Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Sample Assessment Materials for first teaching September 2018

(Time: 1 hour 30 minutes) | Paper Reference **WMA11/01**

Mathematics

International Advanced Subsidiary/Advanced Level
Pure Mathematics P1

You must have:
Mathematical Formulae and Statistical Tables, calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 10 questions in this question paper. The total mark for this paper is 75.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ▶

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Pearson

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Answer ALL questions. Write your answers in the spaces provided.

1. Given that $y = 4x^3 - \frac{5}{x^2}$, $x \neq 0$, find in their simplest form

(a) $\frac{dy}{dx}$,

(3)

(b) $\int y \, dx$

(3)

a) $y = 4x^3 - 5x^{-2}$

$\frac{dy}{dx} = 12x^2 + 10x^{-3}$

b) $\int 4x^3 - 5x^{-2} \, dx$

$= \frac{4x^4}{4} - \frac{5x^{-1}}{-1} + C = x^4 + 5x^{-1} + C$

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Question 1 continued

Q1

(Total for Question 1 is 6 marks)

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2. (a) Given that $3^{-1.5} = a\sqrt{3}$ find the exact value of a

(2)

(b) Simplify fully $\dfrac{(2x^{\frac{1}{2}})^3}{4x^2}$

(3)

a) $a = \dfrac{3^{-1.5}}{\sqrt{3}} = \dfrac{1}{9}$

b) $\dfrac{(2x^{1/2})^3}{4x^2} = \dfrac{2^3 x^{1/2 \times 3}}{4x^2} = 2x^{-1/2}$

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Question 2 continued

Q2

(Total for Question 2 is 5 marks)

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3. Solve the simultaneous equations

$$y + 4x + 1 = 0$$

$$y^2 + 5x^2 + 2x = 0$$

(6)

① $y = -4x - 1$

$\therefore (-4x-1)^2 + 5x^2 + 2x = 0$

$\therefore 16x^2 + 8x + 1 + 5x^2 + 2x = 0$

$\therefore 21x^2 + 10x + 1 = 0$

$$x = \frac{-10 \pm \sqrt{(-10)^2 - 4(21)(1)}}{2 \times 21}$$

$x = -1/7$ $\quad$ $x = -1/3$

$y = -4(-1/7) - 1$ $\quad$ $y = -4(-1/3) - 1$

$= -3/7$ $\quad$ $= 1/3$

$(-1/7, -3/7)$ $\quad$ $(-1/3, 1/3)$

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Question 3 continued

Q3

(Total for Question 3 is 6 marks)

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4. The straight line with equation $y = 4x + c$, where c is a constant, is a tangent to the curve with equation $y = 2x^2 + 8x + 3$

Calculate the value of c

(5)

$y = mx + c \rightarrow y = 4x + c \quad (m = 4)$

$\therefore \frac{dy}{dx} = 4x + 8 = 4$ (Gradient equation)

$4x + 8 = 4$

$x = -1 \rightarrow y = -3$

At $(-1, -3)$ $-3 = 4(-1) + c$

$c = 1$

$y = 4x + 1$

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Question 4 continued

Q4

(Total for Question 4 is 5 marks)

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5. (a) On the same axes, sketch the graphs of $y = x + 2$ and $y = x^2 - x - 6$ showing the coordinates of all points at which each graph crosses the coordinate axes.

(4)

