Answers - Angles, circles and 3D shapes

Year: Year 6

Answer to Question 1

a. Angles in a triangle add up to 180°. $x = 180 - 50 - 60 =$ **70°**.
b. The right angle is 90°. $180 - 90 - 35 =$ **55°**.
c. The two base angles are equal. $180 - 40 = 140$, and $140 \div 2 =$ **70°** each.
d. $180 \div 3 =$ **60°**.

Answer to Question 2

a. $x = 360 - 90 - 85 - 110 =$ **75°**.
b. Opposite angles are equal, so another angle is 65°. The other two angles are equal and add up to $360 - 65 - 65 = 230$, so each is **115°**. The angles are 65°, 115°, 65°, 115°.
c. $360 - 100 - 100 - 60 =$ **100°**.
d. Each angle is 90°, and $4 \times 90 = 360$.

Answer to Question 3

a. Angles on a straight line add up to 180°, so $x = 180 - 125 =$ **55°**. Check: 125 + 55 = 180.
b. Again the angles on the line total 180°: $40 + 75 = 115$, so $y = 180 - 115 =$ **65°**.
c. Angles around a point make a full turn of 360°: $110 + 130 = 240$, so $z = 360 - 240 =$ **120°**.
d. $90 + 80 + 100 = 270$, so $w = 360 - 270 =$ **90°**, a right angle.

Answer to Question 4

a. The angle opposite 48° is vertically opposite, so $c =$ **48°**. Angles on a straight line add up to 180°, so $b = 180 - 48 =$ **132°**. d is opposite b, so $d =$ **132°**.
b. The 48° angle and b are next to each other on a straight line, so they add up to 180°. Then $b = 180 - 48 = 132^{\circ}$.
c. Vertically opposite angles are equal, so $3x = 120$ and $x =$ **40**.

Answer to Question 5

a. $d = 2 \times 6 =$ **12 cm**.
b. $r = 15 \div 2 =$ **7.5 cm**.

c. $r = 9.4 \div 2 =$ **4.7 cm**.
d. The circle is 7 cm wide, which is the diameter. The radius is $7 \div 2 =$ **3.5 cm**, so set the compasses to 3.5 cm.
e. The line from the centre to the edge is the **radius**. The line across the circle through the centre is the **diameter**.

Answer to Question 6

a. Triangular prism: **5 faces, 9 edges, 6 vertices**. Square-based pyramid: **5 faces, 8 edges, 5 vertices**. Cylinder: **2 flat faces and 1 curved face**, 2 curved edges and 0 vertices.
b. Cube: 8 + 6 − 12 = 2. Triangular prism: 6 + 5 − 9 = 2. Square-based pyramid: 5 + 5 − 8 = 2. All of them give **2**.

Answer to Question 7

a. $180 - 100 = 80$ and $80 \div 2 =$ **40°** each.
b. $180 - 70 = 110$ and $110 \div 2 =$ **55°** each.
c. Both base angles are 55°. $180 - 55 - 55 =$ **70°**.
d. Two angles of 100° add up to 200°, which is more than the 180° total for a triangle.

Answer to Question 8

a. The angles at the centre make a full turn of 360°, shared equally by 8 slices: 360 ÷ 8 = **45°** each.
b. Three slices of 45°: 3 × 45 = **135°**, an obtuse angle.
c. Shared between 6 slices: 360 ÷ 6 = **60°** each.
d. 6 − 4 = 2 slices are left, so 2 × 60 = **120°**. Check: 4 × 60 + 120 = 360.

Answer to Question 9

a. 360 ÷ 12 = **30°**.
b. 3 numbers apart: 3 × 30 = **90°** (a right angle).
c. 4 numbers apart: 4 × 30 = **120°**.
d. 6 numbers apart: 6 × 30 = **180°**, which is a straight line.
e. 150 ÷ 30 = 5, so the hands are 5 numbers apart: **5 o'clock** (the minute hand points at 12 and the hour hand at 5).

Answer to Question 10

a. A quarter turn clockwise from north is **east**.
b. 135° is between east (90°) and south (180°), so it faces **south-east**. The angle to south is 180 − 135 = **45°**.
c. Total turn = 135 + 225 = 360°, a complete turn, so it faces **north** again.
d. East to west is a half turn: **180°**.

Answer to Question 11

a. The angles of any quadrilateral add up to 360°, so $120 + 60 + x + 2x = 360$, which simplifies to $180 + 3x = 360$.
b. Subtract 180 from both sides: $3x = 180$. Divide by 3: $x =$ **60**.
c. $x = 60^\circ$ and $2x = 2 \times 60 = 120^\circ$. The four angles are **120°, 60°, 60° and 120°**.
d. $120 + 60 + 60 + 120 =$ **360°**, so the answer is correct.

