NAME:

Date to be handed in:

MARK (out of 100):

PAPER B

Qu	1	2	3	4	5	6	7	8	9	10	11	12	13

Mathematics

Advanced Subsidiary
Paper 1: Pure Mathematics

Practice Paper B:
Time 2 hours

Paper Reference
8MA0/01

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 algebraic 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** the 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.

Questions to revise:

1. A teacher asks one of her students to solve the equation $2 \cos 2x + \sqrt{3} = 0$ for $0 \leqslant x \leqslant 180°$.

The attempt is shown below.

$$2\cos 2x = -\sqrt{3}$$
$$\cos 2x = -\frac{\sqrt{3}}{2}$$
$$2x = \cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$$
$$2x = 150°$$
$$x = 75°$$
$$w \text{ or } x = 360° - 75° = 295° \quad \text{so reject as out of range.}$$

(*a*) Identify the mistake made by the student.

(1)

(*b*) Write down the correct solutions to the equation.

(1)

(Total 3 marks)

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2. Find in exact form the unit vector in the same direction as $\mathbf{a} = 4\mathbf{i} - 7\mathbf{j}$.

(Total 3 marks)

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3. Simplify $\dfrac{6\sqrt{3}-4}{8-\sqrt{3}}$, giving your answer in the form $p\sqrt{3} - q$, where p and q are positive rational numbers.

(Total 4 marks)

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4. (*a*) Prove that, if $1 + 3x^2 + x^3 < (1 + x)^3$, then $x > 0$.

(4)

(*b*) Show, by means of a counter example, that the inequality $1 + 3x^2 + x^3 < (1 + x)^3$ is not true for all values of x.

(2)

(Total 6 marks)

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5. The curve with equation $y = \mathrm{h}(x)$ passes through the point (4, 19).

Given that $\mathrm{h}'(x) = 15x\sqrt{x} - \dfrac{40}{\sqrt{x}}$, find $\mathrm{h}(x)$.

(Total 6 marks)

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6. Find all the solutions, in the interval $0 \leqslant x \leqslant 360°$, to the equation $8 - 7\cos x = 6\sin^2 x$, giving solutions to 1 decimal place where appropriate.

(Total 6 marks)

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7. (*a*) Expand $(1 + 3x)^8$ in ascending powers of x, up to and including the term in x^3, simplifying each coefficient in the expansion.

(4)

(*b*) Showing your working clearly, use your expansion to find, to 5 significant figures, an approximation for 1.03^8.

(3)

(Total 7 marks)

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8. (*a*) Sketch the graph $y = \log_9 (x + a)$, $a > 0$, for $x > -a$, labelling any asymptotes and points of intersection with the x-axis or y-axis. Leave your answers in terms of a where necessary.

(6)

(*b*) For $x > -a$, describe, with a reason, the relationship between the graphs of $y = \log_9 (x + a)^2$ and $y = \log_9 (x + a)$.

(2)

(Total 8 marks)

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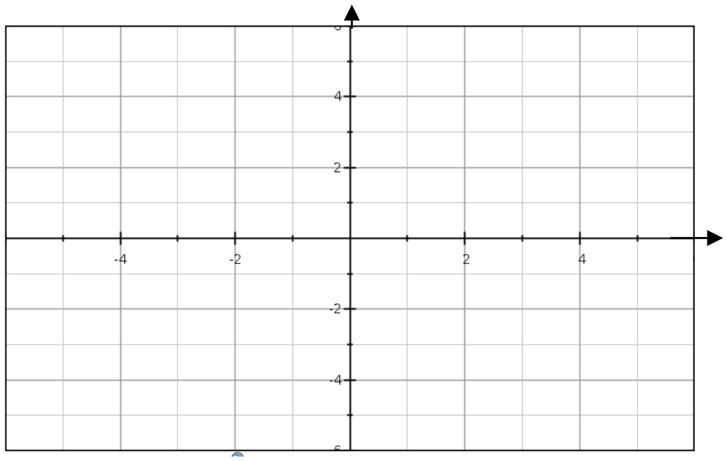
9. (*a*) On the grid shade the region comprising all points whose coordinates satisfy the inequalities $y \leq 2x + 5$, $2y + x \leq 6$ and $y \geq 2$.



(3)

(*b*) Work out the area of the shaded region.

