1 The diagram shows a square and an isosceles triangle.
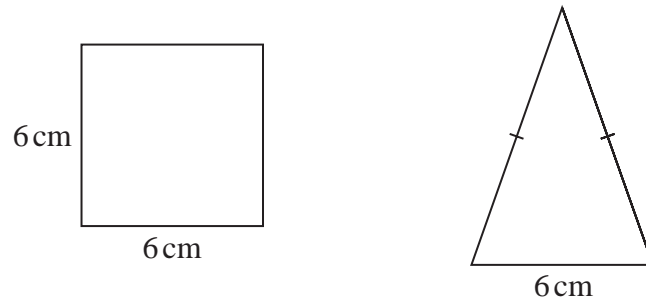
6 cm

6 cm

6 cm

Diagram **NOT** accurately drawn

The square has sides of length 6 cm.
The base of the isosceles triangle is 6 cm.

The perimeter of the square is equal to the perimeter of the isosceles triangle.

The shaded shape is made by putting three of the isosceles triangles around the square as shown in the diagram below.
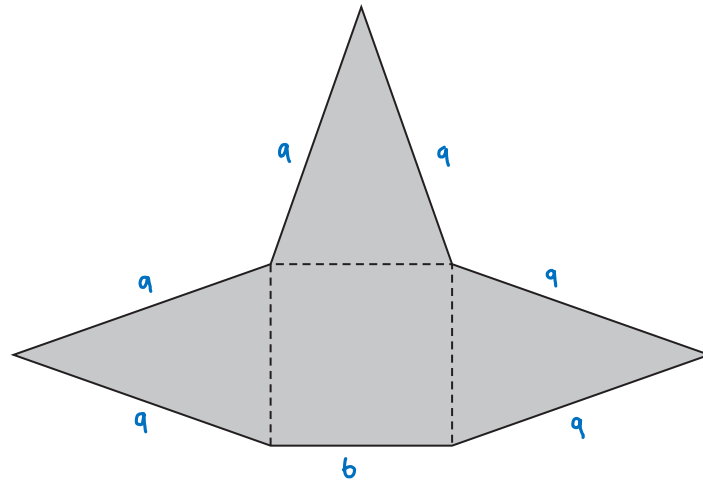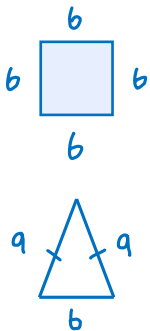
9   9

9   9

9   9

6

Diagram **NOT** accurately drawn

Work out the perimeter of the shaded shape.
Show your working clearly.

6
6 ☐ 6
6

9 ⋀ 9
6

Perimeter of square = 4 × 6 = 24 cm ①

perimeter of square = perimeter of triangle

Long side of triangle = $\frac{24 - 6}{2}$ = 9 ①

Perimeter of shaded shape = (6 × 9) + 6 ①
(see diagram)   = 60 cm

60 ① cm

(Total for Question 1 is 4 marks)

