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Pearson Edexcel
International GCSE

Centre Number	Candidate Number
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Further Pure Mathematics

Level 2
Paper 1



Sample assessment material for first teaching September 2017 Time: 2 hours	Paper Reference 4PM1/01
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Calculators may be used.	Total Marks
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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You must **NOT** write anything on the formulae page.
Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ►

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International GCSE in Further Pure Mathematics Formulae sheet

Mensuration

Surface area of sphere = $4\pi r^2$

Curved surface area of cone = $\pi r \times$ slant height

Volume of sphere = $\frac{4}{3}\pi r^3$

Series

Arithmetic series

Sum to n terms, $S_n = \frac{n}{2}[2a + (n - 1)d]$

Geometric series

Sum to n terms, $S_n = \frac{a(1 - r^n)}{(1 - r)}$

Sum to infinity, $S_\infty = \frac{a}{1 - r} \quad |r| < 1$

Binomial series

$$(1 + x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots \quad \text{for } |x| < 1, n \in \mathbb{Q}$$

Calculus

Quotient rule (differentiation)

$$\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Trigonometry

Cosine rule

In triangle ABC : $a^2 = b^2 + c^2 - 2bc \cos A$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Logarithms

$$\log_a x = \frac{\log_b x}{\log_b a}$$

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Answer all ELEVEN questions.

Write your answers in the spaces provided.

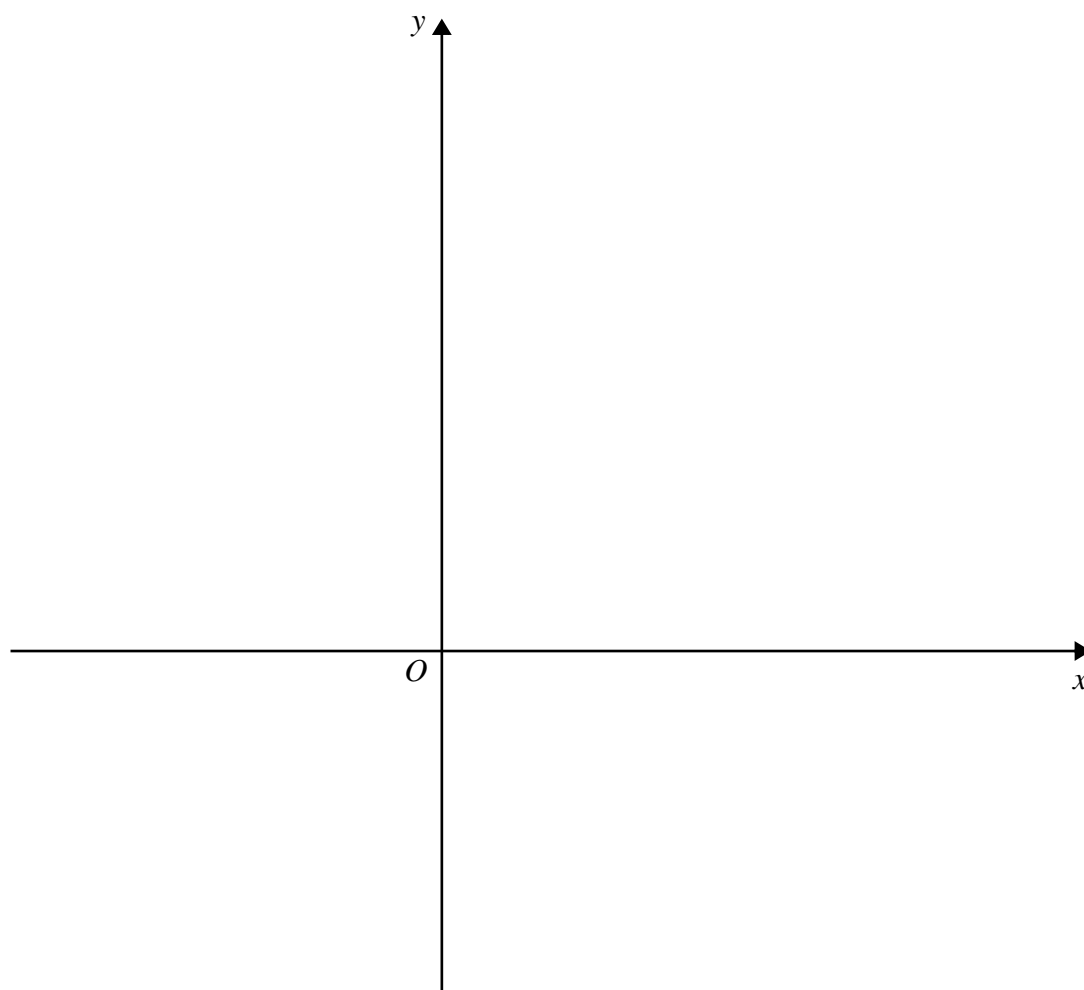
You must write down all the stages in your working.

