CBC Grade 10 Mathematics Lesson Plan

Area of Squares and Rectangles

Strand	**Measurement and Geometry**
Sub-Strand	Area of Polygons
Specific Learning Outcome	Determine the area of quadrilaterals in different situations, and explore the area of polygons as used in real-life situations
Key Inquiry Questions	How do we work out the area of polygons?
Learning Resources	CBC Grade 10 textbooks, grid/graph paper, rulers, calculators
Lesson Duration	40 minutes

Lesson Structure Overview

Phase	Activity	Duration
Phase 1	Problem-Solving and Discovery (Anchor Activity)	15 minutes
Phase 2	Structured Instruction (Key Takeaways)	10 minutes
Phase 3	Practice and Application (Worked Examples)	15 minutes
Phase 4	Assessment (Exit Ticket)	5 minutes

Phase 1: Problem-Solving and Discovery (15 minutes)

Anchor Activity: Discovering Area Through Counting

Work in groups

Form groups of 2 or 3 students.

Materials: Grid/graph paper and a ruler

Instructions:

Task 1: Exploring Rectangles

- Consider a rectangle on grid paper with dimensions 6 units by 4 units.
- Count the number of unit squares inside the rectangle.
- Verify your answer using multiplication.

Task 2: Exploring Squares

- Now consider a square on grid paper with dimensions 5 units by 5 units.

- Count the number of unit squares inside the square.
- Verify your answer using multiplication.

Task 3: Pattern Recognition

- What relationship do you observe between the side lengths and the number of square units?
- Discuss your findings with your group members.

Teacher Guidance for Anchor Activity

This anchor activity activates prior knowledge of counting and multiplication while introducing the concept of area as the amount of surface covered by a shape. Students discover the relationship between dimensions and area through hands-on exploration.

Facilitation Strategy:

- • Ensure each group has grid paper with pre-drawn rectangles and squares
- • Circulate among groups to observe counting strategies
- • Ask probing questions: "How many rows do you see?" "How many squares in each row?"
- • Guide students to see that multiplication is faster than counting
- • Encourage students to articulate the pattern they observe
- • Use student discoveries as a bridge to formal area formulas

Phase 2: Structured Instruction (10 minutes)

Key Takeaways

After students have explored through the anchor activity, formalize their discoveries with these key concepts:

1. Definition of Area

The area of a two-dimensional shape is the amount of surface it covers, measured in square units (e.g., cm^2, m^2).

2. Properties of Rectangles and Squares

- Rectangle: A quadrilateral with all right angles and opposite sides parallel and equal.
- Square: A special rectangle where all four sides are equal.

3. Area Formula for Rectangles

The area of a rectangle is found by multiplying its length and width:

Area of rectangle = length × width

This formula works because when we arrange unit squares in rows and columns, the total number equals the number of rows (length) times the number of columns (width).

4. Area Formula for Squares

A square is a special rectangle where all sides are equal, so:

Area of square = side × side = side^2

For example, a square with side 5 cm has area 5 × 5 = 25 cm^2.

5. Key Understanding

In both cases, the area represents the number of square units that fit inside the shape. The formulas provide a quick way to calculate area without counting individual squares.

Scaffolding Strategies

Address common misconceptions revealed during the anchor activity:

- • If students confuse perimeter with area, emphasize that area measures "inside" while perimeter measures "around"
- • Use visual representations with grid paper to show how multiplication counts all squares
- • Clarify the difference between linear units (cm, m) and square units (cm^2, m^2)
- • Demonstrate that a square is a special type of rectangle
- • Connect to real-world contexts: floor tiles, garden plots, classroom size

Phase 3: Practice and Application (15 minutes)

Worked Examples

Example 1: Finding Area of Simple Shapes

Find the area of the following:

(a) A square with side 9 cm

Solution:

Area of square = side × side

Area = 9 × 9 = 81 cm^2

(b) A rectangle with length 12 m and width 7 m

Solution:

Area of rectangle = length × width

Area = 12 × 7 = 84 m^2

Example 2: Real-World Application (Rectangular Field)

A rectangular field has length 120 m and width 75 m. Find the area in m^2.

