

IGCSE MATHEMATICS

ANGLES AND POLYGONS

NAME Solutions.

Question 1

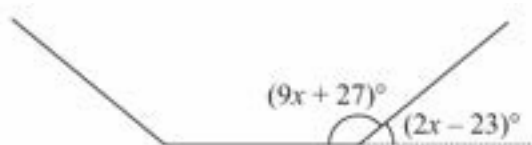


Diagram NOT
accurately drawn

The diagram shows part of a regular n -sided polygon with

an interior angle of $(9x + 27)^\circ$

an exterior angle of $(2x - 23)^\circ$

Work out the value of n

$$9x + 27 + 2x - 23 = 180$$

$$11x + 4 = 180 \quad \checkmark$$

$$11x = 176$$

$$x = 16 \quad \checkmark$$

$$\text{Exterior angle} = 2(16) - 23$$

$$= 32 - 23$$

$$= 9 \quad \checkmark$$

$$n = \frac{360}{9}$$

$n =$

40 $\checkmark$

(4)

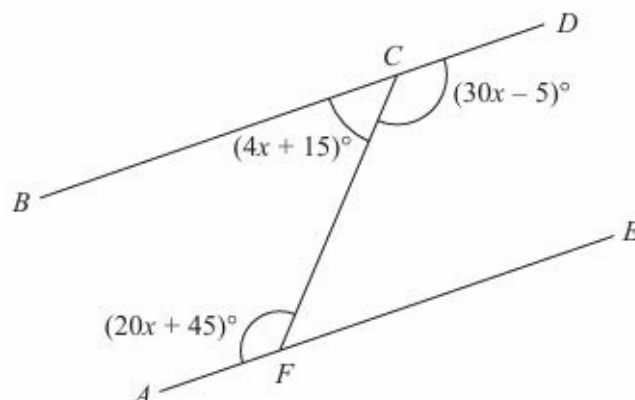
Question 2

Diagram **NOT**
accurately drawn

BCD and *AFE* are straight lines.

Show that *BCD* is parallel to *AFE*.

Give reasons for your working.

$$4x + 15 + 30x - 5 = 180 \quad \checkmark \quad \text{angles on straight line add to } 180. \quad \checkmark$$

$$34x + 10 = 180$$

$$34x = 170$$

$$x = 5 \quad \checkmark$$

If *BCD* is parallel to *AFE*, then

$$20x + 45 = 30x - 5 \quad \checkmark \quad \text{alternate angles are equal}$$

$$100 + 45 = 150 - 5 \quad \checkmark$$

$$145 = 145$$

(5)

Question 3

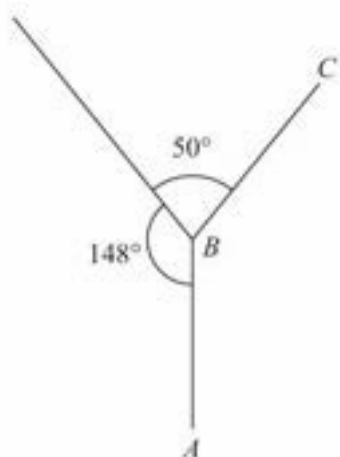


Diagram **NOT**
accurately drawn

AB and BC are two sides of a regular polygon with n sides.

Work out the value of n
Show your working clearly.

$$\begin{aligned} \angle ABC &= 360 - 148 - 50 \\ &= 162 \end{aligned}$$

$$\text{Ext} = 180 - 162 = 18$$

$$\begin{aligned} n &= 360 \div 18 \\ &= 20. \end{aligned}$$

.....(4)

Question 4

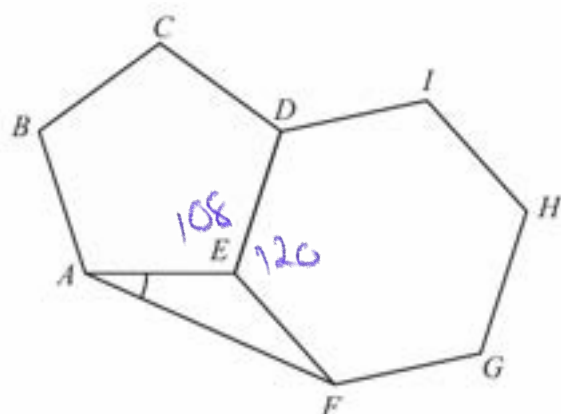


Diagram **NOT**
accurately drawn

ABCDE is a regular pentagon.

