EQUITY
LEARNING PLACE

Elementary Math Topical (Polygon)

Question 1:

The angles, in degrees, of a quadrilateral *ABCD* are represented by these expressions:

Angle $A = 80 - 4x$, angle $B = 10 + 3x$, angle $C = 5x + 90$ and angle $D = 15x - 10$.

a) Calculate the value of x.

b) What is the name of the quadrilateral?

a)

$$80 - 4x + 10 + 3x + 5x + 90 + 15x - 10 = 360$$

$$19x = 190$$

$$x = 10$$

b)

$$\text{angle } A = 40, \quad \text{angle } B = 40, \quad \text{angle } C = 140, \quad \text{angle } D = 140$$

Parallelogram

Question 2:

Three of the exterior angles of an n-sided polygon are $37°$, $47°$ and $73°$ while the remaining $(n-3)$ exterior angles are each equal to $29°$. Find the value of n.

$$37 + 47 + 73 + (n - 3)(29) = 360$$

$$29n - 87 = 203$$

$$29n = 290$$

$$n = 10$$

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Question 3:

The ratio of the interior angle of a regular polygon to its exterior angle is $8:1$. How many sides does the polygon have?

$$9 \text{ units} = 180°$$

$$1 \text{ unit} = 20°$$

$$\text{Exterior angle} = 20°$$

$$\text{No. of sides} = \frac{360}{20} = 18$$

Question 4:

The size of each interior angle of a regular polygon is 6.5 times the size of each exterior angle. Calculate

a) the size of each exterior angle

b) the number of sides of the polygon

c) the sum of all the interior angles of the polygon

a)

$$7.5 \text{ units} = 180°$$

$$1 \text{ unit} = 24$$

$$\text{Exterior angle} = 24°$$

b)

$$\text{No of side} = \frac{360}{24} = 15$$

c)

$$\text{sum of interior angle} = (15 - 2) \times 180° = 2340°$$

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Question 5:

a) The exterior angle of a regular polygon is 15° each. Calculate the number of sides of the polygon.

b) A polygon has *n* sides. Two of its interior angles are 82° and 125° while the remaining interior angles are 157° each. Calculate the value of *n*.

a)

$$\text{Number of sides} = \frac{360}{15} = 24$$

b)

$$\text{Exterior angle} = 180 - 82 = 98°$$

$$\text{Exterior angle} = 180 - 125 = 55°$$

$$\text{Exterior angle} = 180 - 157 = 23°$$

$$98 + 55 + (n - 2)(23) = 360$$

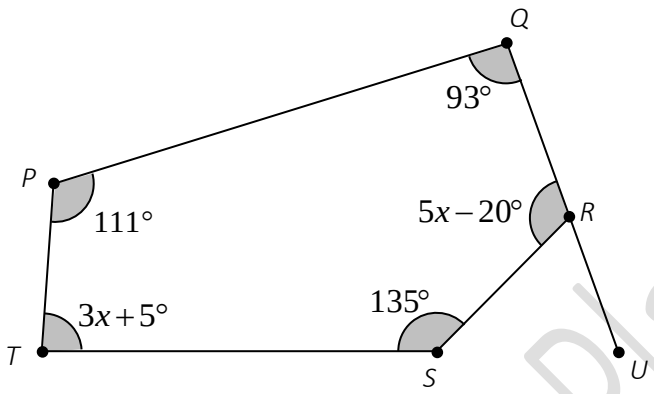
$$23n - 46 = 207$$

$$23n = 253$$

$$n = 11$$

Question 6:

The diagram below shows a polygon *PQRST*.



a) Name this polygon

b) Find the sum of the interior angles of the polygon *PQRST*.

c) Find the value of *x*.

a) Pentagon

b)

$$\text{sum of int. angle} = (5-2) \times 180 = 540°$$

c)

$$111 + 93 + 5x - 20 + 3x + 5 + 135 = 540$$

$$8x = 216$$

$$x = 27$$

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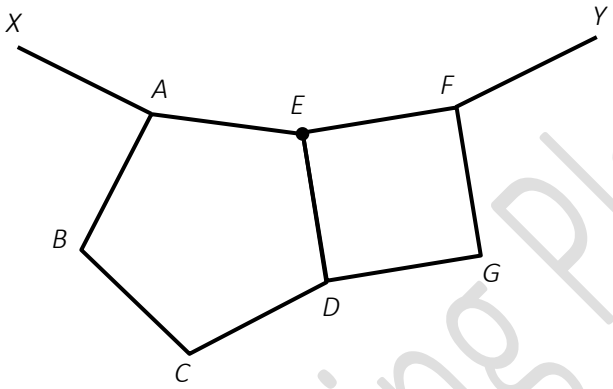
Question 7:

In the diagram, $ABCDE$ is a regular pentagon and $DEFG$ is a square XA, AE, EF and FY are four sides of another regular polygon. The three polygons fit together at E.