2 Here is a 10-sided polygon.

Diagram **NOT**
accurately drawn

148°

150°   150°

168°   168°

134°   134°

125°   125°

y°

125°

x°
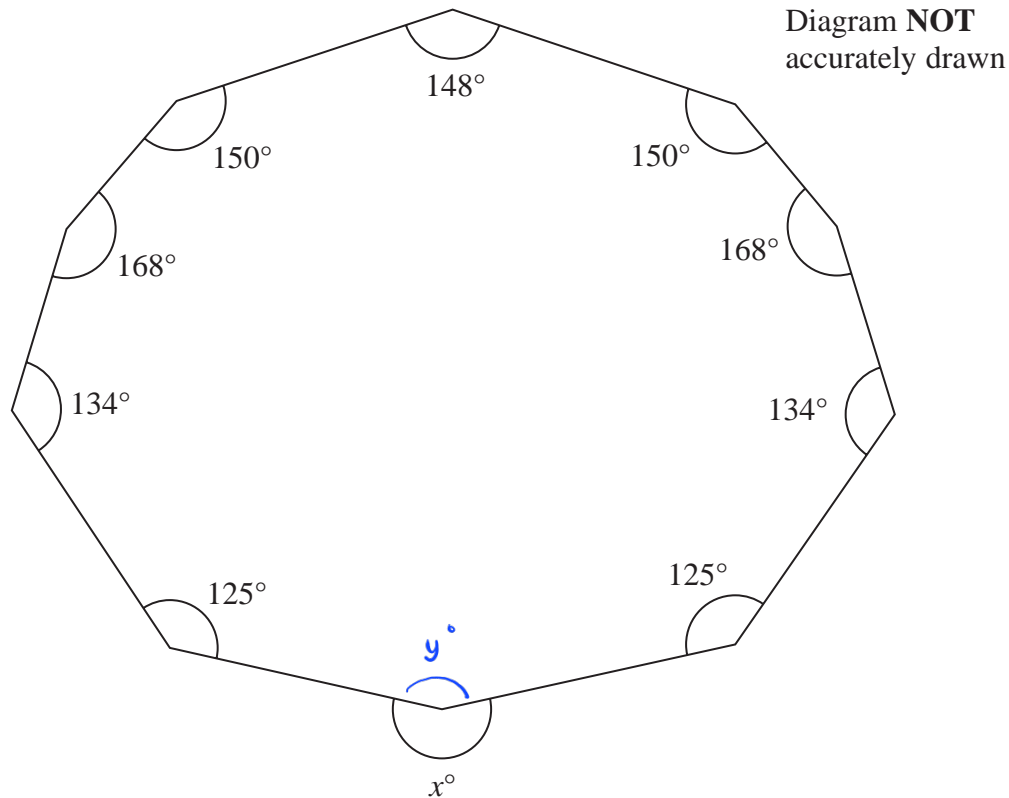
Work out the value of *x*.

angle inside polygon : $(n-2) \times 180°$

$: (10-2) \times 180° = 1440°$ ①

$125° + 134° + 168° + 150° + 148° + 150° + 168° + 134° + 125° + y° = 1440°$

$y° = 1440° - 1302°$

$= 138°$ ①

∴ $x° = 360° - y°$

$: 360° - 138°$ ①

$: 222°$ ①

$x = $ .... $222°$

(Total for Question 2 is 4 marks)

3 The diagram shows two congruent isosceles triangles and parts of two congruent regular polygons, **X** and **Y**.
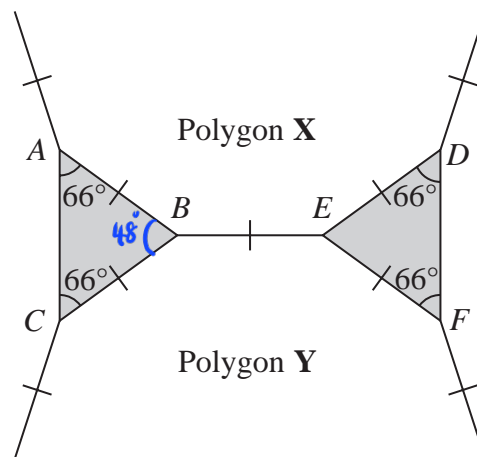
Polygon **X**

Diagram **NOT** accurately drawn

A

66°

B

48

E

66°

D

66°

66°

66°

C

F

Polygon **Y**

The two regular polygons each have *n* sides.

Work out the value of *n*.

angle ABC = 180° − 66° − 66°

= 48° ①

Half of angle ABC = exterior angle of   polygon X and Y

= $\frac{1}{2}$ × 48° = 24°

Exterior angle of polygon = $\dfrac{360°}{no.\ of\ sides}$

24° = $\dfrac{360°}{n}$

n = $\dfrac{360°}{24°}$ ①

= 15 ①

n = ...15..........

(Total for Question 3 is 3 marks)

4 A regular polygon has n sides.
The size of each interior angle of the regular polygon is $140°$

Work out the value of n.