DEFGHI is a regular hexagon.

AF is a straight line.

Work out the size of angle *EAF*.

$$\begin{aligned}
 \text{Sum (pentagon)} &= (n-2) \times 180 \\
 &= 3 \times 180 \\
 &= 540
 \end{aligned}
 \quad \rightarrow \begin{aligned}
 &\text{Size of one} \\
 &= 540 \div 5 \\
 &= 108
 \end{aligned}$$

$$\begin{aligned}
 \text{Sum (hexagon)} &= (n-2) \times 180 \\
 &= 4 \times 180 \\
 &= 720
 \end{aligned}
 \quad \rightarrow \begin{aligned}
 &\text{Size of one} \\
 &= 720 \div 6 \\
 &= 120
 \end{aligned}$$

$$\begin{aligned}
 \text{AEF} &= 360 - 108 - 120 \\
 &= 132
 \end{aligned}$$

$$\alpha = \frac{180 - 132}{2}$$

$$\alpha = 24 \dots\dots\dots(5)$$

Question 5

In the diagram, $ABCDE$ is a regular pentagon.

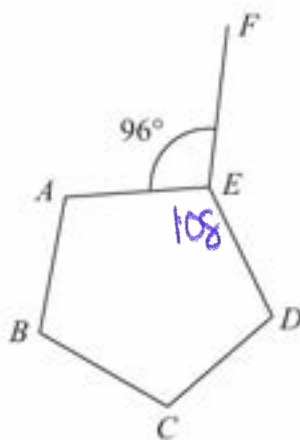


Diagram **NOT**
accurately drawn

Angle $AEF = 96^\circ$

Work out the size of the obtuse angle FED
Show your working clearly.

$$\begin{aligned} \text{Sum (pentagon)} &= (5-2) \times 180 \\ &= 540 \end{aligned}$$

$$AED = 540 \div 5 = 108$$

$$\begin{aligned} FED &= 360 - 96 - 108 \\ &= \underline{\underline{156}} \end{aligned}$$

.....(4)

Question 6

$ABCD$ is a trapezium.

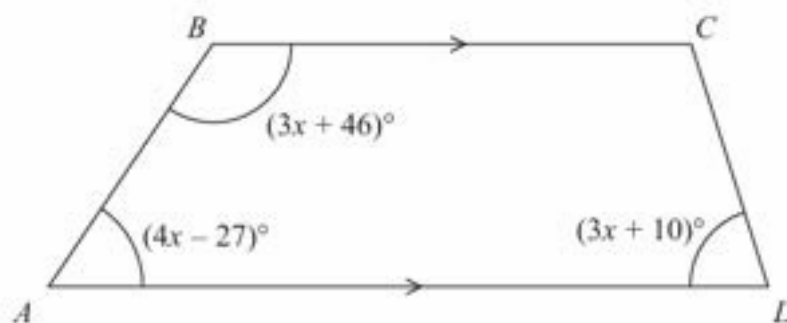


Diagram **NOT** accurately drawn

BC is parallel to AD

Find the size of the largest angle inside the trapezium.

$$4x - 27 + 3x + 46 = 180$$

$$7x + 19 = 180$$

$$7x = 161$$

$$x = 23$$

$$3(23) + 46 = 115$$

$$4(23) - 27 = 65$$

$$3(23) + 10 = 79$$

$$360 - 115 - 65 - 79 = 101$$

115

(4)

