Lesson 75 SHAPE & SPACE

Angle sum of a triangle

CURRICULUM ALIGNMENT

SHA.SHP.4b investigate and construct angles in the context of shape; and solve angle-related problems.

ALG.PRR.4a identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.

INTERACTIVES Polygon Angles · challenge, display, explore

WHAT THIS LESSON TEACHES

The three angles inside any triangle always add up to 180 degrees.

→ 50 degrees plus 70 degrees plus 60 degrees equals 180 degrees.

→ A triangle with a 40 degree top angle has two equal base angles of 70 degrees each.

MODEL THIS ON THE BOARD

SOLVE FOR THE MISSING ANGLE

1. Add the two known angles: 50 degrees plus 60 degrees makes 110 degrees.
2. Subtract 110 degrees from 180 degrees to find the third angle.
3. The missing angle is 70 degrees.

LESSON ARC

Sketch a triangle with 50° and 60° marked and a blank third corner — take three hands-up guesses and write them up before naming any rule. Show three contrasting triangles on the polygon-angles interactive, add each set aloud, and let pupils land on 180° themselves; then tear a paper triangle's corners into a straight line to prove it. Pupils solve missing angles at the board, then write full equation lines in their copy including the isosceles halving.

TEACHING MOVES

1. **Getting Started.** Sketch the triangle marking 50° and 60°, third corner blank. Give five seconds of silent think-time, then take three guesses and write them on the board — do NOT confirm, deny, or say 180. Resist naming the rule; the guesses are what the class returns to after the investigation.
2. **Watch and Notice.** For each of the three triangles, get the class adding the angles aloud before you reveal the sum readout. On the second (tall thin) one ask 'do you expect a different total this time?' — don't flag that it's isosceles. Only after the third do you name the pattern: every one made 180. Then tear a real paper triangle's three corners and lay them in a straight line to show it isn't luck.
3. **Try It Together.** Run the polygon-angles interactive in explore mode — pupils drag vertices and predict the missing angle before checking. Revoice the method when it surfaces: 'so you took the two we knew away from 180'. Watch for the pupil who adds the two known angles and stops — ask 'and what do you still have to do with that total?'
4. **Solve It in Your Copy.** Walk the room glancing for the full equation line, not just the answer — e.g. 180 − 55 − 65 = 60. On the isosceles item, check for both lines: the subtraction (180 − 50 = 130) and the halving (130 ÷ 2 = 65). This is the only spot pupils halve a remainder on their own.
5. **Class Challenge.** Brisk practice — pupils take turns at the board, class confirms each answer before the next card comes up. Use the isosceles worked example on screen to remind them how halving works, then let the interactive rehearse the subtract-from-180 step. Don't re-explain each card.

6. **What Did We Notice?.** Push pupils to connect the torn corners to a straight angle: 'so the three corners together always make a half-turn, and a half-turn is 180'. Head off the belief that a bigger triangle has a bigger sum — point back at the wide one and the tall one both making 180.

COMMON MISCONCEPTIONS

⚠ A pupil adds the two known angles and stops there — gives 120° for a triangle showing 50° and 70°, thinking the sum of the two IS the third.

Ask 'and what do you still have to do with that total?' Drag the polygon-angles interactive so the live sum readout shows all three adding to 180, and revoice: the two known ones come away from 180, they aren't the answer themselves.

⚠ Pupils think a bigger, more stretched-out triangle should have a bigger angle sum than a small one.

Point straight back at the wide flat triangle and the tall thin one from Watch and Notice — both made 180. Tear the corners off a large paper triangle and a small one; both sets of three fit the same straight line.

⚠ On the isosceles copy item, pupils write 180 − 50 = 130 and put 130 as a base angle, forgetting to share it between the two equal angles.

Remind them the 130 belongs to BOTH base angles together, so it splits in two: 130 ÷ 2 = 65 each. Point to the two equal-length sides on the sketch — equal sides mean equal angles, so the remainder halves.

DIFFERENTIATION

EMERGING

- Keep these pupils on the two-known-angles cards only (like 50° and 70° find the third); hold the isosceles halving back until they're secure on subtract-from-180.
- Give them the equation frame pre-written in the copy — 180 − ___ − ___ = ___ — so they fill numbers rather than build the line from scratch.

DEVELOPING

- After the copy task, give a triangle with only one angle and a 'the other two are equal' clue — same isosceles method, but they decide it's isosceles from the words.
- Ask them to check a claim: 'could a triangle have two right angles?' Let them try it and explain why 90 + 90 already uses up the 180.

PROFICIENT

- Pose the next-shape leap early: 'if a triangle is 180, what would a four-sided shape be? Can you split it into triangles to find out?' Let them investigate in the copy without being told — this feeds directly into the coming lesson.
- Ask them to explain the torn-corners proof to the class in their own words: why does it work for ANY triangle, stretched or squashed?

↗ **Cross-curricular:** Tie to the STE strand — triangular bracing makes bridges and roof trusses rigid because the fixed 180° angle sum locks the shape in place.

ANSWER KEY

Scaffold: visual check on the page

Q1: 80 degrees

Q2: 85 degrees

Q3: 25 degrees

Q4: 40 degrees

a) Always — This is the rule for every triangle.

b) Never — No angle in a triangle can be 200 degrees or more as the sum is 180.

c) Sometimes — In an equilateral triangle all three are 60 degrees; in any other isosceles triangle the third differs.

d) Never — The top angle can be any measure as long as base angles match and sum to 180.

EXTENSION SHEET · STRETCH ANSWERS

S1: 46°

S2: 74°

S3: 57°

S4: 42°

S5: 44°