By using sum of interior angle formula :

$$(n-2) \times 180° = 140° \times n \quad \textcircled{1}$$

$$180n - 360° = 140n$$

$$180n - 140n = 360°$$

$$40n = 360°$$

$$n = \frac{360°}{40°} \textcircled{1} = 9 \quad \textcircled{1}$$

$n = $ _____ 9

(Total for Question 4 is 3 marks)

5 The diagram shows a regular pentagon, *ABCDE*, a regular hexagon, *CFGHID*, and a quadrilateral, *EDIJ*.

Diagram **NOT** accurately drawn

B *C* *F* *G* *A* *D* 108° 120° 108° *E* 120° *H* *I* *x* *J*

Interior angle of a polygon :

$$\frac{n-2}{n} \times 180°$$

where n = number of sides
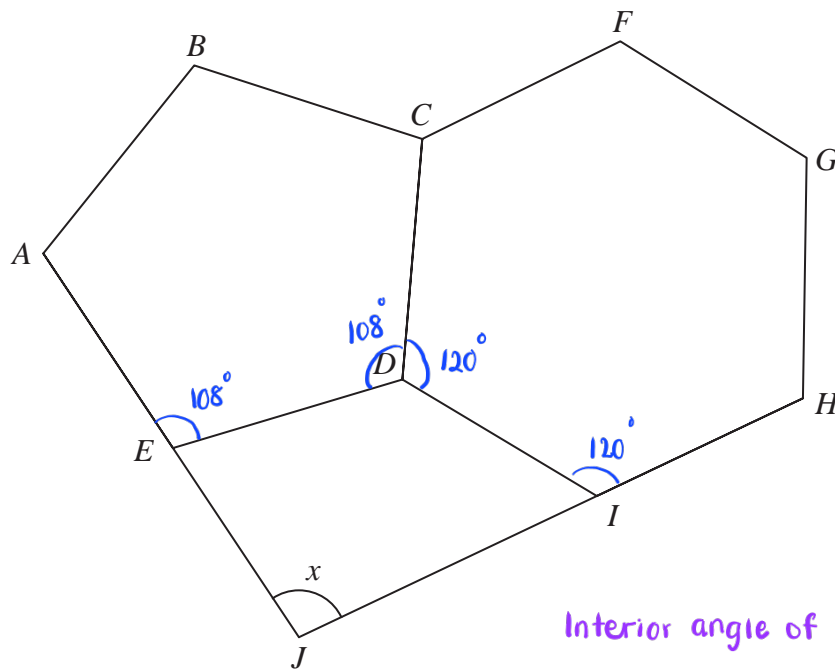
AEJ and *HIJ* are straight lines.

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

Finding interior angle of a Pentagon :

$$\frac{5-2}{5} \times 180° = 108° \ ①$$

Finding interior angle of a hexagon :

$$\frac{6-2}{6} \times 180° = 120° \ ①$$

angle JED = 180° - 108° = 72°

angle EDI = 360° - 108° - 120° = 132° ①

angle DIJ = 180° - 120° = 60°

$$x° = 360° - 72° - 132° - 60° \ ①$$

$$= 96° \ ①$$

96

(Total for Question 5 is 5 marks)

6   The diagram shows quadrilateral *ABCD* and isosceles triangle *ADE*, where *AE* = *AD*.
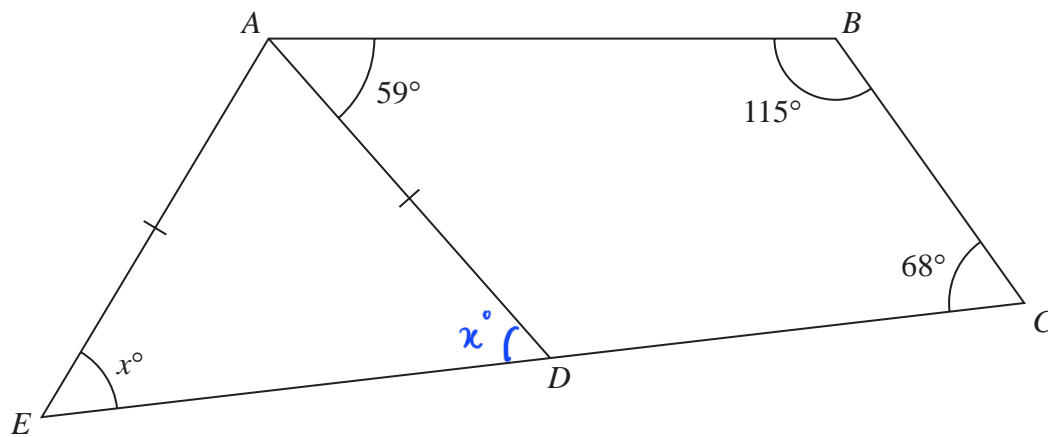
EDC is a straight line.