- 1 (a) On the axes below, sketch the lines with equations $2x + 3y = 8$ and $2y = 4x + 1$

On your sketch, show the coordinates of the points where the lines cross the coordinate axes. (2)

- (b) Show, by shading on your sketch, the region R defined by the inequalities

$$2x + 3y \leq 8 \quad 2y \leq 4x + 1 \quad y \geq 0 \quad x \leq 2 \quad (2)$$



(Total for Question 1 is 4 marks)

2

Diagram NOT accurately drawn

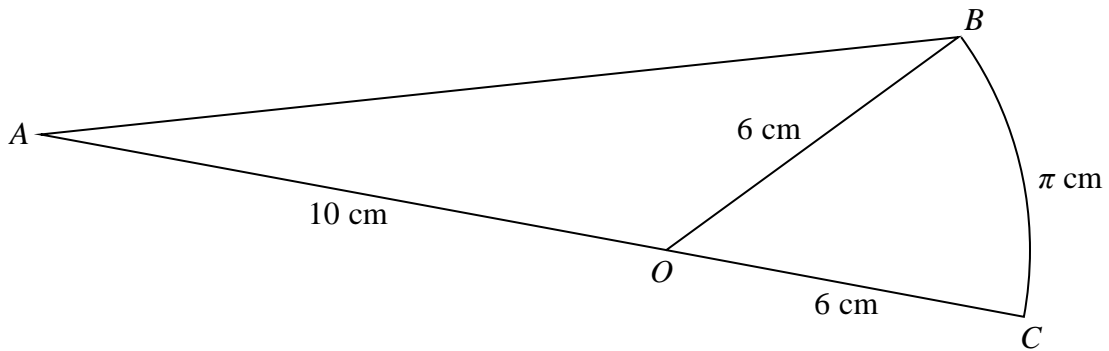


Figure 1

Figure 1 shows a shape ABC in which AOB is a triangle, AOC is a straight line and OBC is a sector of a circle with centre O .

$AO = 10$ cm, $OC = OB = 6$ cm and the length of arc $BC = \pi$ cm.

Find, to 3 significant figures,

(a) the length of AB , (3)

(b) the area of the shape ABC . (3)

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Question 2 continued

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(Total for Question 2 is 6 marks)

3 Solve, in degrees to 1 decimal place, for $0 \leq \theta < 180$

$$2 \cos(2\theta + 30)^\circ + \tan(2\theta + 30)^\circ = 0$$

(6)

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Question 3 continued

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(Total for Question 3 is 6 marks)

4 A particle P is moving along the x -axis.

At time t seconds ($t \geq 0$) the velocity, v m/s, of P is given by $v = 4t^2 - 19t + 12$

(a) Find the values of t for which P is instantaneously at rest.

(2)

When $t = 0$, the displacement of P from the origin is -4 m.

(b) Find the displacement of P from the origin when $t = 6$

(4)

At time t seconds the acceleration of P is a m/s².

