



- 1 A hexagon has 6 sides.
- Work out the sum of the interior angles of a hexagon.
  - Work out the size of one interior angle of a regular hexagon.

(2 marks)

a)

$$(6 - 2) \times 180$$

$$= 4 \times 180 = 720^\circ$$

b)

$$720 \div 6 = 120^\circ$$

$$\boxed{a) 720^\circ \quad b) 120^\circ}$$

- 2 Each exterior angle of a regular polygon is  $30^\circ$ .  
Work out the number of sides of the polygon.

(2 marks)

The exterior angles of any polygon add up to  $360^\circ$

$$\text{Number of sides} = 360 \div 30 = 12$$

Walking once around a convex polygon turns you through one complete turn,  $360^\circ$ . In a regular polygon each turn is equal, so divide  $360^\circ$  by the exterior angle

$$\boxed{12}$$

3 Work out the size of each interior angle of a regular decagon.

(3 marks)

Draw diagonals from one vertex of a convex decagon

they divide it into  $10 - 2 = 8$  triangles. Each triangle contributes  $180^\circ$ , explaining the interior-angle sum formula

A decagon has 10 sides, so the sum of its interior angles is  $(10 - 2) \times 180^\circ = 1440^\circ$

Each interior angle =  $1440 \div 10 = 144^\circ$

(Alternatively

each exterior angle =  $360 \div 10 = 36^\circ$ , so each interior angle =  $180 - 36 = 144^\circ$ )

144<sup>°</sup>

4 Five of the exterior angles of a hexagon are  $40^\circ$ ,  $50^\circ$ ,  $60^\circ$ ,  $70^\circ$  and  $80^\circ$ .

Work out the size of the sixth exterior angle.

(2 marks)

Exterior angles add to  $360^\circ$

$$40 + 50 + 60 + 70 + 80 = 300$$

$$360 - 300 = 60$$

60<sup>°</sup>

5 Each interior angle of a regular polygon is  $156^\circ$ .

Work out the number of sides of the polygon.

(3 marks)

Each exterior angle =  $180^\circ - 156^\circ = 24^\circ$  because an interior angle and its exterior angle lie on a straight line

The exterior angles of any polygon add up to  $360^\circ$

Number of sides =  $360 \div 24 = 15$

15

- 6 In a regular polygon, each interior angle is  $100^\circ$  more than each exterior angle.

Work out the number of sides of the polygon.

(3 marks)

Let the exterior angle be  $e$ . Then the interior angle is  $e + 100$ , and  $e + (e + 100) = 180$  because they lie on a straight line

$$2e + 100 = 180, \text{ so } e = 40^\circ$$

$$\text{Number of sides} = 360 \div 40 = 9$$

9

- 7 The interior angles of a pentagon are  $x^\circ$ ,  $(x + 30)^\circ$ ,  $(x + 40)^\circ$ ,  $2x^\circ$  and  $(2x + 50)^\circ$ .

Work out the size of the largest interior angle of the pentagon.

(4 marks)

The interior angles of a pentagon add up to  $(5 - 2) \times 180^\circ = 540^\circ$

$$x + (x + 30) + (x + 40) + 2x + (2x + 50) = 540, \text{ so } 7x + 120 = 540$$

$$7x = 420, \text{ so } x = 60$$

The angles are  $60^\circ$ ,  $90^\circ$ ,  $100^\circ$ ,  $120^\circ$  and  $170^\circ$ . The largest angle is  $2x + 50 = 170^\circ$

170°

- 8 Each exterior angle of a regular polygon is  $18^\circ$ .

- Work out how many sides the polygon has.
- Work out the size of one interior angle.

(4 marks)

a)

$$360 \div 18 = 20 \text{ sides}$$

$$\text{b) interior + exterior} = 180^\circ$$

$$180 - 18 = 162$$

a) 20 sides b) 162°

9

In a pentagon, four of the interior angles are equal.

The fifth interior angle is  $60^\circ$  larger than each of the equal angles.

Work out the size of the largest interior angle of the pentagon.

(4 marks)

The interior angles of a pentagon add up to  $540^\circ$

Let each equal angle be  $a$ . Then  $4a + (a + 60) = 540$

$$\begin{aligned} 5a + 60 &= 540, \text{ so } 5a \\ &= 480 \text{ and } a \\ &= 96^\circ \end{aligned}$$

$$\begin{aligned} \text{The largest angle} &= 96 + 60 = \\ &156^\circ. \text{ Check:} \\ 4 \times 96 + 156 \\ &= 540^\circ \end{aligned}$$

$156^\circ$

10

ABCDEF is a hexagon.

Angle A = angle D =  $90^\circ$ .

The other four interior angles are all equal.

Work out the size of angle B.

(4 marks)

The interior angles of a hexagon add up to  $(6 - 2) \times 180^\circ = 720^\circ$

The four equal angles add up to  $720 - 90 - 90 = 540^\circ$

$$\begin{aligned} \text{Angle B} &= 540 \div 4 = \\ &135^\circ \end{aligned}$$

$135^\circ$

- 11 A regular pentagon and a square have the same side length.

They are joined along one common edge PQ, on opposite sides of PQ, so they do not overlap.

