

Chapter 11 Polygons and Interior Angle Sums

Worksheet C Mixed Practice and Application

Name: _____ Grade: _____ Date: _____

1. Explain Before You Calculate

A student says:

“A decagon has 10 sides, so its interior angle sum is $10 \times 180^\circ$.”

a. Explain the mistake.

b. Find the correct interior angle sum.

2. Regular or Irregular?

A pentagon has interior angle sum 540° .

A student says each angle must be 108° .

Is the student always correct?

Explain.

3. Missing Angle in a Sign

A sign is shaped like an irregular pentagon.

Four angles are:

85° , 120° , 110° , 95°

Find the fifth angle.

4. Exterior Angle Reasoning

A regular polygon has one exterior angle of 45° .

a. How many sides does the polygon have?

b. What is the name of the polygon?

c. Find one interior angle.

5. Trap Check

A student says the exterior angles of a polygon add to 180° because they are outside a straight line.

Explain the mistake.

6. Compare Two Polygons

A regular hexagon and an irregular hexagon both have 6 sides.

a. Do they have the same interior angle sum?

b. Do they have to have the same individual angle measures?

c. Explain.

Cumulative Recalculation Review

Purpose

This is a diagnostic review, not a score-only test. Read the question, name the measurement or relationship, choose the method, show the work, and check the unit. When errors cluster, use NOTICE → INTERPRET → CONFIRM → REPAIR → RECHECK → TRANSFER.

Part A — Measurement and Geometry Language

1. Convert 3.5 m to centimetres.

2. Convert 2400 m to kilometres.

3. A ruler reading starts at 5.6 cm and ends at 17.8 cm. What is the measured length?

4. Choose a reasonable unit for: (a) distance between cities, (b) length of a pencil, (c) thickness of a coin, (d) height of a classroom door.

5. Is a circle a polygon? Explain using the definition of polygon.

Part B — Perimeter, Area, Composite Shapes, and Circles

6. A rectangle is 14 m by 9 m. Find its perimeter and area.

7. Find the area of a triangle with base 12 cm and perpendicular height 7 cm.

8. Find the area of a trapezoid with bases 10 m and 16 m and height 5 m.

9. A rectangular patio is 18 m by 10 m with a 4 m by 3 m corner removed. Find the remaining area.

10. Find the circumference of a circle with diameter 18 cm. Use $\pi \approx 3.14$.

11. Find the area of a circle with radius 7 cm. Use $\pi \approx 3.14$.

12. A circular table has diameter 1.4 m. Find both circumference and area.

Part C — Angles, Triangles, Quadrilaterals, and Polygons

13. Classify 42° , 90° , 136° , 180° , and 240° .

14. Two angles are complementary. One is 37° . Find the other.

15. Two angles are supplementary. One is 118° . Find the other.

16. Angles around a point are 80° , 115° , 90° , and x . Find x .

17. A triangle has angles 48° , 67° , and x . Find x .

18. An isosceles triangle has a top angle of 52° . Find each base angle.

19. A quadrilateral has angles 92° , 86° , 110° , and x . Find x .

20. Find the interior-angle sum of a hexagon.

21. Find one interior angle of a regular octagon.

22. A regular polygon has one exterior angle of 30° . How many sides does it have?

Tripwire Review

23. A circle has diameter 16 cm. A student uses 16 cm as the radius in the area formula. Explain the error and state the first correction.

24. A student finds the area of a triangle using a slanted side instead of the perpendicular height. Explain why the setup may be wrong.

Cumulative Recalculation Record

Record patterns rather than only totals. One repeated misconception is more useful than several isolated wrong answers. Confirm the suspected misconception with a fresh question before reteaching.

Final Mastery Assessment

Purpose of This Assessment

This assessment checks whether students can select and use 2-D geometry and measurement ideas when the chapter title does not name the method. Show reasoning and units.

