NCETM
NATIONAL CENTRE FOR EXCELLENCE
IN THE TEACHING OF MATHEMATICS

Core concept 6.4: Constructions

This document is part of a set that forms the subject knowledge content audit for Key Stage 3 maths. The audit is based on the NCETM Secondary Professional Development materials and there is one document for each of the 17 core concepts. Each document contains audit questions with check boxes you can select to show how confident you are (1 = not at all confident, 2 = not very confident, 3 = fairly confident, 4 = very confident), exemplifications and explanations, and further support links. At the end of each document there is space to type reflections, targets and notes. The document can then be saved for your records.

6.4.1 Use the properties of a circle in constructions

How confident are you that you can explain how to construct triangles and rhombuses from given lengths using the properties of a circle?
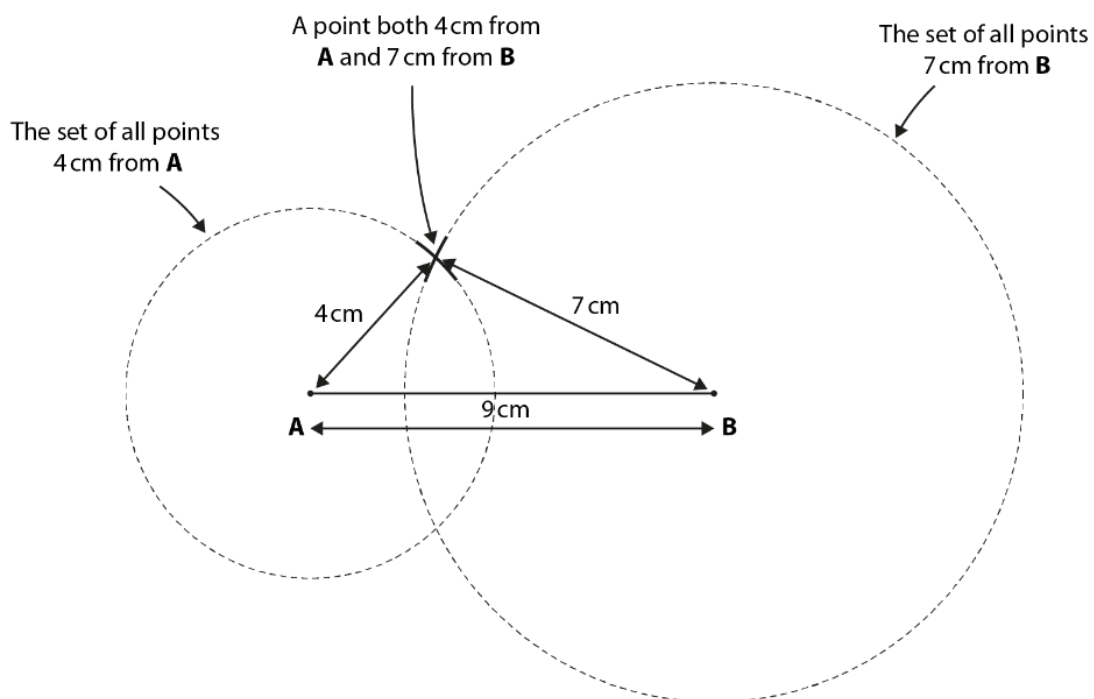
1 ☐   2 ☐   3 ☐   4 ☐

A key awareness is that drawing a circle creates an infinite set of points, all of which are equidistant from its centre. Students will need plenty of experience of using a ruler and a pair of compasses to appreciate the nature of the construction, and to explore the different ways drawn circles can be used to identify points that are a specified distance away from one or more points. Students should also become aware that drawing full circles is not necessary – the drawing of carefully placed arcs is more efficient.

Once students can construct a scalene triangle with ease and efficiency, they can be challenged to construct other shapes (for example, equilateral and isosceles triangles and rhombuses). This will not only provide opportunities for students to become fluent with the construction processes, but also, importantly, to engage in some early discussions about the basic properties of these shapes.

