

Measuring angles accurately 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 · challenge, display, explore

WHAT THIS LESSON TEACHES

To measure an angle accurately, place the protractor's centre mark exactly on the vertex where the two arms meet and align the baseline with one arm.

- Place the protractor centre on the vertex of the clock hands showing 2 o'clock and read 60 degrees.
- Align the baseline with the desk edge and read the angle to the wall at 90 degrees.

MODEL THIS ON THE BOARD

PLACE PROTRACTOR AND READ THE SCALE

- 1 Put the centre mark exactly on the vertex of the angle.
- 2 Line up the baseline with one arm so it reads zero.
- 3 Follow the correct scale ring to the second arm and read the number.

LESSON ARC

Open with the spot-the-mistake image — a protractor laid badly over an angle — and have pupils name what looks wrong before any vocabulary lands. In Watch and Notice, model 40° , 130° , 90° and a 290° reflex, saying 'centre on the vertex first, then baseline along an arm' verbatim each time. Pupils take turns at the board, then measure three drawn angles on the practice sheet in their copy. The Student Activity Book practice follows.

TEACHING MOVES

1. **Getting Started.** Display the spot-the-mistake protractor image as pupils settle and take three hands-up answers only. Listen for 'the middle dot isn't on the corner' or 'the bottom edge isn't on an arm' — but don't name vertex or baseline yet, and don't reveal the fix. Keep it to a minute.
2. **Watch and Notice.** Model each angle one at a time, saying 'centre on the vertex first, then baseline along an arm' word-for-word every time. On 40° , point at the zero on the baseline arm and trace THAT SAME ring up to 40, then show the wrong ring saying 140 so pupils see why ring choice matters. Ask: 'which arm did we start counting from?'
3. **Try It Together.** Keep angles between 0° and 180° this round. Before each board reading, make the class estimate silently — 'bigger or smaller than a right angle?' — so they catch a wrong-ring reading before it happens. Rotate four pupils to place and read. Watch for the centre drifting off the vertex and re-voice the fix: 'centre on the vertex, then swing the baseline onto the arm.'
4. **Measure the Angles in Your Copy.** Hand out the practice sheet (or use the three board angles). Walk the room glancing only at protractor placement — centre on the vertex, baseline along an arm. No individual marking; this is copybook practice, not assessment.
5. **Class Challenge.** Brisk board work through 35° , 95° , 145° , then the 290° reflex — pupils place, read, and the class confirms each before moving on. Force an estimate on the 35° so careless readers don't grab

145° off the wrong ring. For the reflex, talk through the whole-turn step aloud: the small angle is 70°, and $360 - 70 = 290$ because the two go all the way round.

6. **What Did We Notice?** Pose: 'how does estimating first stop us reading the wrong scale?' Listen for 'if I think it's about 40 and the scale says 140, I'm on the wrong ring' and re-voice it as the lesson's rule: estimate first, then the number can only be the one that makes sense.

COMMON MISCONCEPTIONS

⚠ Pupils read 40° off as 140° — they follow whichever ring their eye lands on rather than the one that starts at zero on the baseline arm.

Stop and point at the zero on the baseline arm, then physically trace that same ring up to the second arm. Show the other ring's number out loud so the class hears why it's wrong: 'that ring doesn't start at zero on our arm.' The estimate-first habit catches this — make them say 'about a right angle?' before reading.

⚠ Pupils slide the protractor's centre dot off the corner so it sits part-way along an arm, then read a number that's off by several degrees.

Catch it at the board as it happens. Re-voice the fix in order: 'centre on the vertex FIRST, then swing the baseline onto the arm.' Have the pupil lift the protractor and replace it, vertex first, so the class sees the two-step sequence.

⚠ Pupils freeze on the 290° reflex because the protractor only reaches 180°, and try to read a number that isn't there.

Show the small 70° angle and the big angle sweeping round, and point out that together they make one full turn — 360°. Then do the subtraction aloud: $360 - 70 = 290$. Keep it concrete to the full turn round the vertex, not a memorised trick.

DIFFERENTIATION

EMERGING

- Keep these pupils on acute and right angles only while the rest of the class moves to obtuse and reflex — same protractor, smaller numbers.
- Before they read, have them lay the protractor and check just the two things from Getting Started: dot on the corner, flat edge on an arm. Reading comes after placement is right.

DEVELOPING

- After the practice sheet, give them a drawn angle and ask them to read it, then say what the OTHER ring would have shown and why that one's wrong.
- Pose a missing-arm challenge: 'this angle is 65° — which ring did the baseline arm sit on?'

PROFICIENT

- During Class Challenge, narrate a harder reflex variant for fast finishers — give them a small angle of 35° and ask them to work the reflex before the class reaches it, justifying the $360 - 35$ step.
- Send them ahead into the Student Activity Book page once their sheet is done and checked.

✂ **Cross-curricular:** Tie to Geography — pupils measure the bearing angle between two points on a simple map of Ireland, reading the protractor from north.

ANSWER KEY

b) 75°, 85°, 95°

Q1: 45°

Q2: 30°

Q3: 60°

Q4: 75°

Q5: 85°

Q6: 95°

a) **Always** — This is the key rule for accurate placement.

b) **Sometimes** — It depends on which ring starts at zero.

c) **Always** — 90 degrees is a right angle, not acute.

d) **Never** — The centre must always be on the vertex regardless of size.

EXTENSION SHEET · STRETCH ANSWERS

S1: 84° is acute

S2: 307° is reflex

S3: 84°

S4: 84°

S5: 85° is acute