Domain Mastery Profile — Instructional Decision

Report an overall score if required, but make the Recalculation decision by domain: Measurement & Units; 2-D Area; Circles; Angles & Polygons; Mixed Selection. A strong total score must not hide a specific gap.

Part A — Measurement and Geometry Language (10 marks)

1. Convert 4.25 m to centimetres. (2)

2. A ruler measurement starts at 3.4 cm and ends at 15.9 cm. Find the length. (2)

3. Explain why a circle is not a polygon. (2)

4. Choose an appropriate metric unit for the thickness of a coin, height of a door, length of a classroom, and distance between cities. (4)

Part B — Perimeter, Area, Composite Shapes, and Circles (20 marks)

5. A rectangle is 16 m by 11 m. Find perimeter and area. (4)

6. Find the area of a triangle with base 14 cm and perpendicular height 9 cm. (2)

7. Find the area of a trapezoid with bases 8 m and 18 m and height 6 m. (2)

8. An L-shaped floor can be treated as a 15 m by 10 m rectangle with a 5 m by 4 m corner removed. Find its area. (4)

9. A circle has diameter 24 cm. Find circumference and area. Use $\pi \approx 3.14$. (4)

10. A semicircle has radius 6 cm. Find its area. (4)

Part C — Angles and Polygons (20 marks)

11. Classify 35° , 90° , 128° , 180° , and 240° . (5)

12. Two angles are supplementary. One is 73° . Find the other. (2)

13. Angles around a point are 95° , 120° , 80° , and x . Find x . (3)

14. An isosceles triangle has a top angle of 38° . Find each base angle. (3)

15. Find one interior angle of a regular hexagon. (3)

16. A regular polygon has exterior angle 45° . Name the polygon and find one interior angle. (4)

Part D — Mixed Selection and Error Analysis (10 marks)

17. A rectangular garden is 20 m by 14 m. Find both the fencing needed and the soil area. Explain why the units differ. (4)

18. A circular rug has diameter 3 m. Find distance around and area. (3)

19. A student uses the diameter as the radius in $A = \pi r^2$. Explain the error and how the answer size is affected. (3)

Total: 60 marks

Teacher Guide and Answer Keys

Diagnostic Answer-Key Standard

Use full diagnostic treatment where a response can meaningfully change the next teaching move. Routine answers stay concise. For diagnostic items, read the response as evidence to investigate rather than proof of a student's thinking.

NOTICE

What did the student write, draw, choose, or omit?

Ask one short question or use one representation to test the likely interpretation.

Address the smallest confirmed gap.

Use a fresh item with different numbers, orientation, or context.

Research-Informed Design Foundations

The Recalculation Method remains the organising idea of this series, but the finished version is deliberately aligned with established evidence about mathematics learning. Research is used to strengthen the method, not replace it.

Problem solving and connected mathematical thinking. Singapore's secondary mathematics framework places mathematical problem solving at the centre and treats concepts, skills, processes, metacognition, and attitudes as inter-related. This book therefore asks students to select methods, represent ideas, reason, communicate, and solve both routine and non-routine problems rather than complete procedures in isolation.

Representation and structure. Representations are chosen to expose mathematical structure: ruler positions as distances, perimeter versus area on the same shape, square areas in the Pythagorean theorem, nets for surface area, and matching solids for volume families. Representations are supports for seeing the mathematics, not permanent substitutes for abstract reasoning.

Variation and intelligent practice. Closely related examples deliberately change one feature while keeping others fixed. This draws attention to the mathematical feature that matters and reduces mechanical pattern-copying. Non-examples and boundary cases are used where they reveal definitions or conditions.

Metacognition. The Recalculation Pause explicitly teaches students to PLAN, MONITOR, EVALUATE, and RECALCULATE. These prompts are embedded in the subject matter so that reflection is about the mathematics being learned, not generic study advice.

Diagnostic assessment and feedback. Wrong answers are treated as evidence to investigate. A likely wrong answer suggests a plausible interpretation; it does not prove what a student was thinking. Teachers confirm with a short follow-up, make the smallest useful repair, and then recheck with a fresh item before deciding that the gap has closed.

