

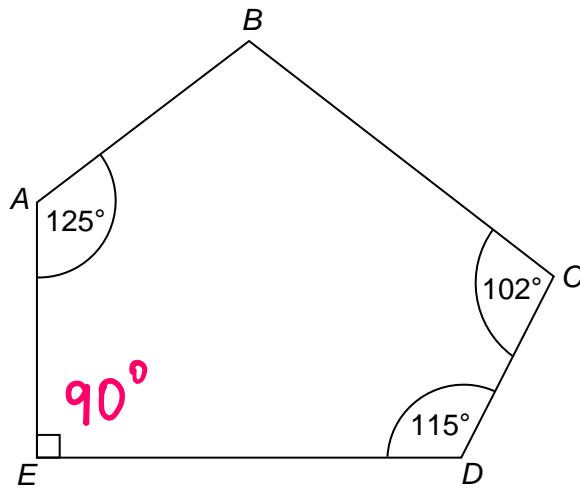


# Angles in Polygons



← REVISE THIS TOPIC

1 *ABCDE* is a pentagon.



Work out the size of angle *ABC*.

[3 marks]

$$(5 - 2) \times 180 = 540^\circ$$

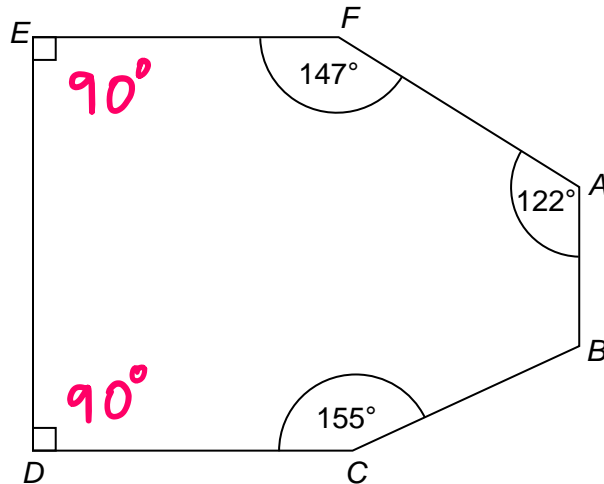
$$125 + 90 + 115 + 102 = 432$$

$$540 - 432 = 108$$

Answer 108 °



2  $ABCDEF$  is a hexagon.



Work out the size of angle  $ABC$ .

[3 marks]

$$(6 - 2) \times 180 = 720^\circ$$

$$90 + 90 + 155 + 122 + 147 = 604$$

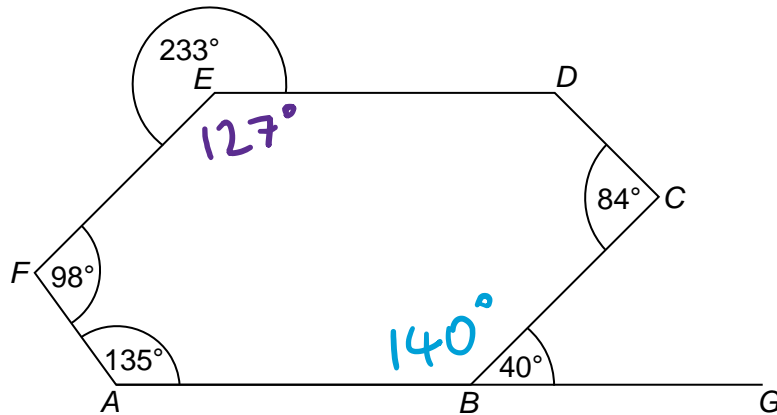
$$720 - 604 = 116$$

Answer

116



3  $ABCDEF$  is a hexagon.



$ABG$  is a straight line.  
Work out the size of angle  $CDE$ .

