OCR
Oxford Cambridge and RSA

# Wednesday 13 May 2015 – Morning

## AS GCE MATHEMATICS (MEI)

**4751/01** Introduction to Advanced Mathematics (C1)

**QUESTION PAPER**

Candidates answer on the Printed Answer Book.

**OCR supplied materials:**
- Printed Answer Book 4751/01
- MEI Examination Formulae and Tables (MF2)

**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**. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

**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 advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- 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**

## **Section A** (36 marks)

**1** Make $r$ the subject of the formula $A = \pi r^2(x+y)$, where $r > 0$. **[2]**

**2** A line $L$ is parallel to $y = 4x+5$ and passes through the point $(-1,6)$. Find the equation of the line $L$ in the form $y = ax+b$. Find also the coordinates of its intersections with the axes. **[5]**

**3** Evaluate the following.

**(i)** $200^0$ **[1]**

**(ii)** $\left(\frac{25}{9}\right)^{-\frac{1}{2}}$ **[3]**

**4** Solve the inequality $\frac{4x-5}{7} > 2x+1$. **[3]**

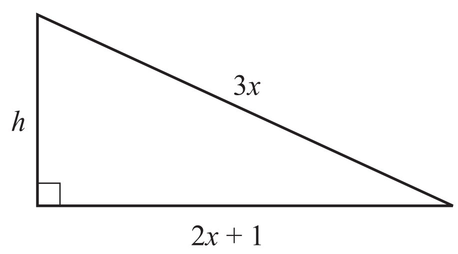
**5** Find the coordinates of the point of intersection of the lines $y = 5x-2$ and $x+3y = 8$. **[4]**

**6** **(i)** Expand and simplify $(3+4\sqrt{5})(3-2\sqrt{5})$. **[3]**

**(ii)** Express $\sqrt{72}+\frac{32}{\sqrt{2}}$ in the form $a\sqrt{b}$, where $a$ and $b$ are integers and $b$ is as small as possible. **[2]**

**7** Find and simplify the binomial expansion of $(3x-2)^4$. **[4]**

**8** Fig. 8 shows a right-angled triangle with base $2x+1$, height $h$ and hypotenuse $3x$.




**Not to scale**

**Fig. 8**

**(i)** Show that $h^2 = 5x^2-4x-1$. **[2]**

**(ii)** Given that $h = \sqrt{7}$, find the value of $x$, giving your answer in surd form. **[3]**

**9** Explain why each of the following statements is false. State in each case which of the symbols $\Rightarrow$, $\Leftarrow$ or $\Leftrightarrow$ would make the statement true.

**(i)** ABCD is a square $\Leftrightarrow$ the diagonals of quadrilateral ABCD intersect at 90° **[2]**

**(ii)** $x^2$ is an integer $\Rightarrow$ $x$ is an integer **[2]**

**Section B** (36 marks)

**10** You are given that $\mathrm{f}(x)=(x+3)(x-2)(x-5)$.

**(i)** Sketch the curve $y=\mathrm{f}(x)$. **[3]**

**(ii)** Show that f($x$) may be written as $x^3-4x^2-11x+30$. **[2]**

**(iii)** Describe fully the transformation that maps the graph of $y=\mathrm{f}(x)$ onto the graph of $y=\mathrm{g}(x)$, where $\mathrm{g}(x)=x^3-4x^2-11x-6$. **[2]**

**(iv)** Show that $\mathrm{g}(-1)=0$. Hence factorise $\mathrm{g}(x)$ completely. **[5]**

**11**

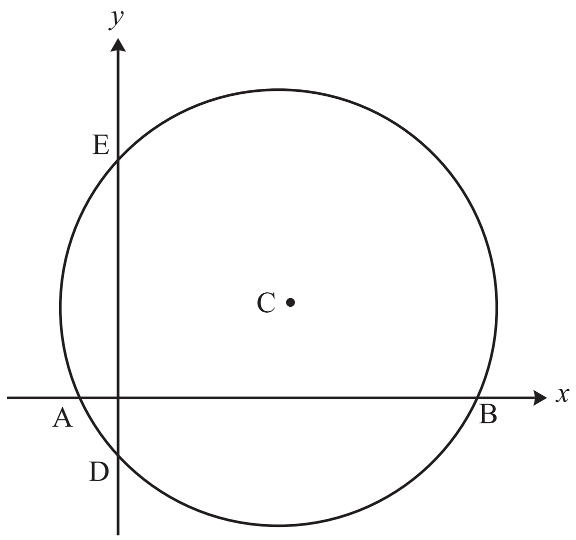



**Fig. 11**

Fig. 11 shows a sketch of the circle with equation $(x-10)^2+(y-2)^2=125$ and centre C. The points A, B, D and E are the intersections of the circle with the axes.

**(i)** Write down the radius of the circle and the coordinates of C. **[2]**

**(ii)** Verify that B is the point (21, 0) and find the coordinates of A, D and E. **[4]**

**(iii)** Find the equation of the perpendicular bisector of BE and verify that this line passes through C. **[6]**

**12** **(i)** Find the set of values of $k$ for which the line $y=2x+k$ intersects the curve $y=3x^2+12x+13$ at two distinct points. **[5]**

**(ii)** Express $3x^2+12x+13$ in the form $a(x+b)^2+c$. Hence show that the curve $y=3x^2+12x+13$ lies completely above the $x$-axis. **[5]**

**(iii)** Find the value of $k$ for which the line $y=2x+k$ passes through the minimum point of the curve $y=3x^2+12x+13$. **[2]**

**END OF QUESTION PAPER**