

# 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.

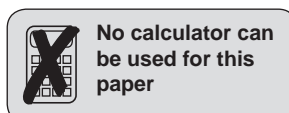
#### INFORMATION FOR CANDIDATES

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.

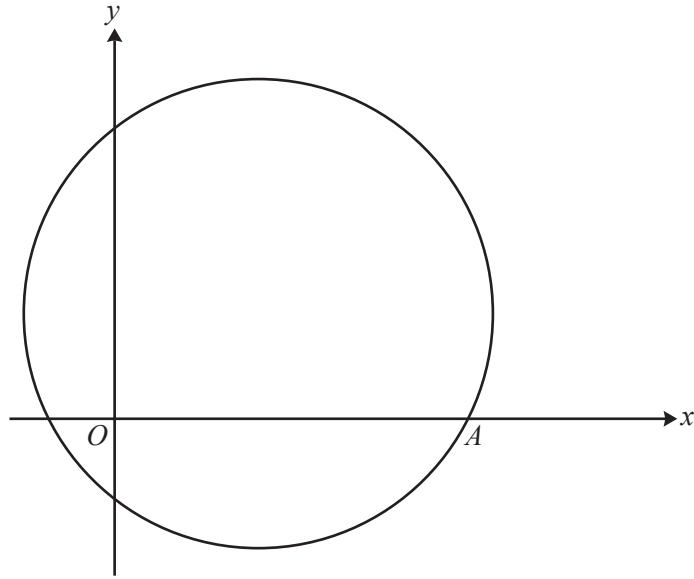


No calculator can be used for this paper

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**

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