



Area of composite figures

GRADE 7 MATH

Answer keys for the exit ticket, practice worksheet, and homework, plus notes for the lesson slides. Each answer shows the steps and the most likely wrong answer (“If wrong”), so you can tell what a mistake means, not just that it is one. Questions go from **fluency** to **application** to **reasoning**.

Exit Ticket — answer key

Use: End of the composite area lesson. 5–8 min, independent. Item 2 is the inner-dimension trap and carries the same fourfold fingerprint as G-05.

Timing: 5–8 min · independent. Require the pieces LISTED before the total; a bare number hides which piece went wrong.

1. Rectangle 10 by 6? **FLUENCY**

Answer: **60 cm²**

1. $10 \times 6 = 60 \text{ cm}^2$.

If wrong: Added to get 16, or gave the perimeter of 32.

2. Semicircle on the 6 cm end **REASONING**

Answer: **Radius 3 cm; area $4.5\pi \text{ cm}^2$**

1. The semicircle spans the 6 cm end, so 6 cm is its DIAMETER.
2. Radius = $6 \div 2 = 3 \text{ cm}$.
3. Full circle: $\pi(3)^2 = 9\pi$. Semicircle: half of that = $4.5\pi \text{ cm}^2$.
4. Using 6 as the radius would give $\pi(6)^2 \div 2 = 18\pi$, four times too large.
5. Always ask what the given length measures ACROSS the circle — a span is a diameter, not a radius.

If wrong: Used 6 as the radius. The number given is the width of the rectangle, which is the full span of the semicircle.

3. L-shape: 12×8 minus 5×3 APPLICATION

Answer: **81 cm²**

1. Whole rectangle: $12 \times 8 = 96 \text{ cm}^2$.
2. Removed piece: $5 \times 3 = 15 \text{ cm}^2$.
3. $96 - 15 = 81 \text{ cm}^2$.
4. Sanity check: the answer must be less than 96, since a piece is missing.

If wrong: Added the two areas to get 111, which exceeds the whole rectangle — impossible when part has been removed.

4. Rectangle 8×5 with a triangle on top REASONING

Answer: **56 cm²**

1. Rectangle: $8 \times 5 = 40 \text{ cm}^2$.
2. Triangle: $(8 \times 4) \div 2 = 16 \text{ cm}^2$.
3. Total: $40 + 16 = 56 \text{ cm}^2$.
4. The triangle's base is the rectangle's width, 8 cm, and its height is the separate 4 cm — not the rectangle's 5 cm.
5. Listing the pieces separately before adding is what stops the two heights getting mixed.

If wrong: Forgot to halve the triangle, giving 72, or used 5 as the triangle's height.

Quick answers for fast checking:

#	Level	Answer
1	fluency	60 cm²
2	reasoning	$r = 3$; $4.5\pi \text{ cm}^2$
3	application	81 cm²
4	reasoning	56 cm²

Practice Worksheet — answer key

Use: During the lesson after the deck. Items 7–9 are one problem in three stages: find the radius, use it, then quantify the error of getting it wrong.

Timing: 15–25 min · pairs or independent · circulate on 7 and 9. Requiring the piece list catches the inner-dimension error before it reaches the total.

1. Rectangle 9 by 4? FLUENCY

Answer: **36 cm²**

1. $9 \times 4 = 36 \text{ cm}^2$.

If wrong: Gave the perimeter, 26.

2. Triangle base 9, height 6? FLUENCY

Answer: **27 cm²**

1. $(9 \times 6) \div 2 = 27 \text{ cm}^2$.

If wrong: Answered 54, forgetting to halve.

3. Rectangle plus triangle APPLICATION

Answer: **63 cm²**

1. $36 + 27 = 63 \text{ cm}^2$.

2. Two pieces, both already found, so just add.

If wrong: Multiplied the two areas.

4. Semicircle radius 4? APPLICATION

Answer: **$8\pi \text{ cm}^2$**

1. Full circle: $\pi(4)^2 = 16\pi$. Half: $8\pi \text{ cm}^2$.

If wrong: Answered 16π , giving the whole circle.

5. Circle radius 4? FLUENCY

Answer: **$16\pi \text{ cm}^2$**

1. $\pi(4)^2 = 16\pi \text{ cm}^2$.

If wrong: Answered 8π , the circumference.

6. Relationship between 4 and 5? REASONING

Answer: **The semicircle is exactly half the circle**

1. 8π is half of 16π .
2. A semicircle is half a circle by definition, so its area is half.
3. Unlike perimeter, no extra piece is needed — the straight edge created by cutting has no area.
4. This is a useful contrast with G-04, where the semicircle's PERIMETER did need the diameter added.

If wrong: Added something for the straight edge. A line has length but no area.

7. Radius of each semicircle on a 10 by 4 rectangle REASONING

Answer: **2 cm**

1. The semicircles sit on the SHORT ends, which are 4 cm.
2. So 4 cm is each semicircle's diameter.
3. Radius = $4 \div 2 = 2$ cm.
4. The 10 cm is the length of the rectangle and has nothing to do with the semicircles.

If wrong: Answered 4, using the diameter, or 5, halving the 10 cm length instead.

8. Total area of the track shape REASONING

Answer: **$(40 + 4\pi)$ cm²**

1. Rectangle: $10 \times 4 = 40$ cm².
2. Two semicircles of radius 2 make one full circle: $\pi(2)^2 = 4\pi$ cm².
3. Total: $40 + 4\pi$ cm².
4. Noticing that two semicircles of equal radius form a whole circle saves halving twice and is less error-prone.

If wrong: Added only one semicircle, or halved the circle again after already combining the two.