Question 7

Here is a 9-sided regular polygon $ABCDEFGHIJ$, with centre O

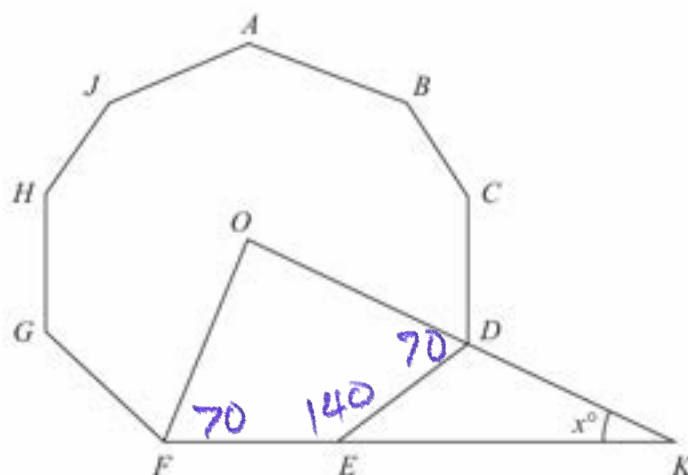


Diagram **NOT**
accurately drawn

ODK and FEK are straight lines.

Work out the value of x

$$\text{Sum (interior)} = 7 \times 180 = 1260$$

$$\text{One interior} = 1260 \div 9 = 140$$

$$\begin{aligned} \angle FOD &= 360 - 140 - 70 - 70 \\ &= 80 \end{aligned}$$

$$\begin{aligned} x &= 180 - 70 - 80 \\ &= 30^\circ \end{aligned}$$

.....(3)

Question 8

The diagram shows a pentagon.

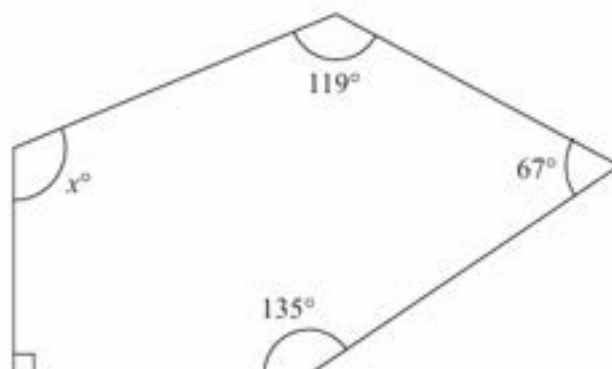


Diagram **NOT** accurately drawn

Work out the value of x

$$\text{Sum} = (5-2) \times 180 = 540,$$

$$x = 540 - 90 - 135 - 67 - 119$$

$$= \underline{\underline{129}}$$

$$x = \underline{\hspace{2cm}} \quad (3)$$

Question 9

The diagram shows parts of three regular polygons, A, B and C, meeting at a point.

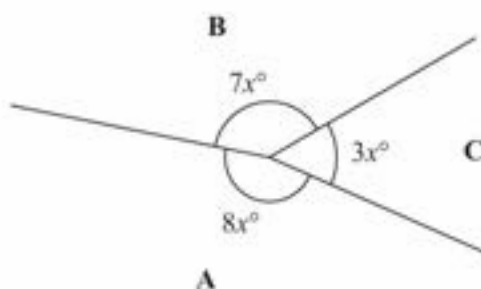


Diagram **NOT** accurately drawn

Polygon B has n sides.

Work out the value of n .

$$7x + 8x + 3x = 360$$

$$18x = 360$$

$$x = 20,$$

$$\text{Interior for B} = 7 \times 20 = 140$$

$$\text{Ext} = 40 \therefore n = \frac{360}{40} = 9.$$

(4)

Question 10

The diagram shows a regular octagon $ABCDHIJK$ and a pentagon $DEFGH$.

