

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 protractor image on the IWB and take three hands-up answers about what looks off — middle dot off the corner, or baseline not along an arm. Model the same centre-then-baseline routine on 40° , 130° , 90° , and the 290° reflex ($360 - 70$). Pupils take turns reading $0-180^\circ$ angles at the board, then draw and measure three angles in their copybooks. Class Challenge runs four angles including one reflex; Student Activity Book is the desk practice that follows.

TEACHING MOVES

1. **Getting Started.** Display the spot-the-mistake image as pupils settle. Take three hands-up answers only — listen for 'the middle dot is off the corner' or 'the bottom edge isn't along an arm'. Do not fix it yet; leave the correct placement for Watch and Notice. Keep this to about a minute.
2. **Watch and Notice.** Say the same routine every time: centre on the vertex first, then baseline along an arm from 0. On 40° , point at 0 and trace that ring up, then show the other ring reads 140° at the same place so the class sees why the ring matters. On 130° , demand an estimate before any read. On the 290° reflex, show the small angle is 70° and talk $360 - 70$ aloud as a full turn round the vertex.
3. **Try It Together.** Set three or four angles within $0-180^\circ$. Before each read, ask 'bigger or smaller than a right angle?' so a wrong-ring answer dies early. Rotate four pupils to place the protractor and read aloud; revoice good fixes as 'centre on the vertex, then swing the baseline onto the arm.' Watch for the centre drifting off the vertex — the commonest slip.
4. **Measure the Angles in Your Copy.** Pupils rule a small acute, a square corner, and a wide obtuse, then measure each with their own protractor and label acute / right / obtuse. Walk the room glancing only at placement — centre on the vertex, baseline along an arm. No individual marking; this is whole-class copybook practice.

5. **Class Challenge.** Keep the board work brisk — pupils take turns, check each answer, class confirms, move on. Demand an estimate before the first acute so careless readers do not grab the large number off the wrong ring. On the final reflex, talk the $360 - 70$ subtraction through as a class rather than announcing it; use the Check as narration: 'yes — that's it.'
6. **What Did We Notice?.** Ask how estimating first stops a wrong-scale read. Listen for 'if I think it's about 40 and the scale says 140, I'm on the wrong ring.' Revoice that as the lesson rule: estimate first, then the number can only be the one that makes sense.

COMMON MISCONCEPTIONS

⚠ Pupils line the baseline up and then read whichever ring their eye hits first — so a 40° acute becomes '140°' because they followed the ring that starts at 180 on that arm.

Stop and ask for the estimate again: 'bigger or smaller than a right angle?' Once they say smaller, only the ring that starts at 0 on the baseline arm can be right. Trace that ring from 0 up to the second arm on the IWB.

⚠ Pupils swing the baseline onto an arm but leave the centre mark hovering beside the vertex, so every reading is a few degrees out.

Freeze the board protractor mid-placement. Point: 'centre first — right on the corner — then swing the baseline.' Have the pupil at the board redo just that order while the class watches the middle dot land.

⚠ On a reflex angle pupils stop at the small reading (70°) and call that the answer, or they try to force the protractor past 180° .

Show both angles round the same vertex on the IWB: the small 70° and the long way round. 'Together they make one full turn — 360° . So the reflex is $360 - 70$.' Count the subtraction aloud as a class.

DIFFERENTIATION

EMERGING

- Give pre-drawn angles already ruled in the copybook so the pupil only places the protractor and reads — skip freehand drawing for now.
- Stay on acute and right angles only; cover the outer ring with a finger on their protractor so one scale is visible while they build the centre-then-baseline habit.

DEVELOPING

- After each Class Challenge read, ask them to name the ring they used and why the other ring's number is impossible given their estimate.
- In the copybook set, add a fourth angle that opens just past a right angle and ask: which two degree-readings on the protractor could someone misread here, and which one is right?

PROFICIENT

- On the reflex Class Challenge item, ask them to justify $360 -$ small without you prompting the subtraction — then invent a different reflex and predict the small angle first.
- Once the copybook three are done, set: 'draw an angle between 100° and 110° without measuring first, then check with the protractor — how close were you?'

✂ **Cross-curricular:** Link to classroom doors and window catches — open a door nearly flat and estimate the reflex angle it makes with the frame before measuring.

ANSWER KEY

- a) 130°
 b) obtuse
 c) 50°
 Q1: 40°
 Q2: 35°
 Q3: 65°
 Q4: 80°
 Q5: 110°

Q6: 125°

- a) **Always** : The centre must match the vertex or the degree reading is wrong.
 b) **Never** : If 0 is on the outer scale, you read the outer scale, not the inner.
 c) **Never** : 90 degrees is a right angle; acute angles are less than 90.
 d) **Always** : Checking both rings stops you picking the wrong scale by mistake.

EXTENSION SHEET · STRETCH ANSWERS

S1: 84°

S2: 98°

S3: 85° is acute

S4: 84° is acute

S5: 84°