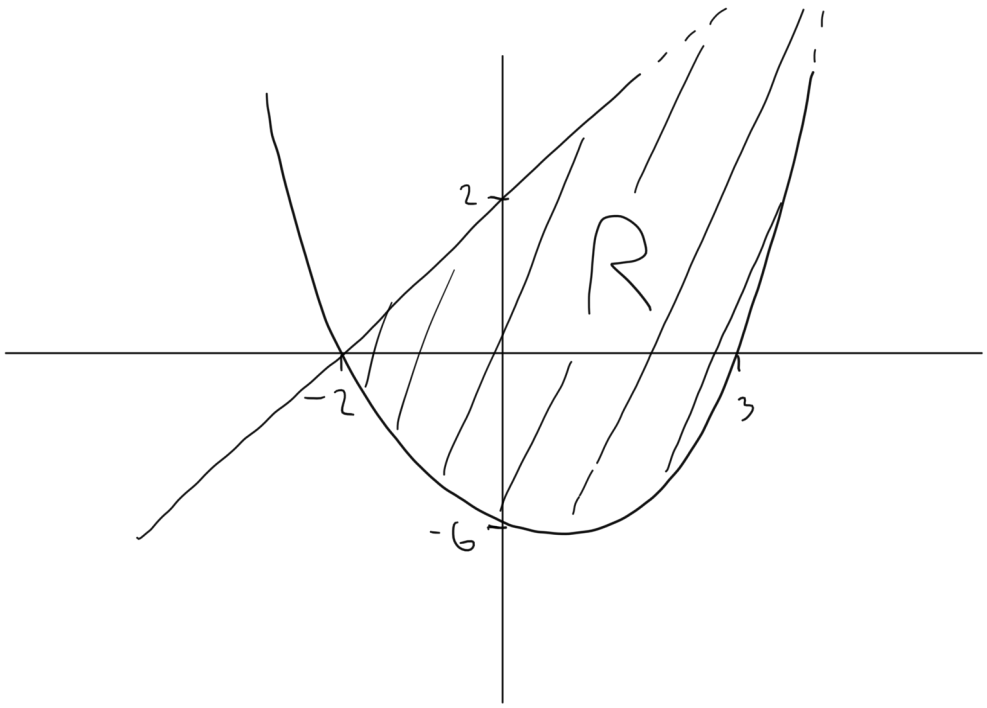
(b) On your sketch, show, by shading, the region R defined by the inequalities

$$y < x + 2 \quad \textbf{and} \quad y > x^2 - x - 6$$

(1)

(c) Hence, or otherwise, find the set of values of x for which $x^2 - 2x - 8 < 0$

(3)



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Question 5 continued

Quadratic: $y = x^2 - x - 6 = (x-3)(x+2)$

$x = 3$, $x = -2$ @ $y = 0$

Linear: $y = x + 2$

$x = 0$: $y = 2$ $(0, 2)$

$y = 0$: $x = -2$ $(-2, 0)$

c) $x^2 - 2x - 8 < 0$

$\therefore (x-4)(x+2) < 0$

$x = 4$ $x = -2$

$\therefore -2 < x < 4$

Q5

(Total for Question 5 is 8 marks)

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6.

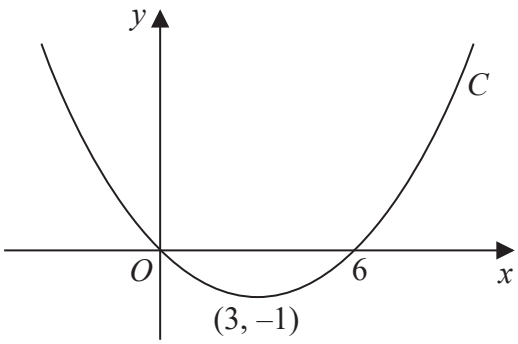


Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$

The curve C passes through the origin and through (6, 0)

The curve C has a minimum at the point (3, –1)

On separate diagrams, sketch the curve with equation

(a) $y = f(2x)$

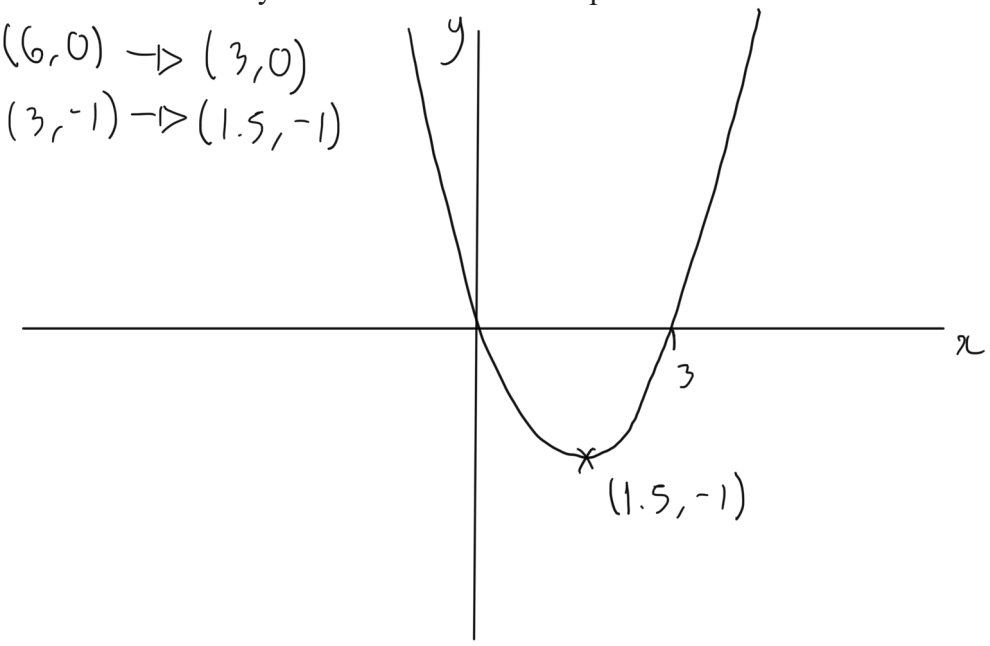
(3)