[4 marks]

$$180 - 40 = 140^\circ$$

$$360 - 233 = 127^\circ$$

$$(6 - 2) \times 180 = 720^\circ$$

$$98 + 135 + 140 + 84 + 127 = 584$$

$$720 - 584 = 136^\circ$$

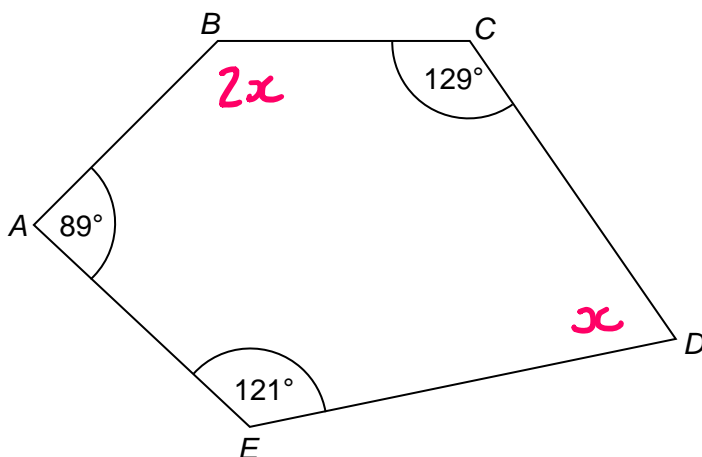
Answer

136

Turn over ►



4  $ABCDE$  is a pentagon.



Angle  $ABC = 2 \times$  angle  $CDE$   
Work out the size of angle  $CDE$ .

[4 marks]

$$(5 - 2) \times 180 = 540^\circ$$

$$2x + x + 89 + 121 + 129 = 540$$

$$3x + 339 = 540$$

$$3x = 201$$

$$x = 67^\circ$$

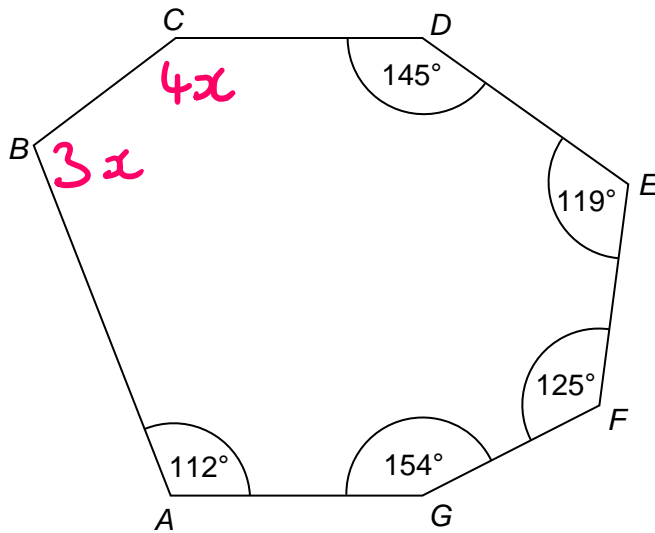
Answer

67





5 *ABCDEFGH* is a heptagon.



Angle *ABC* : Angle *BCD* = 3 : 4  
Work out the size of angle *ABC*.

[5 marks]

$$(7 - 2) \times 180 = 900$$

$$3x + 4x + 145 + 119 + 125 + 154 + 112 = 900$$

$$7x + 655 = 900$$

$$7x = 245$$

$$x = 35$$

$$3 \times 35 = 105$$

Answer 105 °

$\frac{1}{9}$

Turn over ►





6 Shape M is an irregular polygon with 9 sides.

8 of the interior angles of shape M are each equal to  $150^\circ$

Work out the size of the other interior angle of shape M.

[3 marks]

$$(9 - 2) \times 180 = 1260$$

$$8 \times 150 = 1200$$

$$1260 - 1200 = 60$$

Answer 60 °

7 (a) Work out the size of the **exterior** angle of a regular pentagon.

[2 marks]

$$360 \div 5 = 72$$

Answer 72 °

7 (b) Work out the size of the **interior** angle of a regular pentagon.

[2 marks]

$$180 - 72 = 108$$

Answer 108 °





8 (a) Work out the size of the **exterior** angle of a regular hexagon. [2 marks]

$$360 \div 6 = 60$$

Answer 60 °

8 (b) Work out the size of the **interior** angle of a regular hexagon. [2 marks]

$$180 - 60 = 120$$

Answer 120 °

9 (a) Work out the size of the **exterior** angle of a regular decagon. [2 marks]

$$360 \div 10 = 36$$

Answer 36 °

9 (b) Work out the size of the **interior** angle of a regular decagon. [2 marks]

$$180 - 36$$

Answer 144 °





10 The interior angle of a regular polygon is  $175^\circ$   
Write down the size of the exterior angle of the regular polygon. [1 mark]