9. Student used $r = 4$ — factor of error? REASONING

Answer: **Four times too big**

1. Correct: two semicircles of radius 2 give $4\pi \text{ cm}^2$.
2. Their version: radius 4 gives $\pi(4)^2 = 16\pi \text{ cm}^2$ for the combined circle.
3. $16\pi \div 4\pi = 4$, so they are four times over.
4. Why exactly four: they doubled the radius, and area depends on radius SQUARED, so $2^2 = 4$.
5. This is the same fingerprint as squaring a diameter in G-05 — an answer exactly four times too large means a radius was doubled somewhere.

If wrong: Said they were 'a bit' over. The error is a factor of four, which is not small, and knowing the exact factor lets you spot it instantly.

Quick answers for fast checking:

#	Level	Answer
1	fluency	36 cm^2
2	fluency	27 cm^2
3	application	63 cm^2
4	application	$8\pi \text{ cm}^2$
5	fluency	$16\pi \text{ cm}^2$
6	reasoning	exactly half
7	reasoning	2 cm
8	reasoning	$40 + 4\pi \text{ cm}^2$
9	reasoning	four times

Homework — answer key

Use: Parallels the practice sheet. Item 8 generalises from halves to any fraction of a circle, which makes the method rather than the special case the thing being learned.

Timing: ~15 min at home · independent · review item 7 as the next-day warm-up; the factor of four recurs across G-01, G-05 and G-07.

1. Rectangle 14 by 5? FLUENCY

Answer: **70 cm^2**

1. $14 \times 5 = 70 \text{ cm}^2$.

If wrong: Gave the perimeter, 38.

2. Triangle base 14, height 4? FLUENCY

Answer: **28 cm²**

1. $(14 \times 4) \div 2 = 28 \text{ cm}^2$.

If wrong: Answered 56.

3. Total APPLICATION

Answer: **98 cm²**

1. $70 + 28 = 98 \text{ cm}^2$.

If wrong: Multiplied the areas.

4. L-shape 15 × 10 minus 6 × 4 APPLICATION

Answer: **126 cm²**

1. Whole: $15 \times 10 = 150 \text{ cm}^2$. Removed: $6 \times 4 = 24 \text{ cm}^2$.

2. $150 - 24 = 126 \text{ cm}^2$.

3. Check: less than 150, as it must be.

If wrong: Added to get 174, exceeding the whole rectangle.

5. Semicircle on a 10 cm end REASONING

Answer: **Radius 5 cm; area $12.5\pi \text{ cm}^2$**

1. The 10 cm end is the semicircle's diameter, so the radius is 5 cm.

2. Full circle: $\pi(5)^2 = 25\pi$. Half: $12.5\pi \text{ cm}^2$.

If wrong: Used 10 as the radius.

6. If they used $r = 10$? APPLICATION

Answer: **$50\pi \text{ cm}^2$**

1. $\pi(10)^2 = 100\pi$ for the full circle; half is $50\pi \text{ cm}^2$.

If wrong: Answered 100π , forgetting it is a semicircle even in the wrong version.

7. Factor of error, and why? REASONING

Answer: **Four times, because the radius was doubled and area squares it**

1. Correct: 12.5π . Their version: 50π .
2. $50\pi \div 12.5\pi = 4$, so they are four times over.
3. They used 10 instead of 5, doubling the radius.
4. Area depends on r^2 , so doubling the radius multiplies the area by $2^2 = 4$.
5. The factor is always exactly 4 for this error, which makes it recognisable: an area four times too large means a diameter was used as a radius.

If wrong: Answered twice, matching the radius error rather than the area consequence. The radius doubled; the area quadrupled.

8. Quarter circle, radius 6 REASONING

Answer: **$9\pi \text{ cm}^2$**

1. Full circle: $\pi(6)^2 = 36\pi \text{ cm}^2$.
2. A quarter is one fourth: $36\pi \div 4 = 9\pi \text{ cm}^2$.
3. How the formula adapts: find the whole circle's area, then multiply by the fraction of it you have.
4. A semicircle is $\frac{1}{2}$, a quarter circle is $\frac{1}{4}$, and a third of a circle would be $\frac{1}{3}$.
5. The formula never changes — only the fraction you keep.

If wrong: Divided the radius by 4 instead of the area, giving $\pi(1.5)^2$. The fraction applies to the AREA, not to the radius.

Quick answers for fast checking:

#	Level	Answer
1	fluency	70 cm^2
2	fluency	28 cm^2
3	application	98 cm^2
4	application	126 cm^2
5	reasoning	$r = 5$; 12.5π
6	application	$50\pi \text{ cm}^2$
7	reasoning	four times
8	reasoning	$9\pi \text{ cm}^2$

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. Builds on the “Area by composing & decomposing” sheet (Grade 6) with circles added. The fourfold fingerprint on slide 4 recurs from G-05.

Slide	~Time	Note
1/8	0:00	Frame it: no new formulas today. The skill is deciding which shape each length belongs to.
2/8	1:00	Hook — poll 6 vs 3. Do NOT resolve. The 6 is written on the diagram, so it gets used as given.
3/8	2:30	WE1 — trace the semicircle's width with a finger. A span across is a diameter, always.
4/8	4:30	Name the fingerprint again: exactly four times too big. Students met it in G-05 and can now recognise it.
5/8	6:30	Add versus subtract, with the sanity check for shapes with holes.
6/8	8:30	CFU — all-student response. $40 + 4\pi \text{ cm}^2$. Watch for a radius of 5 taken from the 10 cm side.
7/8	10:30	Combining the two semicircles. Fewer steps means fewer places to slip.
8/8	13:00	Launch the in-class practice sheet.