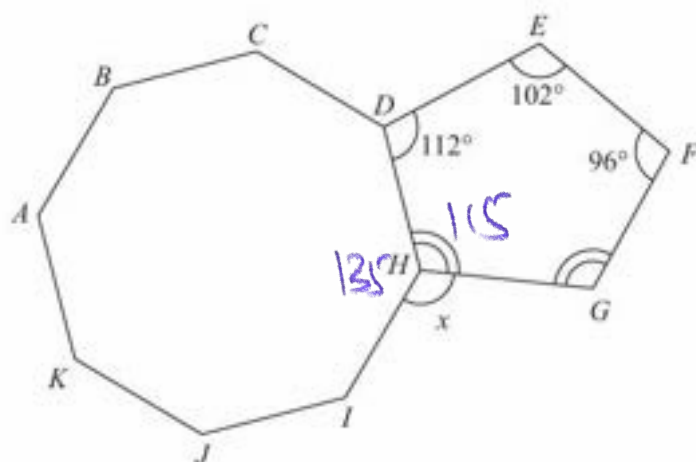


Diagram **NOT** accurately drawn

Angle $GHD = \text{angle } FGH$.

Work out the size of the angle marked x .
Show your working clearly.

$$\begin{aligned}\text{Sum (octagon)} &= 6 \times 180 \\ &= 1080\end{aligned}$$

$$\begin{aligned}\text{Size of one} &= 1080 \div 8 \\ &= 135.\end{aligned}$$

$$\begin{aligned}\text{Sum (pentagon)} &= (5-2) \times 180 \\ &= 540\end{aligned}$$

$$\begin{aligned}2w + y &= 540 - 112 - 102 - 96 \\ &= 230\end{aligned}$$

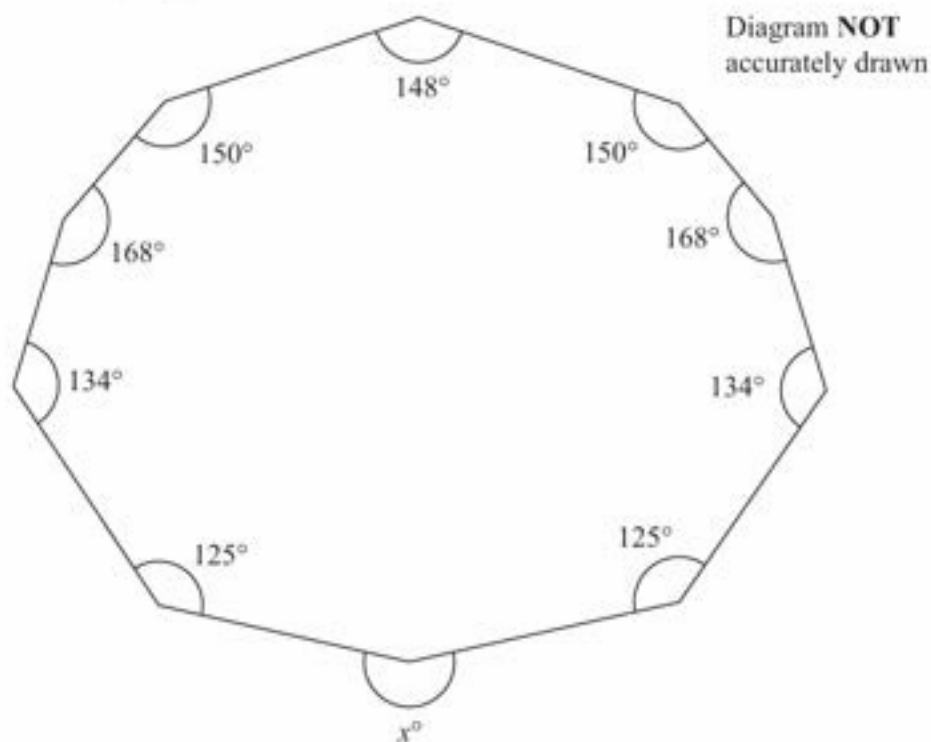
$$w = 115$$

$$x = 360 - 135 - 115$$

$$= \underline{110^\circ} \dots\dots(5)$$

Question 11

Here is a 10-sided polygon.



