

OCR

Oxford Cambridge and RSA

Wednesday 18 May 2016 – Morning

AS GCE MATHEMATICS

4721/01 Core Mathematics 1

QUESTION PAPER

Candidates answer on the Printed Answer Book.

OCR supplied materials:

- Printed Answer Book 4721/01
- List of Formulae (MF1)

Other materials required:

None

Duration: 1 hour 30 minutes



INSTRUCTIONS TO CANDIDATES

These instructions are the same on the Printed Answer Book and the Question Paper.

- The Question Paper will be found inside the Printed Answer Book.
- Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the Printed Answer Book.** If additional space is required, you should use the lined page(s) at the end of the Printed Answer Book. The question number(s) must be clearly shown.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

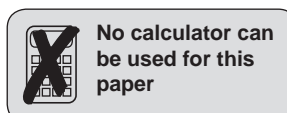
INFORMATION FOR CANDIDATES

This information is the same on the Printed Answer Book and the Question Paper.

- The number of marks is given in brackets [] at the end of each question or part question on the Question Paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The Printed Answer Book consists of **12** pages. The Question Paper consists of **4** pages. Any blank pages are indicated.

INSTRUCTION TO EXAMS OFFICER/INVIGILATOR

- Do not send this Question Paper for marking; it should be retained in the centre or recycled. Please contact OCR Copyright should you wish to re-use this document.

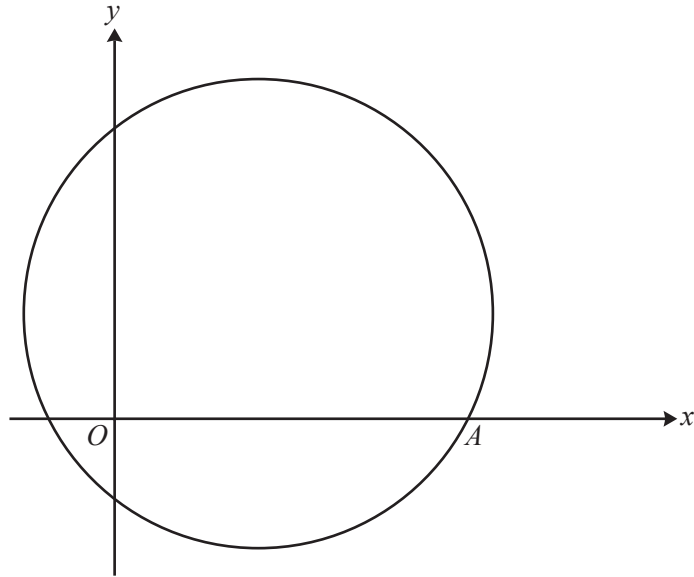


No calculator can be used for this paper

Answer **all** the questions.

- 1 (i) Simplify $(2x-3)^2 - 2(3-x)^2$. [2]
 (ii) Find the coefficient of x^3 in the expansion of $(3x^2 - 3x + 4)(5 - 2x - x^3)$. [2]
- 2 Express $\frac{3 + \sqrt{20}}{3 + \sqrt{5}}$ in the form $a + b\sqrt{5}$. [4]
- 3 Solve the simultaneous equations $x^2 + y^2 = 34$, $3x - y + 4 = 0$. [5]
- 4 Solve the equation $2y^{\frac{1}{2}} - 7y^{\frac{1}{4}} + 3 = 0$. [5]
- 5 Express the following in the form 2^p .
 (i) $(2^5 \div 2^7)^3$ [2]
 (ii) $5 \times 4^{\frac{2}{3}} + 3 \times 16^{\frac{1}{3}}$ [3]
- 6 (i) Express $4 + 12x - 2x^2$ in the form $a(x+b)^2 + c$. [4]
 (ii) State the coordinates of the maximum point of the curve $y = 4 + 12x - 2x^2$. [2]
- 7 (i) Sketch the curve $y = x^2(3-x)$ stating the coordinates of points of intersection with the axes. [3]
 (ii) The curve $y = x^2(3-x)$ is translated by 2 units in the positive direction parallel to the x -axis. State the equation of the curve after it has been translated. [2]
 (iii) Describe fully a transformation that transforms the curve $y = x^2(3-x)$ to $y = \frac{1}{2}x^2(3-x)$. [2]
- 8 A curve has equation $y = 2x^2$. The points A and B lie on the curve and have x -coordinates 5 and $5+h$ respectively, where $h > 0$.
 (i) Show that the gradient of the line AB is $20 + 2h$. [3]
 (ii) Explain how the answer to part (i) relates to the gradient of the curve at A . [1]
 (iii) The normal to the curve at A meets the y -axis at the point C . Find the y -coordinate of C . [3]
- 9 Find the set of values of k for which the equation $x^2 + 2x + 11 = k(2x - 1)$ has two distinct real roots. [7]

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The diagram shows the circle with equation $x^2 + y^2 - 8x - 6y - 20 = 0$.

- (i) Find the centre and radius of the circle. [3]

The circle crosses the positive x -axis at the point A .

- (ii) Find the equation of the tangent to the circle at A . [6]

- (iii) A second tangent to the circle is parallel to the tangent at A . Find the equation of this second tangent. [3]

- (iv) Another circle has centre at the origin O and radius r . This circle lies wholly inside the first circle. Find the set of possible values of r . [2]

- 11 The curve $y = 4x^2 + \frac{a}{x} + 5$ has a stationary point. Find the value of the positive constant a given that the y -coordinate of the stationary point is 32. [8]

END OF QUESTION PAPER

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