Work out the value of *x*.
Give a reason for each stage of your working.

$$\angle ADE = x^\circ$$

(the base angles of an isosceles angle are equal)

$$\angle ADC = 360^\circ - 115^\circ - 68^\circ - 59^\circ$$
$$= 118^\circ \ ①$$

(angles in a quadrilateral sums up to 360°) ②

$$\angle ADE = 180^\circ - 118^\circ$$
$$= 62^\circ \ ①$$

(angles on a straight line sums up to 180°)

$$x = \underline{\qquad 62^\circ \qquad}$$

(Total for Question 6 is 4 marks)

7 The diagram below shows the trapezium *PQRS*
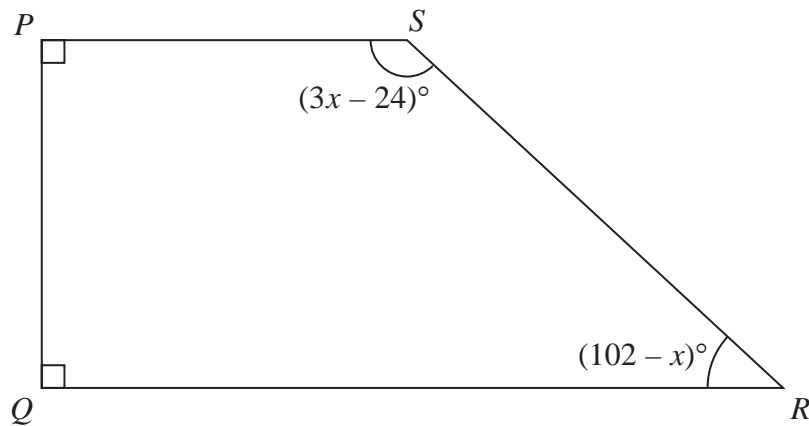

Diagram **NOT**
accurately drawn

Angle *PQR* and angle *QPS* are right angles.

Find the value of *x*

Angles in a quadrilateral adds up to $360°$:

$$90 + 90 + (3x-24) + (102-x) = 360 \quad ①$$

$$180 + 2x + 78 = 360$$

$$2x = 360 - 180 - 78 \quad ①$$

$$2x = 102$$

$$x = 51 \quad ①$$

$x =$ ....51......................

(Total for Question 7 is 3 marks)

8 The diagram shows triangle *ABP* inside the regular hexagon *ABCDEF*

Diagram **NOT** accurately drawn

D *E*

C *F*

P

2

21·8

B 5 *A*
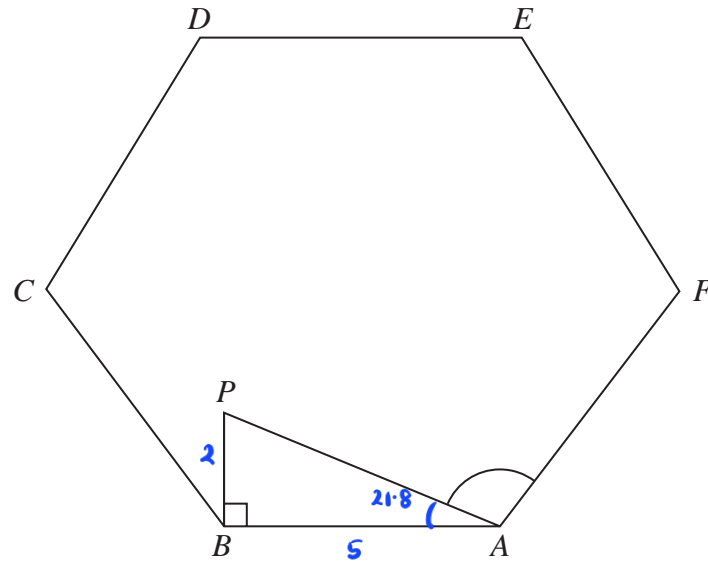
$AB = 5$ cm $BP = 2$ cm   Angle $ABP = 90°$

Work out the size of angle *PAF*

Give your answer correct to 3 significant figures.

