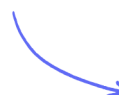


Angles in Polygons & Parallel Lines

Basic Angle Properties / Angles in Polygons / Angles in Parallel Lines

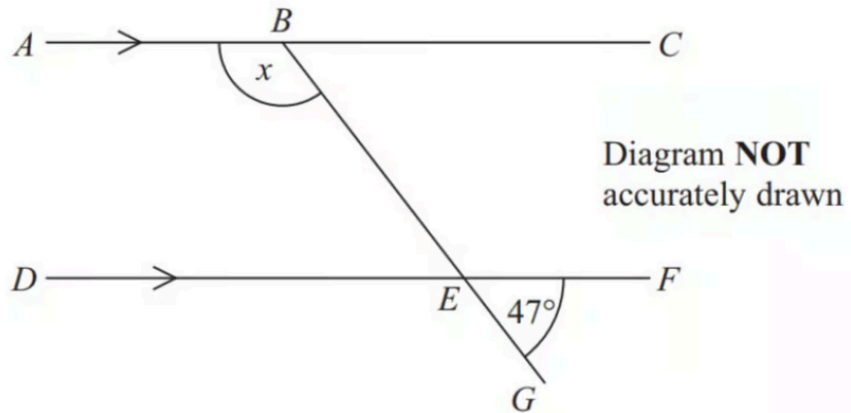
Medium (20 questions)	/66
Hard (19 questions)	/75
Very Hard (12 questions)	/53
Total Marks	/194

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Medium Questions

1



ABC and DEF are parallel lines.

BEG is a straight line.

Angle $GEF = 47^\circ$.

Work out the size of the angle marked x .

Give reasons for your answer.

(3 marks)

2

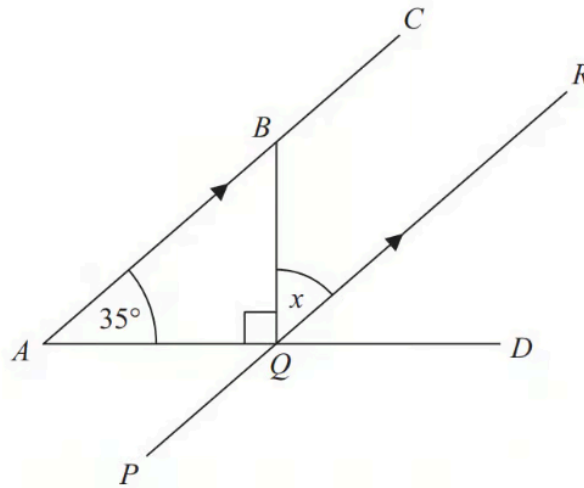


Diagram **NOT**
accurately drawn

ABC , PQR and AQD are straight lines.
 ABC is parallel to PQR .

Angle $BAQ = 35^\circ$
Angle $BQA = 90^\circ$

Work out the size of the angle marked x .
Give reasons for each stage of your working.

(4 marks)

3

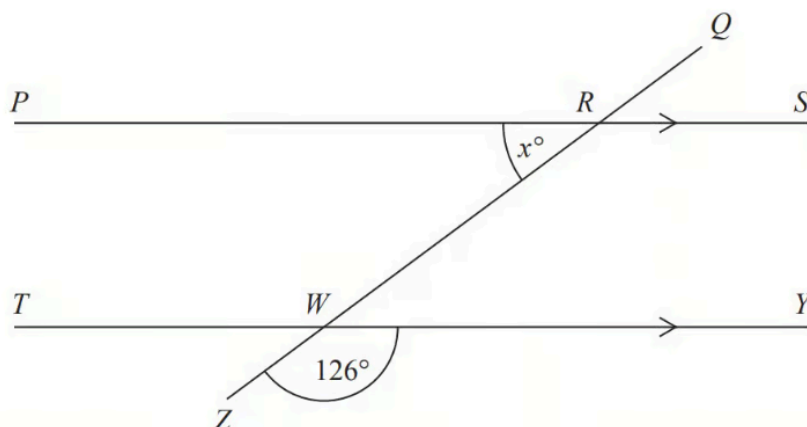


Diagram **NOT**
accurately drawn

PRS and TWY are parallel straight lines.
 $QRWZ$ is a straight line.

Work out the value of x .
Give reasons for your answer.

(3 marks)

4

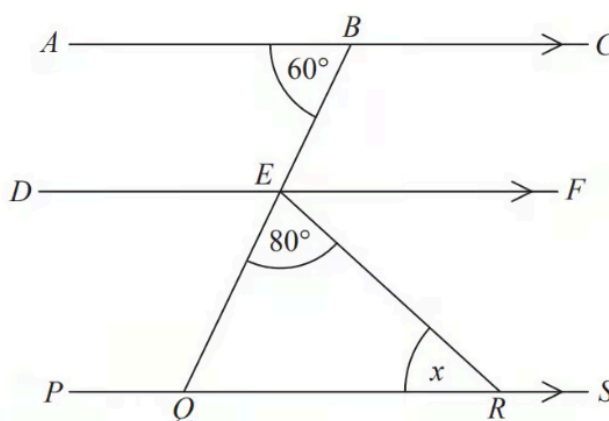


Diagram **NOT**
accurately drawn

ABC , DEF and $PQRS$ are parallel lines.
 BEQ is a straight line.

Angle $ABE = 60^\circ$.

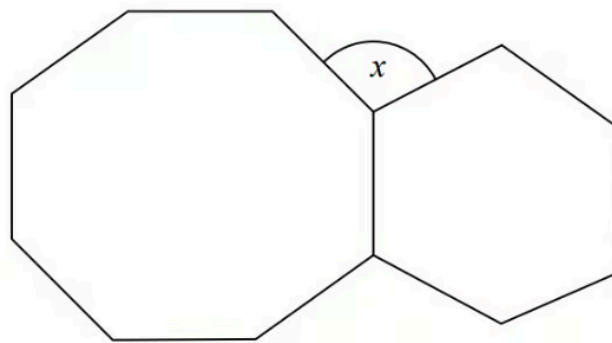
Angle $QER = 80^\circ$.

Work out the size of the angle marked x .

Give reasons for each stage of your working.

(4 marks)

5



The diagram shows a regular octagon and a regular hexagon.

Find the size of the angle marked x .

You must show all your working.

(3 marks)

6 $ABCDE$ and $PQRST$ are regular pentagons.

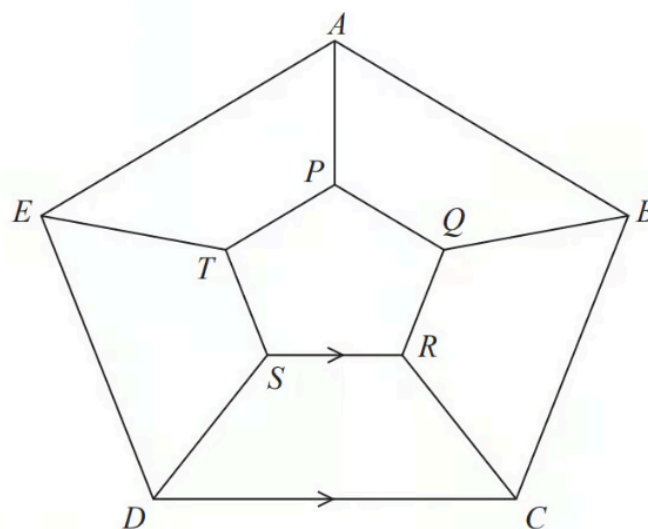


Diagram **NOT**
accurately drawn

SR is parallel to DC .

