

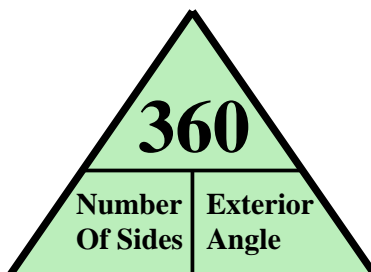
Lesson 8

GCSE Mathematics Angles & Polygons

8.1 The Polygon Puzzles

To tackle questions on regular polygon the key facts you need to know are;

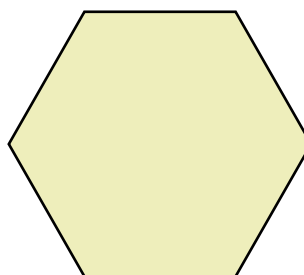
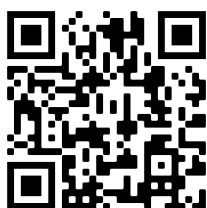
- This formulae triangle;



- This formula; $\text{One Interior Angle} + \text{One Exterior Angle} = 180^\circ$

8.2 Example

Teaching Video: <http://www.NumberWonder.co.uk/v9034/8.mp4>



For a regular hexagon use the above “key facts” to determine;

- (i) one exterior angle

[1 mark]

- (ii) one interior angle

[1 mark]

- (iii) the sum of all six interior angles

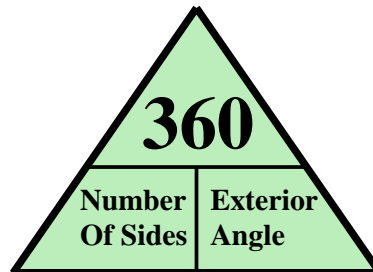
[1 mark]

8.3 Exercise

You may use a calculator
Marks Available : 50

Question 1

Recall that for a regular polygon,



and that

$$\text{One Interior Angle} + \text{One Exterior Angle} = 180$$

For a pentagon use the above information to determine;

(i) one exterior angle

[1 mark]

(ii) one interior angle

[1 mark]

(iii) the sum of all five interior angles

[1 mark]

Question 2

For an icosagon (20 sides) use the above information to determine;

(i) one exterior angle

[1 mark]

(ii) one interior angle

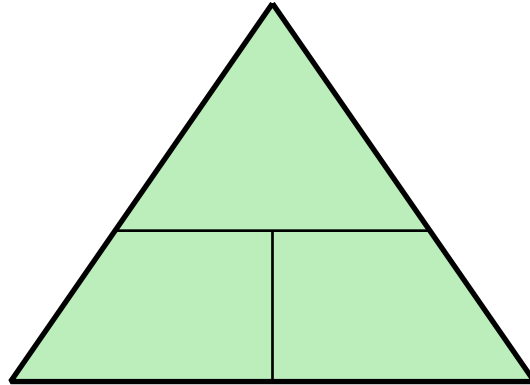
[1 mark]

(iii) the sum of all twenty interior angles

[1 mark]

Question 3

Without looking back at the previous page, fill in this Regular Polygon Formulae Triangle;



[2 marks]

Question 4

In your own words (and perhaps a diagram) explain why it is true that;

$$\text{One Interior Angle} + \text{One Exterior Angle} = 180$$

[2 marks]

Question 5

For a hexadecagon (16 sides) determine;

(i) one exterior angle

[1 mark]

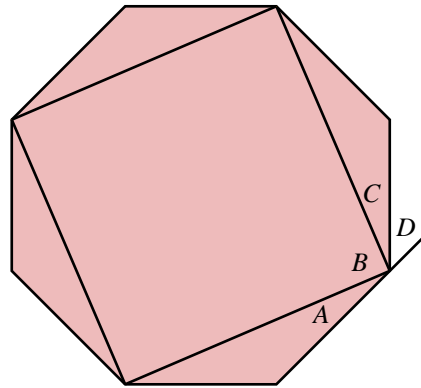
(ii) one interior angle

[1 mark]

(iii) the sum of all sixteen interior angles

[1 mark]

Question 6



A regular octagon has a square inside it, as shown.

Angle D is an exterior angle of the octagon.

- (i) Calculate D by using the formula;

$$\text{Exterior Angle} = \frac{360}{\text{Number Of Sides}}$$

[1 mark]

- (ii) What is the size of angle B ?

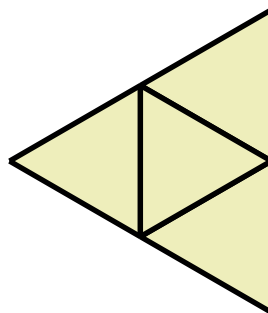
[1 mark]

- (iii) By symmetry angles A and C are equal.
What size are they each ?

[2 marks]

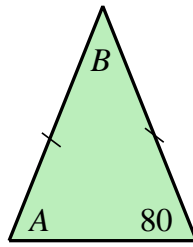
Question 7

How many equilateral triangles are contained within this figure ?