Internal angle of hexagon $= \dfrac{6-2}{6} \times 180°$

$= \dfrac{4}{6} \times 180°$

$= 120°$ ①

$\tan BAP = \dfrac{2}{5}$ ①

$BAP = \tan^{-1} \dfrac{2}{5}$ ①

$= 21·8°$

angle $PAF = 120° - 21·8°$ ①

$= 98·2°$ ①

98·2 °

(Total for Question 8 is 5 marks)

9 The diagram shows a regular octagon *ABCDEFGH* and a regular pentagon *ABIJK*

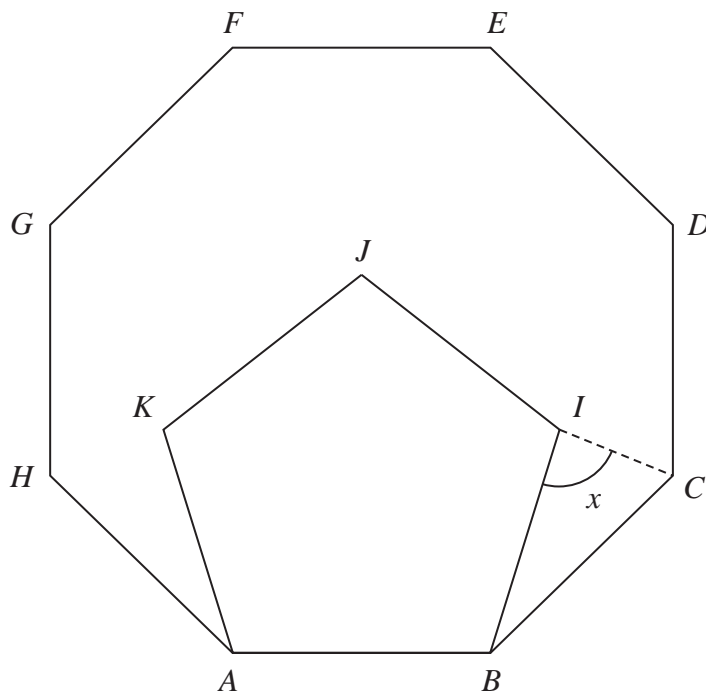
Diagram **NOT**
accurately drawn

Work out the size of the angle *x*

Interior angle :

$$\text{octagon} : 180° - (360 \div 8) = 135°$$ ①

$$\text{pentagon} : 180° - (360 \div 5) = 108°$$

$$IBC = 135° - 108°$$ ①
$$= 27°$$

since BCI is isosceles,

$$x = \frac{180° - 27°}{2}$$ ①

$$= 76.5°$$ ①

76.5 .... °

(Total for Question 9 is 4 marks)

10 The diagram shows a regular 10-sided polygon, *ABCDEFGHIJ*
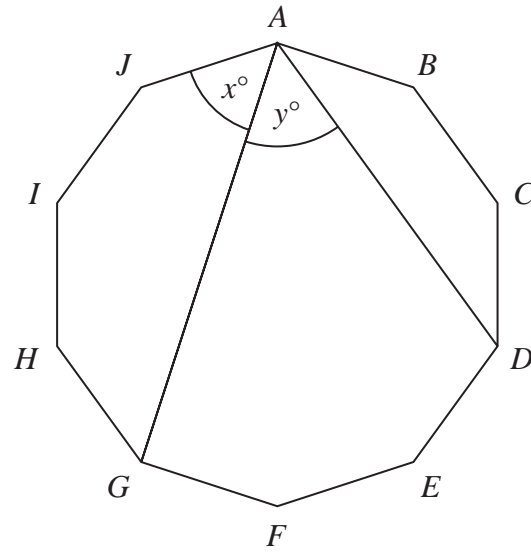
Diagram **NOT** accurately drawn