6.4.2 Use the properties of a rhombus in constructions

How confident are you that you understand and can explain how to use the properties of a rhombus to construct a perpendicular bisector of a line segment, a perpendicular to a given line through a given point and an angle bisector?
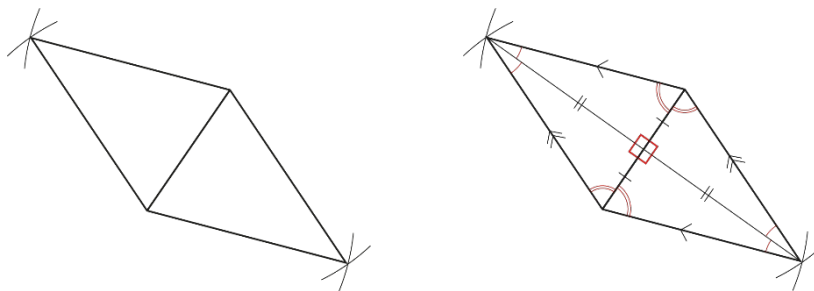
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The key awareness here is that, when a rhombus is constructed, other constructions have also necessarily been produced.
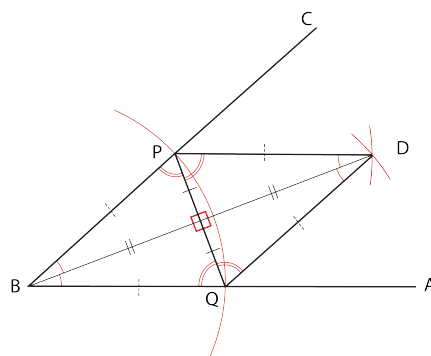
It is also useful to be aware of how to use arcs efficiently to create these constructions:
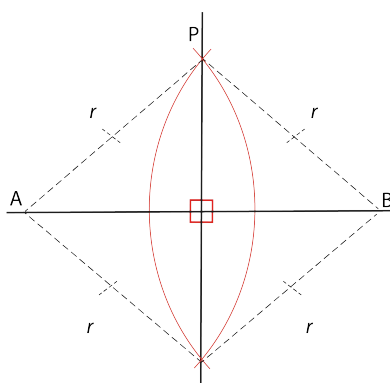
For example:

a) To construct the bisector of angle ABC:

- Draw an arc, centre B, to cross AB at Q and AC at P.
- Draw an arc, centre P, and an arc, centre Q, with the same radius. The two arcs cross at D.
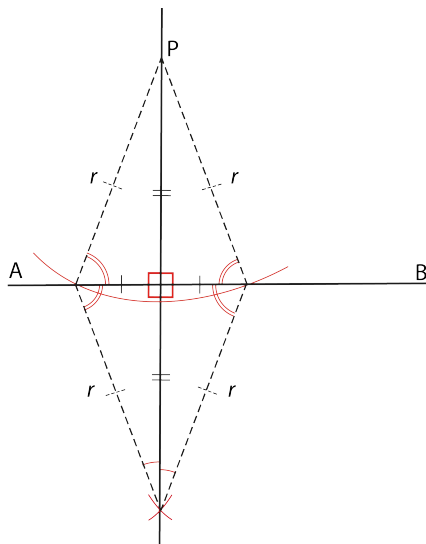- Draw a line from B through D. This line is the bisector of angle ABC.

b) To construct the midpoint and the perpendicular bisector of line AB:

- With the pair of compasses open to more than half the length of the line, draw an arc, centre A, that extends above and below the line.
- Do the same at B, with the same radius, such that the arcs cross both above and below the line.
- Draw a line through the two points of intersection of the arcs. This line is the perpendicular bisector of AB.

c) To construct the perpendicular from P to line AB:
- Draw an arc, centre P, to cross AB at two distinct places.
- Find the perpendicular of the segment of AB that is between these two points of intersection. This line is the perpendicular of the given line through a given point.

Further support links

- NCETM Secondary Professional Development materials: 6.4 Constructions, pages 11–16

Notes