(b) $y = f(x + p)$, where p is a constant and $0 < p < 3$

(4)

On each diagram show the coordinates of any points where the curve intersects the x-axis and of any minimum or maximum points.

a) (6,0) ⟶ (3,0)
(3,-1) ⟶ (1.5,-1)



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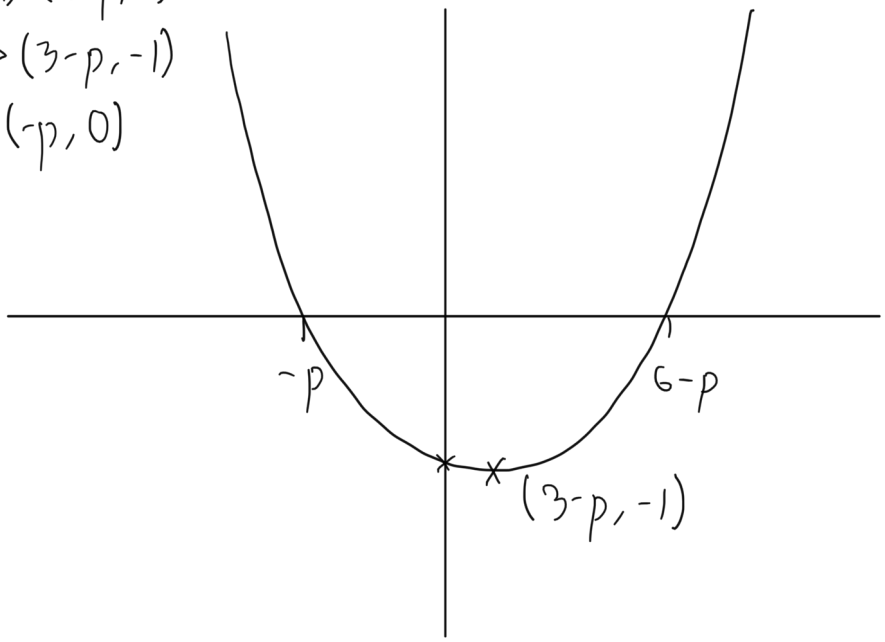
Question 6 continued

$y = f(x+p)$

$(6,0) \rightarrow (6-p,0)$

$(3,-1) \rightarrow (3-p,-1)$

$(0,0) \rightarrow (-p,0)$



Q6

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7. A curve with equation $y = f(x)$ passes through the point (4, 25)

Given that

$$f'(x) = \frac{3}{8}x^2 - 10x^{-\frac{1}{2}} + 1, \qquad x > 0$$

find $f(x)$, simplifying each term.

(5)

$\therefore f(x) = \int f'(x) = \int \frac{3}{8}x^2 - 10x^{-\frac{1}{2}} + 1 \, dx$

$f(x) = \frac{3x^3}{8(3)} - \frac{10x^{\frac{1}{2}}}{\frac{1}{2}} + x + C$

$f(x) = \frac{1}{8}x^3 - 20x^{\frac{1}{2}} + x + C$

$25 = \frac{1}{8}(4)^3 - 20(4)^{\frac{1}{2}} + 4 + C$

$25 = 8 - 40 + 4 + C$

$C = 53$

$f(x) = \frac{1}{8}x^3 - 20x^{\frac{1}{2}} + x + 53$

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Question 7 continued

Q7

(Total for Question 7 is 5 marks)

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8.