Find the number of sides of the regular polygon with sides XA, AE, EF and FY.



$$\angle AED = \frac{(5-2)\times 180}{5} = 108°$$

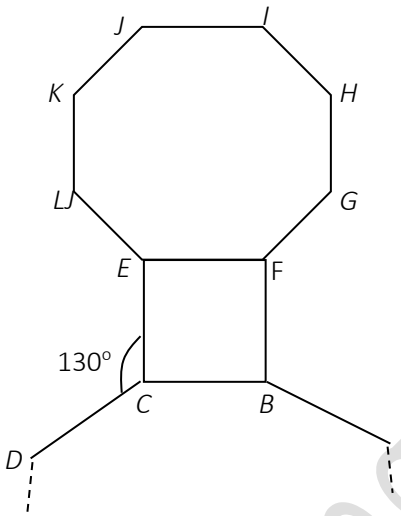
$$\angle AEF = 360° - 108° - 90° = 162°$$

$$\text{Exterior angle} = 180 - 162 = 18°$$

$$\text{Number of side} = \frac{360}{18} = 20$$

Question 8:

The diagram below shows part of a regular ***n***-sided polygon *ABCD*..., a square *BCEF* and a regular octagon *EFGHIJKL*.



If$\angle ECD$=130°, calculate

a) the size of the reflex angle $\angle LEC$

b) the value of ***n***.

a)

$$\angle LEF = \frac{(8-2)\times 180}{8} = 135°$$

$$\text{Reflex } \angle LEC = 135 + 90 = 225°$$

b)

$$\angle DCB = 360 - 130 - 90 = 140°$$

$$\text{Exterior angle} = 180 - 140 = 40°$$

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

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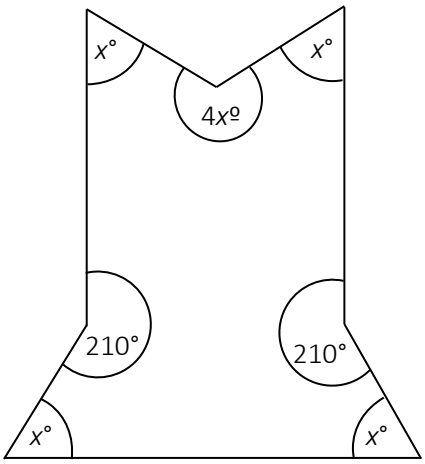
Question 9:

A symmetrical polygon is shown below with all its interior angles labelled. Find the value of x.



$$\text{Sum of interior angle} = (7-2) \times 180 = 900°$$

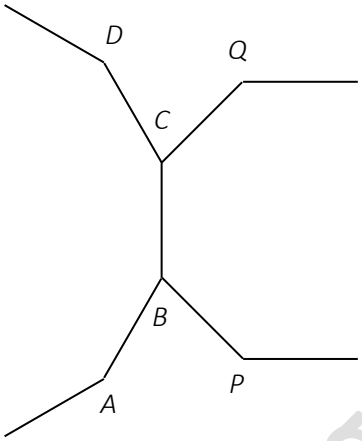
$$x + 4x + x + 210 + x + x + 210 = 900$$

$$8x = 480$$

$$x = 60$$

Question 10:

The diagram below shows part of a regular 14-sided polygon *ABCD* and part of a regular octagon *PBCQ*. They share a common line BC.



a) Find obtuse $\angle ABC$,

b) Find $\angle BPQ$

c) Find $\angle ABP$.

a)

$$\angle ABC = \frac{(14-2)\times 180}{14} = 154.285 = 154.3°$$

b)

$$\angle CBP = \frac{(8-2)\times 180}{8} = 135°$$

$$\angle BPQ = 180 - 135 = 45° \text{ (int. angle)}$$

c)

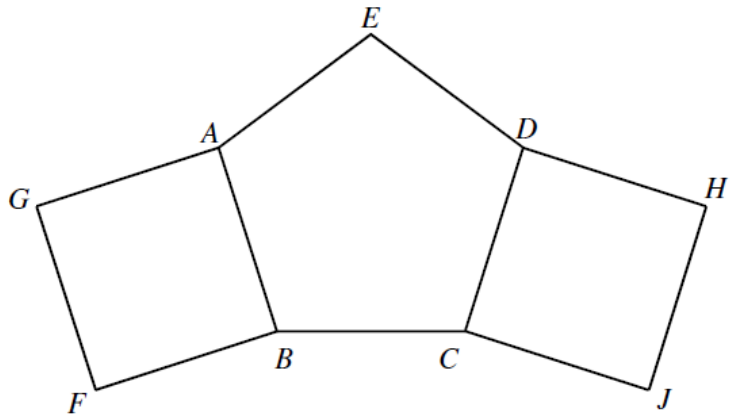
$$\angle ABP = 360 - 154.285 - 135 = 70.7°$$

Question 11:

In the diagram, *ABCDE* is a regular pentagon. *ABFG* and *CDHJ* are squares.

a) Find obtuse angle *FBC*.

b) Show that *G*, *B* and *J* do not lie on a straight line.



