

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 by ruling a baseline on the board and moving one pencil mark along it so the class sees the mark's position sets the angle size. Model the five moves on 60°, 110° and 25° — baseline, centre on vertex, count from zero, mark, join — lingering on the small one. Pupils build those three in their copybooks with their own protractors. Try It Together runs 40°, 90° and 135° with a measure-back check after each. Class Challenge adds 30°, 75° and a straight-line pair (60° + 120°). Student Activity Book is the solo practice hand-off.

TEACHING MOVES

1. **Getting Started.** Rule one baseline and put your pencil mark in two different spots above it so the class sees the mark's place controls the angle. Take two or three hands-up guesses for where a right-angle mark would sit — don't confirm yet. Hold the question: where would the mark need to go?
2. **Watch and Notice.** Build 60° slowly through the five moves; hold the count from zero, not 180. On 110°, freeze before the mark and ask which scale it reads from — that is where the wrong-scale grab lands. On 25°, ask is 25° bigger or smaller than a right angle? before anyone marks, so a near-flat slip is caught by sense, not only by the number.
3. **Build These in Your Copy.** Pupils construct the same 60°, 110° and 25° in their copybooks — fresh baseline each time, labelled. Walk the room watching two things only: count up from zero, and vertex on the protractor centre. Flag any 110° that has become 70° off the inner scale without stopping the whole class yet.
4. **Try It Together.** Talk it through together — no marking. Pupils build 40°, then 90°, then 135° on paper while the board tool is the measure-back check, not the construction. On 135°, hold the class on the count aloud before the mark goes down. Revoice a clean check: you built it and you proved it.

5. **Class Challenge.** Keep board turns brisk — construct, check, confirm, move on. Before the straight-line pair, show 60° sitting on a full line and write 180° beside it. Ask what is left for the partner before anyone builds: if the whole line is 180° and one part is 60° , what remains? Let them reason to 120° rather than telling them.
6. **What Did We Notice?.** Ask what a mismatch told them about their method, and where the count from zero went wrong most often. Listen for the wrong-scale slip on obtuse angles. Revoice: measuring back doesn't just check the answer — it tells you which step slipped. Head off 'my protractor is broken'; almost always it is the count.

COMMON MISCONCEPTIONS

⚠ On an obtuse target like 110° or 135° , pupils mark the acute number on the other scale — 70° or 45° — because they started counting from 180 instead of zero.

Freeze before the mark. Ask which end of the baseline the zero is lined up on, then count aloud together from that zero only. Measure the finished angle back so the mismatch names the slip.

⚠ Pupils line the protractor edge on the baseline but leave the centre hole off the vertex, so the second arm is skewed even when the degree mark looks right.

Have them tap the vertex with the pencil tip, then drop the protractor centre onto that tip before any counting. Rebuild one angle with the class watching the centre land first.

⚠ On a small acute angle like 25° , pupils overshoot and land near 35° – 40° because the marks are tight and they rush the count.

Sense-check first: is 25° bigger or smaller than a right angle — and roughly how much of a right angle? Count the marks in tens then ones, and measure back; a near-flat look means the count ran past.

DIFFERENTIATION

EMERGING

- Stay on acute targets (30° , 40° , 60°) while the class moves to obtuse; pre-mark the vertex dot on their baseline so they only place and count.
- Use the paper protractor printable if the plastic one slips; sit them where you can glance that the centre is on the vertex before they mark.

DEVELOPING

- After a clean measure-back, ask them to predict the mark for 75° before placing the protractor — then check how close the prediction landed.
- Give 150° as a fourth copybook angle and ask which scale they will read from, and why, before they draw.

PROFICIENT

- On the straight-line pair, withhold the 60° and ask: find two different pairs that sit on a straight line and prove each with the protractor.
- Challenge: construct 90° without using the 90 mark on the scale — only 0 and count — then measure back to prove it.

✂ **Cross-curricular:** Link to Geography — pupils sketch a simple compass rose and construct the 90° turns between N, E, S and W with the protractor.

ANSWER KEY

Scaffold: visual check on the page

Q1: (drawing of 30° angle)

a) **Always** : The baseline is drawn first so the protractor can sit on it.

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

c) **Never** : A careful construction gives exactly 90 degrees, not 80 .

d) **Sometimes** : It depends where 0 sits: use whichever scale starts at 0 on your baseline.

EXTENSION SHEET · STRETCH ANSWERS

S1: 307° is reflex

S2: 126° is obtuse

S3: 136°

S4: 47° is acute

S5: 69°