Solution:

Area of rectangle = length × width

Area = 120 × 75

Area = 9,000 m^2

The field covers 9,000 square meters.

Example 3: Working Backwards (Finding Side Length)

The area of a square is 196 m^2. Find the length of its side.

Solution:

Area of square = $side^2$

196 = $side^2$

side = $\sqrt{196}$ = 14 m

The side length is 14 m.

Example 4: Finding Missing Dimension

The area of a rectangle is 150 cm^2 and its width is 10 cm. Find the length.

Solution:

Area of rectangle = length × width

150 = length × 10

length = 150 ÷ 10 = 15 cm

The length is 15 cm.

Individual Practice (Students work independently)

Provide students with similar problems to solve:

1. 1. Find the area of a square with side 8 cm
2. 2. Find the area of a rectangle with length 15 m and width 9 m
3. 3. A square garden has area 144 m^2. Find the length of one side
4. 4. A rectangle has area 200 cm^2 and width 8 cm. Find the length

Phase 4: Assessment - Exit Ticket (5 minutes)

Students complete individually to demonstrate understanding:

Question 1: Find the area of a square with side 15 cm.

Question 2: Find the area of a rectangle with length 8 m and width 5 m.

Question 3: A rectangular field has length 120 m and width 75 m. Find the area in m^2.

Question 4: The area of a square is 196 m^2. Find the length of its side.

Question 5: The area of a rectangle is 150 cm^2 and its width is 10 cm. Find the length.

Question 6: Which has a greater area:

- (a) A square with side 14 cm, or
- (b) A rectangle with length 18 cm and width 10 cm?
- Show your working.

Exit Ticket Answer Key

Question 1: 225 cm^2

Question 2: 40 m^2

Question 3: 9,000 m^2

Question 4: 14 m

Question 5: 15 cm

Question 6: Square = 196 cm^2, Rectangle = 180 cm^2. The square has greater area.

Differentiation Strategies

For Struggling Learners:

- • Provide grid paper with shapes already drawn for counting practice
- • Use manipulatives (square tiles) to physically build rectangles and squares
- • Create a reference card with formulas and examples
- • Allow use of calculators for multiplication
- • Start with smaller numbers before progressing to larger dimensions
- • Pair with stronger students for peer support

For Advanced Learners:

- • Introduce algebraic expressions for dimensions (e.g., length = 2x, width = x)
- • Challenge with composite shapes (L-shapes made from rectangles)
- • Explore how area changes when dimensions are doubled or tripled
- • Solve optimization problems (maximum area for given perimeter)
- • Connect to real-world planning (designing a garden, tiling a floor)
- • Introduce square roots for working backwards from area

Extension Activity

Real-World Project: Classroom Floor Planning

Objective: Apply area concepts to a practical design challenge.

Activity Description:

5. 1. Measure the classroom floor dimensions (or use provided measurements).
6. 2. Calculate the total floor area in square meters.
7. 3. Design a new classroom layout with different zones (reading area, group work area, teacher area).
8. 4. Calculate the area of each zone ensuring all zones fit within the total floor area.
9. 5. If floor tiles are 1 m^2 each, calculate how many tiles are needed for the entire floor.
10. 6. Present your design with calculations to the class.

Garden Design Challenge

Students design a rectangular garden with specific requirements:

- • Total area must be 48 m^2
- • Find at least 3 different length-width combinations that give this area
- • Draw each design on grid paper
- • Discuss which design would be most practical and why
- • Calculate the perimeter of each design and compare

Post-Lesson Reflection for Teachers

- • Did students successfully discover the area formula through counting and multiplication?
- • Were students able to distinguish between area and perimeter?
- • What misconceptions emerged during the lesson?
- • How well did students apply formulas to solve real-world problems?
- • Did students understand when to work backwards from area to find dimensions?
- • What adjustments are needed for future lessons on this topic?