Answer 5°

11 The interior angle of a regular polygon is  $x^\circ$   
Write down an expression, in terms of  $x$ , for the size of the exterior angle of the regular polygon. [1 mark]

Answer  $180 - x$

12 A regular icosagon has 20 sides.  
Work out the sum of the interior angles of a regular icosagon. [2 marks]

$(20 - 2) \times 180$

Answer 3240

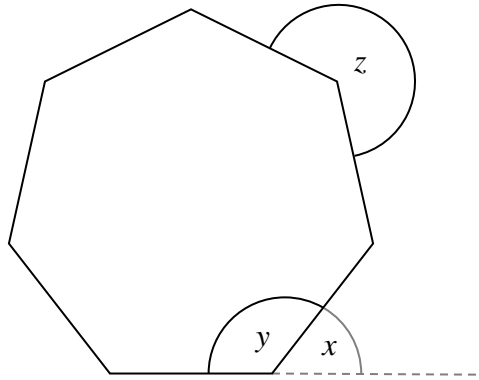
13 A regular hexadecagon has 16 sides.  
Show that the interior angle of a regular hexadecagon is not an integer. [3 marks]

$(16 - 2) \times 180 = 2520$   
 $2520 \div 16 = 157.5$   
↑  
not an integer





14 Here is a regular polygon.



14 (a) Work out the size of the angle marked  $x$ .  
Give your answer to 1 decimal place.

[2 marks]

$$360 \div 7 = 51.428\dots$$

Answer 51.4 °

14 (b) Work out the size of the angle marked  $y$ .  
Give your answer to 1 decimal place.

[2 marks]

$$180 - 51.4$$

Answer 128.6 °

14 (c) Work out the size of the angle marked  $z$ .  
Give your answer to 1 decimal place.

[2 marks]

$$360 - 128.6$$

Answer 231.4 °





15

Match each regular polygon on the left with its **interior** angle on the right.  
One has been done for you.

[4 marks]

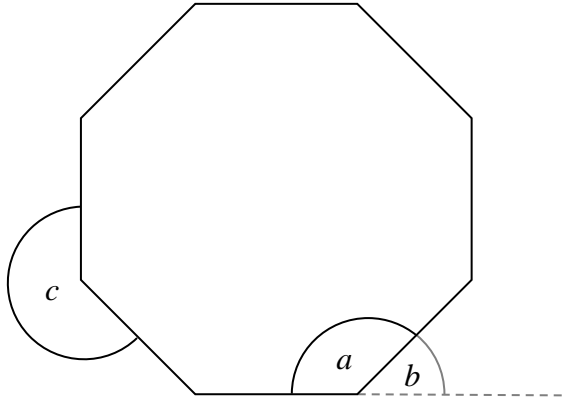
Square	45
Regular Pentagon	60
Equilateral triangle	72
Regular Octagon	90
Regular Hexagon	108
	120
	135

*Note: A black line connects 'Square' to '90'. Pink lines connect 'Regular Pentagon' to '108', 'Equilateral triangle' to '120', and 'Regular Hexagon' to '135'.*





16 Here is a regular octagon.



Write a number in each of the boxes below to make the statements correct.

[3 marks]

$a + b =$

180

$a + c =$

360

$\frac{a}{b} =$

3

$a = 135$

$b = 45$



17 The **exterior** angle of a regular polygon is  $24^\circ$

Work out the number of sides that the regular polygon has.

[2 marks]

$$360 \div 24 = 15$$

Answer 15

18 The **interior** angle of a regular polygon is  $162^\circ$

Work out the number of sides that the regular polygon has.

[2 marks]

$$180 - 162 = 18$$

$$360 \div 18 = 20$$

Answer 20

19 The **exterior** angle of a regular polygon is  $5^\circ$

Work out the number of sides that the regular polygon has.

[2 marks]

$$360 \div 5 = 72$$

Answer 72





20 The **interior** angle of a regular polygon is  $168^\circ$

Work out the number of sides that the regular polygon has.

[2 marks]

$$180 - 168 = 12$$

$$360 \div 12 = 30$$

Answer 30

21 The **exterior** angle of a regular polygon is  $20^\circ$

Work out the number of sides that the regular polygon has.

