Worksheet - Angles, circles and 3D shapes

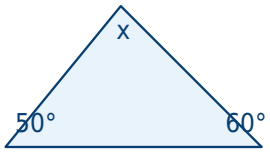
Year: Year 6 · 20

Show your working.

Question 1

Question 1 – Angles in triangles *(Section A · Skills practice)*

Use the fact that angles in a triangle add up to 180° to find each missing angle. Write the angle fact next to each step.

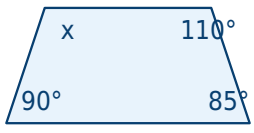


a. The triangle in the diagram, with angles 50°, 60° and x.
b. A right-angled triangle has one of its other angles equal to 35°. Find the third angle.
c. An isosceles triangle has an angle of 40° at the top (between the equal sides). Find the two base angles.
d. What is the size of each angle in an equilateral triangle?

Question 2

Question 2 – Angles in quadrilaterals *(Section A · Skills practice)*

The angles in a quadrilateral add up to 360°.

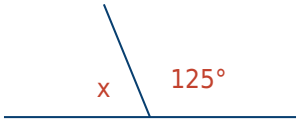


a. Find the missing angle x in the diagram.
b. A parallelogram has one angle of 65°. Find the other three angles.
c. A kite has angles of 100°, 100° and 60°. Find the fourth angle.
d. A rectangle has all its angles equal. What is the size of each angle? Show that the total is 360°.

Question 3

Question 3 – Angles on a line and at a point *(Section A · Skills practice)*

Use the facts that angles on a straight line add up to 180° and angles around a point add up to 360°.

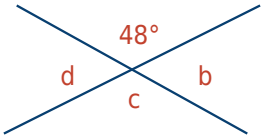


a. Two angles on a straight line are 125° and x. Find x.
b. Three angles on a straight line are 40°, 75° and y. Find y.
c. The angles around a point are 110°, 130° and z. Find z.
d. Four angles meet at a point: 90°, 80°, 100° and w. Find w.

Question 4

Question 4 – Vertically opposite angles *(Section A · Skills practice)*

Two straight lines cross. The angles opposite each other are equal.



a. One angle is 48°. Find b, c and d.
b. Explain how you can find b using angles on a straight line.
c. In another diagram, two crossing lines make angles of $3x$ and 120° opposite each other. Find x.

Question 5

Question 5 – Parts of a circle *(Section A · Skills practice)*

Use the fact that the diameter is twice the radius.

a. A circle has a radius of 6 cm. What is its diameter?
b. A circle has a diameter of 15 cm. What is its radius?
c. A circle has a diameter of 9.4 cm. What is its radius?
d. You want to draw a circle that is 7 cm wide. To what length do you set the compasses?
e. Name the line from the centre to the edge, and the line across the circle through the centre.

Question 6

Question 6 – Faces, edges and vertices *(Section A · Skills practice)*

Complete the table for these 3D shapes. A vertex is a corner (the plural is vertices).

Shape	Faces	Edges	Vertices
Cube	6	12	8
Triangular prism	?	?	?
Square-based pyramid	?	?	?
Cylinder	flat: ?, curved: ?	?	?

a. Fill in the missing numbers.
b. A cube has 8 vertices, 12 edges and 6 faces. Check that vertices + faces − edges = 2. Do the same for the triangular prism and for the square-based pyramid.

Question 7

Question 7 – The roof frame *(Section B · Real-life practice)*

A carpenter builds a triangular frame for a roof. The two sloping sides are the same length, so the frame is an isosceles triangle. The angle at the top of the roof is 100°.

a. Work out the size of each of the two base angles.
b. The carpenter builds a different frame with a top angle of 70°. Find each base angle.
c. A third frame has a base angle of 55°. Find the top angle.
d. Why can the base angles of an isosceles triangle not be 100° each?

Question 8

Question 8 – Pizza slices *(Section B · Real-life practice)*

Mia cuts a circular pizza into 8 equal slices by cutting through the centre.

a. What angle is at the centre for each slice?
b. Mia eats 3 slices. What angle at the centre do her slices make together?
c. Dad cuts a different pizza into 6 equal slices. What is the angle for each slice?
d. How many degrees are the slices that are left if Dad serves 4 of the 6 slices?

Question 9

Question 9 – What time is it? *(Section B · Real-life practice)*

The numbers on a clock face are equally spaced round the centre, so the angle between neighbouring numbers is the same.

a. What is the angle between two neighbouring numbers on a clock face?

b. What angle do the hands make at 3 o'clock?
c. What angle do the hands make at 4 o'clock?
d. What angle do the hands make at 6 o'clock? What kind of angle is this?
e. At what time between 12 o'clock and 6 o'clock is the angle between the hands exactly 150°?

Question 10

Question 10 – The robot turns *(Section B · Real-life practice)*

A robot faces north. Every turn it makes is a clockwise turn. A complete turn is 360°, a quarter turn is 90° and a half turn is 180°.

a. The robot turns 90°. Which direction does it face now (north, east, south or west)?
b. From north it turns 135° clockwise. Which direction is it facing roughly, and what is the angle between it and south?
c. It then turns a further 225°. What is the total turn and which way is it facing now?
d. What angle must it turn clockwise from east to face west?

