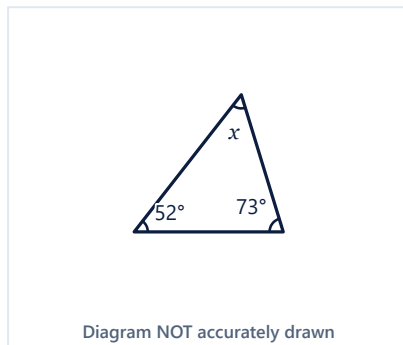


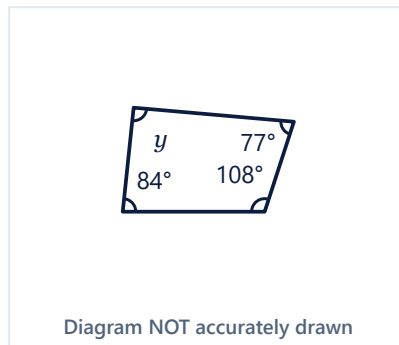


1 The diagrams show a triangle and a quadrilateral.

- Work out the size of angle x .
- Work out the size of angle y .



a



b

(2 marks)

a) angles in a triangle add to 180°

$$52 + 73 = 125$$

$$x = 180 - 125$$

$$x = 55^\circ$$

b) angles in a quadrilateral add to 360°

$$84 + 108 + 77 = 269$$

$$y = 360 - 269$$

$$y = 91^\circ$$

2 A stop sign is the shape of a regular octagon.

- Work out the size of each exterior angle of a regular octagon.
- Work out the size of each interior angle of a regular octagon.

(2 marks)

a) exterior angles add to 360°

$$360 \div 8 = 45$$

$$45^\circ$$

b) interior + exterior = 180°

$$180 - 45 = 135$$

$$135^\circ$$

3

Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

(2 marks)

The exterior angles of any polygon add up to 360°

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

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

12

4

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° , explaining the interior-angle sum formula

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

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

(Alternatively

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

144°

5

- a. Work out the sum of the interior angles of a heptagon.
- b. The diagram shows a hexagon. Work out the size of angle x .
- c. Four of the exterior angles of a pentagon are 62° , 85° , 71° and 58° . Work out the size of the fifth exterior angle.

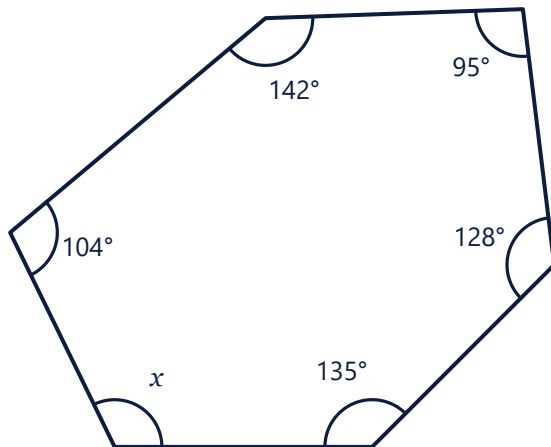


Diagram NOT accurately drawn

(4 marks)

a) 7 sides make 5 triangles

$$(7 - 2) \times 180 = 5 \times 180$$

$$5 \times 180 = 900$$

$$\boxed{900^\circ}$$

b) hexagon: 4 triangles

$$4 \times 180 = 720$$

$$135 + 128 + 95 + 142 + 104 = 604$$

$$x = 720 - 604$$

$$\boxed{x = 116^\circ}$$

c) exterior angles add to 360°

$$62 + 85 + 71 + 58 = 276$$

$$360 - 276 = 84$$

$$\boxed{84^\circ}$$

6

DE and FG are parallel straight lines.

Triangle ABC is drawn so that A lies on DE, and B and C both lie on FG.

D is to the left of A and E is to the right of A.

Angle DAB = 48° and angle ACB = 63° .

Work out the size of angle BAC.

Give a reason for each stage of your working.

