FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

# Core Mathematics C2

Paper C

Time: 1 hour 30 minutes

*Instructions and Information*

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and / or integration.

Full marks may be obtained for answers to ALL questions.

Mathematical formulae and statistical tables are available.

This paper has nine questions.

*Advice to Candidates*

You must show sufficient working to make your methods clear to an examiner. Answers without working may gain no credit.




*Written by Shaun Armstrong*

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**1.** Find the coefficient of $x^2$ in the expansion of

$$(1 + x)(1 - x)^6.$$ **(4)**

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**2.** A geometric series has common ratio $\frac{1}{3}$.

Given that the sum of the first four terms of the series is 200,

*(a)* find the first term of the series, **(3)**

*(b)* find the sum to infinity of the series. **(2)**

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**3.**

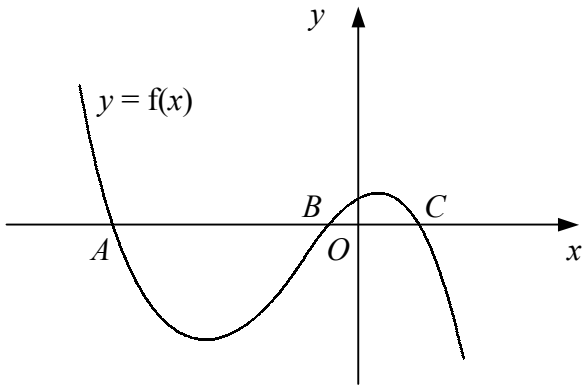



**Figure 1**

Figure 1 shows the curve $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = 4 + 5x + kx^2 - 2x^3,$$

and $k$ is a constant.

The curve crosses the $x$-axis at the points $A$, $B$ and $C$.

Given that $A$ has coordinates $(-4, 0)$,

*(a)* show that $k = -7$, **(2)**

*(b)* find the coordinates of $B$ and $C$. **(5)**

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**4.** *(a)* *(i)* Sketch the curve $y = \sin(x - 30)°$ for $x$ in the interval $-180 \leq x \leq 180$.

*(ii)* Write down the coordinates of the turning points of the curve in this interval. **(4)**

*(b)* Find all values of $x$ in the interval $-180 \leq x \leq 180$ for which

$$\sin(x - 30)° = 0.35,$$

giving your answers to 1 decimal place. **(4)**

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**5.** *(a)* Evaluate

$$\log_3 27 - \log_8 4.$$ **(4)**

*(b)* Solve the equation

$$4^x - 3(2^{x+1}) = 0.$$ **(5)**

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**6.** $$f(x) = 2 - x + 3x^{\frac{2}{3}}, \quad x > 0.$$

*(a)* Find $f'(x)$ and $f''(x)$. **(3)**

*(b)* Find the coordinates of the turning point of the curve $y = f(x)$. **(4)**

*(c)* Determine whether the turning point is a maximum or minimum point. **(2)**

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**7.** The points $P$, $Q$ and $R$ have coordinates $(-5, 2)$, $(-3, 8)$ and $(9, 4)$ respectively.

*(a)* Show that $\angle PQR = 90°$. **(4)**

Given that $P$, $Q$ and $R$ all lie on circle $C$,

*(b)* find the coordinates of the centre of $C$, **(3)**

*(c)* show that the equation of $C$ can be written in the form

$$x^2 + y^2 - 4x - 6y = k,$$

where $k$ is an integer to be found. **(3)**

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***Turn over***

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**8.**

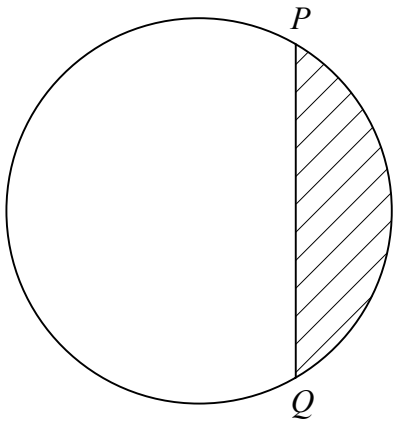



**Figure 2**

Figure 2 shows a circle of radius 12 cm which passes through the points $P$ and $Q$. The chord $PQ$ subtends an angle of 120° at the centre of the circle.

*(a)* Find the exact length of the major arc $PQ$. **(2)**

*(b)* Show that the perimeter of the shaded minor segment is given by $k(2\pi + 3\sqrt{3})$ cm, where $k$ is an integer to be found. **(4)**

*(c)* Find, to 1 decimal place, the area of the shaded minor segment as a percentage of the area of the circle. **(4)**

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**9.** The finite region $R$ is bounded by the curve $y = 1 + 3\sqrt{x}$, the $x$-axis and the lines $x = 2$ and $x = 8$.

*(a)* Use the trapezium rule with three intervals of equal width to estimate to 3 significant figures the area of $R$. **(6)**

*(b)* Use integration to find the exact area of $R$ in the form $a + b\sqrt{2}$. **(5)**

*(c)* Find the percentage error in the estimate made in part *(a)*. **(2)**

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**END**

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