Lesson 71 MIXED

Constructing triangles from given measurements

CURRICULUM ALIGNMENT

SHA.SHP.4a construct 3-D and 2-D models or structures given defined measurements and/or specific conditions.

WHAT THIS LESSON TEACHES

To **construct** a triangle accurately, use a ruler for the sides and a protractor for the angles, drawing carefully from a base line.

→ Given two sides and the angle between them, draw the base first.

LESSON ARC

Open with a sketched triangle (6 cm, 4 cm, 5 cm) and ask whether two pupils given the same sides build identical shapes — hold the suspense. On the board's circle tool, model the three moves: draw the base, swing both arcs, join the crossing point. Pupils then construct the 6-5-4 triangle in their copy with their own compass before the whole-class Class Challenge bank steps them up to an equilateral.

TEACHING MOVES

1. **Getting Started.** Take exactly three hands-up answers to 'same shape or different?' — no open call-outs. Don't resolve it. Park it with 'let's see by the end whether you were right' and move on; the suspense carries the lesson.
2. **Watch and Notice.** Use the circle tool and say the same three words every example: 'base, swing both arcs, join the crossing point.' Save 2-2-9 for last and trace the two short arcs with your finger so the class watches them fall short — then state the rule: the two shorter sides must add up to more than the longest.
3. **Try It Together.** Run the circle tool in construction mode and rotate three or four pupils across the three sets. After each, ask the class out loud: 'did the arcs cross? where? does the triangle close?' Watch for pupils setting the compass to the wrong side length before swinging.
4. **Construct the Triangle in Your Copy.** Give time for one unhurried construction of 6-5-4 — for many this is their first compass triangle. Walk the room watching technique: point planted firmly, arc swung in one smooth move. Catch the compass slipping wider mid-swing. Hand the compass_construction_sheet (base pre-drawn) to anyone struggling with the base line.
5. **Class Challenge.** Brisk practice — a pupil sets the base, swings both arcs, joins the crossing; the class checks the sides match before moving on. Don't re-explain each one. Hold the equilateral as the closing challenge and ask 'what's special about the two arc radii here?'
6. **What Did We Notice?.** Put the two pupil claims (long-thin triangle vs. no triangle) to the class and listen for someone reasoning that two 2 cm arcs can't reach across a 9 cm base. Point back to the on-screen non-example, then re-voice the rule. Close the loop on the Getting Started question.

COMMON MISCONCEPTIONS

⚠ A pupil sets the compass to the base length, or to the wrong one of the two remaining sides, before swinging — so the arc is the wrong radius and the corner lands in the wrong place.

Stop them before the swing: 'which side is this arc? read the radius off the ruler first.' Make it a habit to set the compass against the ruler and say the length aloud each time before lifting it to the paper.

⚠ Pupils believe 2 cm, 2 cm and 9 cm will just make a 'long thin triangle' rather than no triangle at all.

Rebuild it on the circle tool and trace both short arcs with your finger — the class sees them stop well short of meeting. Land the plain rule: if the two shorter sides don't add up to more than the longest, the arcs never cross, so there's no corner.

⚠ The compass slips wider mid-swing, so the arc traces too long a radius and the triangle's sides come out wrong when measured back.

Walk the room and model a single smooth swing with the point planted hard. Have pupils measure their finished sides with the ruler to check against the given lengths — a side that's 5.4 cm instead of 5 cm shows the slip.

DIFFERENTIATION

EMERGING

- Hand out the compass_construction_sheet with the base already drawn so pupils focus only on setting the radius and swinging the two arcs.
- Start them on the 4-4-4 equilateral from the Class Challenge — both arcs are the same radius, so there's one length to set, not two.

DEVELOPING

- After the 6-5-4 copy construction, give 7, 6, 5 and ask them to measure all three finished sides back with the ruler to confirm their accuracy.
- Ask: if you start the same 5-4-3 triangle from a different base, do you get the same shape? Build it twice to check.

PROFICIENT

- Pose: find three whole-centimetre side lengths that only just fail to make a triangle, and three that only just succeed — explain how you knew before drawing.
- Once finished, ask them to narrate the three construction steps to the class as the teacher builds, catching any slip in the wording.

⚬ **Cross-curricular:** Link to the STE/woodwork strand — the same set-and-swing compass skill is used to mark out and check a square frame before cutting.

ANSWER KEY

W1: scalene

W2: a parallelogram

Q1: scalene

Q2: an isosceles triangle

Q3: an isosceles trapezium

Q4: isosceles

EXTENSION SHEET · STRETCH ANSWERS

S1: a regular hexagon

S2: a regular hexagon

S3: a trapezium

S4: a rectangle

S5: an isosceles triangle