[2 marks]

$$360 \div 20 = 18$$

Answer 18

22 The **interior** angle of a regular polygon is  $176^\circ$

Work out the number of sides that the regular polygon has.

[2 marks]

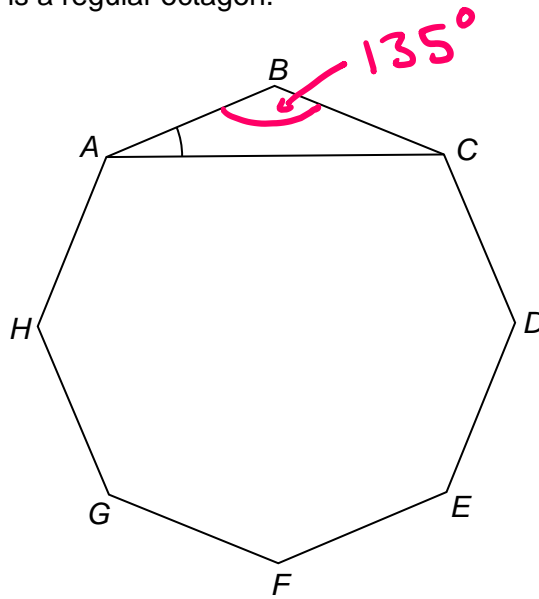
$$180 - 176 = 4$$

$$360 \div 4 = 90$$

Answer 90



23  $ABCDEFGH$  is a regular octagon.

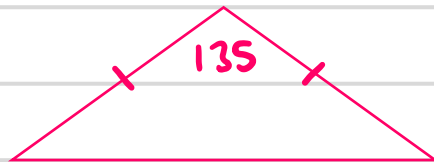


Work out the size of angle  $BAC$

[4 marks]

$$(8 - 2) \times 180 = 1080$$

$$1080 \div 8 = 135^\circ$$



$$180 - 135 = 45$$

$$45 \div 2 = 22.5$$

Answer \_\_\_\_\_

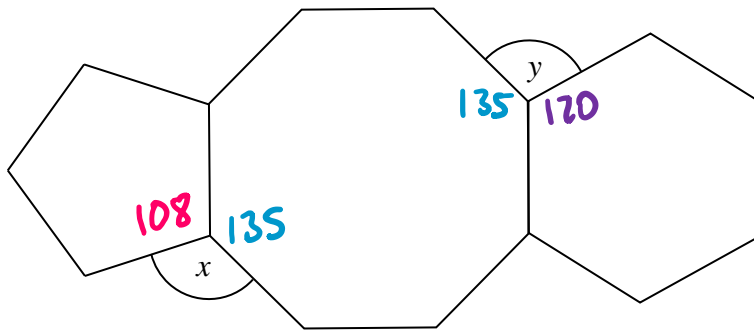
22.5

°



24

Here is a regular pentagon, a regular octagon and a regular hexagon.

Work out  $x : y$ 

Give your answer in its simplest form.

[5 marks]

$$(5-2) \times 180 = 540$$

$$540 \div 5 = 108^\circ$$

$$(8-2) \times 180 = 1080$$

$$1080 \div 8 = 135^\circ$$

$$(6-2) \times 180 = 720$$

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

$$x = 360 - 108 - 135$$

$$x = 117$$

$$y = 360 - 120 - 135$$

$$y = 105$$

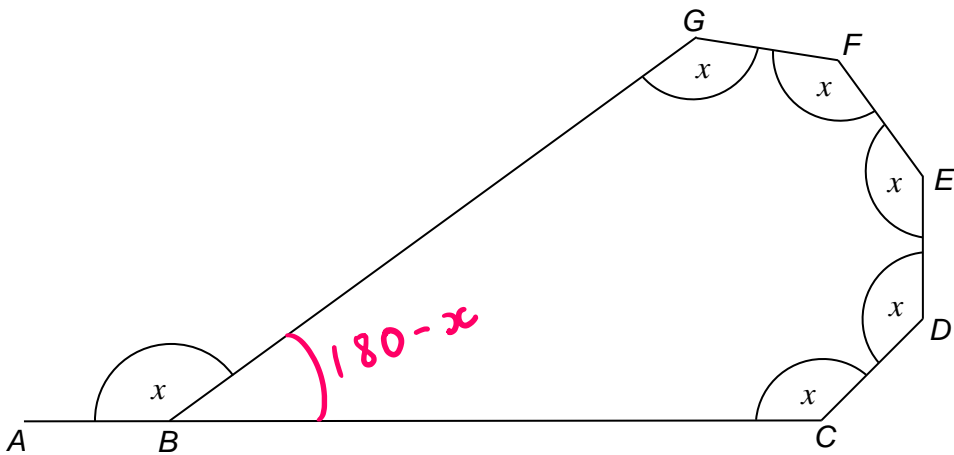
$$\begin{array}{l} x : y \\ 117 : 105 \\ \div 3 \quad \curvearrowright \quad \div 3 \\ 39 : 35 \end{array}$$

