

Lesson 78 SHAPE & SPACE

Angle sums in triangles and quadrilaterals: 180° and 360°

CURRICULUM ALIGNMENT

SHA.SHP.4b

investigate and construct angles in the context of shape; and solve angle-related problems.

INTERACTIVES

Polygon Angles · challenge, display, explore

WHAT THIS LESSON TEACHES

The three interior angles of any triangle always add up to 180° . The four interior angles of any quadrilateral always add up to 360° .

→ A triangle with angles 50° , 70° and 60° adds to 180° .

→ A square: $90^\circ \times 4 = 360^\circ$.

MODEL THIS ON THE BOARD

MISSING ANGLE IN A TRIANGLE

- 1 A builder's triangular frame has angles 40° and 80° . Find the third angle.
- 2 Add the known angles: $40 + 80 = 120$.
- 3 Subtract from 180° : $180 - 120 = 60$.
- 4 The missing angle is 60° .

LESSON ARC

Sketch a triangle then a quadrilateral on the IWB and split the quad corner-to-corner so pupils see two triangles. Walk three triangle snapshots aloud to land the 180° rule, then use the diagonal to reason $180^\circ + 180^\circ = 360^\circ$ for quadrilaterals. Pupils drag a triangle's vertices at the board and watch the total refuse to leave 180° . Copybook practice sums each shape's angles, then the paper-corner tear proves 180° before the five-problem missing-angle bank.

TEACHING MOVES

1. **Getting Started.** Sketch the triangle, then draw a quadrilateral and slice it corner-to-corner so the two triangles appear on screen. Take two or three hands-up predictions on 'could you find the third angle without measuring?' — do not confirm or deny; that reveal is the whole lesson.
2. **Watch and Notice.** Walk the three triangle snapshots aloud so the 180° rule lands first; ask the class to predict the total on the right-angled one before you add it. Then point back to your diagonal: 'two triangles, each 180° , makes 360° ' — that reasoning matters more than the fact.
3. **Try It Together.** Over the 9 minutes, ask a fresh pupil to predict what the running total will do before each drag, take a hands-up answer, then let them drag and read it. Dragging is the only interaction — don't ask for exact angle values. Re-anchor every couple of drags by reading the total aloud with the room.
4. **Sketch the Angles in Your Copy.** Walk the room glancing at the two underlined totals. If one is off, nudge the pupil to re-add their column rather than correcting it — this is practice, not marking.
5. **Class Challenge.** Run the paper tear-and-line-up first, then give a clear spoken cue when the class puts paper down and turns to the board. Keep the five-problem bank brisk — pupils take turns, check each

answer, class confirms. The strategy is 180° minus the two known angles; watch the isosceles trap where both base angles are equal.

6. **What Did We Notice?** Listen for pupils tying the paper rip to certainty. Revoice a strong answer: 'so it's not that they usually add to 180° — the torn corners show they have to.' Head off the idea that scissor wobble means the rule sometimes fails.

COMMON MISCONCEPTIONS

⚠ Pupils treat a quadrilateral like a triangle and try to make its angles add to 180° , or can't say why 360° is the total.

Go back to the diagonal you drew — trace both triangles with a finger and count aloud: 180° here, 180° here, together 360° . The diagonal is the reason, not a memorised number.

⚠ On an isosceles triangle with a 50° apex, pupils forget both base angles match and calculate $180 - 100 = 80^\circ$ for a single missing angle when two are actually unknown.

Mark the two equal base angles with matching ticks on the board sketch. Ask 'how many angles are we still missing here?' before anyone subtracts — surface that two angles share the leftover.

⚠ When their torn paper corners don't quite form a perfect straight line, pupils conclude the 180° rule is only 'usually' true.

Name it as scissor-and-finger wobble, not a fault in the triangle. Re-lay the corners against the ruler and point out how close they land — the rule is exact; our hands are not.

DIFFERENTIATION

EMERGING

- Give these pupils triangles only during the board bank — leave quadrilaterals until they're secure on 180° minus two knowns.
- In the copybook, pre-write the '= 180° ' total so pupils fill the three angles above it rather than building the whole layout.

DEVELOPING

- Hand a triangle with just one angle and one 'these two are equal' clue — can they still find all three?
- Ask them to check a quadrilateral both ways: add the four angles, then add the two triangles the diagonal makes, and confirm the totals agree.

PROFICIENT

- While the class finishes the board bank, pose: 'a pentagon splits into how many triangles from one corner — so what's its angle total?' Let them reason it from the diagonal idea, no formula given.
- Ask them to explain to a younger pupil, in one sentence, why every quadrilateral is exactly 360° — forcing the diagonal argument into words.

✂ **Cross-curricular:** Tie to Geography — pupils spot triangular and four-sided panels in a photo of a local bridge or GAA stand roof and predict the angle totals.

ANSWER KEY

a) 180°

b) 180°

c) 360°

Q1: 75°

Q2: 115°

Q3: 45°

Q4: 110°

Q5: 30°

a) **Always** : This is the angle sum rule for every triangle.

b) **Always** : This is the angle sum rule for every quadrilateral.

c) **Never** : Triangle angles always total exactly 180° , never more.

d) **Never** : Two 90° angles already total 180° , leaving 0° for the third which is impossible.

EXTENSION SHEET · STRETCH ANSWERS

S1: 11°

S2: 99°

S3: 46°

S4: 74°

S5: 57°