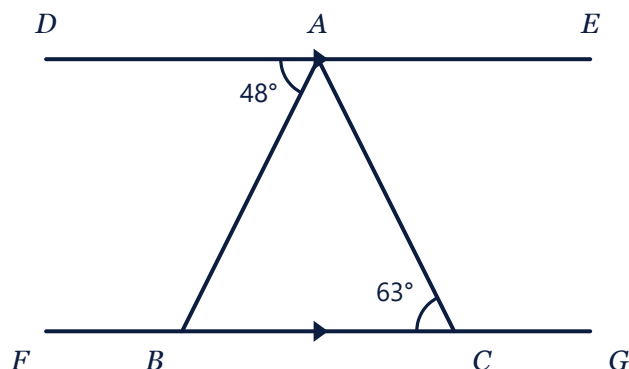


Diagram NOT accurately drawn

(4 marks)

Angle ABC = 48° because angle DAB and angle ABC are alternate angles (DE is parallel to FG), and alternate angles are equal

Angle BAC = $180^\circ - 48^\circ - 63^\circ = 69^\circ$ because angles in a triangle add up to 180°

69°

7

Each interior angle of a regular polygon is 156° .

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°

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

15

8

A pattern of shapes tessellates if the shapes fit together around every point with no gaps and no overlaps.

- Explain why regular hexagons tessellate.
- Explain why regular pentagons do not tessellate.
- Ella makes a floor tile pattern where two regular octagons and one square meet at every point. Show that this pattern has no gaps.

(3 marks)

a) hexagon

$$360 \div 6 = 60$$

$$180 - 60 = 120$$

$$3 \times 120 = 360$$

3 hexagons make 360° exactly

b) pentagon

$$360 \div 5 = 72$$

$$180 - 72 = 108$$

$$3 \times 108 = 324$$

$$4 \times 108 = 432$$

324° leaves a gap, 432° overlaps

c) octagon angle = 135° , square = 90°

$$135 + 135 + 90 = 360$$

360° so no gaps

9

The four angles of a quadrilateral are 74° , 101° , $2t^\circ$ and $(t + 5)^\circ$.

Work out the size of the largest angle of the quadrilateral.

(3 marks)

Angles in a quadrilateral add up to 360°

$$74 + 101 + 2t + t + 5 = 360$$

$$3t + 180 = 360, \text{ so } 3t = 180 \text{ and } t = 60$$

The four angles are 74° , 101° , 120° and 65°

Check

$$74 + 101 + 120 + 65 = 360. \text{ The largest angle is } 120^\circ$$

120°

- 10 The interior angles of a hexagon are $2x^\circ$, $2x^\circ$, $3x^\circ$, $3x^\circ$, $4x^\circ$ and $4x^\circ$.

Work out the size of the largest angle.

(3 marks)

angles in a hexagon add to 720°

$$2x + 2x + 3x + 3x + 4x + 4x = 720$$

$$18x = 720$$

$\div 18$

$$x = 40 \quad \div 18$$

Largest angle is $4x$

$$4 \times 40 = 160$$

$$\boxed{160^\circ}$$

- 11 The interior angles of a pentagon are x° , $(x + 30)^\circ$, $(x + 40)^\circ$, $2x^\circ$ 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° , 90° , 100° , 120° and 170° . The largest angle is $2x + 50 = 170^\circ$

$$\boxed{170^\circ}$$

12

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.

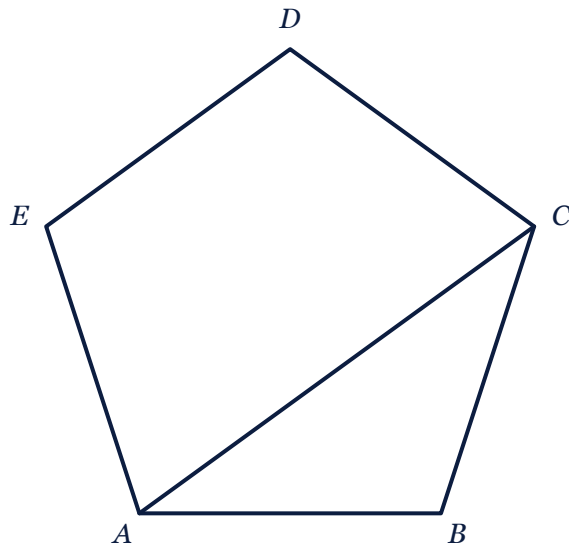


Diagram NOT accurately drawn

(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° and base angles of an isosceles triangle are equal

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

72