Grade 10 Mathematics

Term 2 - 56 complete lesson plans

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

ABOUT THIS PACK

56 complete, ready-to-teach Grade 10 Mathematics lesson plans for Term 2, covering trigonometry 1, area of polygons, area of a part of a circle and surface area and volume of solids.

TOPICS IN THIS PACK

Topic	Name	Lessons
2.4	Trigonometry 1	15
2.5	Area of Polygons	14
2.6	Area of a Part of a Circle	12
2.7	Surface Area and Volume of Solids	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

Right-angled triangles around us and the names of the sides

By the end of the lesson, the learner should be able to: a) identify right-angled triangles in the environment; b) name the hypotenuse, opposite and adjacent sides for a given angle

> **Sides of a right-angled triangle**
> Trigonometry is the study of the relationships between the sides and angles of triangles. It starts with right-angled triangles, which are found in ladders against walls, roofs, ramps, kite strings, shadows, slopes and bridges.
> In a right-angled triangle the hypotenuse is the longest side, opposite the right angle. For a chosen acute angle A, the opposite side is the one facing the angle and the adjacent side is the one next to the angle that is not the hypotenuse. The names of the opposite and adjacent sides change if you choose the other acute angle.

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	Right-angled triangles around us and the names of the sides	2.4 Trigonometry 1	5
2	The tangent ratio	2.4 Trigonometry 1	8
3	The sine and cosine ratios	2.4 Trigonometry 1	12
4	Trigonometric ratios from tables and calculators	2.4 Trigonometry 1	15
5	Finding an angle from its ratio	2.4 Trigonometry 1	18
6	Finding sides of right-angled triangles	2.4 Trigonometry 1	21
7	Solving right-angled triangles: ladders, roofs and ramps	2.4 Trigonometry 1	24
8	Sines and cosines of complementary angles	2.4 Trigonometry 1	27
9	Relating sine, cosine and tangent	2.4 Trigonometry 1	30
10	The special angle 45°: the isosceles right-angled triangle	2.4 Trigonometry 1	33
11	The special angles 30° and 60°: the equilateral triangle	2.4 Trigonometry 1	36
12	Using the special angles in calculations	2.4 Trigonometry 1	39
13	Angles of elevation and depression	2.4 Trigonometry 1	42
14	Project: making and using a simple clinometer	2.4 Trigonometry 1	46
15	Trigonometry in real life: consolidation	2.4 Trigonometry 1	50
16	Areas of triangles and quadrilaterals: a review	2.5 Area of Polygons	53
17	Deriving the area of a triangle from two sides and the included angle	2.5 Area of Polygons	56
18	Finding the area of a triangle from two sides and the included angle	2.5 Area of Polygons	59
19	Using the area formula to find a missing side or angle	2.5 Area of Polygons	62
20	Heron's formula for the area of a triangle	2.5 Area of Polygons	65
21	Applying Heron's formula: plots of land and heights of triangles	2.5 Area of Polygons	68
22	Areas of parallelograms, rhombuses, kites and trapeziums using trigonometry	2.5 Area of Polygons	71
23	Area of a general quadrilateral: splitting it into triangles	2.5 Area of Polygons	74
24	Area of regular polygons: hexagons and pentagons	2.5 Area of Polygons	77
25	Area of a regular heptagon and octagon	2.5 Area of Polygons	80
26	Area of irregular polygons: dividing into triangles	2.5 Area of Polygons	83
27	Area of irregular polygons: squares, coordinates and the plan of a compound	2.5 Area of Polygons	86
28	Practical: measuring polygons in the environment	2.5 Area of Polygons	89
29	Area of polygons in real life: land, tiling, roofing and cost; review	2.5 Area of Polygons	93