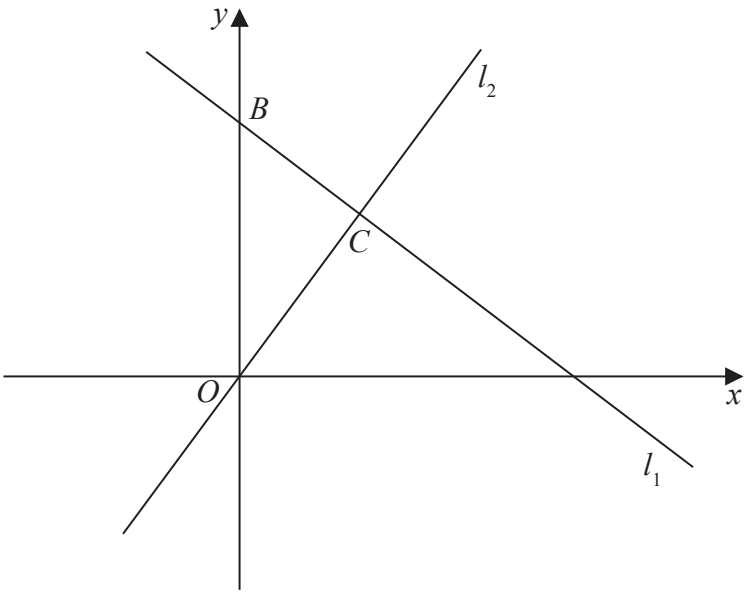

Figure 2

The line l_1, shown in Figure 2 has equation $2x + 3y = 26$

The line l_2 passes through the origin O and is perpendicular to l_1

(a) Find an equation for the line l_2

(4)

The line l_2 intersects the line l_1 at the point C. Line l_1 crosses the y-axis at the point B as shown in Figure 2.

(b) Find the area of triangle OBC. Give your answer in the form $\frac{a}{b}$, where a and b are integers to be found.

(6)

a) l_1: $2x + 3y = 26$

$\therefore y = -\frac{2}{3}x + \frac{26}{3}$

$m = -\frac{2}{3}$

$\therefore$ l_2 gradient, $m = \frac{3}{2}$

$y = \frac{3}{2}x + 0$

$y = \frac{3}{2}x$

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Question 8 continued

b) $A = \frac{b \times h}{2}$ $\quad L_1: 2x + 3y = 26$

$L_2: y = \frac{3}{2}x$

At B: $x = 0$: $\quad 0 + 3y = 26$

$y = \frac{26}{3}$

At C: $\quad 2x + 3\left(\frac{3x}{2}\right) = 26$

$\therefore x = 4$

$A = \frac{4 \times \frac{26}{3}}{2} = \frac{52}{3}$

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Question 8 continued

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Question 8 continued

Q8

(Total for Question 8 is 10 marks)

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9.

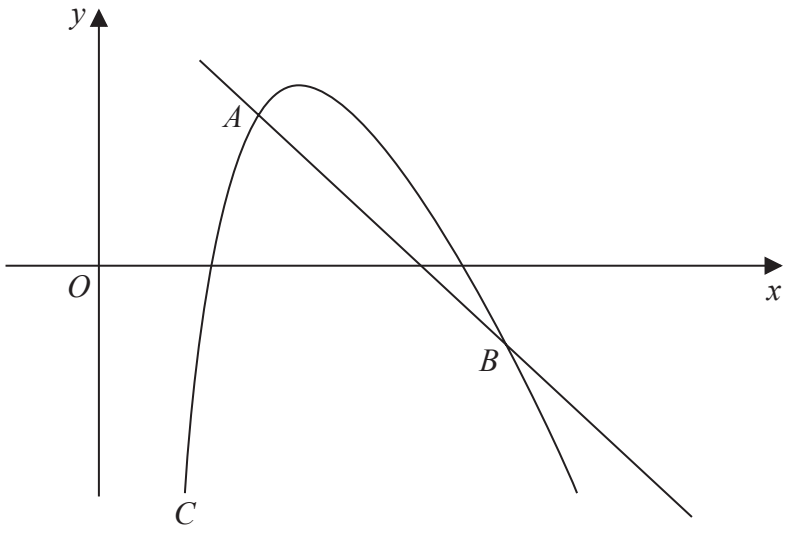

Figure 3

A sketch of part of the curve C with equation

$$y = 20 - 4x - \frac{18}{x}, \qquad x > 0$$

is shown in Figure 3.

Point A lies on C and has x coordinate equal to 2

(a) Show that the equation of the normal to C at A is $y = -2x + 7$.

