Lesson 73 SHAPE & SPACE

Constructing 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 · challenge, display, explore

WHAT THIS LESSON TEACHES

To construct an angle with a protractor, first rule a straight baseline and mark the vertex at one end. Place the protractor on the vertex, count from zero to the required degrees, mark the dot, then join it to the vertex.

→ Rule a 6 cm line and mark a dot at the left end for the vertex.

→ For 60 degrees, follow the scale up to 60 and mark a dot at 60.

MODEL THIS ON THE BOARD

CONSTRUCT A 90 DEGREE ANGLE

1. Rule a straight baseline and mark the vertex at the left end.
2. Place the protractor so the centre is on the vertex and the baseline aligns with zero.
3. Count from zero up to 90 and mark a dot at that point on the scale.
4. Join the vertex to the 90 degree dot with a ruler.

LESSON ARC

Open at the board with a baseline and a pencil, moving the mark to two spots so pupils see the mark's position controls the angle — where would 55° go? Model three constructions live (60°, 110°, 25°), holding out for the count up from zero. Pupils build the same three in their copy, then construct-and-measure-back together. Class Challenge closes on two angles making a straight line, reasoning 180° − 60° = 120°.

TEACHING MOVES

1. **Getting Started.** Put your pencil mark in one spot on the board baseline, then a second spot, so the class sees the mark's position is what sets the angle. Take two or three hands-up guesses for where 55° would land — don't confirm. 'Where would the mark go?' is the whole lesson in one question.
2. **Watch and Notice.** Model the five moves slowly on 60°, holding out for the count from zero not 180. On 110°, ask which scale the mark reads from before you reveal — that's where pupils grab the wrong number. Linger on 25°: ask 'is 25° bigger or smaller than a right angle?' so a miscount that looks nearly flat gets caught.
3. **Build These in Your Copy.** Walk the room glancing for two things: is the vertex sitting on the protractor's centre, and are pupils counting up from zero? The 110° is the one to watch — a wrong-scale read shows up as 70°. No marking; this is whole-class copybook practice.
4. **Try It Together.** Pupils build 40°, 90° then 135° on paper with their own protractors; the board tool is only the measure-back check. Pupils take turns reading each angle back on the board and the class agrees or corrects aloud. On 135° hold the class on the count before the mark goes down — revoice a good check with 'you built it AND you proved it'.

5. **Class Challenge.** Keep it brisk — pupils take turns at the board, check each answer, class confirms, move on. Before the straight-line pair, show the 60° sitting on a straight line and write 180° up top. Ask the class to name the partner angle before anyone builds it: if the whole line is 180° and one part is 60°, what's left? Let them reason to 120°.
6. **What Did We Notice?.** Listen for pupils naming the wrong-scale slip on obtuse angles as the usual cause of a mismatch. Revoice: 'so measuring back doesn't just check the answer — it tells you which step slipped.' Head off the idea that a mismatch means a faulty protractor; it's almost always the count.

COMMON MISCONCEPTIONS

⚠ Asked for 110°, a pupil reads the inner scale and marks 70° — they've counted from the wrong zero on the protractor's double scale.

Before they mark, ask 'which zero is your baseline sitting on?' and have them trace 0, 10, 20 up that one scale aloud. Then measure the finished angle back on the board tool — a 70° reading against a 110° request makes the wrong-scale slip visible.

⚠ A pupil overshoots a small angle like 25° so it comes out looking nearly flat, and doesn't notice anything is wrong.

Build in the sense-check before the mark: 'is 25° bigger or smaller than a right angle?' If they've drawn something near 90° or more, the answer to that question flags it immediately. Rebuild slowly, counting each ten from zero.

⚠ When a measured-back angle doesn't match, a pupil decides the protractor is broken rather than checking their own method.

Revoice the mismatch as information: measuring back tells you which step slipped, usually the count from zero. Rebuild the same angle together, saying the count aloud, so the same protractor now gives the right answer.

DIFFERENTIATION

EMERGING

- Give the paper-protractor template so the pupil overlays the baseline directly and reads degrees without juggling a plastic protractor's centre point.
- Stay with the round, familiar sizes — 90°, 60°, 30° — in the copybook build before attempting the obtuse 110° with teacher support at the table.

DEVELOPING

- After building 135°, ask the pupil to construct its partner on a straight line and predict the size (45°) before measuring back.
- Set a construct-then-check chain: build 40°, then an angle exactly double it, and prove both by measuring back.

PROFICIENT

- Narrate a harder whole-class variant: construct three angles that together make a straight line (e.g. 50°, 70° and the partner) and reason out the third before building — or pull ahead into the Student Activity Book page.
- Pose: 'construct a 105° angle using only a right angle and one small angle added on — how?' Let them find that 90° + 15° gets there without reading 105° directly.

↗ **Cross-curricular:** Tie to Geography — pupils construct compass bearings on paper (e.g. a 135° south-east heading) and check each with the measure-back.

ANSWER KEY

Scaffold: visual check on the page

Q1: (drawing of 30° angle)

Q2: 40° angle (drawing)

Q3: 60° angle (construction)

Q4: 90°

a) Always — The rule says the starting straight line is drawn first.

b) Always — The method always counts up from zero to the size.

c) Never — If done correctly it will always measure 90 degrees.

d) Sometimes — The tip says the 135 degree one is the tricky one.

EXTENSION SHEET · STRETCH ANSWERS

S1: 98°

S2: 136°

S3: 126° is obtuse

S4: 57°

S5: 158° is obtuse