At the vertex P, the pentagon has an interior angle and the square has an interior angle.

Work out the size of the angle at P that is outside both the pentagon and the square.

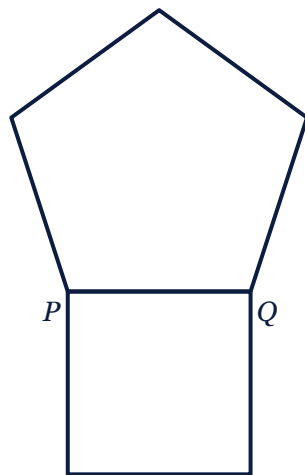


Diagram NOT accurately drawn

(4 marks)

Each interior angle of a regular pentagon =  $540 \div 5 = 108^\circ$

Each interior angle of a square =  $90^\circ$

Angles around the point P add up to  $360^\circ$

The remaining angle =  $360 - 108 - 90 = 162^\circ$

162°

- 12 The sum of the interior angles of a polygon is  $1800^\circ$ .

a. Work out the number of sides of the polygon.

b. The polygon is regular. Work out the size of each interior angle.

(4 marks)

a) Sum of interior angles =  $(n - 2) \times 180$ , so  $(n - 2) \times 180 = 1800$

$$n - 2 = 10, \text{ so } n = 12$$

b) Each interior angle =  $1800 \div 12 = 150^\circ$

13

ABCDE is a regular pentagon.

The diagonal AC is drawn.

Work out the size of angle ACD.

Give a reason for each stage of your working.

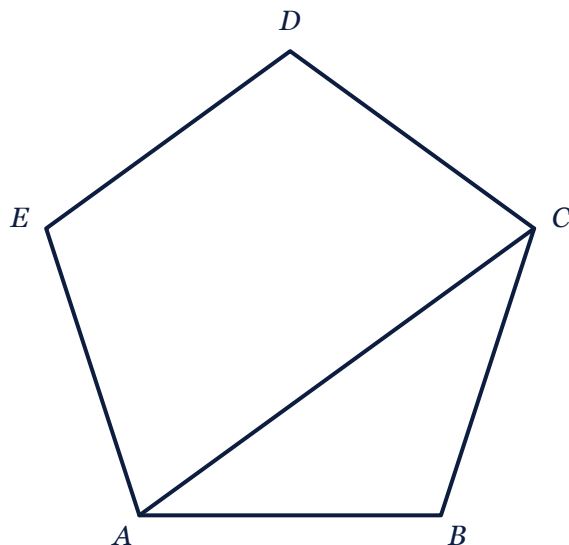


Diagram NOT accurately drawn

(4 marks)

Each interior angle of a regular pentagon =  $540 \div 5 = 108^\circ$

In triangle ABC,  $AB = BC$  because the pentagon is regular, so the triangle is isosceles

Angle  $BCA = (180 - 108) \div 2 = 36^\circ$  because angles in a triangle add up to  $180^\circ$  and base angles of an isosceles triangle are equal

Angle  $ACD = \text{angle } BCD - \text{angle } BCA = 108 - 36 = 72^\circ$

72°

14

In a regular polygon, the ratio of each interior angle to each exterior angle is 13 : 2.

a. Work out the number of sides of the polygon.

b. Work out the sum of the interior angles of the polygon.

(5 marks)

a) An interior angle and its exterior angle add up to  $180^\circ$ , in the ratio 13 : 2, so the exterior angle =  $180 \times \frac{2}{15} = 24^\circ$  and the interior angle =  $156^\circ$

Number of sides =  $360 \div 24 = 15$

b) Sum of interior angles =  $(15 - 2) \times 180 = 2340^\circ$ . Check:  $15 \times 156 = 2340$

15

Regular pentagon ABCDE and regular hexagon ABFGHI have the same side length.

They share the common edge AB and lie on opposite sides of AB, so they do not overlap.

a. Work out the size of angle EAI.

b. Work out the size of angle AEI.

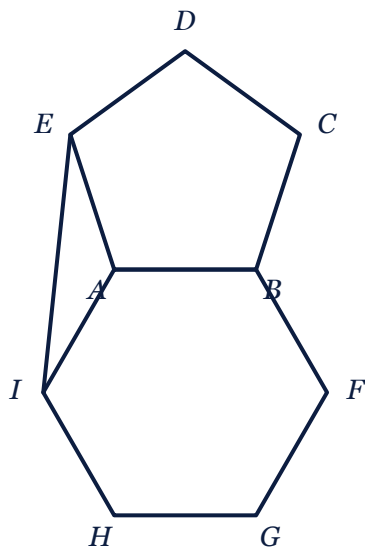


Diagram NOT accurately drawn

(5 marks)

a) Interior angle of a regular pentagon  $= 540 \div 5 = 108^\circ$ ; interior angle of a regular hexagon  $= 720 \div 6 = 120^\circ$

Angles around the point A add up to  $360^\circ$ , so angle EAI  $= 360 - 108 - 120 = 132^\circ$

b) AE and AI are both sides of the polygons, so  $AE = AI$  and triangle AEI is isosceles

$$\text{Angle AEI} = (180 - 132) \div 2 = 24^\circ$$