

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.

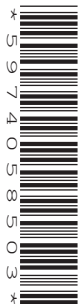
OCR supplied materials:

- 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.

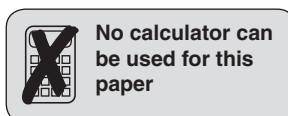
INFORMATION FOR CANDIDATES

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.

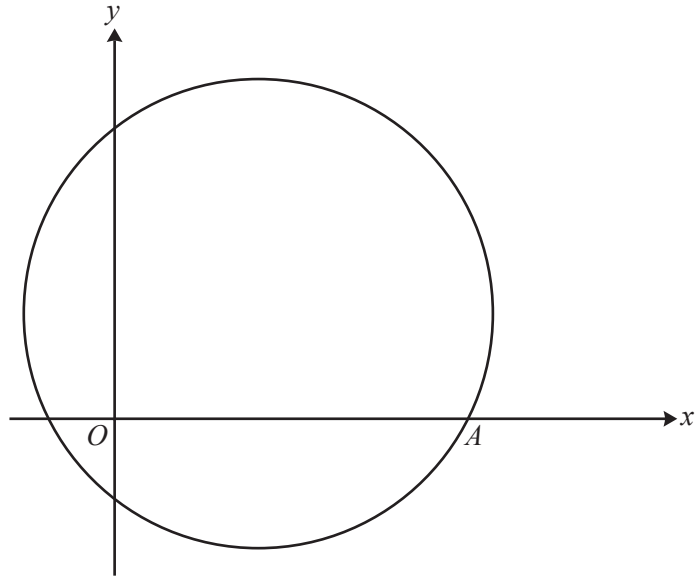


No calculator can be used for this paper

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]

10



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

**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.