

Interior and exterior angles of regular polygons

Year 8 About 60 minutes No calculator 48 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-8-interior-and-exterior-angles-of-regular-polygons/

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Last lesson [1 mark]
 Work out $360 \div 24$. Work out the sum of the interior angles of an octagon.

Answer

Answer

- A3** Year 7 [1 mark] **A4** From chapter 1 [1 mark]
 Two angles on a straight line. Write 54 as a percentage of 360.
 One is 148° . Work out the other.

Answer

Answer

B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A regular dodecagon has 12 equal sides and 12 equal angles. Work out the size of each exterior angle and each interior angle.

Hint The exterior angles add up to 360° and they are all equal. Work out the exterior angle first.

- B1** A regular polygon has 15 sides. Work out the size of each exterior angle and each interior angle. [2 marks]

Answer exterior $^\circ$ interior $^\circ$

EXAMPLE 2

Each exterior angle of a regular polygon is 20° . How many sides does it have?

Hint The exterior angles add up to 360° . How many lots of 20° make 360° ?

- B2** Each exterior angle of a regular polygon is 15° . How many sides does it have? [2 marks]

Answer sides

EXAMPLE 3

Each interior angle of a regular polygon is 170° . How many sides does it have?

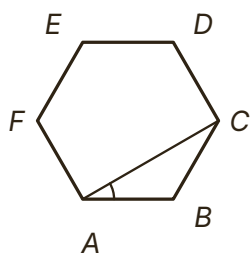
Hint Work out the exterior angle first.

- B3** Each interior angle of a regular polygon is 172° . How many sides does it have? [2 marks]

Answer sides

EXAMPLE 4

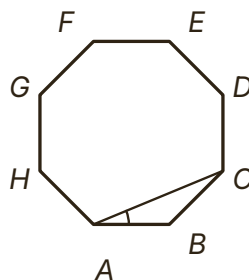
$ABCDEF$ is a regular hexagon. Work out the size of angle BAC .



Not drawn accurately

Hint $AB = BC$, so triangle ABC is isosceles. Find angle ABC first.

- B4** $ABCDEFGH$ is a regular octagon. Work out the size of angle BAC . [3 marks]



Not drawn accurately

Answer angle $BAC = \dots\dots^\circ$

c Practice

Year 8

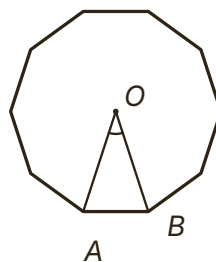
- C1** Could a regular polygon have an exterior angle of 25° ? Give a reason for your answer. [2 marks]
- C2** A regular polygon has 14 sides. Work out the size of each exterior angle. Give your answer as a mixed number. [2 marks]

Answer $^\circ$

- C3** Each interior angle of a regular polygon is 174° . Work out the sum of its interior angles. [3 marks]

Answer $^\circ$

- C4** O is the centre of this regular decagon. Work out the size of angle AOB . [2 marks]



Not drawn accurately

Answer angle $AOB = \dots\dots^\circ$

- C5** A regular polygon has 40 sides. [2 marks]
Work out the size of each interior angle.

Answer

- C6** The interior angle of a regular polygon is 54° more than the interior angle of a regular pentagon. How many sides does the polygon have? [2 marks]

Answer sides

D Exam-style questions

GCSE Foundation

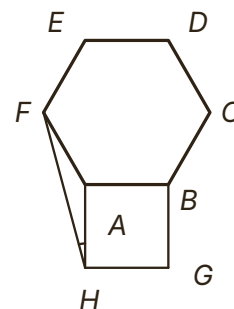
- D1** Mia says, "I can draw a regular polygon with an interior angle of 130° ." [2 marks]
Explain why Mia is wrong.

- D2** $ABCDEF$ is a regular hexagon and $ABGH$ is a square. F is joined to H .

- (a) Work out the size of angle FAH .

[2 marks]

Answer



Not drawn accurately

(b) Work out the size of angle AHF . Give a reason for each step.

[3 marks]

Answer angle $AHF = \dots\dots^\circ$

Total for D2: 5 marks

D3 The interior angle of a regular polygon is 156° more than its exterior angle. How many sides does the polygon have? You must show your working. [4 marks]

Answer $\dots\dots$ sides

D4 In a regular polygon, interior angle : exterior angle = $7 : 2$. How many sides does the polygon have? [4 marks]

Answer $\dots\dots$ sides

D5 Each interior angle of a regular polygon is x° and each exterior angle is $(x - 140)^\circ$. Work out the value of x , then the number of sides. [3 marks]

Answer $x = \dots\dots$ $\dots\dots$ sides

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 Some regular polygons have angles that are whole numbers of degrees: a regular hexagon has exterior angle 60° and interior angle 120° . How many different regular polygons have exterior angles that are whole numbers of degrees? [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The exterior angle is $360 \div n$. For it to be a whole number, n must divide 360 exactly.
- Hint 2** List all the factors of 360. There are 24 of them.
- Hint 3** A polygon has at least 3 sides, so remove the factors 1 and 2: $24 - 2 = 22$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can work out the exterior and interior angles of a regular polygon. ☐ ☐ ☐
- I can find the number of sides of a regular polygon from one of its angles. ☐ ☐ ☐
- I can find angles in diagrams made of regular polygons. ☐ ☐ ☐