

Lesson 77 SHAPE & SPACE

Constructing circles and exploring their parts

CURRICULUM ALIGNMENT

SHA.SHP.4a

construct 3-D and 2-D models or structures given defined measurements and/or specific conditions.

ALG.PRR.4a

identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.

WHAT THIS LESSON TEACHES

The distance from the centre of a circle straight out to the edge is the radius. Every radius of the same circle is the same length.

→ A compass opened to 5 cm draws a circle with a radius of 5 cm.

→ A radius of 5 cm gives a diameter of 10 cm.

MODEL THIS ON THE BOARD

CONSTRUCT A CIRCLE WITH RADIUS 6 CM

- 1 Open your compass to 6 cm from the point to the pencil.
- 2 Place the point on the paper and draw the circle all the way round.
- 3 Mark the centre point and draw one radius line from centre to edge.

LESSON ARC

Open with two circles on the IWB — one freehand, one compass-drawn — and draw out that the compass keeps the same gap all the way round. On the Watch and Notice interactive, trace centre-then-radius-then-diameter on a 5 cm circle, then shrink to 3 cm so pupils see the diameter halve. Try It Together runs board-set circles with predict-before-check, including one worked backwards from the diameter. Copybook practice: construct and label a 5 cm-radius circle.

TEACHING MOVES

1. **Getting Started.** Hands up, not call-outs — take two or three answers on which circle is 'true'. Listen for 'every point is the same distance from the centre' and revoice it as 'the compass keeps the exact same gap the whole way round'.
2. **Watch and Notice.** On the interactive, point to the centre first, trace the radius out, then trace the diameter across but pause at the centre — 'one radius plus another radius'. Ask what the diameter reads before revealing. On the 3 cm circle, hold out until someone names the pattern: the diameter halved when the radius halved.
3. **Try It Together.** Pupils take turns setting each circle at the board while the class predicts aloud — 6 cm gives 12 cm, 2 cm gives 4 cm. On the last one, flip it: diameter 8 cm, so ask 'what radius must the compass be opened to?' Expect the halving direction to slow them down — that's the one worth the extra beat.
4. **Construct a Circle in Your Copy.** Walk the room checking compass technique — point planted still, pencil arm steady, no wandering centre. Glance for the diameter labelled 5 cm instead of 10 cm and prompt on the spot. This is practice, not marking — keep moving.
5. **Class Challenge.** Brisk board rotation — pupils set each target circle and the class confirms before the next. On the diameter targets (10 cm → 5 cm, 6 cm → 3 cm) ask 'what did you open the compass to?' each time. Don't re-teach the rule — just keep the halving visible.

6. What Did We Notice?. Ask why the doubling always holds, not just for today's circles. Listen for 'the diameter is two radii laid end to end'. Revoice a strong answer and press any pupil who thinks it only works for the sizes drawn today.

COMMON MISCONCEPTIONS

⚠ Pupils label the diameter with the same number as the radius — a 5 cm-radius circle gets '5 cm' written across the middle.

On the interactive, retrace the diameter stopping at the centre: 'here's one radius of 5, here's the second radius of 5 — count them together, that's 10.' Have the pupil re-label from the two-radii picture, not from memory.

⚠ Pupils call any straight line across the circle a diameter, including a chord that misses the centre.

Put the chord and the diameter up side by side on the interactive and ask which one passes through the centre dot. Only the line through the centre is a diameter; the other is a chord. Name both aloud.

⚠ Given a diameter of 8 cm, pupils open the compass to 8 cm rather than halving to 4 cm.

Stop and ask 'is the compass gap the whole way across, or from the centre out?' Trace on the board that the compass only ever spans one radius. Rework 8 cm → 4 cm before they set the next one.

DIFFERENTIATION

EMERGING

- Give these pupils a pre-marked centre dot in the copybook so the effort goes into steady compass technique, not placing the point.
- Keep them on the radius-given circles (3 cm, 7 cm) at the board; hold the diameter-halving targets for teacher-supported turns.

DEVELOPING

- After the copybook circle, ask them to draw a second chord that does not pass through the centre and explain how they know it isn't a diameter.
- Give an odd diameter — say 9 cm — and ask what compass setting it needs, so halving lands on a half-centimetre.

PROFICIENT

- At the Class Challenge, pose a teacher-narrated stretch: 'if two circles share the same centre but one has double the radius, what happens to the diameter?' Let them reason it aloud before you confirm.
- Ask them to construct one circle inside another (same centre) so a radius of the big one is the diameter of the small one, and explain the relationship in their copybook.

✂ **Cross-curricular:** Link to Geography — the compass rose on an Ordnance Survey map is a circle; pupils identify its centre and mark radii out to the eight main directions.

ANSWER KEY

Scaffold: visual check on the page

Q1: circle radius 3 cm

Q2: circle $r=5\text{cm}$ + chord

a) Always — All radii reach the same distance from centre to edge.

b) Never — A chord does not touch the centre.

c) Always — The diameter is one radius plus another radius.

d) Never — Only a compass circle keeps all radii equal.

EXTENSION SHEET · STRETCH ANSWERS

S1: 3 cm

S2: radius, 5 cm

S3: 4.6 cm

S4: 3 concentric circles, radii 3/5/7 cm

S5: single circle, radius 6.5 cm