Question 11

Question 11 – The kite in the park *(Section B · Real-life practice)*

Leo makes a kite from a light frame. The frame is a quadrilateral. Three of its angles are 120°, 60° and x, and the fourth angle is $2x$.

a. Write an equation for the sum of the angles.
b. Solve the equation to find x.
c. Write down all four angles of the kite.
d. Check that the four angles add up to 360°.

Question 12

Question 12 – The bicycle wheel *(Section B · Real-life practice)*

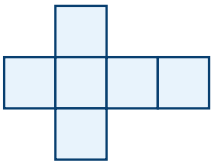
A bicycle wheel has a diameter of 66 cm. It has 36 spokes that are equally spaced round the centre of the wheel.

a. What is the radius of the wheel?
b. What angle is there between neighbouring spokes?
c. The wheel turns through 90°. How many spokes does it move past?
d. A model wheel has half the diameter. What is its radius?

Question 13

Question 13 – Gift boxes and nets *(Section B · Real-life practice)*

A factory makes gift boxes from flat card. The card is cut in the shape of a net, then it is folded.



a. How many squares are in the net of a cube shown in the diagram?
b. The factory wants to make a box shaped like a triangular prism. How many rectangles and how many triangles are in its net?
c. How many faces does a cuboid have? How many of them are rectangles that are not squares if the cuboid has a square base?
d. A net has 6 squares in a row. Explain why it will not fold into a cube.

Question 14

Question 14 – The roundabout *(Section B · Real-life practice)*

A playground has a circular roundabout with a diameter of 4 m. A designer draws a scale drawing in which 1 cm stands for 50 cm.

a. What is the radius of the roundabout in metres?
b. What is the diameter of the roundabout in centimetres?
c. What diameter does the designer draw in the scale drawing?
d. To what length should the designer set the compasses to draw the roundabout?

Question 15

Question 15 – Angles in an isosceles triangle *(Section C · Problem solving)*

An isosceles triangle has two equal angles. The equal angles are each x degrees. The third angle is $(x + 30)$ degrees.

a. Write an equation for the sum of the angles of the triangle.
b. Solve the equation to find x.
c. Write down the three angles and check that they add up to 180°.
d. Another isosceles triangle has the third angle equal to $2x$. Find all three angles.
e. Which triangle has the larger third angle, and by how many degrees?

Question 16

Question 16 – Turning wind turbine blades *(Section C · Problem solving)*

A wind turbine has three blades. They are equally spaced round the centre of the turbine. One blade points straight up at the start.

a. What is the angle between neighbouring blades?
b. The turbine turns 90° clockwise. Where is the first blade now, as a fraction of a

full turn?
c. How many degrees must it turn from the start for another blade to point straight up?
d. One full turn takes 6 seconds. How long does it take to turn 90°? How many degrees does it turn in 1 second?
e. How many complete turns does the turbine make in 2 minutes?

Question 17

Question 17 – The straight line and the triangle *(Section C · Problem solving)*

In triangle ABC, the angle at A is 50° and the angle at B is 60°. The side AB is extended to a point D on a straight line, so that the exterior angle at B is e.

a. Work out the angle at C inside the triangle.
b. Work out the exterior angle e at B, using the straight line.
c. Show that the exterior angle is equal to the sum of the two opposite interior angles.
d. Another triangle has interior angles of 40° at A and 75° at C. Find the exterior angle at B.

Question 18

Question 18 – The garden sprinkler *(Section C · Problem solving)*

A garden sprinkler sprays water over part of a circle. The sprinkler stands at the centre of the circle. On one setting it sprays through an angle of 120° and the water reaches a distance of 4 m from the sprinkler.

a. What fraction of a full circle does the sprinkler cover on this setting?
b. How many sprinklers on this setting are needed to cover the whole circle without any overlap?
c. Two sprinklers are placed at the same point so that they cover different parts without overlapping. What angle is left uncovered?
d. On another setting the sprinkler sprays through 270°. What fraction of the circle is this, and what angle is not watered?
e. What is the diameter of the whole circle that the water could reach from the sprinkler?

Question 19

Question 19 – Shape detective *(Section C · Problem solving)*

Four pupils describe a 3D shape. Use the clues to work out the name of each shape.

a. "I have 5 faces, 9 edges and 6 vertices. Two of my faces are triangles."
b. "I have 6 faces that are all squares, and 12 edges."
c. "I have 5 faces and 8 edges. Four of my faces are triangles."

d. "I have 2 flat faces and 1 curved face. I have no vertices."
e. Show that the shape in part (a) obeys: vertices + faces − edges = 2.

Question 20

Question 20 – Challenge: angles in a quadrilateral and a triangle *(Section D · Challenge)*

The four angles of a quadrilateral are x, $2x$, $3x$ and $4x$. The three angles of a triangle are in the ratio 2 : 3 : 4.

a. Find each angle of the quadrilateral.
b. Find each angle of the triangle.
c. Which is bigger: the largest angle of the quadrilateral or the largest angle of the triangle? By how many degrees?
d. Which pairs of angles of the quadrilateral add up to 180°?