30	The circle and its parts: a review of circumference, area, arc and sector	2.6 Area of a Part of a Circle	96
31	The area of an annulus	2.6 Area of a Part of a Circle	99
32	The area of a sector	2.6 Area of a Part of a Circle	102
33	Sectors: finding the angle, the radius and the arc length from the area	2.6 Area of a Part of a Circle	105
34	Practical: making sectors from paper and comparing areas	2.6 Area of a Part of a Circle	108
35	The area of an annular sector	2.6 Area of a Part of a Circle	112
36	The area of a segment	2.6 Area of a Part of a Circle	115
37	Segments from a chord: finding the angle first	2.6 Area of a Part of a Circle	118
38	The area of the common region between two intersecting circles	2.6 Area of a Part of a Circle	121
39	Applying the area of a part of a circle: irrigation, windows and slices	2.6 Area of a Part of a Circle	124
40	Project: a dartboard and beaded necklaces from annular sectors	2.6 Area of a Part of a Circle	127
41	Area of a part of a circle: consolidation and appreciation	2.6 Area of a Part of a Circle	131
42	Surface area and volume of cuboids, cylinders and prisms: a review	2.7 Surface Area and Volume of Solids	134
43	Surface area of prisms using nets	2.7 Surface Area and Volume of Solids	137
44	Surface area of pyramids	2.7 Surface Area and Volume of Solids	140
45	Surface area of cones	2.7 Surface Area and Volume of Solids	143
46	Surface area of spheres and hemispheres	2.7 Surface Area and Volume of Solids	146
47	Surface area of a frustum	2.7 Surface Area and Volume of Solids	149
48	Surface area of composite solids	2.7 Surface Area and Volume of Solids	152
49	Volume of prisms and cylinders	2.7 Surface Area and Volume of Solids	155
50	Volume of pyramids	2.7 Surface Area and Volume of Solids	158
51	Practical: the volume of a cone as one third of a cylinder	2.7 Surface Area and Volume of Solids	161
52	Volume of cones and spheres	2.7 Surface Area and Volume of Solids	165
53	Volume of a frustum	2.7 Surface Area and Volume of Solids	168
54	Volume of composite solids	2.7 Surface Area and Volume of Solids	171

55	Practical: the volume and capacity of containers in the environment	2.7 Surface Area and Volume of Solids	174
56	Surface area and volume of solids in real life; consolidation	2.7 Surface Area and Volume of Solids	178

Right-angled triangles around us and the names of the sides

Strand 2.0 Measurements and Geometry > Sub-strand 2.4 Trigonometry 1 | Lesson 1 of 15 | 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) identify right-angled triangles in the environment; b) name the hypotenuse, opposite and adjacent sides for a given angle

KEY INQUIRY QUESTION(S)

- What is trigonometry?
- How do we use trigonometry in real-life situations?

CORE COMPETENCIES, VALUES AND PCIS IN THIS LESSON

COMPETENCY	**Creativity and imagination**	Learners make up their own examples, patterns or ways of showing the idea.
COMPETENCY	**Critical thinking and problem solving**	Learners choose a method, check their answers and give reasons for their choices.
COMPETENCY	**Digital literacy**	Learners use a phone, tablet or the class computer to explore or check the idea.
VALUE	**Responsibility**	Learners look after shared materials and finish every task.
VALUE	**Unity**	Learners share materials fairly and work as one team.
PCI	**Environmental education**	Examples link to caring for the school and home environment.
PCI	**Parental engagement and empowerment**	Developed through the activities in this lesson.

LEARNING RESOURCES

Scientific calculators and four-figure tables of natural sines, cosines and tangents | Charts of the trigonometric ratios and of the special-angle triangles | Squared paper, rulers, protractors and compasses | Digital devices with a geometry app such as GeoGebra (where available) | Manila paper and marker pens

ORGANISATION OF LEARNING

Groups of three or four for the measuring outdoors and the clinometer project, with roles for measurer, reader and recorder; pairs for calculator and table work; whole class for introducing each ratio; individual practice.