Show that $x = y$

Interior angle: $\dfrac{(10-2) \times 180°}{10} = 144°$ ①

$x = \dfrac{540° - 3(144°)}{2} = 54°$ ①

$B\hat{A}D = \dfrac{360° - 2(144°)}{2} = 36°$ ①

$y = 90° - 36°$

$\quad = 54°$ ①

∴ $y = x$

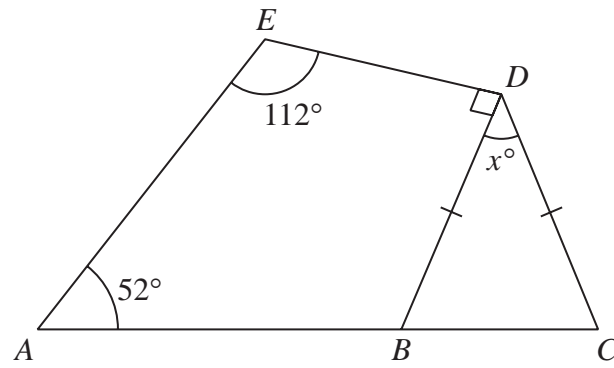**(Total for Question 10 is 4 marks)**

11

Diagram **NOT** accurately drawn

BCD is an isosceles triangle with *BD* = *CD*
ABC is a straight line.
ABDE is a quadrilateral.

Work out the value of *x*
Give a reason for each stage of your working.

ABD : 360 -52 -112 -90

＝ 106 ①

(angles in a quadrilateral add up to 360°) ①

CBD ＝ 180 - 106

＝ 74 ①

(angles on a straight line add to 74°)

x = 180° - 2(74°)   - (base angles in isosceles are equal)

＝ 180° - 148°

＝ 32° ①

$x =$ ....32............

(Total for Question 11 is 4 marks)

12
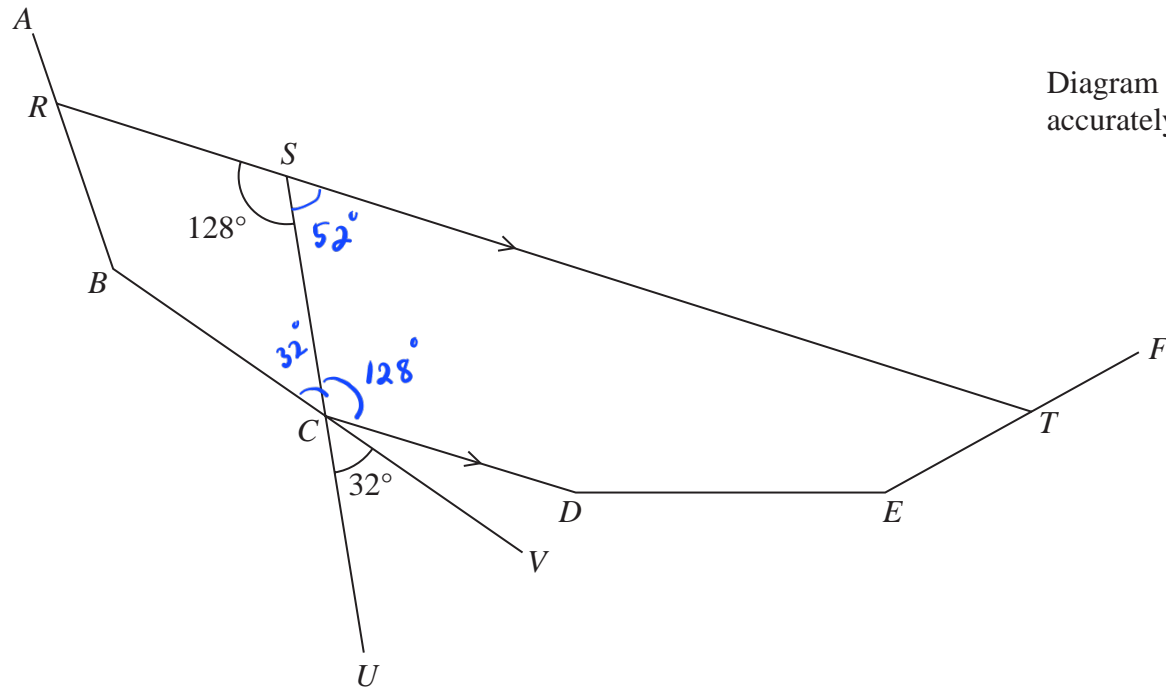
AB, *BC*, *CD*, *DE* and *EF* are five sides of a regular polygon.

