

## 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.

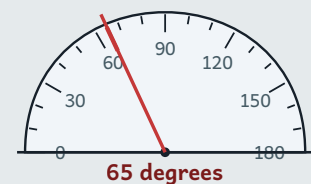
**INTERACTIVES** [Angle Tool · challenge, display, explore](#)

### WHAT THIS LESSON TEACHES

A **protractor** measures angles in degrees. Put the centre on the vertex, a zero line along one arm, and read where the other arm crosses.

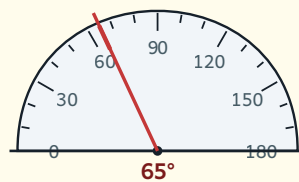
→ Use the scale that starts at  $0^\circ$  on your baseline arm.

→ A right angle is  $90^\circ$ ; a straight angle is  $180^\circ$ .



### MODEL THIS ON THE BOARD

#### MEASURE THIS ANGLE WITH A PROTRACTOR



- 1 Put the protractor's **centre cross on the vertex**.
- 2 Lay the  **$0^\circ$  line along one arm**.
- 3 Read the scale that starts at 0 on that arm where the other arm crosses →  **$65^\circ$** .

### 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  $40^\circ$ ,  $130^\circ$ ,  $90^\circ$  and a  $290^\circ$  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  $40^\circ$ , 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  $0^\circ$  and  $180^\circ$  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  $35^\circ$ ,  $95^\circ$ ,  $145^\circ$ , then the  $290^\circ$  reflex — pupils place, read, and the class confirms each before moving on. Force an estimate on the  $35^\circ$  so careless readers don't grab  $145^\circ$  off the wrong ring. For the reflex, talk through the whole-turn step aloud: the small angle is  $70^\circ$ , 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  $40^\circ$  off as  $140^\circ$  — 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  $290^\circ$  reflex because the protractor only reaches  $180^\circ$ , and try to read a number that isn't there.

Show the small  $70^\circ$  angle and the big angle sweeping round, and point out that together they make one full turn —  $360^\circ$ . 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  $65^\circ$  — 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  $35^\circ$  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

W1:  $30^\circ$  is acute

W2:  $48^\circ$

Q1:  $47^\circ$  is acute

Q2:  $57^\circ$

Q3:  $84^\circ$  is acute

Q4:  $84^\circ$

EXTENSION SHEET · STRETCH ANSWERS

**S1:**  $307^\circ$  is reflex

**S2:**  $84^\circ$

**S3:**  $98^\circ$

**S4:**  $85^\circ$  is acute

**S5:**  $69^\circ$