

Lesson 8

Lines and angles

Objectives

Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes (Y7)

Vocabulary

parallel, perpendicular, transversal, intersecting, vertically opposite, supplementary, complementary, alternate, corresponding, interior, exterior, equidistant, convention, definition

Resources

Whiteboards (if available)

Objectives

Solve geometrical problems using side and angle properties and explaining reasoning with diagrams and text (Y8)

Vocabulary

parallel, perpendicular, transversal, vertically opposite, supplementary, complementary, alternate, corresponding, interior, exterior, equidistant, prove, proof, convention, definition, derived property

Resources

OHT of M8.1

OHT of M8.2 (for plenary)

Whiteboards (if available)

Mixed set of questions drawn from the Framework

By the end of the lesson

pupils should:

- know and use the angle properties of parallel lines, and of triangles and polygons
- be able to justify and explain reasoning with diagrams and text

Framework supplement of examples, pages 16, 17, 183 Levels 5 and 6

Oral and mental starter

10 minutes

Ask pupils to listen to the following instructions, and sketch and label the diagram:

Draw an isosceles triangle ABC.

Mark the equal angles and sides.

Mark and shade angle ABC.

Extend line AB to point D, and mark the exterior angle of the triangle.

Discuss different orientations of the triangle.

Now ask pupils to do the same for these instructions:

Draw a pair of parallel lines with an intersecting transversal.

Label the parallel lines.

Label a pair of corresponding angles with the letter *c*.

Label a pair of alternate angles with the letter *a*.

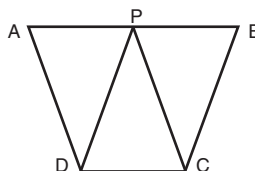
Label a pair of vertically opposite angles with the letter *v*.

Discuss pupils' answers and the relationships between the angles: Which are equal? Do any add up to 90° (complementary)? ... add up to 180° (supplementary)?

Main teaching

40 minutes

Tell pupils that they are going to use their knowledge of lines and angles to solve geometrical problems. Model how to solve the problem on **OHT M8.1**.



ABCD is an isosceles trapezium with AB parallel to DC.

P is the midpoint of AB, and $AP = CD$, $AD = DP$.

$\angle DAP = 75^\circ$. Calculate the sizes of the other angles.

Ask pupils to draw and label the diagram and discuss the question in pairs.

Q What information can you add to the diagram?

Label AB and CD as parallel.

Label $AP = PB = CD$.

Label $BC = AD$ (isosceles trapezium).

Label $\angle DAP = \angle PBC = 75^\circ$ (isosceles trapezium).

Q Which angles can you calculate first? Justify your answers.

Discuss pupils' solutions and model the use of correct language and geometrical reasoning.

$$\angle DAP = \angle APD = 75^\circ \quad (\text{triangle APD is isosceles})$$

$$\angle ADC = 180^\circ - 75^\circ \quad (\text{interior angles, AB and DC are parallel})$$

$$\angle ADP = 180^\circ - 75^\circ - 75^\circ \quad (\text{angle sum of triangle is } 180^\circ) \quad \text{and so on}$$

Ask pupils to solve a selection of mixed problems involving lines and angles. Use the Framework supplement of examples, pages 16, 17 and 183, and examples from previous Key Stage 3 test papers.

Check pupils' knowledge of interior and exterior angle properties of polygons.

Plenary

10 minutes

Show **OHT M8.2**, developed from a 1999 test question. Ask pupils to discuss in pairs how to solve the problem and to explain their reasoning.

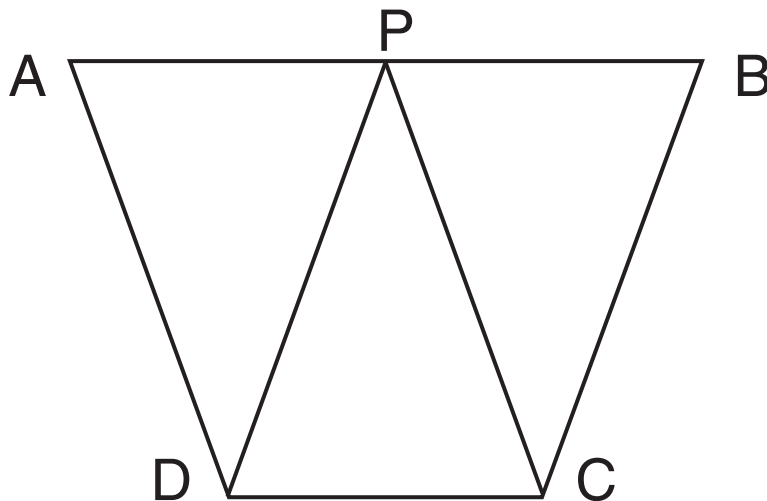
$$k = 180 - 70 \quad (\text{interior angles})$$

$$3(m + 70) = 360 \quad (\text{angles at a point total } 360^\circ)$$

Demonstrate how pupils should show their working concisely.

Isosceles trapezium

M8.1



ABCD is an isosceles trapezium
with AB parallel to DC.

P is the midpoint of AB, and
 $AP = CD$, $AD = DP$.

$\angle DAP = 75^\circ$.

Calculate the sizes of the other angles.

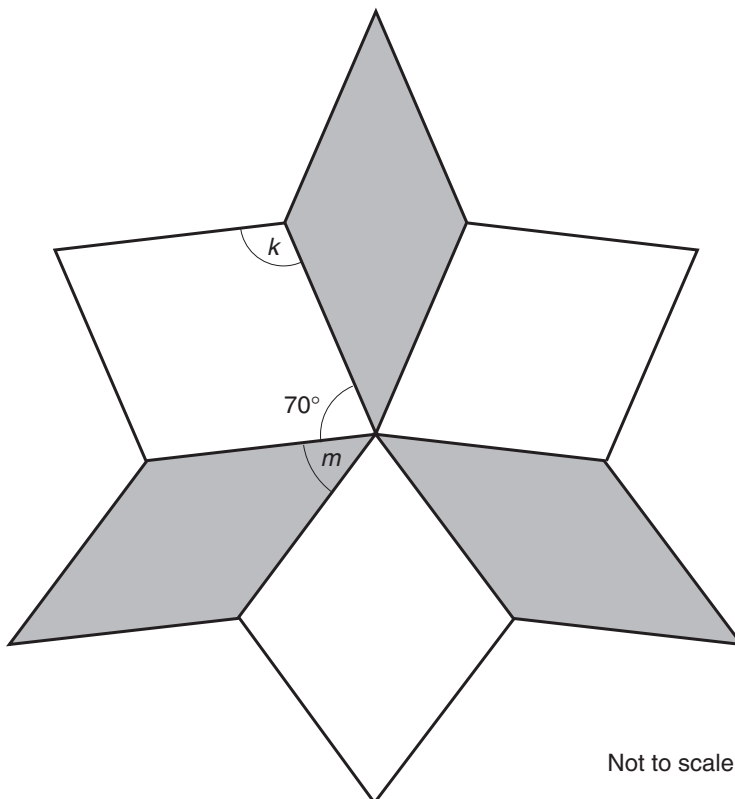
Star

M8.2

The shape below has three identical white tiles and three identical grey tiles.

The sides of each tile are the same length. Opposite sides of each tile are parallel.

One of the angles is 70° .



- Calculate the size of angle k .
Give a reason for your answer.
- Calculate the size of angle m .
Give a reason for your answer.