Retrieval and transfer. Earlier learning returns after a delay and in mixed contexts. Worked examples are followed by problem solving, and transfer tasks change the representation, context, orientation, or unknown so that mastery is not confused with copying a familiar template.

Key evidence sources used in this design: Singapore Ministry of Education, 2020 Mathematics Syllabuses; Education Endowment Foundation, Improving Mathematics in Key Stages 2 and 3, Metacognition and Self-Regulated Learning, and Teacher Feedback to Improve Pupil Learning; National Centre for Excellence in the Teaching of Mathematics, Five Big Ideas in Teaching for Mastery; Institute of Education Sciences / What Works Clearinghouse, Organizing Instruction and Study to Improve Student Learning.

The Corrected Recalculation Cycle

NOTICE

What did the student actually do? Record the evidence without interpreting yet.

INTERPRET

What are the most plausible explanations? Keep the claim tentative.

What is the smallest teachable idea that addresses the confirmed gap?

What fresh item checks the same idea without copying the original?

Do not route a student from one wrong answer alone when more than one explanation is plausible. The confirming question is what turns a tempting interpretation into usable instructional evidence.

Cumulative Recalculation Reviews — Answer Guide

Cumulative Recalculation Review — Part 1: Measurement and 2-D Foundations

1. 10.6 cm.

2. km.

3. A polygon must be a closed 2-D shape made only of straight sides; a circle has a curved boundary.

4. Perimeter 32 m; area 60 m^2 .

5. 63 cm^2 .

6. 160 cm^2 .

7. The height must be perpendicular to the chosen base; look for or create a 90° relationship.

8. Route to the earliest prerequisite that explains the repeated error, not simply the latest chapter.

1. 31.4 cm.

2. 78.5 cm².

3. 122°, because obtuse angles are greater than 90° and less than 180°.

4. 109°.

5. 62°.

6. 68° each.

7. 75° .

8. A circle answer off by a factor tied to r/d routes to Chapters 6–7; an incorrect 90/180/360/equal relationship routes to Chapter 9.

Cumulative Recalculation Review — Part 3: Polygons, Pythagorean Reasoning, and 3-D Structure

1. 1080° .

2. 36° .

3. 15 cm.

4. 15 m.

5. Yes: $10^2 + 24^2 = 676 = 26^2$.

6. It requires a right triangle.

7. Prisms have polygon bases and flat side faces; a cylinder has circular bases and a curved surface.

8. Identify the right angle and hypotenuse first; return to Chapter 12's structure before further arithmetic.

Cumulative Recalculation Review — Part 4: Surface Area, Volume, and Capacity

1. 216 cm^2 .

2. 188 cm^2 .

3. 160 cm^2 .

4. 120 cm^3 .

5. 471 cm^3 .

6. 150.72 cm^3 .

7. $3250 \text{ mL} = 3.25 \text{ L}$.

8. Surface area must use square units; volume must use cubic units. A correct-looking number with the wrong dimension is evidence to recheck the measurement choice.

Cumulative Review — Compact Answer Guide

1. 350 cm. 2. 2.4 km. 3. 12.2 cm. 4. km, cm, mm, m. 5. No; polygons have straight sides.

6. $P = 46 \text{ m}$; $A = 126 \text{ m}^2$. 7. 42 cm^2 . 8. 65 m^2 . 9. 168 m^2 . 10. 56.52 cm . 11. 153.86 cm^2 . 12. $C \approx 4.40 \text{ m}$; $A \approx 1.54 \text{ m}^2$.

13. acute, right, obtuse, straight, reflex. 14. 53° . 15. 62° . 16. 75° . 17. 65° . 18. 64° each. 19. 72° . 20. 720° . 21. 135° . 22. 12 sides.

23. Diameter must be halved before using the radius in $A = \pi r^2$. 24. Area height is perpendicular to the chosen base; a slanted side is not automatically height.
