

By the end of the lesson, the learner should be able to: a) add and subtract integers using a number line; b) state the rules for adding and subtracting signed numbers

KEY INQUIRY QUESTION(S)

- How do we carry out operations of integers in real life situations?
- How do we apply integers in daily activities?

CORE COMPETENCIES, VALUES AND PCIS IN THIS LESSON

COMPETENCY	**Critical thinking and problem solving**	Learners choose a method, check their answers and give reasons for their choices.
COMPETENCY	**Learning to learn**	Learners say what they found easy or hard and decide their next step.
COMPETENCY	**Digital literacy**	Learners use a phone, tablet or the class computer to explore or check the idea.
VALUE	**Respect**	Learners listen while others explain and accept correction politely.
VALUE	**Unity**	Learners share materials fairly and work as one team.
PCI	**Environmental education**	Examples link to caring for the school and home environment.

LEARNING RESOURCES

Number line drawn on the floor or chart (from (-10) to 10) | Number cards with positive and negative integers | A thermometer or a picture of one | Calculator or phone (optional) | Learners' exercise books

ORGANISATION OF LEARNING

Whole class for the introduction and the summary; pairs or groups of four to five for guided practice; individual work for the independent tasks.

KEY WORDS

integer | positive | negative | number line | sign | order of operations | BODMAS

THE LESSON AT A GLANCE

Introduction	Teacher models	Guided practice	On their own	Wrap-up
6 min	9 min	10 min	9 min	6 min

LESSON FLOW

Stage	Minutes	The teacher	The learners
Introduction	6	Greet the class and ask: "The temperature at dawn on a high mountain was (-4) °C. By noon it had risen by 7 degrees. What was the noon temperature?" Take two or three answers, link them to earlier work, then state today's outcome.	Answer the starter question, recall what they already know and read the outcome aloud.
Step 1: Teacher models	9	Work through the worked example on the next page, thinking aloud. Use number line drawn on the floor or chart (from (-10) to 10), number cards with positive and negative integers, a thermometer or a picture of one. Ask learners to predict each step before you show it.	Watch, predict the next step, ask questions and note the key steps in their exercise books.
Step 2: Guided practice	10	Give questions 1 and 2. Move round the groups, ask "How do you know?" and correct errors kindly on the spot.	Work in pairs or small groups, explain each step to a partner and check one another's answers.
Step 3: Independent practice	9	Set questions 3 and 4 for individual work. Mark as you walk round and note who needs help in the next lesson.	Work on their own, then swap books with a partner to check.
Summary and conclusion	6	Ask two or three learners to state the key idea in their own words. Give this exit question and check the answers: "Work out (-3) - (-10)."	Say the key idea in their own words and answer the exit question in the exercise book.

WORKED EXAMPLE

Using the number line

Start at (-4) and move 7 steps to the right (adding a positive): (-4) + 7 = 3.

Adding a negative is moving left: 5 + (-9) = (-4). Subtracting a positive is also moving left: (-3) - 5 = (-8).

Subtracting a negative is the same as adding a positive: 6 - (-2) = 6 + 2 = 8.

PRACTICE QUESTIONS - WITH ANSWERS FOR THE TEACHER

No.	Question	Answer
1	Work out (-7) + 12.	**5**
2	Work out 4 + (-11).	**(-7)**
3	Work out (-6) - 9.	**(-15)**
4	Work out (-3) - (-10).	**7**

WATCH OUT FOR

Learners treat "minus a negative" as a bigger negative: 6 - (-2) becomes 4. Show on the number line that taking away a debt leaves you richer.

ASSESSMENT RUBRIC - THE FOUR CBC LEVELS

Level	What the learner can do
Exceeds expectations (EE)	Can add and subtract integers using a number line confidently and accurately, explain the method used, and apply the idea to new or unfamiliar problems.
Meets expectations (ME)	Can add and subtract integers using a number line accurately in familiar situations; notices and corrects slips without help.
Approaches expectations (AE)	Can partly add and subtract integers using a number line, or does so with prompts from the teacher or a partner; makes some errors.
Below expectations (BE)	Cannot yet add and subtract integers using a number line without direct help; needs the idea taught again with concrete objects.

SUPPORT AND EXTENSION

Learners who need support	Let the learner walk the floor number line, facing right for "+" and turning round for "-".
Learners ready for more	A diver is at (-18) m. She rises 7 m, then dives 12 m. Where is she now? (Answer: (-18) + 7 + (-12) = (-23), so 23 m below the surface)
Inclusion	Seat learners with low vision near the board and read aloud whatever you write; use large, clear, tactile materials; allow extra time; pair with a patient partner; use gestures or Kenyan Sign Language for the key words.