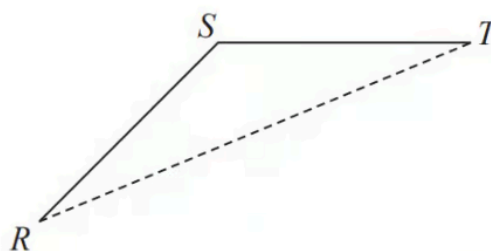
$$AP = BQ = CR = DS = ET$$

Work out the size of angle SRC .

You must show all your working.

(3 marks)

7



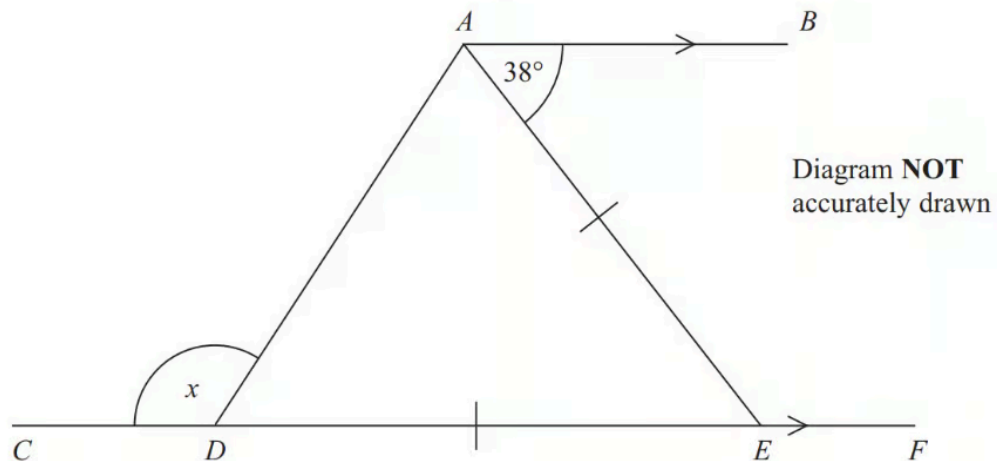
RS and ST are 2 sides of a regular 12-sided polygon.

RT is a diagonal of the polygon.

Work out the size of angle STR .
You must show your working.

(3 marks)

8

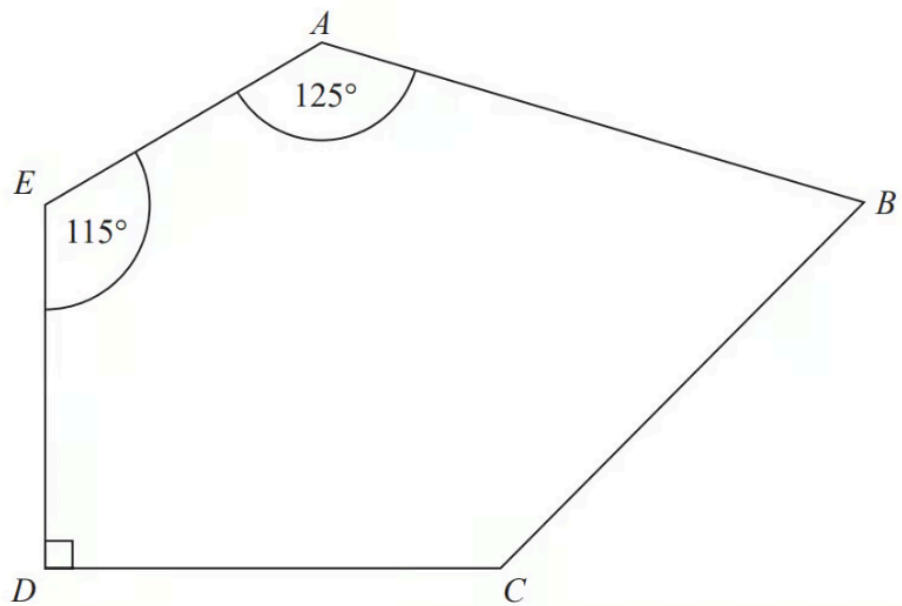


$CDEF$ is a straight line.
 AB is parallel to CF .
 $DE = AE$.

Work out the size of the angle marked x .
You must give reasons for your answer.

(4 marks)

9 $ABCDE$ is a pentagon.

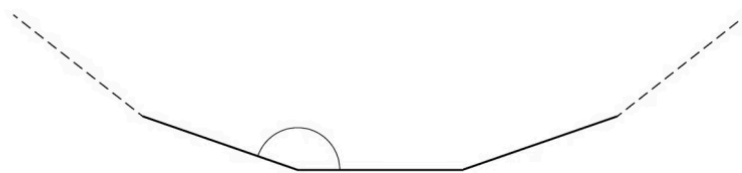


Angle $BCD = 2 \times$ angle ABC .

Work out the size of angle BCD .
You must show all your working.

(5 marks)

- 10 Part of a regular polygon with 15 sides is shown.



Not drawn
accurately

Work out the size of an interior angle.

.....degrees

(2 marks)

- 11 The diagram shows a triangle.

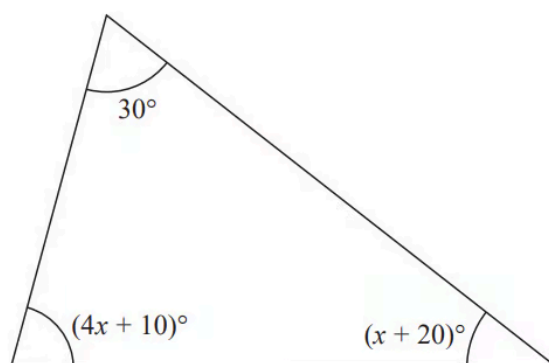


Diagram **NOT**
accurately drawn

Work out the value of x .

$x = \dots\dots\dots$

(4 marks)

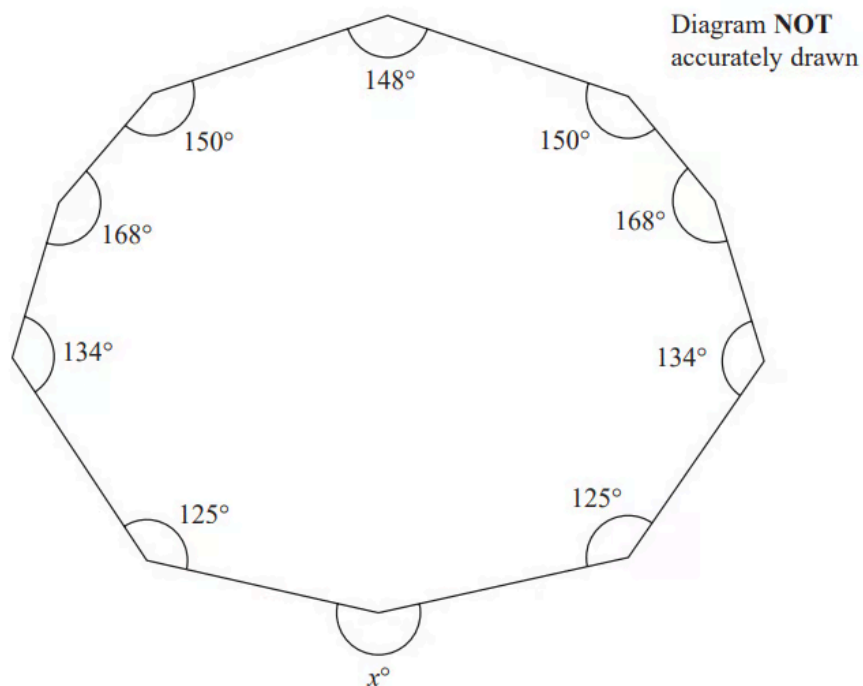
12 (a) Work out the size of the exterior angle of a regular 12-sided polygon.

(2 marks)

(b) Use your answer to part (a) to write down the size of the interior angle of a regular 12-sided polygon.

(1 mark)

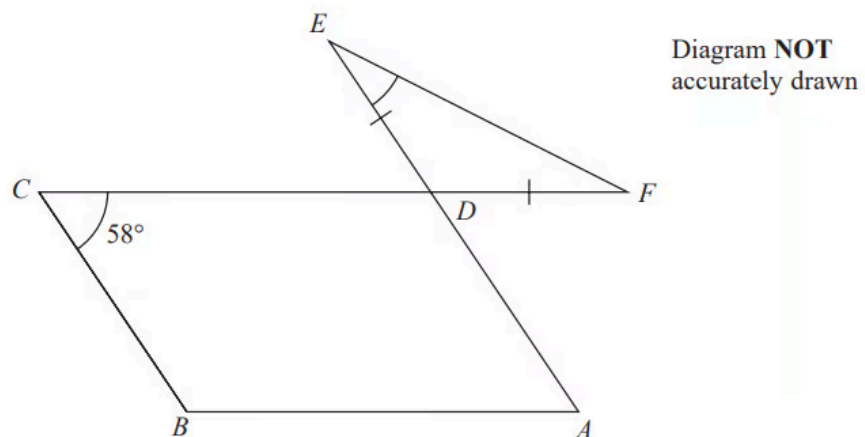
13 Here is a 10-sided polygon.



Work out the value of x .

$x = \dots\dots\dots$

(4 marks)



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

CDF and ADE are straight lines.

Angle $BCD = 58^\circ$

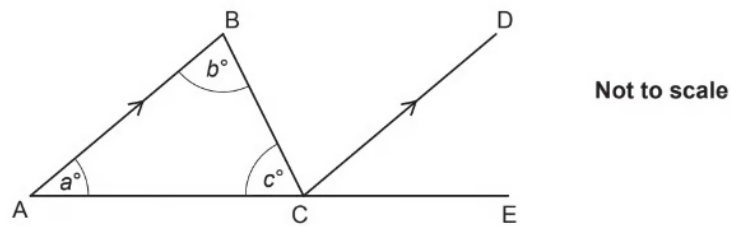
Work out the size of angle DEF .

Give a reason for each stage of your working.

(5 marks)

- 15 (a)** The diagram shows triangle ABC .
 CD is parallel to AB .

A, C and E lie in a straight line.
Angles of size a° , b° and c° are shown.



Insert a° , b° or c° to make this statement true.
Give a reason for your answer.

Angle DCE = because
(2 marks)

- (b) Use the diagram and the answer to part (a) to show that the angles of a triangle add up to 180° .

Give a reason for each statement you make.

(3 marks)

- 16 Each interior angle of a regular polygon is 162°
Work out the number of sides the polygon has.

(3 marks)

17 What is the size of an exterior angle of a regular decagon?

- A.** 18°
- B.** 36°
- C.** 144°
- D.** 162°

(1 mark)

18 The sum of the angles in any quadrilateral is 360°

For example, in a rectangle $4 \times 90^\circ = 360^\circ$

Zak writes,

$5 \times 90^\circ = 450^\circ$ so the sum of the angles in any pentagon must be 450°

Is he correct?

Tick a box.

☐ Yes ☐ No

Show working to support your answer.

(2 marks)

19 The exterior angle of a regular polygon is 45°

Choose the name of the regular polygon.

- A.** pentagon
- B.** hexagon
- C.** octagon
- D.** decagon

(1 mark)

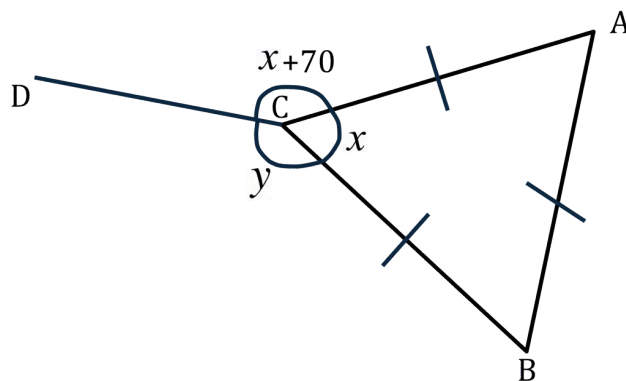
20 (a) The diagram shows an equilateral triangle ABC and straight line ABD .

$$AB = AC = BC$$

$$\text{Angle } ACB = x$$

$$\text{Angle } ACD = x + 70$$

$$\text{Angle } BCD = y$$



Find the value of x

(1 mark)

(b) Find the value of y

(3 marks)

Hard Questions

1

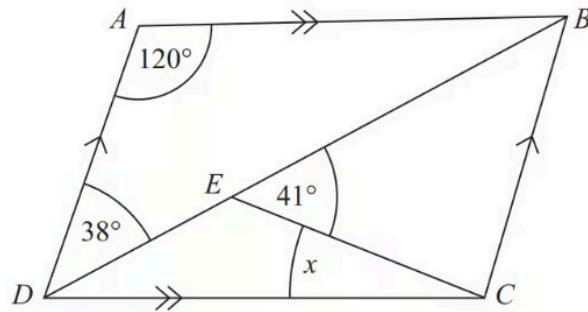


Diagram **NOT**
accurately drawn

$ABCD$ is a parallelogram.

Angle $ADB = 38^\circ$.

Angle $BEC = 41^\circ$.

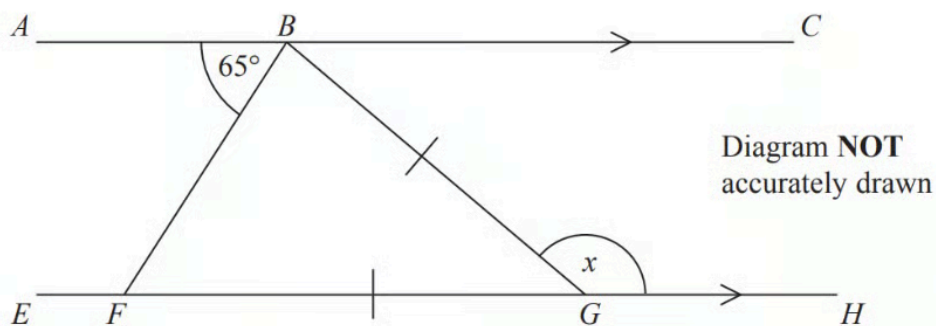
Angle $DAB = 120^\circ$.

Calculate the size of angle x .

You must give reasons for your answer.

(4 marks)

2



ABC is parallel to $EFGH$.

$$GB = GF$$

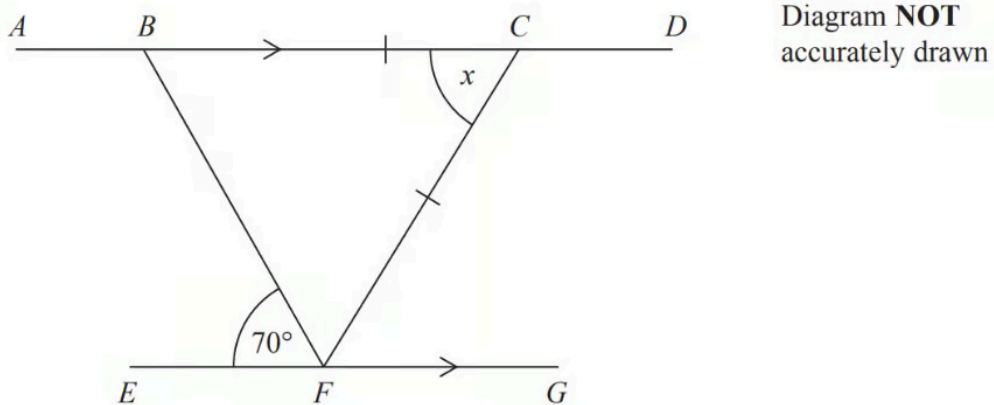
$$\text{Angle } ABF = 65^\circ$$

Work out the size of the angle marked x .

Give reasons for your answer.

(4 marks)

3



$ABCD$ and EFG are parallel lines.

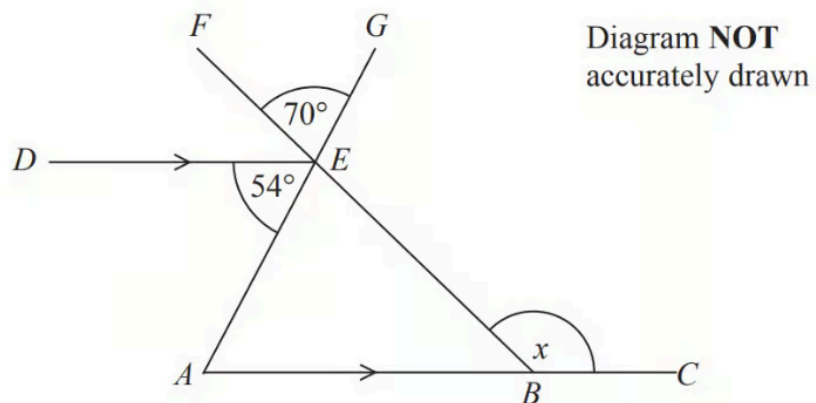
$$BC = CF$$

$$\text{Angle } BFE = 70^\circ$$

Work out the size of the angle marked x .
Give reasons for each stage of your working.

(4 marks)

4



ABC and DE are parallel lines.
 AEG and BEF are straight lines.

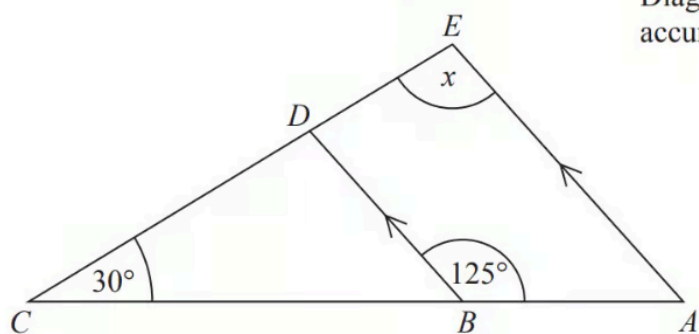
Angle $AED = 54^\circ$

Angle $FEG = 70^\circ$

Work out the size of the angle marked x .
Give a reason for each stage of your working.

(4 marks)

5



ABC and EDC are straight lines.

AE and BD are parallel.

Angle $ABD = 125^\circ$

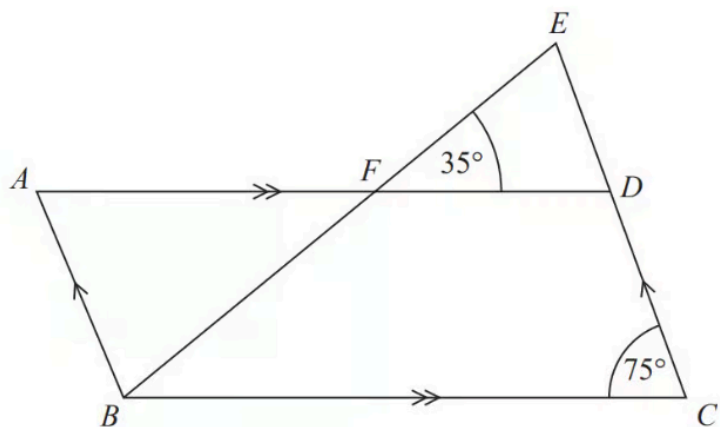
Angle $BCD = 30^\circ$

Work out the size of the angle marked x .

Give reasons for your answer.

(4 marks)

6



$ABCD$ is a parallelogram.

EDC is a straight line.

F is the point on AD so that BFE is a straight line.

Angle $EFD = 35^\circ$

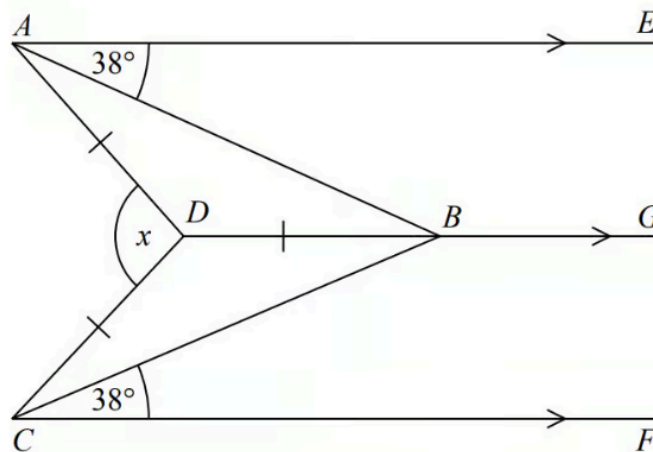
Angle $DCB = 75^\circ$

Show that angle $ABF = 70^\circ$

Give a reason for each stage of your working.

(4 marks)

7



AE , DBG and CF are parallel.

$DA = DB = DC$.

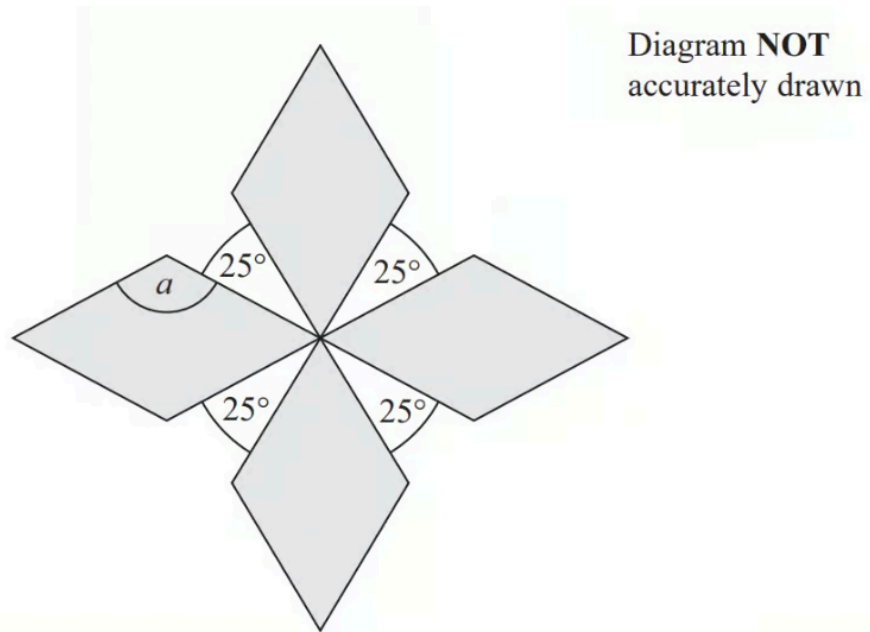
Angle $EAB = \text{angle } BCF = 38^\circ$

Work out the size of the angle marked x .

You must show your working.

(3 marks)

- 8 The diagram shows a pattern using four identical rhombuses.



Work out the size of the angle marked a .
You must show your working.

(4 marks)

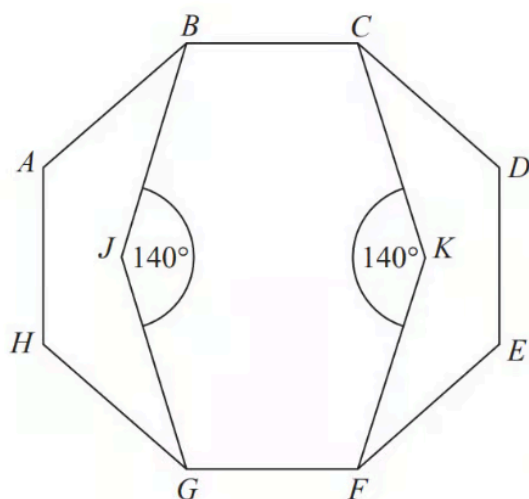


Diagram **NOT**
accurately drawn

$ABCDEFGH$ is a regular octagon.

$BCKFGJ$ is a hexagon.

JK is a line of symmetry of the hexagon.

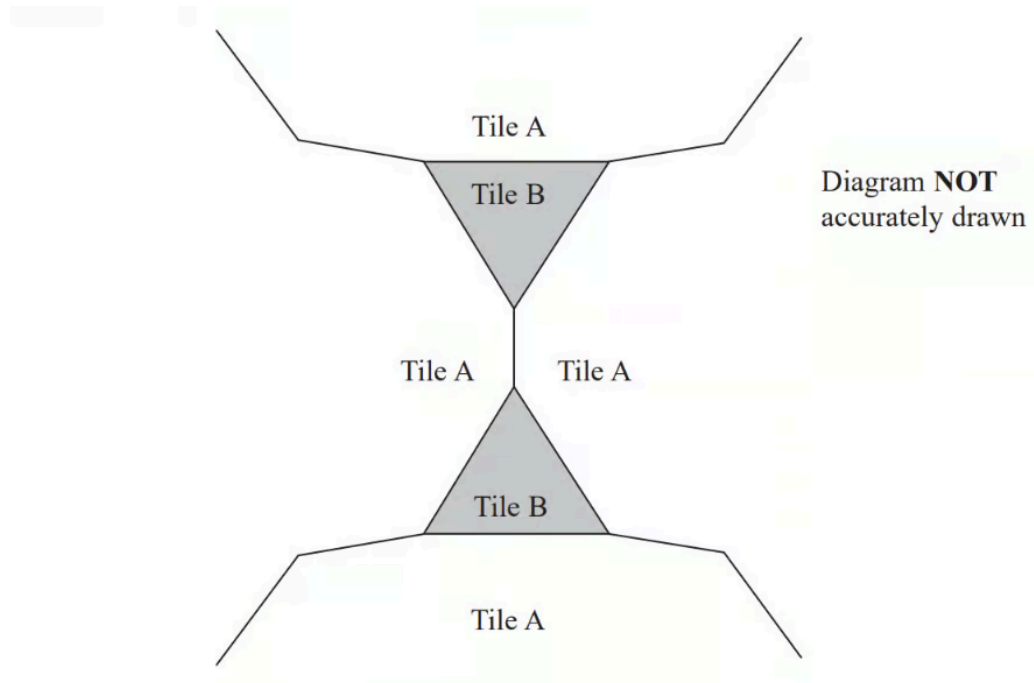
Angle $BJG = \text{angle } CKF = 140^\circ$

Work out the size of angle KFE .

You must show all your working.

(4 marks)

10 The diagram shows part of a pattern made from tiles.



The pattern is made from two types of tiles, tile A and tile B.

Both tile A and tile B are regular polygons.

Work out the number of sides tile A has.

(4 marks)

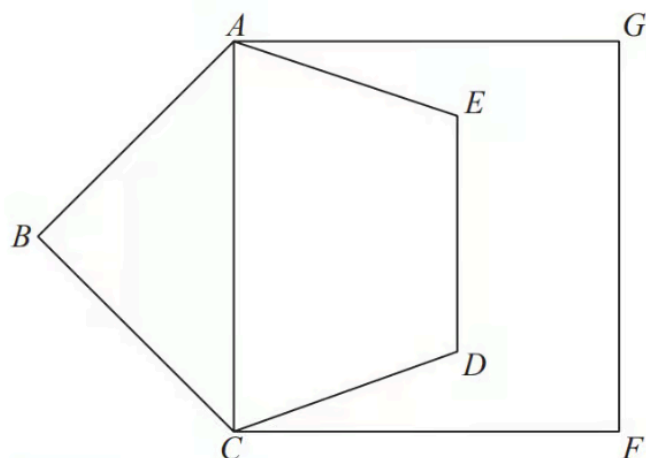


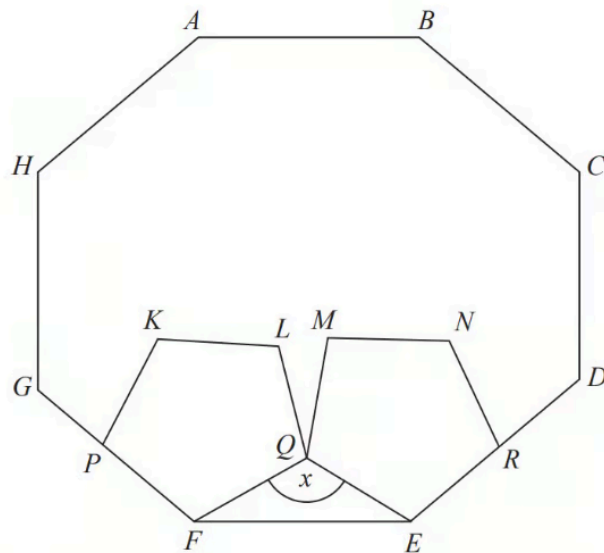
Diagram **NOT**
accurately drawn

$ABCDE$ is a regular pentagon.
 $ACFG$ is a square.

Work out the size of angle DCF .
You must show all your working.

(4 marks)

Diagram **NOT**
accurately drawn



$ABCDEFGH$ is a regular octagon.

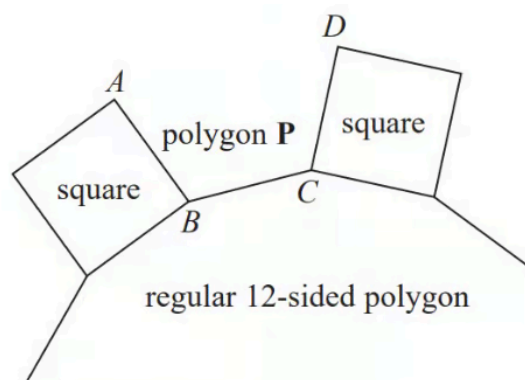
$KLQFP$ and $MNREQ$ are two identical regular pentagons.

Work out the size of the angle marked x .

You must show all your working.

(4 marks)

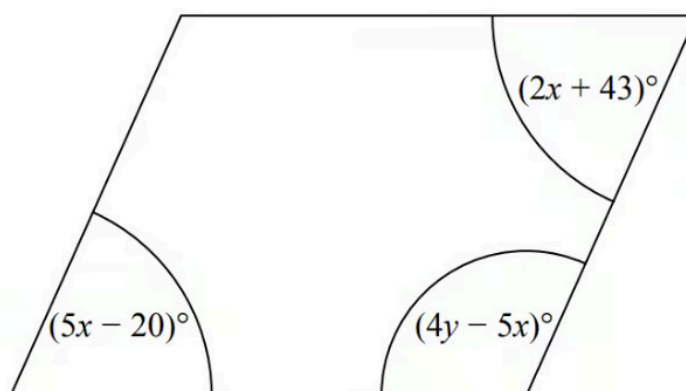
- 13 In the diagram, AB , BC and CD are three sides of a regular polygon P .



Show that polygon P is a hexagon.
You must show your working.

(4 marks)

- 14 Here is a parallelogram.



Work out the value of x and the value of y .

(5 marks)

15

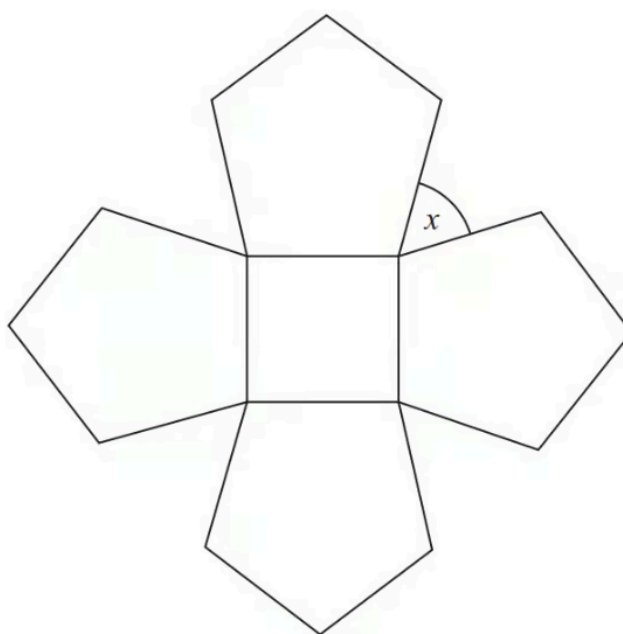


Diagram **NOT**
accurately drawn

The diagram shows a square and 4 regular pentagons.

Work out the size of the angle marked x .

(3 marks)

16

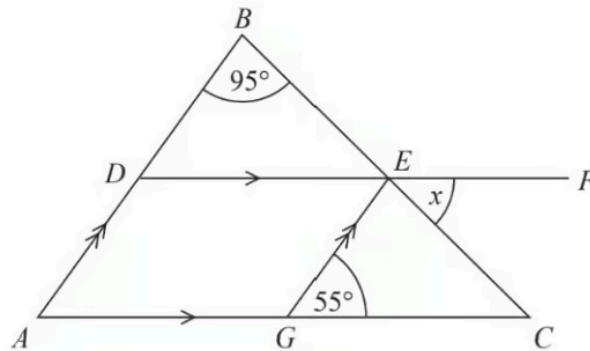


Diagram **NOT**
accurately drawn

AGC and DEF are parallel lines.

ADB and GE are parallel lines. BEC is a straight line.

Angle $DBE = 95^\circ$

Angle $CGE = 55^\circ$

Work out the size of the angle marked x .

Give reasons for each stage of your working.

(4 marks)

17

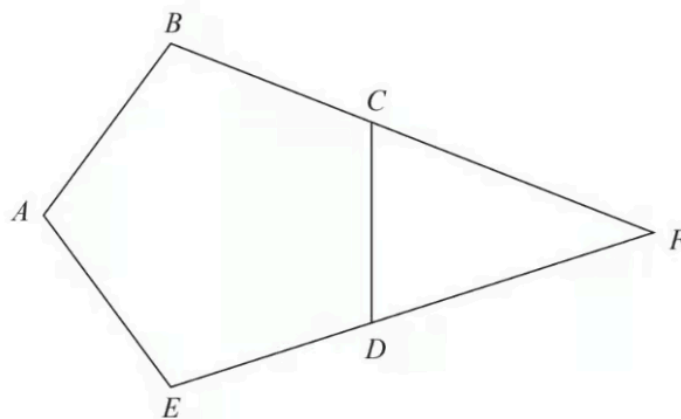


Diagram **NOT**
accurately drawn

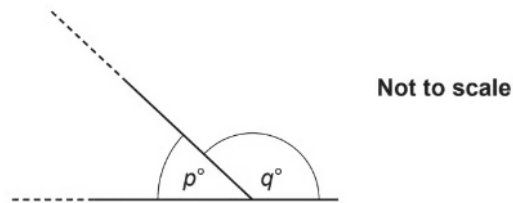
$ABCDE$ is a regular pentagon.

BCF and EDF are straight lines.

Work out the size of angle CFD .
You must show how you got your answer.

(3 marks)

18 (a) An interior angle of an isosceles triangle is p° and an exterior angle is q° .



It is given that $q = 5p$.
Write the ratio $p : q$ in its simplest form.

(2 marks)

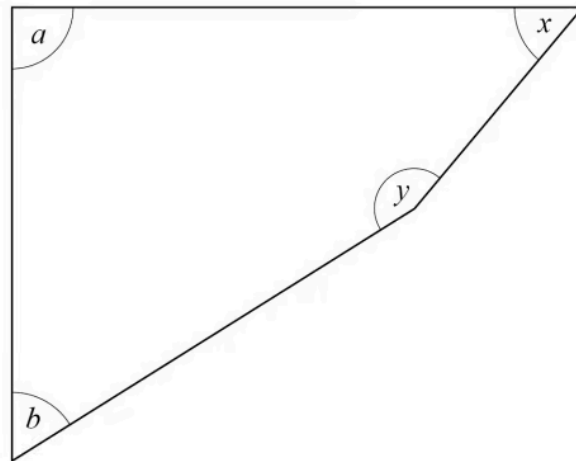
(b) Work out the two different possible sets of angles for the isosceles triangle.

Triangle 1: $^\circ$, $^\circ$, $^\circ$

Triangle 2: $^\circ$, $^\circ$, $^\circ$

(4 marks)

19 Here is a quadrilateral.



Not drawn
accurately

$$a = 90^\circ \text{ and } a : b = 5 : 3$$

$$x : y = 1 : 3$$

Show that $b = x$

(3 marks)

Very Hard Questions

1

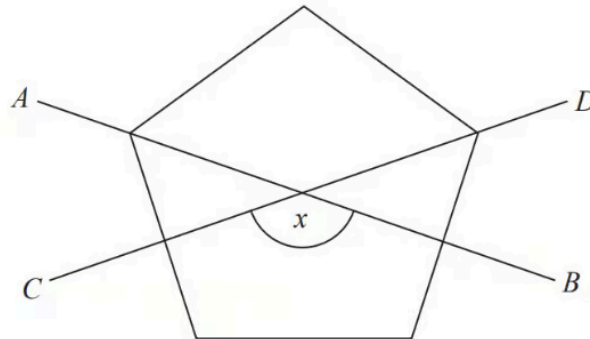


Diagram **NOT**
accurately drawn

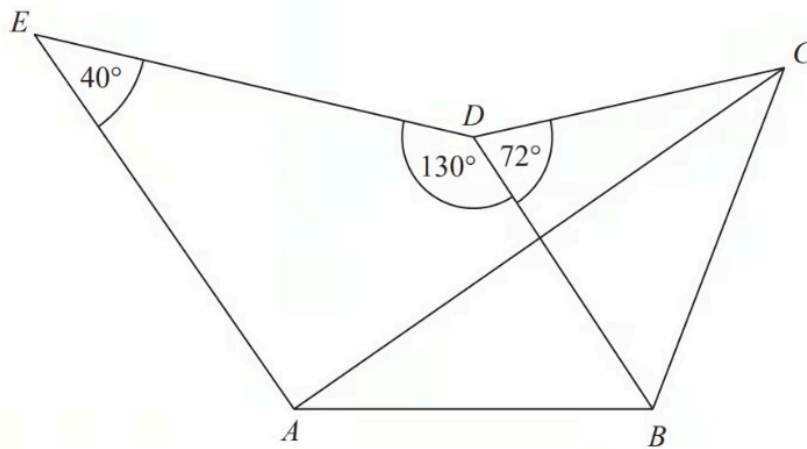
The diagram shows a regular pentagon.
 AB and CD are two of the lines of symmetry of the pentagon.

Work out the size of the angle marked x .
You must show all your working.

(4 marks)

2 Here is a pentagon $ABCDE$.

Diagram **NOT**
accurately drawn



$$AB = BC = BD$$

$ABDE$ is a kite.

$$\text{Angle } AED = 40^\circ$$

$$\text{Angle } EDB = 130^\circ$$

$$\text{Angle } BDC = 72^\circ$$

Work out the size of angle ACB .

(3 marks)

3 $ABCDEFGHI$ is a regular 9-sided polygon.

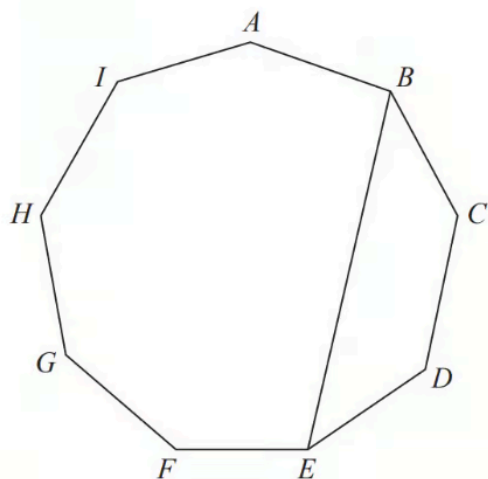


Diagram **NOT**
accurately drawn

The vertices B and E are joined with a straight line.

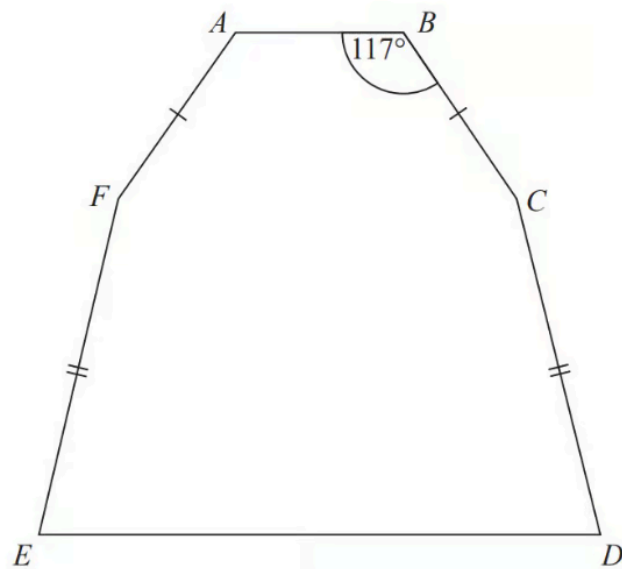
Work out the size of angle BEF .

You must show how you get your answer.

(4 marks)

4 The diagram shows a hexagon.

The hexagon has one line of symmetry.



$$FA = BC$$

$$FE = CD$$

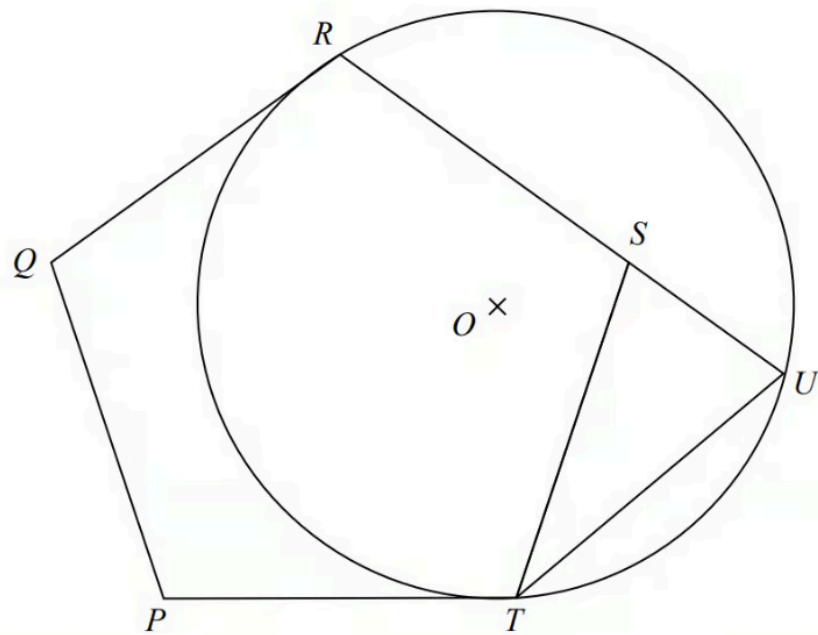
$$\text{Angle } ABC = 117^\circ$$

$$\text{Angle } BCD = 2 \times \text{angle } CDE.$$

Work out the size of angle AFE .

You must show all your working.

(4 marks)



$PQRST$ is a regular pentagon.
 R , U and T are points on a circle, centre O .
 QR and PT are tangents to the circle.
 RSU is a straight line.

Prove that $ST = UT$.

(5 marks)

- 6 The diagram shows a regular 10-sided polygon, $ABCDEFGHIJ$

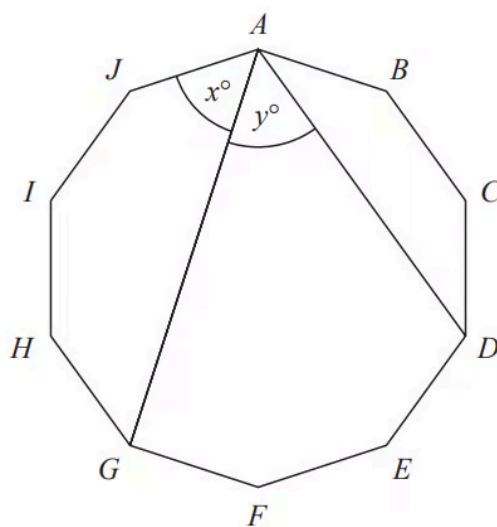


Diagram **NOT**
accurately drawn

Show that $x = y$.