RST, *SCU* and *BCV* are straight lines.
RST is parallel to *CD*
Angle *RSC* = 128°
Angle *UCV* = 32°

Work out how many sides the polygon has.
Show your working clearly.

$$BCS = UCV = 32°$$

$$SCD = RSC = 128°$$ ①

$$TSC = 180° - 128° = 52°$$

$$\text{interior angle} = 128° + 32° = 160°$$ ①

$$180(n-2) = 160n$$ ①

$$180n - 360 = 160n$$

$$20n = 360$$

$$n = 18$$ ①

18

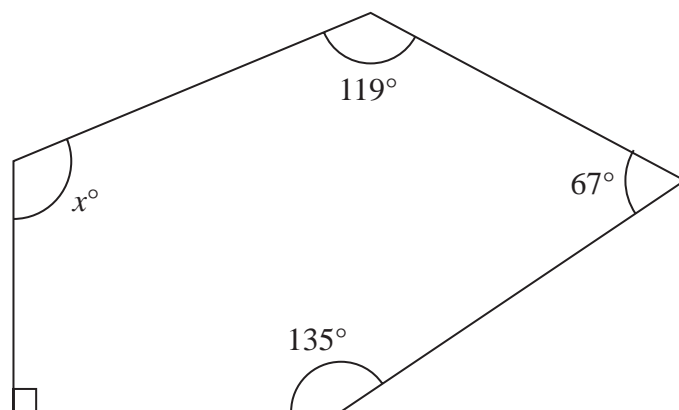**(Total for Question 12 is 4 marks)**

13 The diagram shows a pentagon.

119°

67°

Diagram **NOT**
accurately drawn

$x°$

135°

Work out the value of x

Total angle : $3 \times 180° = 540°$ ①

$540 - 90 - 135 - 67 - 119$ ①

$= 540 - 411$

$= 129$ ①

$x =$ ....129.............

(Total for Question 13 is 3 marks)

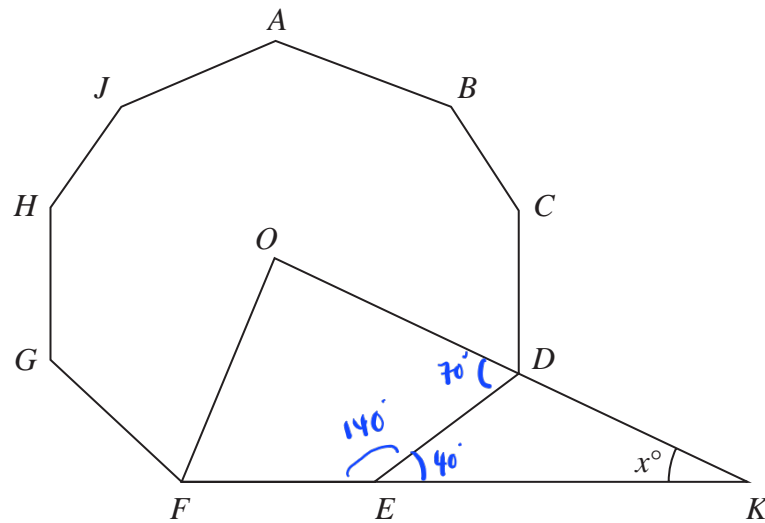**14** Here is a 9-sided regular polygon *ABCDEFGHJ*, with centre *O*

Diagram **NOT**
accurately drawn

ODK and *FEK* are straight lines.

Work out the value of *x*

interior angle of polygon $= \dfrac{(9-2)(180)}{9} = 140°$ ①

$DEK = 180° - 140° = 40°$

$EDK = 180° - \left(\dfrac{140}{2}\right) = 110°$ ①

$x = 180° - 110° - 40°$

$= 30°$ ①

$x =$ 30

(Total for Question 14 is 3 marks)