HOMEWORK AND FOLLOW-UP

Redo questions 3 and 4 neatly in the exercise book. Then tell someone at home what you learned about "adding and subtracting integers" and bring one question of your own to ask next lesson.

TEACHER SELF-CHECK

- Did every learner get a turn to handle materials or explain their thinking?
- Did most learners meet the outcome? Write down the names of those who did not.
- Was the pace right — did any step take too long or too short a time?
- Which competency and value did I see learners showing?
- What will I change the next time I teach this lesson?

REFLECTION ON THE LESSON / SELF-REMARKS

Write this after teaching - what worked, what to change, which learners need follow-up.

ELIMU254

Multiplying and dividing integers

Strand 1.0 Numbers > Sub-strand 1.1 Integers | Lesson 2 of 5 | 40 minutes

SCHOOL	TEACHER	DATE
CLASS / STREAM	TIME	ROLL (B / G)

SPECIFIC LEARNING OUTCOME(S)

By the end of the lesson, the learner should be able to: a) multiply and divide integers; b) apply the sign rules: same signs give positive, different signs give negative

KEY INQUIRY QUESTION(S)

- How do we carry out operations of integers in real life situations?
- How do we apply integers in daily activities?

CORE COMPETENCIES, VALUES AND PCIS IN THIS LESSON

COMPETENCY	**Critical thinking and problem solving**	Learners choose a method, check their answers and give reasons for their choices.
COMPETENCY	**Learning to learn**	Learners say what they found easy or hard and decide their next step.
COMPETENCY	**Digital literacy**	Learners use a phone, tablet or the class computer to explore or check the idea.
VALUE	**Respect**	Learners listen while others explain and accept correction politely.
VALUE	**Unity**	Learners share materials fairly and work as one team.
PCI	**Environmental education**	Examples link to caring for the school and home environment.

LEARNING RESOURCES

Number line drawn on the floor or chart (from (-10) to 10) | Number cards with positive and negative integers | A thermometer or a picture of one | Calculator or phone (optional) | Learners' exercise books

ORGANISATION OF LEARNING

Whole class for the introduction and the summary; pairs or groups of four to five for guided practice; individual work for the independent tasks.

KEY WORDS

integer | positive | negative | number line | sign | order of operations | BODMAS

THE LESSON AT A GLANCE

Introduction	Teacher models	Guided practice	On their own	Wrap-up
6 min	9 min	10 min	9 min	6 min

LESSON FLOW

Stage	Minutes	The teacher	The learners
Introduction	6	Greet the class and ask: "If you lose 5 shillings every day for 4 days, how would you write the total change as a multiplication?" Take two or three answers, link them to earlier work, then state today's outcome.	Answer the starter question, recall what they already know and read the outcome aloud.
Step 1: Teacher models	9	Work through the worked example on the next page, thinking aloud. Use number line drawn on the floor or chart (from (-10) to 10), number cards with positive and negative integers, a thermometer or a picture of one. Ask learners to predict each step before you show it.	Watch, predict the next step, ask questions and note the key steps in their exercise books.
Step 2: Guided practice	10	Give questions 1 and 2. Move round the groups, ask "How do you know?" and correct errors kindly on the spot.	Work in pairs or small groups, explain each step to a partner and check one another's answers.
Step 3: Independent practice	9	Set questions 3 and 4 for individual work. Mark as you walk round and note who needs help in the next lesson.	Work on their own, then swap books with a partner to check.
Summary and conclusion	6	Ask two or three learners to state the key idea in their own words. Give this exit question and check the answers: "Work out (-144) ÷ (-12)."	Say the key idea in their own words and answer the exit question in the exercise book.

WORKED EXAMPLE

The sign rules

Different signs give a negative answer: (-6) × 4 = (-24) and (-36) ÷ 9 = (-4).

Same signs give a positive answer: (-8) × (-3) = 24 and (-45) ÷ (-5) = 9.

Work out the numbers first as usual, then decide the sign.

PRACTICE QUESTIONS - WITH ANSWERS FOR THE TEACHER

No.	Question	Answer
1	Work out (-7) × 6.	**(-42)**
2	Work out (-9) × (-8).	**72**
3	Work out 56 ÷ (-7).	**(-8)**
4	Work out (-144) ÷ (-12).	**12**

WATCH OUT FOR

Learners carry the addition rule over ("bigger number wins the sign"). For × and ÷, only whether the signs match matters.