Lesson 76 SHAPE & SPACE

Measuring angles with a protractor

CURRICULUM ALIGNMENT

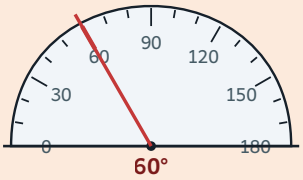
SHA.SHP.4b investigate and construct angles in the context of shape; and solve angle-related problems.

MEA.MSR.4b find, interpret and deduce measures experimentally with increasing precision.

INTERACTIVES Angle Tool · display, explore

WHAT THIS LESSON TEACHES

Place the protractor's **centre** on the vertex and its **0° line** along one arm of the angle. Read where the other arm crosses the scale. Use the scale that runs from your 0° line — choose the inner or outer scale carefully.

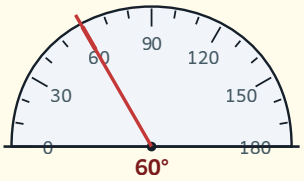


→ If the 0° line runs left-to-right and the arm goes up-right, read from the **inner scale** (0° at the right).

→ If the angle looks **acute** (< 90°), your reading should be **less than 90°** — double-check the scale.

MODEL THIS ON THE BOARD

READING A 60° ANGLE ON THE PROTRACTOR



1. Line up the **centre cross** of the protractor on the **vertex** of the angle.
2. Set the **0° baseline** along one of the angle's arms.
3. Read the scale that **starts at 0** on that arm — follow it round to where the second arm crosses the scale. Here it crosses at **60°**.

LESSON ARC

Open at the IWB with a protractor and an angle already drawn — pupils call out which part goes where. Walk through four readings, with 145° as the load-bearing one: same placement, two numbers, which is right? Pupils take turns at the board reading four more angles, naming acute or obtuse before they commit. They record each reading in copybook with the inner/outer label, then pair up at desks with paper protractors for the six-angle bank.

TEACHING MOVES

1. **Getting Started.** Five seconds of think-time before any hands go up. Take two or three hands-up answers, not call-outs. Listen for 'centre on the corner' and 'zero on one of the lines'; revoice as 'centre on the vertex, zero on one ray.'
2. **Watch and Notice.** Walk each example aloud. On 35°, name the three steps and have the class read the routine back aloud. Pause hard on 145° — ask 'why is 145 right and not 35?' and revoice the pupil who

names the opening: 'wider than a right angle, so the reading must be more than 90.' On 178°, circle the exact tick with the IWB pen so pupils at the back can see.

3. **Try It Together.** For each of the four angles (60°, 120°, 135°, 165°), hands-up the whole class on 'acute or obtuse?' before the pupil at the board commits to a number. That keeps the rest of the room thinking. If a pupil reads 60 for an obtuse angle, pause and ask the class to compare the opening to a right angle before re-reading.
4. **Record Each Angle in Your Copy.** Walk the room glancing at the inner/outer label beside each reading. Don't stop to mark; if you spot 60 written under an obtuse sketch, tap the copy and say 'look at the opening again.'
5. **Class Challenge.** Pairs share one paper protractor — one holds, the other reads and names the scale, swap each angle. Walk the room watching for the protractor off-centre on the vertex, or the zero not lined up on a ray; pause the pair to re-set before they read. Direct fast finishers to the extension card with the reflex-angle problem.
6. **What Did We Notice?.** Take two or three hands-up answers. Listen for pupils naming the opening as the deciding factor and revoice the strongest version. If a pupil offers 'follow the scale that starts at zero on the ray', revoice that too — both strategies are valid and pupils should hear both.
7. **What's Next.** Keep it short. Repeat 'centre on the vertex, zero on a ray' one more time — the next lesson on drawing angles leans on exactly the same placement.

COMMON MISCONCEPTIONS

⚠ A pupil reads an obtuse angle as 60° instead of 120° — they followed the wrong scale, picking the number nearer to zero without checking the opening.

Pause and ask the pupil: 'is this opening bigger or smaller than a right angle?' Hold a finger up at 90° on the protractor to make the comparison visible. Then reread: the answer must be more than 90 because the opening is wider than a right angle.

⚠ A pupil places the bottom edge of the protractor along a ray and reads from there, ignoring the centre cross-hair on the vertex.

Stop the pupil, lift the protractor off, and re-place it deliberately: 'centre dot first, on the corner. Now swing it until the zero sits on a ray.' Have the pupil re-place it themselves before reading.

⚠ A pupil reports 178° as 180° (or 2° as 0°) — they're reading the nearest big tick rather than the actual tick the ray lands on.

Use the IWB pen to circle the exact tick the ray crosses. Count the small ticks aloud from the nearest labelled number: '170, 171, 172... 178.' Hand them back the angle and ask them to count the ticks the same way.

DIFFERENTIATION

EMERGING

- Pre-mark the vertex with a small dot on the angle card so pupils know exactly where the centre cross-hair sits. Bring them to the teacher's table for the first two angles of the Class Challenge bank.
- Stay with acute angles only for the copybook moment — pupils sketch and read 35° and 60° while the rest of the class works through the full mix.

DEVELOPING

- After the six-angle bank, ask these pupils to draw an angle of exactly 95° freehand, then check it with the protractor. How close did they get?
- Give a chained reading: measure the angle, then ask what the other angle (on the other side of the ray) must be. The two add to 180°.

PROFICIENT

- Direct fast finishers to the extension card with the reflex angle — measure the smaller angle and subtract from 360°. Ask them to explain to the class why subtracting works.

Cross-curricular: Tie to Geography — pupils use the protractor to measure the bearing of one classroom wall from another, reading degrees the way a compass would.

ANSWER KEY

W1: 121°

W2: 45° is acute

Q1: 57°

Q2: 47° is acute

a) Always — True for every triangle in flat geometry — the rip-the-corners proof shows why.

b) Sometimes — True for obtuse triangles only. An equilateral has none; a right-angled has none.

c) Always — Three equal sides → three equal angles, totalling 180°, so 60° each.

d) Always — Yes — 90° + 45° + 45°. The two short sides are equal.

e) Never — Two 90° angles already total 180°, leaving 0° for the third — not a triangle.

f) Always — 180° − 65° − 80° = 35°.

EXTENSION SHEET · STRETCH ANSWERS

S1: 85° is acute

S2: 84°

S3: 84° is acute

S4: 84°

S5: 136°