Answer 39 : 35

Turn over ►



25 *ABCDEF* is a hexagon



*ABC* is a straight line

Angle *ABC* = angle *BCD* = angle *CDE* = angle *DEF* = angle *EFG* = angle *FGB* =  $x^\circ$

Work out the value of  $x$

[4 marks]

$$(6-2) \times 180 = 720$$

$$x + x + x + x + x + 180 - x = 720$$

$$4x + 180 = 720$$

$$4x = 540$$

$$x = 135$$

$$x = \underline{\hspace{2cm} 135 \hspace{2cm}}^\circ$$





26 Shape A is a regular polygon.

Interior angle of shape A : exterior angle of shape A = 13 : 2

Work out how many sides shape A has.

[4 marks]

$$13 + 2 = 15$$

$$180 \div 15 = 12$$

$$\text{sides} = \frac{360}{24}$$

$$\begin{aligned} \text{Interior} &= 13 \times 12 \\ &= 156 \end{aligned}$$

$$\begin{aligned} \text{Exterior} &= 2 \times 12 \\ &= 24 \end{aligned}$$

Answer 15

27 Shape B is a regular polygon.

The interior angle of shape B is  $100^\circ$  greater than the exterior angle of shape B.

Work out how many sides shape B has.

[4 marks]



$$x + x + 100 = 180$$

$$2x + 100 = 180$$

$$\text{sides} = \frac{360}{40}$$

$$2x = 80$$

$$x = 40$$

Answer 9



28

The sum of the interior angles of a regular polygon is  $7740^\circ$ Work out the size of the **exterior** angle of the regular polygon.

[4 marks]

$$\begin{aligned} \div 180 \left\{ (n-2) \times 180 = 7740 \right. & \left. \right\} \div 180 \\ & +2 \left\{ n-2 = 43 \right. \\ & \left. n = 45 \right\} +2 \end{aligned}$$

$$\frac{360}{45} = 8$$

Answer

8

29

The sum of the interior angles of a regular polygon is  $6840^\circ$ Work out the size of the **interior** angle of the regular polygon.

[4 marks]

$$\begin{aligned} \div 180 \left\{ (n-2) \times 180 = 6840 \right. & \left. \right\} \div 180 \\ & +2 \left\{ n-2 = 38 \right. \\ & \left. n = 40 \right\} +2 \end{aligned}$$

$$\frac{360}{40} = 9 \text{ (exterior)} \quad 180 - 9 = 171$$

Answer

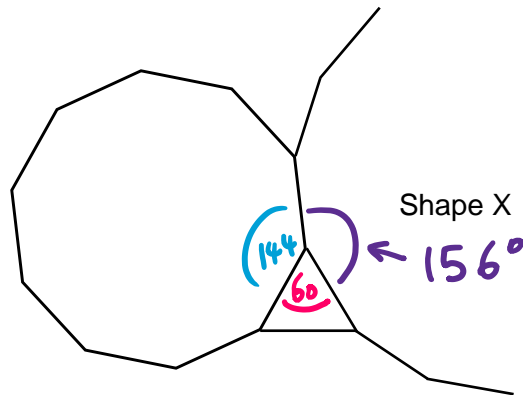
171



30

The diagram shows a regular decagon, an equilateral triangle and shape X.

10      3



Shape X is a regular polygon.  
Work out how many sides shape X has.

[4 marks]

$$180 \div 3 = 60$$

$$(10 - 2) \times 180 = 1440$$

$$1440 \div 10 = 144^\circ$$

$$360 - 60 - 144 = 156$$

$$180 - 156 = 24$$

$$360 \div 24 = 15$$

Answer 15