

Drawing circles with a compass

CURRICULUM ALIGNMENT

SHA.SHP.4a

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

MEA.MSR.4a

determine and calculate units of measurement in fractional and/or decimal form to solve practical problems.

WHAT THIS LESSON TEACHES

The gap between the compass point and the pencil tip is the radius of the circle. Keep the point fixed and turn the pencil smoothly all the way round to draw a perfect circle.

- Set the gap to 4 cm against a ruler, and every point of the circle will be 4 cm from the centre.
- A dartboard is made of concentric circles around one centre spot.

MODEL THIS ON THE BOARD

DRAWING A PLAY TARGET CIRCLE

- 1 Set the compass gap to **3 cm** against a ruler.
- 2 Plant the sharp point firmly at the chosen centre mark.
- 3 Rotate the pencil arm in one smooth turn without lifting it.
- 4 Check that the curve joins up to make a closed circle.

LESSON ARC

Open with one clean circle on the visualiser and take two or three hands-up answers on what stayed still versus what moved. Animate three finished circles naming set-plant-rotate, then deliberately lift the point mid-turn so the class sees the curve break. Pupils set real compass gaps against their rulers for 3 cm, 5 cm and 2 cm while one works the screen. Copybook practice nests three concentric rings from one centre cross; Class Challenge adds half-centimetre targets. Olympic rings close the practice; maths-talk pins the planted point as the centre.

TEACHING MOVES

1. **Getting Started.** Draw one clean circle on the visualiser in a single smooth turn. Take two or three hands-up answers only — fish for ‘the point stayed still’ and ‘the pencil moved round’. Do not confirm yet; the model step proves it.
2. **Watch and Notice.** Name each animated beat aloud: set, plant, rotate. On the 2.5 cm circle, hold the class for the join so they see the ends meet. Then, on plain paper at the front, deliberately lift the point halfway through one turn — that broken curve is the slip they must avoid.
3. **Try It Together.** Call each radius clearly — 3 cm, then 5 cm, then 2 cm. One pupil works the screen; everyone else sets the real compass gap against their own ruler before the point goes down. Circulate and catch measuring-by-eye; compare each paper circle to the screen after every radius.
4. **Draw the Rings in Your Copy.** Walk the room for the shared centre cross and a clean unbroken curve on each ring — this is whole-class copybook practice, not marking. If the point drifts between the 2 cm, 4 cm and 6 cm settings the rings will not nest; that is the thing to catch.
5. **Class Challenge.** Keep board turns brisk: pupils set 2.5 cm, 3 cm, 4.5 cm and 5 cm on screen, press Check, and the class confirms before moving on. No re-teaching — pupils draw each target on paper while waiting turns watch and predict the next radius.

6. **Draw the Olympic Rings.** Before anyone starts, mark three top-row centres about 4 cm apart on the board (less than the 6 cm diameter so neighbours truly overlap), then two bottom centres nestled between. Draw one ring live. Celebrate evenly-linked overlaps more than perfect curves.
7. **What Did We Notice?** Ask why keeping the sharp point still matters so much, and what happened when it slipped. Re-voice a strong answer: the point is the centre, so every part of the circle stays the same distance from it — that distance is the radius. Head off blame on a shaky drawing hand; it is the planted point that matters.

COMMON MISCONCEPTIONS

⚠ Pupils set the compass gap by eye instead of against the ruler, so a '3 cm' circle comes out closer to 2.5 cm or 3.5 cm.

Stop the class and re-set one compass live against a ruler: point on 0, pencil tip exactly on 3. Have the pupil redraw and lay the ruler across the radius to prove the match.

⚠ Pupils lift or drag the sharp point mid-turn — the two ends of the curve miss and the shape will not close.

Replay the deliberate mid-turn lift from Watch and Notice. Plant one point firmly under a fingertip, rotate only the pencil-arm, and have the class call out the moment the ends meet.

⚠ Pupils treat the gap as the diameter: asked for a 4 cm circle they open the legs to 4 cm thinking that is all the way across, then get a circle twice as big as intended.

Draw a 4 cm radius circle, mark the centre, and lay the ruler from centre to rim (4 cm) then all the way across (8 cm). 'The gap is centre-to-rim only — half the width, not the full width.'

DIFFERENTIATION

EMERGING

- Stay on whole-centimetre radii (3 cm, 5 cm) and pre-mark the centre cross in the copy so the pupil only sets the gap and rotates.
- Teacher sets the compass gap against the ruler once; the pupil's job is plant and rotate without lifting.

DEVELOPING

- After the concentric rings, ask: if the outer ring is 6 cm, what radius sits exactly halfway between the 2 cm and 6 cm rings — and draw it.
- On the Olympic rings, measure centre spacing with the ruler and adjust until every neighbour overlaps by roughly the same amount.

PROFICIENT

- Once the Olympic rings link cleanly, add a sixth circle of radius 3 cm that overlaps two existing rings and explain where its centre had to sit.
- Design four concentric rings from one centre with radii 1.5 cm, 3 cm, 4.5 cm and 6 cm — same set-plant-rotate routine, tighter half-centimetre control.

✂ **Cross-curricular:** Tie to PE and the Olympic rings logo — five equal-radius circles linked by careful centre spacing, just as they drew.

ANSWER KEY

Scaffold: visual check on the page

Q1: circle, radius 2 cm

a) Always : That fixed gap keeps every point on the curve the same distance from the centre.

b) Always : Any slip of the point stops the curve from meeting itself cleanly.

c) Never : A larger gap sets a larger radius and therefore a bigger circle.

d) Never : Opening wider moves the pencil further from the centre, so it finishes outside its starting point.

EXTENSION SHEET · STRETCH ANSWERS

S1: 3 concentric circles, radii 3/5/7 cm

S4: single circle, radius 6.5 cm

S2: single circle, radius 6 cm

S5: 6 cm

S3: 10