(6)

The normal to C at A meets C again at the point B, as shown in Figure 3.

(b) Use algebra to find the coordinates of B.

(5)

a) $y = 20 - 4(2) - \frac{18}{2}$ $\therefore$ $y = 3$

$y = 20 - 4x - 18x^{-1}$

$\therefore \frac{dy}{dx} = -4 + 18x^{-2}$

@ $x = 2$ $\frac{dy}{dx} = -4 + \frac{18}{2^2} = \frac{1}{2}$

$\therefore$ perpendicular $m = -2$

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Question 9 continued

$\therefore y = -2x + c$

$3 = -2(2) + c$

$c = 7$

$y = -2x + 7$

b) $20 - 4x - \frac{18}{x} = -2x + 7$

$\therefore 13 - 2x - \frac{18}{x} = 0$

$13x - 2x^2 - 18 = 0$

$0 = 2x^2 - 13x + 18$

$\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = 2 \quad b = -13 \quad c = 18$

$x = 2 \qquad x = \frac{9}{2}$

$\therefore y = 3 \qquad \therefore y = -2$

$B = (\frac{9}{2}, -2)$

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Question 9 continued

Q9

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10.

Major sector

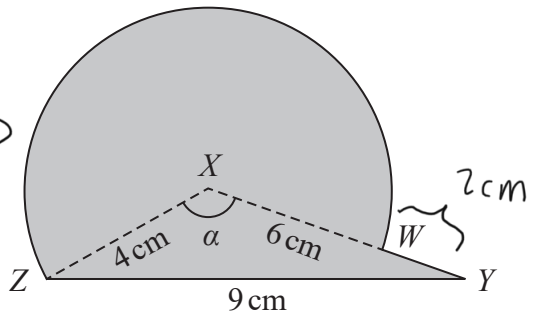


Figure 4

The triangle XYZ in Figure 4 has $XY = 6$ cm, $YZ = 9$ cm, $ZX = 4$ cm and angle $ZXY = \alpha$.

The point W lies on the line XY.

The circular arc ZW, in Figure 4, is a major arc of the circle with centre X and radius 4 cm.

(a) Show that, to 3 significant figures, $\alpha = 2.22$ radians.

(2)

(b) Find the area, in cm^2, of the major sector $XZWX$.

(3)

The region, shown shaded in Figure 4, is to be used as a design for a logo.

Calculate

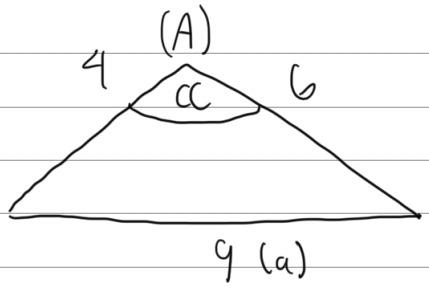
(c) the area of the logo

(3)

(d) the perimeter of the logo.

(4)

a)



Cosine Rule:

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{4^2 + 6^2 - 9^2}{2(4)(6)}$$

$A = 2.22$ radians

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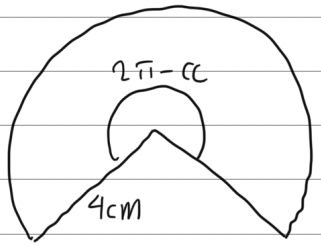
Question 10 continued

b) 

$$\text{Area} = \tfrac{1}{2} r^2 \theta$$
$$= \tfrac{1}{2}(4)^2(2\pi - 2.22)$$
$$= 32.5 \text{ cm}^2$$

c) $\text{Area (Logo)} = \text{Area}(\Delta) + \text{Area (sector)}$

$\tfrac{1}{2}ab\sin C$

$$= \tfrac{1}{2}(4)(6)\sin 2.22$$

$$\text{Area (Logo)} = \tfrac{1}{2}(4)(6)\sin 2.22 + \tfrac{1}{2}(4)^2(2\pi - 2.22)$$
$$= 42.1 \text{ cm}^2$$

d) $P = 9 + 2 + \text{Arc length}$

$r\theta$

$$P = 9 + 2 + 4(2\pi - 2.22)$$
$$= 27.3 \text{ cm}$$

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Question 10 continued

Leave blank

Question 10 continued

Q10

(Total for Question 10 is 12 marks)

TOTAL FOR PAPER IS 75 MARKS