(c) Find the value of t when $a = 0$

(3)

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Question 4 continued

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(Total for Question 4 is 9 marks)

Question 5 continued

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(Total for Question 5 is 9 marks)

6

$$y = e^x(x^2 - 3x)$$

Show that $y - 2\frac{dy}{dx} + \frac{d^2y}{dx^2} = 2e^x$

(8)

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Question 6 continued

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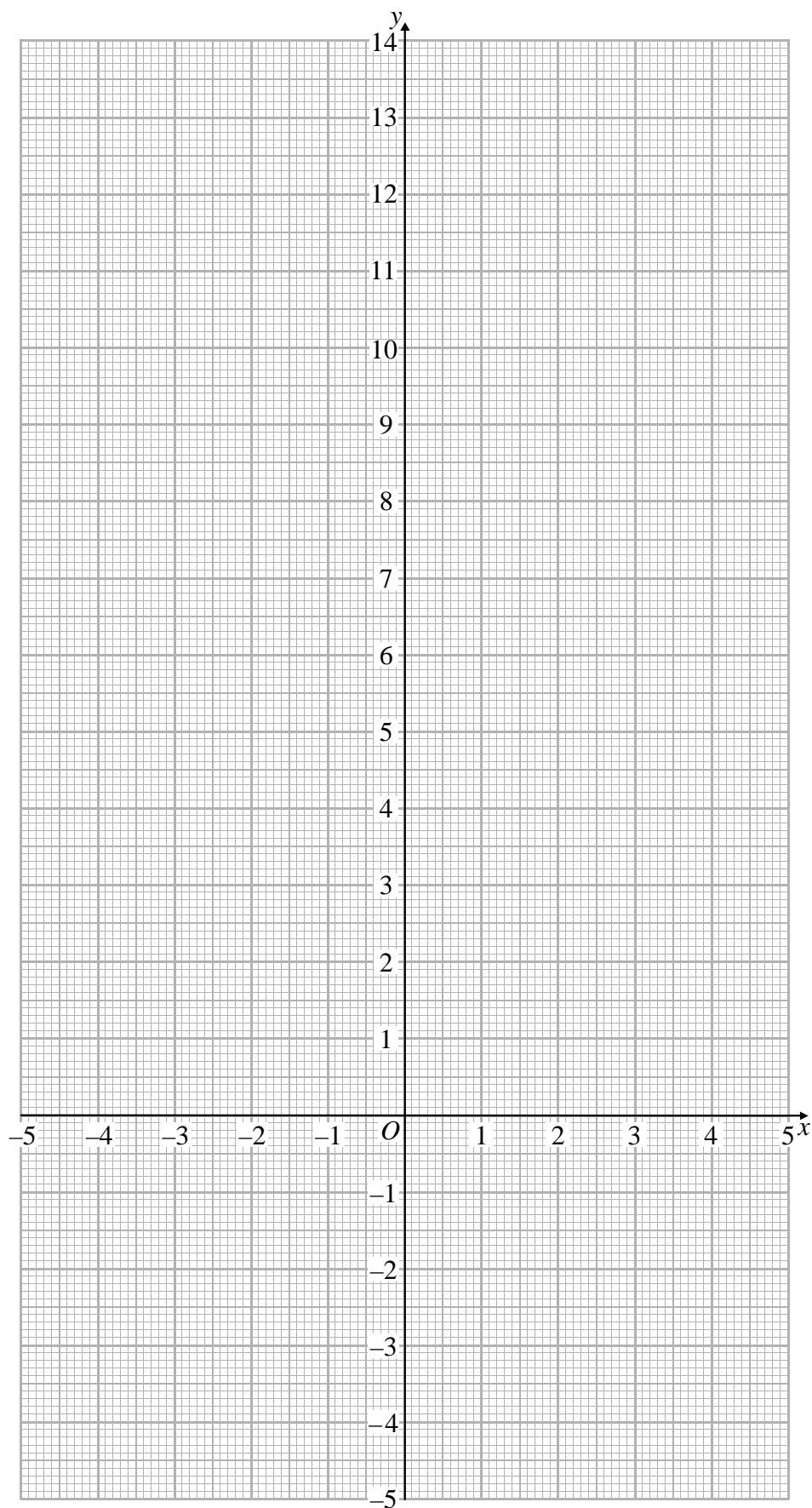
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(Total for Question 6 is 8 marks)

Question 7 continued



(Total for Question 7 is 8 marks)

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8 The sum S_n of the first n terms of an arithmetic series is given by $S_n = 2n(n + 3)$

(a) Find the first term of the series.