a)

$$\angle ABC = \frac{(5-2)\times 180}{5} = 108°$$

$$\angle FBC = 360 - 90 - 108 = 162°$$

b)

$$\angle GBA = 45°$$

$$\angle BCJ = \angle FBC = 162°$$

$$\angle CBJ = \frac{180-162}{2} = 9°$$

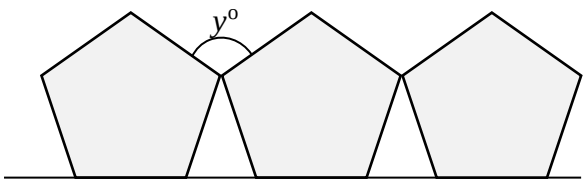
$$\angle ABC + \angle GBA + \angle CBJ = 45 + 9 + 108 = 161°$$

Since the sum of the angles is not equal to 180°,

by angle on straight line property, G, B and J does not lie on a straight line.

Question 12:

The diagram shows three regular pentagons arranged on a straight line.



Find the value of y

$$\text{An interior angle} = \frac{(5-2)\times 180}{5} = 108°$$

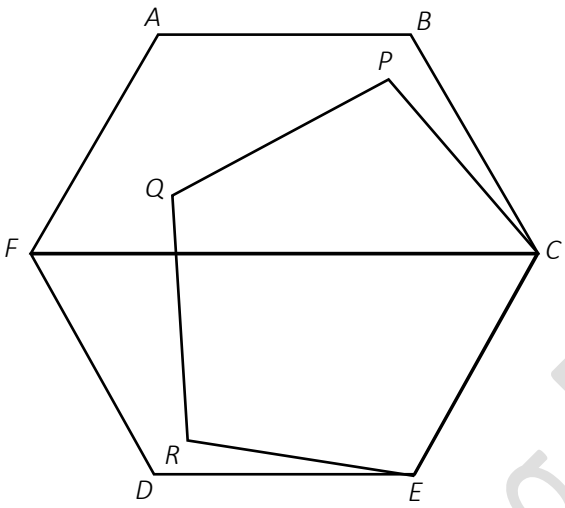
$$\text{Base angle} = 180 - 108 = 72°$$

$$\text{Top angle} = 180 - 72 - 72 = 36°$$

$$\angle y = 360 - 108 - 108 - 36 = 108°$$

Question 13:

In the diagram below, *ABCDEF* is a regular hexagon and *CPQRE is* a regular pentagon.



Find

a) angle *ECP*

b) angle *QPR*

c) Show that *FC* is parallel to *AB*.

a)

$$\angle ECP = \frac{(5-2)\times 180}{5} = 108°$$

b)

$$\angle QPR = \frac{180-108}{2} = 36°$$

c)

$$\text{an interior angle} = \frac{(6-2)\times 180}{6} = 120°$$

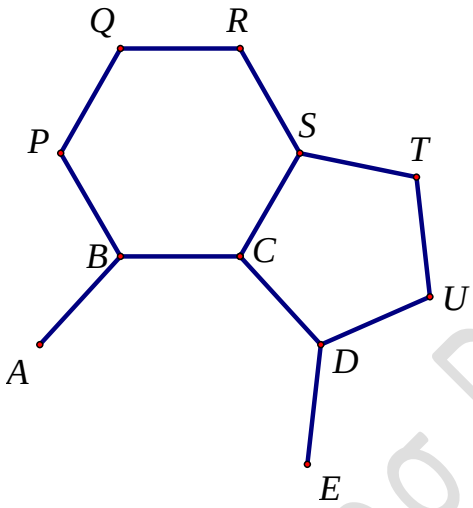
$$\angle AFC = 120 \div 2 = 60°$$

$$\angle BAF + \angle AFC = 120 + 60 = 180°$$

$$\therefore \text{ by interior angle, } FC \text{ is parallel to } AB.$$

Question 14:

In the diagram, *BCSRQP* is a regular hexagon and *CDUTS* is a regular pentagon.



a) Find $\angle BCS$.

b) Find $\angle SCD$.

c) Mr Tan suggests that *ABCDE* can form part of an *n*-sided regular polygon. Do you agree with him, stating your reasons clearly with calculations?

a)

$$\angle BCS = \frac{(6-2)\times 180}{6} = 120°$$

b)

$$\angle SCD = \frac{(5-2)\times 180}{5} = 108°$$

c)

$$\angle BCD = 360 - 120 - 108 = 132°$$

$$\text{Ext. angle} = 180 - 132 = 48$$

$$\text{Number of side} = \frac{360}{48} = 7.5$$

Since the number of sides is not an positive integer, $ABCDE$ is not part of a regular polygon.

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Question 15:

a) A 7-sided polygon has 6 interior angles of $130°$. Find the remaining interior angle.

b) A regular polygon has interior angles of $165°$. Find the number of sides of the polygon.

a)

$$\text{Exterior angle} = 180 - 130 = 50$$

$$50(6) + x = 360$$

$$x = 60$$

$$\text{Remaining interior angle} - 180 - 60 - 120°$$

b)

$$\text{Exterior angle} = 180 - 165 = 15°$$

$$\text{Number of sides} = \frac{360}{15} = 24 \text{ sides.}$$