

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

The vertex is the point where the two arms of an angle meet. Sit the protractor's centre exactly on the vertex and line one arm along the 0 mark before you read the scale.

→ Place the centre on the vertex of a 25° classroom corner angle and read from the 0 arm.

→ For a 90° right angle at a desk edge, check the centre is on the vertex and one arm lies on 0.

MODEL THIS ON THE BOARD

READING A 25° ANGLE

- ① Sit the protractor centre exactly on the **vertex** where the two arms meet.
- ② Lay one arm along the flat base so it points at **0** on the scale.
- ③ Because the zero ray sits on the right 0, follow the outer scale round to the other arm.
- ④ The other arm points to **25**, so the angle measures 25°.

LESSON ARC

Open with an angle and protractor on the IWB and take hands-up answers for where the centre must sit — the vertex — before any reading. Walk four measured snapshots naming the sequence out loud each time: centre on vertex, one arm on 0, then the ring that starts at 0. Class names the scale on three board angles before a pupil drags each arm. Copybook sketches record the reading and which scale was used. Class Challenge puts real protractors on pupil-drawn angles at desks.

TEACHING MOVES

1. **Getting Started.** Take two or three hands-up answers only — listen for 'on the corner' or 'on the point'. Name that spot the vertex, then stop. Do not confirm any degree reading yet; the sequence of checks comes next.
2. **Watch and Notice.** For each of the four snapshots, say the move out loud before anyone offers a number: centre on the vertex, arm on 0, then read round. On 145°, ask which ring starts at 0 on the arm and follow only that ring with your finger — name 35° as the wrong-ring trap you are heading off. On 178°, slow down and ask what the arm would look like at a full 180°.
3. **Try It Together.** Before each drag, the class points to the 0 on the arm and names the ring they will follow. A different pupil comes up for each of the three angles. Head off 115° and 160° early — wrong-ring readings are 65° and 20°. Revoice a strong answer: 'the arm is on the left 0, so we follow the inner ring round.'
4. **Note the Reading in Your Copy.** Pupils sketch each measured angle and write the reading plus inner or outer underneath. Walk the rows glancing for the scale note — that is the thinking; without it the number is a guess. Nothing is marked yet.

5. **Class Challenge.** Keep board talk brisk. Circulate for the two alignment slips: centre off the vertex, and reading the ring that does not start at 0 on the arm. When the round ends, take one pair's trickiest angle, read it aloud together, and settle any disagreement on the spot.
6. **What Did We Notice?.** Ask why a protractor needs two scales and how you know which to read every time. Listen for 'the ring that starts at 0 on the zero arm'. Revoice: 'the scale isn't chosen by the angle — it's chosen by where you laid the arm.' Add the sense-check: an obtuse angle can never read under 90° .

COMMON MISCONCEPTIONS

- ⚠ Pupils line the arm on 0 but then follow the other ring, so 145° becomes 35° , or 115° becomes 65° . Stop and point only at the 0 under the arm. Ask 'which ring begins here?' and trace that ring alone with a finger before any number is accepted.
- ⚠ Pupils sit the protractor so the baseline looks neat but the centre hole is a few millimetres off the vertex, so every reading is quietly wrong. On the demonstration protractor, lift and reseal the centre on the vertex out loud. Have the pupil tap the vertex first, then lower the hole onto that point before lining up 0.
- ⚠ Pupils see a nearly-straight angle and call 180° without checking the arm's exact crossing. Ask what the arm would look like if it had reached a full straight line. Nudge them back to the scale for the one- or two-degree difference.

DIFFERENTIATION

EMERGING

- Stay with acute angles first so both the vertex seat and the 0-arm line-up can be practised before inner/outer choice gets hard.
- Pre-mark the vertex with a pencil dot on their drawn angles so the centre hole has a clear target to land on.

DEVELOPING

- After two successful readings, ask them to predict acute or obtuse before they look at the scale, then confirm with the ring that starts at 0.
- Give one angle with the zero ray on the left and one on the right in the same round so they must switch rings deliberately.

PROFICIENT

- Once five angles are measured, ask: draw an angle that would read the same number on both rings — where must the arm sit, and why?
- Challenge them to explain, without touching the protractor, how they would know a partner's 65° reading of an obtuse-looking angle must be the wrong ring.

✂ **Cross-curricular:** Tie to PE on the yard — estimate the angle between two cone markers, then check with the large demonstration protractor.

ANSWER KEY

Q1: 35°

Q2: 45°

Q3: 40°

Q4: outer scale, 120°

Q5: inner scale, 80°

Q6: 75°

a) **Always** : The rule states the centre point sits exactly on the vertex where the arms meet.

b) **Always** : Lining an arm on 0 is required so the correct scale reading can be taken.

c) **Sometimes** : True at 90° , where both read 90; false at 40° , where the other scale reads 140.

d) **Never** : The centre must sit on the vertex; any other spot gives a wrong reading.

EXTENSION SHEET · STRETCH ANSWERS

S1: 98°

S2: 84°

S3: 84°

S4: 136°

S5: 69°