(1)

(b) Find the common difference of the series.

(2)

The n th term of the series is T_n

Given that $6S_{(n-4)} = 7T_{(n+3)}$

(c) find the value of n .

(6)

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Question 8 continued

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(Total for Question 8 is 9 marks)

9 The roots of a quadratic equation are α and β where $\alpha + \beta = -\frac{7}{3}$ and $\alpha\beta = -2$

(a) Find a quadratic equation, with integer coefficients, which has roots α and β (4)

Given that $\alpha > \beta$ and without solving the equation,

(b) show that $\alpha - \beta = \frac{11}{3}$ (2)

(c) form a quadratic equation, with integer coefficients, which has roots

$$\frac{\alpha + \beta}{\alpha} \text{ and } \frac{\alpha - \beta}{\beta} \quad (7)$$

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Question 9 continued

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(Total for Question 9 is 13 marks)

10

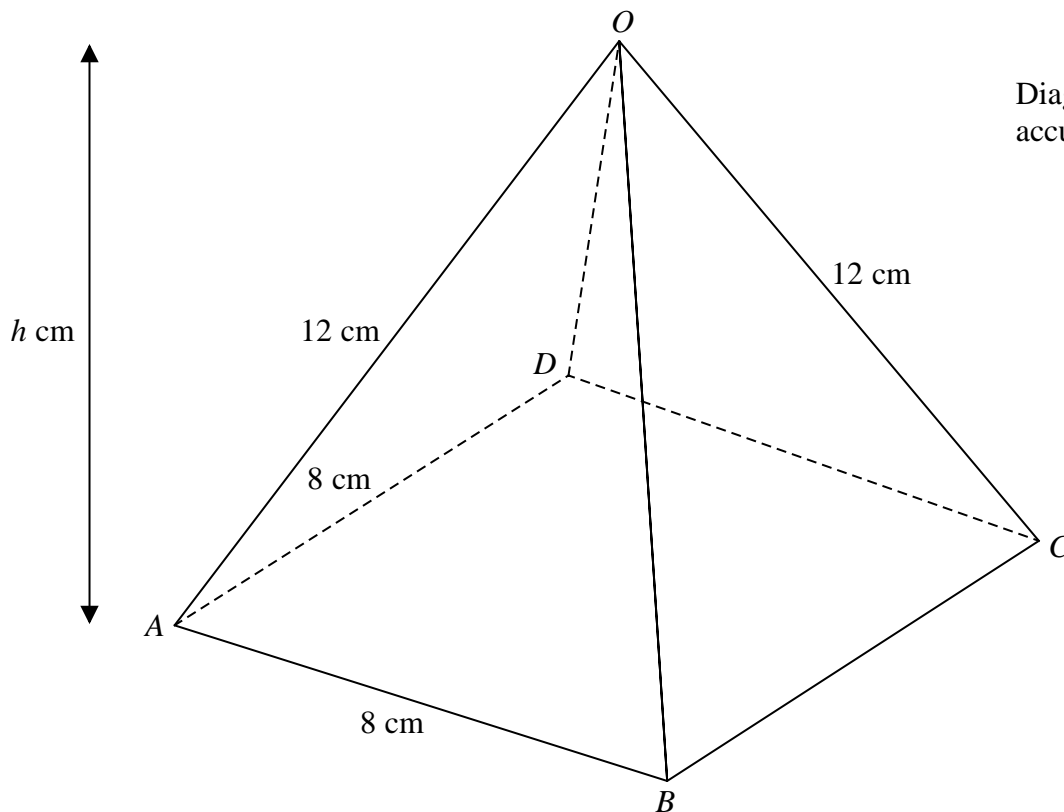


Figure 2

Figure 2 shows a right pyramid $ABCDO$ with a horizontal square base of side 8 cm. The vertical height of the pyramid is h cm and $OA = OB = OC = OD = 12$ cm.