(5)

(Total 8 marks)

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10. A particle P of mass 6 kg moves under the action of two forces, F_1 and F_2, where

$$F_1 = (8\mathbf{i} - 10\mathbf{j})\text{ N and } F_2 = (p\mathbf{i} + q\mathbf{j})\text{ N}, \; p \text{ and } q \text{ are constants.}$$

The acceleration of P is $\mathbf{a} = (3\mathbf{i} - 2\mathbf{j})\text{ m s}^{-2}$.

(*a*) Find, to 1 decimal place, the angle between the acceleration and **i**.

(2)

(*b*) Find the values of p and q.

(3)

(*c*) Find the magnitude of the resultant force R of the two forces F_1 and F_2. Simplify your answer fully.

(3)

(Total 8 marks)

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11. $$f(x) = x^3 - 7x^2 - 24x + 18.$$

(a) Sketch the graph of the gradient function, $y = f'(x)$.

(b) Use algebraic methods to determine any points where the graph cuts the coordinate axes and mark these on the graph.

(c) Using calculus, find the coordinates of any turning points on the graph.

(Total 9 marks)

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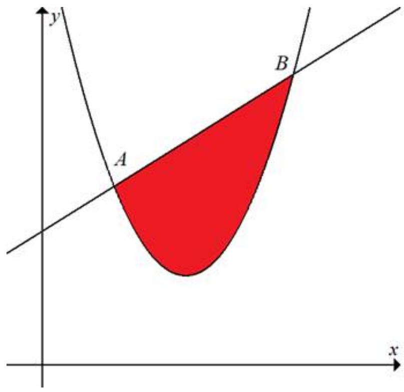
12 The diagram shows part of curve with equation $y = x^2 - 8x + 20$ and part of the line with equation $y = x + 6$.



(a) Using an appropriate algebraic method, find the coordinates of A and B.

(4)

The x-coordinates of A and B are denoted x_A and x_B respectively.

(b) Find the exact value of the area of the finite region bounded by the x-axis, the lines $x = x_A$ and $x = x_B$ and the line AB.

(2)

(c) Use calculus to find the exact value of the area of the finite region bounded by the x-axis, the lines $x = x_A$ and $x = x_B$ and the curve $y = x^2 - 8x + 20$.

(5)

(d) Hence, find, to one decimal place, the area of the shaded region enclosed by the curve $y = x^2 - 8x + 20$ and the line AB.

(2)

(Total 13 marks)

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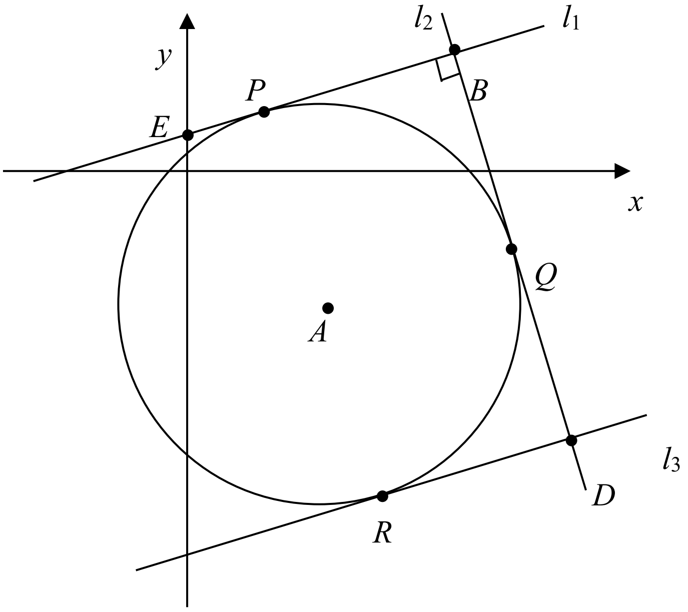
13. A is the centre of circle C, with equation $x^2 - 8x + y^2 + 10y + 1 = 0$.

P, Q and R are points on the circle and the lines l_1, l_2 and l_3 are tangents to the circle at these points respectively.

Line l_2 intersects line l_1 at B and line l_3 at D.



(a) Find the centre and radius of C.

(3)

(b) Given that the x-coordinate of Q is 10 and that the gradient of AQ is positive, find the y-coordinate of Q, explaining your solution.

(4)

(c) Find the equation of l_2, giving your answer in the form $y = mx + b$.

(4)

(d) Given that $APBQ$ is a square, find the equation of l_1 in the form $y = mx + b$.

(4)

l_1 intercepts the y-axis at E.

(e) Find the area of triangle EPA.

(4)

(Total 19 marks)

END OF PAPER (TOTAL: 100 MARKS)