Work out the value of x .

$$\text{Sum} = (10 - 2) \times 180$$

$$= 1440$$

$$\text{missing} = 1440 - 1302$$

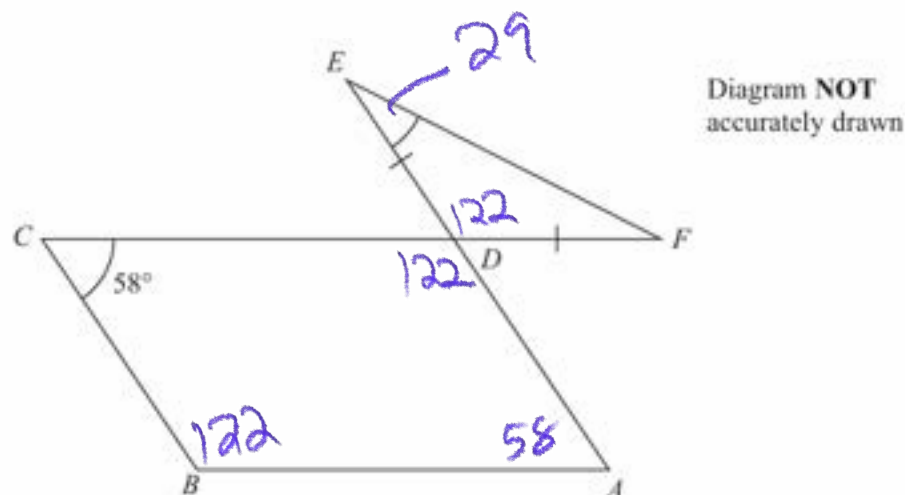
$$= 138$$

$$x = 360 - 138$$

$$= \underline{\underline{222}}$$

.....(4)

Question 12



The diagram shows a parallelogram $ABCD$ and an isosceles triangle DEF in which $DE = DF$

CDF and ADE are straight lines.

Angle $BCD = 58^\circ$

Work out the size of angle DEF .

Give a reason for each stage of your working.

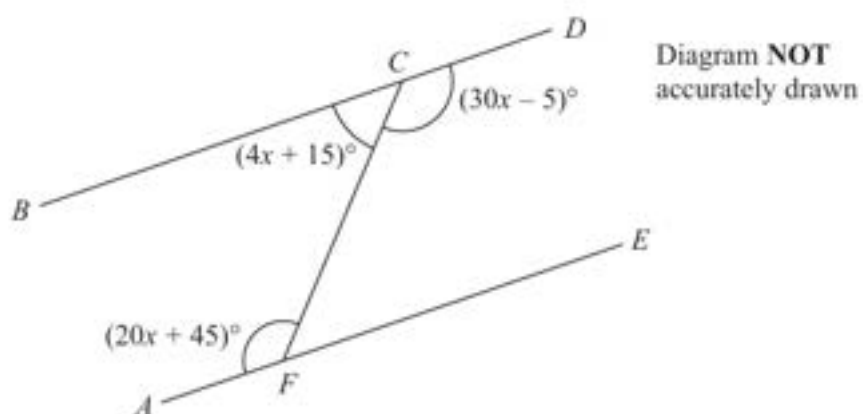
$A = 58^\circ$ Opposite angles of parallelogram are equal.

$B = D = 122^\circ$ opposite angles of parallelogram and vertically opposite angles are equal.

$DEF = 29^\circ$ (base angles of an isosceles triangle are equal)

.....(5)

Question 13



BCD and AFE are straight lines.

Show that BCD is parallel to AFE .

Give reasons for your working.

.....(5)