[2 marks]

Question 8



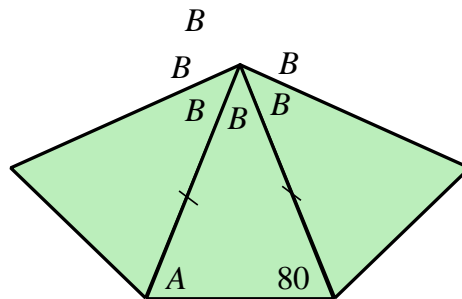
(a) What is the size of angle;

(i) A

(ii) B

[2 marks]

(b) As many copies of this triangle as needed are used to form a polygon.

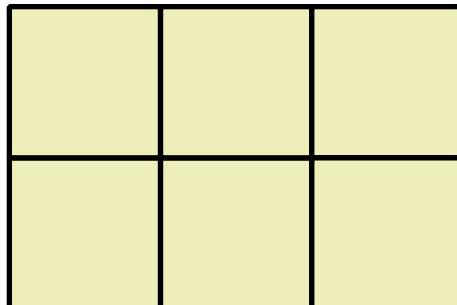


How many sides will the polygon formed have ?

[2 marks]

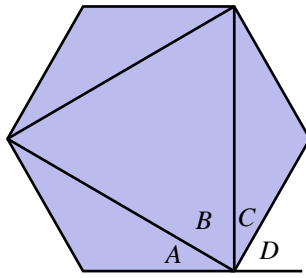
Question 9

How many squares are contained within this figure ?



[2 marks]

Question 10



A regular hexagon has an equilateral triangle inside it, as shown.

Angle D is an exterior angle of the hexagon.

- (i) Calculate D by using the formula;

$$\text{Exterior Angle} = \frac{360}{\text{Number Of Sides}}$$

[1 mark]

- (ii) What is the size of angle B ?

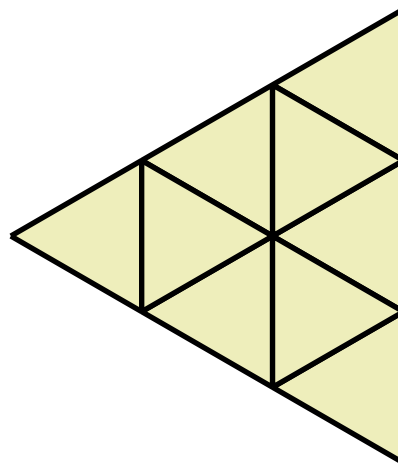
[1 mark]

- (iii) By symmetry angles A and C are equal.
What size are they each ?

[2 marks]

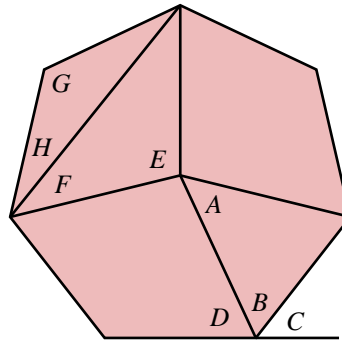
Question 11

How many equilateral triangles are contained within this figure ?



[2 marks]

Question 12



The diagram features a regular septagon.

- (a) How many sides has a septagon ?

[1 mark]

- (b) Use the formula;

$$\textit{Exterior Angle} = \frac{360}{\textit{Number Of Sides}}$$

to calculate the exterior angle of a septagon.

[1 mark]

- (c) Use the formula;

$$\textit{One Interior Angle} + \textit{One Exterior Angle} = 180$$

to calculate the interior angle of a septagon.

[1 mark]

- (d) State the size of the following angles;

(i) A

(v) E

(ii) B

(vi) F

(iii) C

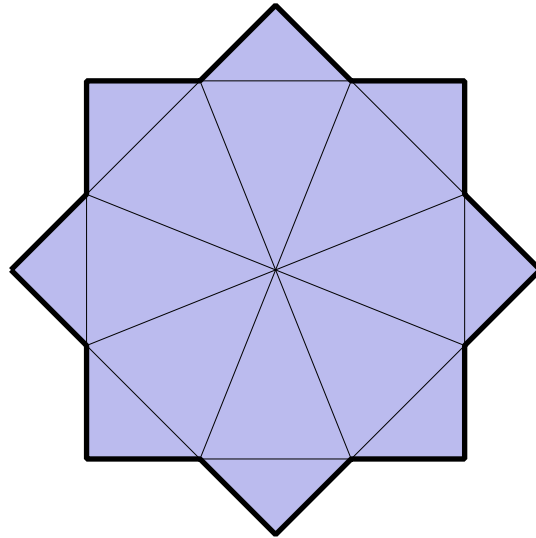
(vii) G

(iv) D

(viii) H

[8 marks]

Question 13



The diagram shows an octagram: an eight pointed star formed by extending the sides of a regular octagon outwards.

What is the sum of all the interior angles of an octagram ?

Explain your answer.

[4 marks]

Question 14

Complete the following table...

Number of sides	Name	Number of sides	Name
		11	Hendecagon
		12	
3	Triangle	13	Tridecagon
4	Quadrilateral	14	Tetradecagon
5	Pentagon	15	
6		16	
7		17	Heptadecagon
8		18	
9		19	
10		20	Icosagon

[4 marks]

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In October 2020, Shrewsbury School was voted "**Independent School of the Year 2020**"

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Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk