1.

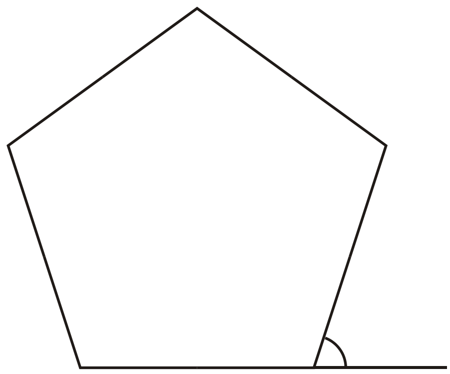

Diagram **NOT** accurately drawn

(a) Work out the size of an exterior angle of a regular pentagon.

..........................°

(2)

The area of the pentagon is 8560 mm^2.

(b) Change 8560 mm^2 to cm^2.

.... cm^2

(2)

Each side of another regular pentagon has a length of 101 mm, correct to the nearest millimetre.

(c) (i) Write down the **least** possible length of each side.

.... mm

(ii) Write down the **greatest** possible length of each side.

.... mm

(2)

(Total 6 marks)

2.

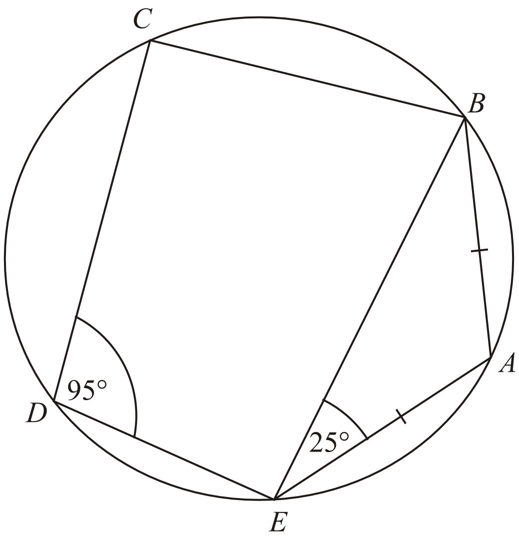

Diagram **NOT** accurately drawn

A, *B*, *C*, *D* and *E* are five points on a circle.
Angle *BEA* = 25° and angle *CDE* = 95°.
AB = *AE*.

(a) (i) Work out the size of angle *BAE*.

.... °

(ii) Give reasons for your answer.

....

....

....

(3)

(b) Work out the size of angle *CBE*.

.... °

(1)
(Total 4 marks)

3.

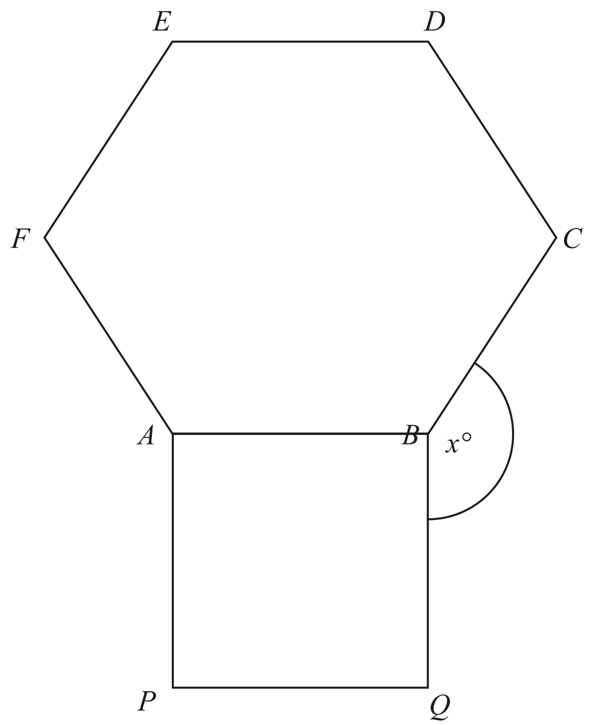

Diagram **NOT** accurately drawn

ABCDEF is a regular hexagon and *ABQP* is a square.
Angle $CBQ = x°$.

Work out the value of x.

$x =$ ....

(Total 4 marks)

4. Here is a regular polygon with 9 sides.

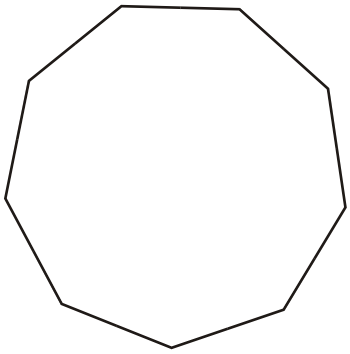

Diagram **NOT** accurately drawn

Work out the size of an exterior angle.

..........................°

(Total 2 marks)

5.

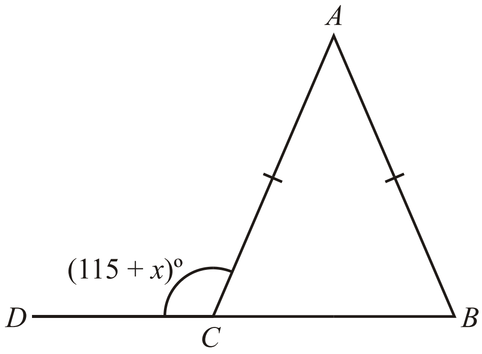

Diagram **NOT** accurately drawn

$AB = AC$.
BCD is a straight line.
Angle $ACD = (115 + x)°$.

Find, in terms of x, the size of angle BAC.
Give your answer in its simplest form.

Angle BAC = ……………………°
(Total 3 marks)

6.

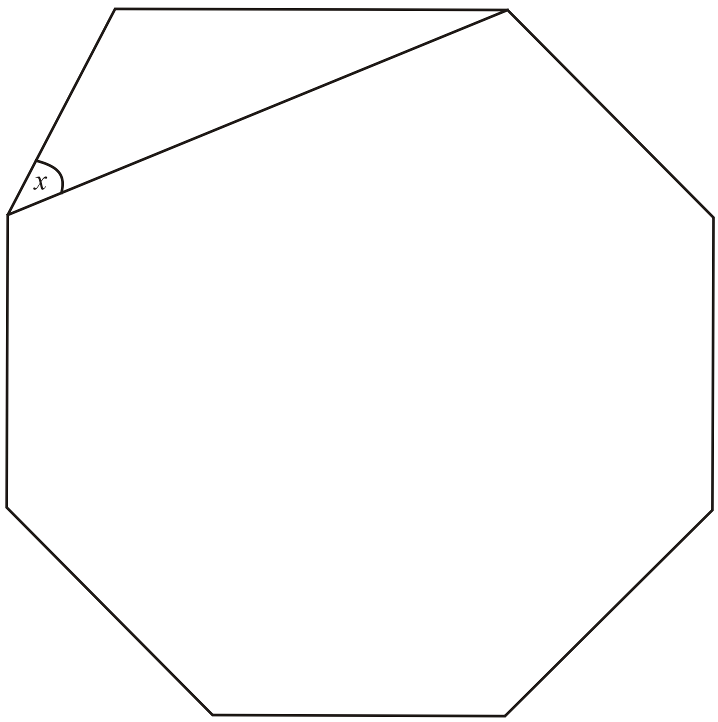

Diagram **NOT** accurately drawn

The diagram shows a regular octagon.

Work out the size of the angle marked *x*.

x = ... °

(Total 4 marks)

1. (a) 72 — 2

$360 \div 5$

M1 for $360 \div 5$ oe
A1 for 72

(b) 85.6 — 2

$8560 \div (10 \times 10)$

M1 for $8560 \div (10 \times 10)$ oe
A1 for 85.6

(c) (i) 100.5 — 2

Least length = 100.5

B1 for 100.5

(ii) 101.5

Greatest length = 101.5

B1 for 101.5 or 101.499 or better

[6]

2. (a) (i) $180 - 2 \times 25 = 130$

M1 for $180 - 2 \times 25$
A1 cao

(ii) Reason — 3

B1 for mentioning isosceles and equal (or base) angles or equal sides and equal (or base) angles

(b) $180 - 95 = 85$ — 1

B1 cao

[4]

3. Interior angle of hexagon =
$180 - (360 \div 6) = 120$
$360 - (90 + 120)$
150 | 4

Alternative1
M1 for 360 ÷ 6
A1 for 60
M1 (dep on M1) for "60" + 90
A1 cao

Alternative 2
M1 for 360 ÷ 6
A1 for 60
M1 (dep on M1) for 360 – (2 × "60" + 90)
A1 cao

Alternative 3
M1 for (6 – 2) × 180 ÷ 6
A1 for 120
M1 (dep on M1) for 360 – (90 + "120")
A1 cao

[4]

4. 40 | 2

$360 \div 9 = 40$

M1 for 360 ÷ 9 oe.
A1 cao

[2]

5. $50 + 2x$ | 3

Angle BCA =
$180 - (115 + x)$ $(= 65 - x)$
$180 - 2$"$(65 - x)$"

M1 for angle BCA = 180 – (115 + x)
M1 for 180 – 2"(180 – (115 + x))"
A1 for 2x + 50 or 2(x + 25)
OR
M1 for 360 – 2(115 + x)
M1 for 180 – (360 – 2(115 + x))
A1 for 2x + 50 or 2(x + 25)

[3]

6. Ext angle = $\frac{360}{8} = 45$

Angle B = 180 – 45 = 135

$x = \frac{(180-135)}{2}$

OR $x = \frac{45}{2}$

22.5 4

M1 for $\frac{360}{8}$

A1 for 45

M1 for $\frac{\text{"45"}}{2}$ *or* $\frac{180 - \text{"135"}}{2}$

A1 cao

Alternative Scheme

M1 for $\frac{180 \times 6}{8}$

A1 for 135

M1 for $\frac{180 - \text{"135"}}{2}$

A1 cao

[4]

1. Mathematics A Paper 3

In part (a), there seemed to be considerable confusion about whether interior or exterior angles sum to 360°. Many of those who worked out 360 ÷ 5 then spoilt their method by subtracting the result of this calculation from 180°. Less than 15% of candidates answered part (b) correctly as the majority chose to divide 8560 by 10. Even some of those candidates who divided by 100 did not obtain 85.6. In part (c) candidates had most success with the lower bound. The concept of upper bound was not well understood and the majority of candidates gave a number below 101.5, such as 101.4 or 101.49.

Mathematics B Paper 16

In part (a) many candidates correctly worked out 360/5 but then subtracted from 180, giving an answer of 108°, showing a lack of understanding of interior and exterior angles of a polygon. Only a quarter of the candidature gained full marks in this part.
The success in part (b) showed a marked improvement on last year but still only a minority (16%) dividing by 100; the vast majority dividing by 10 to give 856 cm^2.
Part (c) 35% correctly identified the least value as 100.5mm, but only 12% gained the mark for the greatest possible length.

2. In part (a) many candidates correctly gave the required angle as 130° in (i), realising that angle *EBA* was 25° and that the angles in a triangle add up to 180°. Some candidates, however, had difficulty with angle notation and did not identify the angle required. The final answer was often given as 180° or 25°, in some cases with the correct angle written on the diagram. Many candidates failed to provide a sufficient explanation to gain the mark in (ii). Those who did mention an isosceles triangle often went no further and did not mention equal sides. Due to the lines on the sides *AB* and *AE*, these sides were often said to be parallel or the triangle was said to be equilateral. Many had difficulty identifying the angles and sides with letters, referring, for example, to angle *AE* and side *A*. Most candidates did attempt to give reasons of some sort, with few giving just working. Part (b) was answered very poorly. A significant number of candidates gave an answer of 95°, assuming the opposite angles to be equal. Some incorrectly assumed that some angles in the diagram were right angles.

3. **Higher Tier**

Many candidates were able to score at least two marks for this question; usually for finding 60° by any one of a number of methods. Candidates should be encouraged to look at their answers critically. The most common incorrect final answer (210°) was an angle clearly unfeasible in the context of the question.

Some popular errors in method include:

- using 360/6 to find 60° and marking this as the *interior* angle of the hexagon
- extending the line CB into the square and assuming that the angle this created is 45°
- counting the number of sides of the hexagon incorrectly and thus working out the interior angle as, e.g. 720/5 = 144°
- assuming that the interior angle *ABC* is equal to *x*

Intermediate Tier

It was disappointing that fully correct answers were not more common but many candidates were able to gain some method marks. Where working was set out in a manner that was easy to follow, marks could often be awarded, and it was encouraging that many candidates had annotated or added to the diagram. There was much confusion, though, over whether the interior or exterior angle of a regular hexagon is 60°. Those who split the hexagon into 6 equilateral triangles tended to achieve full marks but a large number divided 360° by 6 in order to find the interior angle. The most common incorrect answer was 210° as a result of subtracting (90 + 60) from 360. Another common incorrect answer was 135° (from 90 + 45).

4. This was often answered correctly, however a notable number of candidates were not convincing in their understanding of exterior and interior angles. Often 40° was shown on the diagram as the interior angle, which then lost the marks. Wrong answers of 140° and 320° were often seen.

5. This was poorly answered, mainly because the standard of written algebra seen was so low. A typical start was for the candidate to omit to use brackets and just write $180 - 115 + x$, or just $65 + x$. This approach frequently lead to the incorrect answer of $50 - 2x$ or, after a double error, to the correct answer of $50 + 2x$. Surprisingly, of those who got the correct unsimplified expression, many were unable to simplify to $50 + 2x$.

6. **Intermediate Tier**

Only the more able candidates showed a real understanding of exterior and interior angles of regular polygons. Some candidates scored one or two marks without demonstrating fully convincing arguments, a few found the correct answer fortuitously. Many recognised the triangle containing the angle x to be isosceles, and gained a mark if the interior angle had been calculated.

Higher Tier

A variety of methods were seen for this question; few of them were fully correct. The majority of candidates were aware that they had to calculate $360 \div 8$ but many believed that this gave them an interior angle of the octagon rather than an exterior angle.