KEY WORDS

sine | cosine | tangent | hypotenuse | opposite | adjacent | complementary angles | angle of elevation | angle of depression | clinometer

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: "A ladder leans against a wall. What right-angled triangle can you see, and what could you measure on it?" 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 scientific calculators and four-figure tables of natural sines, cosines and tangents, charts of the trigonometric ratios and of the special-angle triangles, squared paper, rulers, protractors and compasses. 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: "Name three objects in your school where a right-angled triangle can be seen."	Say the key idea in their own words and answer the exit question in the exercise book.

WORKED EXAMPLE

Sides of a right-angled triangle

Trigonometry is the study of the relationships between the sides and angles of triangles. It starts with right-angled triangles, which are found in ladders against walls, roofs, ramps, kite strings, shadows, slopes and bridges.

In a right-angled triangle the hypotenuse is the longest side, opposite the right angle. For a chosen acute angle A, the opposite side is the one facing the angle and the adjacent side is the one next to the angle that is not the hypotenuse. The names of the opposite and adjacent sides change if you choose the other acute angle.

Example: in triangle PQR with the right angle at Q, PQ = 3 cm, QR = 4 cm and PR = 5 cm. For angle P: opposite = QR = 4 cm, adjacent = PQ = 3 cm, hypotenuse = PR = 5 cm. For angle R: opposite = PQ = 3 cm and adjacent = QR = 4 cm.

PRACTICE QUESTIONS - WITH ANSWERS FOR THE TEACHER

No.	Question	Answer
1	Name the hypotenuse in a right-angled triangle ABC with the right angle at B.	**AC.**
2	In triangle PQR above, name the side opposite angle R.	**PQ.**
3	In a right-angled triangle, which side is always the longest?	**The hypotenuse.**

4	Name three objects in your school where a right-angled triangle can be seen.	**Answers vary, for example a roof, a ladder against a wall, a ramp or a shadow.**

WATCH OUT FOR

Learners label the sides without saying which angle they are using. The opposite and adjacent sides depend on the angle.

ASSESSMENT RUBRIC - THE FOUR CBC LEVELS

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

SUPPORT AND EXTENSION

Learners who need support	Give triangle cut-outs with a marked angle to turn so that the opposite side faces the angle.
Learners ready for more	Find the third side of a right-angled triangle with hypotenuse 13 cm and one side 5 cm. (Answer: sqrt(169 - 25) = sqrt(144) = 12 cm)
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 "right-angled triangles around us and the names of the sides" 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

The tangent ratio

Strand 2.0 Measurements and Geometry > Sub-strand 2.4 Trigonometry 1 | Lesson 2 of 15 | 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) define the tangent of an acute angle; b) show that the ratio depends only on the angle

KEY INQUIRY QUESTION(S)

- What is trigonometry?
- How do we use trigonometry in real-life situations?

CORE COMPETENCIES, VALUES AND PCIS IN THIS LESSON

COMPETENCY	**Creativity and imagination**	Learners make up their own examples, patterns or ways of showing the idea.
COMPETENCY	**Critical thinking and problem solving**	Learners choose a method, check their answers and give reasons for their choices.
COMPETENCY	**Digital literacy**	Learners use a phone, tablet or the class computer to explore or check the idea.
VALUE	**Responsibility**	Learners look after shared materials and finish every task.
VALUE	**Unity**	Learners share materials fairly and work as one team.
PCI	**Environmental education**	Examples link to caring for the school and home environment.
PCI	**Parental engagement and empowerment**	Developed through the activities in this lesson.

LEARNING RESOURCES

Scientific calculators and four-figure tables of natural sines, cosines and tangents | Charts of the trigonometric ratios and of the special-angle triangles | Squared paper, rulers, protractors and compasses | Digital devices with a geometry app such as GeoGebra (where available) | Manila paper and marker pens

ORGANISATION OF LEARNING

Groups of three or four for the measuring outdoors and the clinometer project, with roles for measurer, reader and recorder; pairs for calculator and table work; whole class for introducing each ratio; individual practice.

KEY WORDS

sine | cosine | tangent | hypotenuse | opposite | adjacent | complementary angles | angle of elevation | angle of depression | clinometer

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