Answer to Question 12

a. $66 \div 2 =$ **33 cm**.
b. 360 ÷ 36 = **10°**.
c. 90 ÷ 10 = **9 spokes**.
d. The model diameter is 33 cm, so the radius is 33 ÷ 2 = **16.5 cm**.

Answer to Question 13

a. The net has **6 squares**, one for each face of the cube.
b. A triangular prism has 3 rectangular faces and 2 triangular faces, so the net has **3 rectangles and 2 triangles**.
c. A cuboid has **6 faces**. With a square base, 2 faces are squares (top and bottom) and **4 are rectangles that are not squares**.
d. A row of 6 squares would have 4 squares that wrap round, but the 5th and 6th squares would overlap the 1st and 2nd. So some faces would overlap and some faces would be missing: **it does not fold into a cube**.

Answer to Question 14

a. The radius is half the diameter: $4 \div 2 =$ **2 m**.
b. 1 m = 100 cm, so 4 m = 4 × 100 = **400 cm**.
c. Each 1 cm on the drawing stands for 50 cm, so divide the real length by 50: 400 ÷ 50 = **8 cm**.
d. The compasses are opened to the radius, which is half the drawn diameter: 8 ÷ 2 = **4 cm**.

Answer to Question 15

a. $x + x + (x + 30) = 180$, so $3x + 30 = 180$.
b. $3x = 150$ and $x =$ **50**.
c. The angles are **50°, 50° and 80°**. 50 + 50 + 80 = 180.
d. $x + x + 2x = 180$ gives $4x = 180$ and $x = 45$. The angles are **45°, 45° and 90°**.
e. The first triangle has a third angle of 80° and the second has 90°. The second is larger by **10°**.

Answer to Question 16

a. 360 ÷ 3 = **120°**.
b. 90° out of 360° is $\frac{90}{360} = \frac{1}{4}$ of a full turn.
c. It must turn **120°**, then another blade points straight up.
d. 6 seconds is 360°, so 90° takes 6 ÷ 4 = **1.5 seconds**. In one second it turns 360 ÷ 6 = **60°**.
e. 2 minutes = 120 seconds. 120 ÷ 6 = **20 complete turns**.

Answer to Question 17

a. Angles in a triangle add up to 180°. Angle C $= 180 - 50 - 60 =$ **70°**.
b. Angles on a straight line add up to 180°. $e = 180 - 60 =$ **120°**.
c. The two interior angles that are not next to e are 50° and 70°. $50 + 70 = 120$, which equals e. So the exterior angle **equals the sum of the other two angles**.
d. Interior angle at B $= 180 - 40 - 75 = 65°$. The exterior angle is $180 - 65 =$ **115°**. (Check: 40 + 75 = 115.)

Answer to Question 18

a. $\frac{120}{360} = \frac{1}{3}$ of the circle.
b. 360 ÷ 120 = **3 sprinklers**.
c. Two sprinklers cover 2 × 120 = 240°. The uncovered angle is 360 − 240 = **120°**.
d. $\frac{270}{360} = \frac{3}{4}$ of the circle. The angle that is not watered is 360 − 270 = **90°**.
e. The radius is 4 m, so the diameter is 2 × 4 = **8 m**.

Answer to Question 19

a. Two triangular faces joined by rectangles give 5 faces, 9 edges and 6 vertices. It is a **triangular prism**, like a Toblerone box.
b. Six square faces and 12 edges describe a **cube**.

c. Four triangles meeting at a point on a square base: 5 faces and 8 edges. It is a **square-based pyramid**.
d. Two flat circular faces joined by one curved face, with no corners: a **cylinder**.
e. For the triangular prism: 6 + 5 − 9 = **2**, so Euler's rule works.

Answer to Question 20

a. $x + 2x + 3x + 4x = 360$, so $10x = 360$ and $x = 36$. The angles are **36°, 72°, 108° and 144°**.
b. 2 + 3 + 4 = 9 parts, and 180 ÷ 9 = 20°. The angles are **40°, 60° and 80°**.
c. The largest angle of the quadrilateral is 144° and of the triangle is 80°. The quadrilateral angle is bigger by 144 − 80 = **64°**.
d. 36° + 144° = 180° and 72° + 108° = 180°. So the pairs are **36° and 144°**, and **72° and 108°**.