(4 marks)

- 7 The diagram shows a regular octagon $ABCDEFGH$ and a regular pentagon $ABIJK$

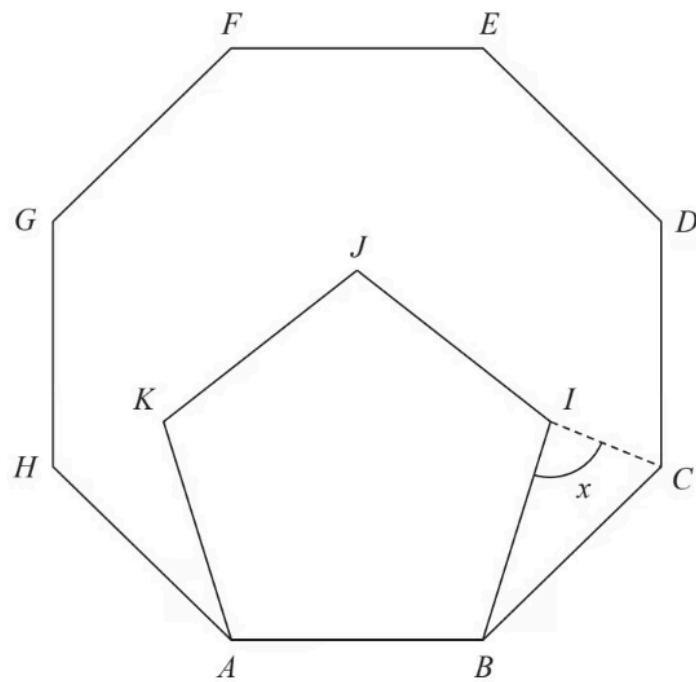
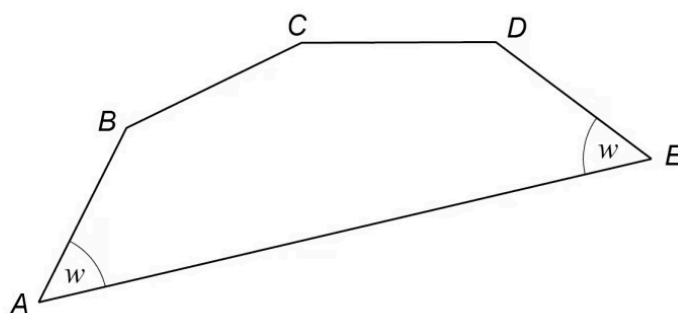


Diagram **NOT**
accurately drawn

Work out the size of the angle x .

(4 marks)

- 8 AB , BC , CD and DE are four of the sides of a regular decagon.



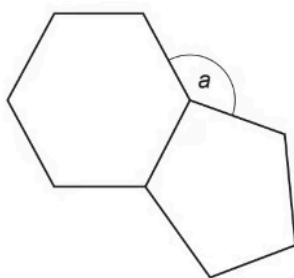
Not drawn accurately

Work out the size of angle w .

.....degrees

(3 marks)

- 9 (a) Imran joins two tiles together as shown below.
One tile is a regular hexagon and the other tile is a regular pentagon.



Not to scale

Show that angle a is 132° .

(3 marks)

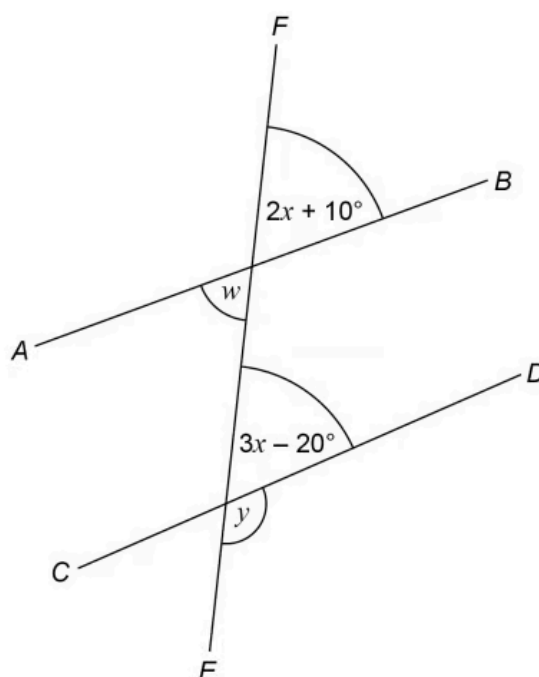
- (b) Imran thinks that another tile in the shape of a regular polygon will fit **exactly** into angle a .

Is Imran correct?

Show your reasoning.

(3 marks)

10 (a) AB , CD and EF are straight lines.



Ava assumes that AB and CD are parallel.

What answer should she get for the size of angle y ?

.....degrees

(4 marks)

(b) In fact,

AB and CD are not parallel

angle w is 60°

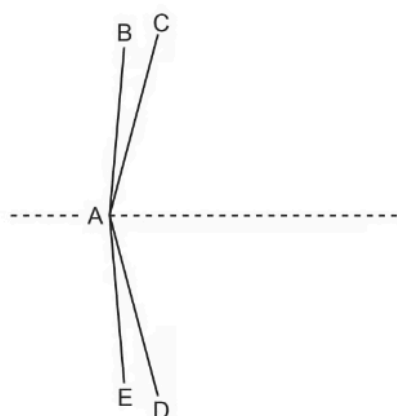
What effect does this have on the size of angle y ? Tick a box.

☐	y is bigger
☐	y is the same
☐	y is smaller

Show working to support your answer.

(3 marks)

- 11** Angle BAE is part of a regular 18-sided polygon.
Angle CAD is part of a regular 10-sided polygon.
The dashed line through A is a line of symmetry of both polygons.

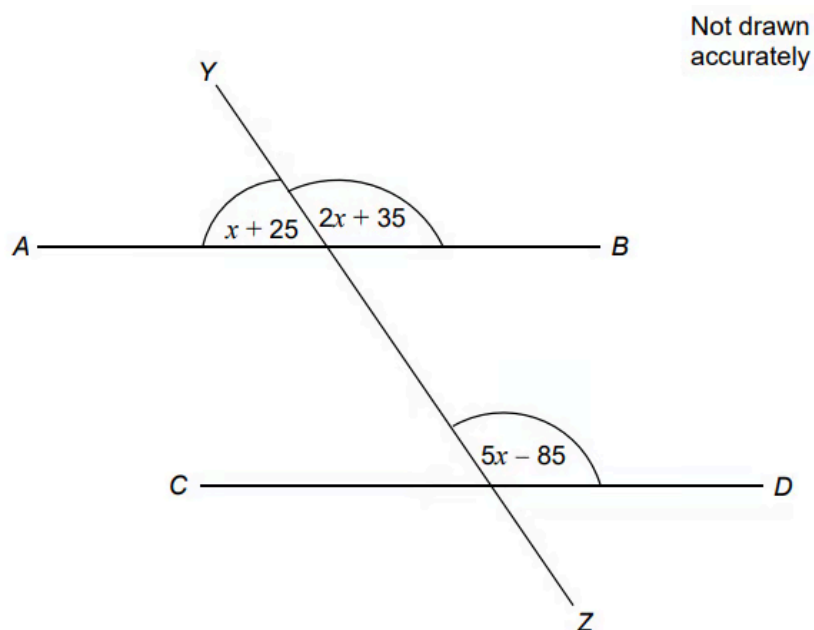


Not to scale

Work out angle BAC.

(5 marks)

- 12 AB , CD and YZ are straight lines.
All angles are in degrees.



Show that AB is parallel to CD .

(4 marks)