- (a) Find the exact value of h . (3)
- (b) Find, to 1 decimal place, the size of the angle between OA and the plane $ABCD$. (2)
- (c) Find, to 1 decimal place, the size of the angle between the plane AOB and the plane $ABCD$. (2)

The midpoint of OA is P and Q is the point on BC such that $BQ : QC = 3 : 1$

- (d) Show that $PQ = 4\sqrt{5}$ cm. (4)
- (e) Find, to 1 decimal place, the size of angle PQA . (4)

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Question 10 continued

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Question 10 continued

A large rectangular area containing 30 horizontal dotted lines for writing.

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Question 10 continued

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(Total for Question 10 = 15 marks)

11

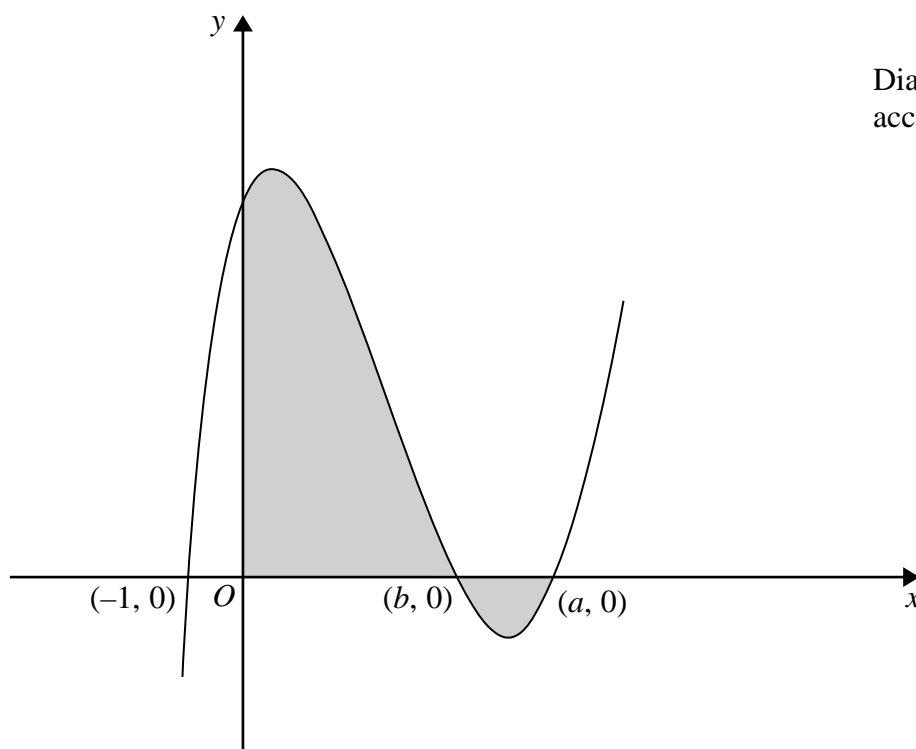
Diagram **NOT**
accurately drawn**Figure 3**

Figure 3 shows a sketch of the curve with equation $y = f(x)$, which passes through the points with coordinates $(-1, 0)$, $(b, 0)$ and $(a, 0)$ where $0 < b < a$.

Given that $f'(x) = 6x^2 - 26x + 12$

(a) find,

(i) the value of a ,

(ii) the value of b .

(8)

(b) Use algebraic integration to determine the exact value of the total area of the shaded regions shown in Figure 3.

(5)

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Question 11 continued

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Question 11 continued

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Question 11 continued

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(Total for Question 11 is 13 marks)

TOTAL FOR PAPER IS 100 MARKS

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