## 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.



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

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

(2)

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.



Figure 1

Figure 1 shows the curve y = f(x) where

$$f(x) = 4 + 5x + kx^2 - 2x^3,$$

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)

4.	( <i>a</i> )	( <i>i</i> )	Sketch the curve $y = \sin (x - 30)^\circ$ for x in the interval $-180 \le x \le 180$	180.	
		(ii)	Write down the coordinates of the turning points of the curve in this interval.	(4)	
	<i>(b)</i>	Find	all values of x in the interval $-180 \le x \le 180$ for which		
			$\sin(x-30)^\circ = 0.35,$		
		(4)			
5.	(a)	Eval	luate		
			$\log_3 27 - \log_8 4.$	(4)	
	<i>(b)</i>	Solv	e the equation		
			$4^x - 3(2^{x+1}) = 0.$	(5)	
6.			$f(x) = 2 - x + 3x^{\frac{2}{3}},  x > 0.$		
	(a)	Find	f'(x) and $f''(x)$ .	(3)	
	<i>(b)</i>	Find	the coordinates of the turning point of the curve $y = f(x)$ .	(4)	
	(c)	Dete	ermine whether the turning point is a maximum or minimum point.	(2)	
7.	The points <i>P</i> , <i>Q</i> and <i>R</i> have coordinates $(-5, 2)$ , $(-3, 8)$ and $(9, 4)$ respectively.				
	(a)	Show	w that $\angle PQR = 90^{\circ}$ .	(4)	
	Given that $P$ , $Q$ and $R$ all lie on circle $C$ ,				
	( <i>b</i> )	find	the coordinates of the centre of <i>C</i> ,	(3)	
	(c)	shov	w that the equation of $C$ can be written in the form		
	$x^2 + y^2 - 4x - 6y = k,$				
		whe	re $k$ is an integer to be found.	(3)	
				Turn over	



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  $120^{\circ}$  at the centre of the circle.

(a)	Find the exact length of the major arc $PQ$ .	(2)			
<i>(b)</i>	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)			
The finite region <i>R</i> is bounded by the curve $y = 1 + 3\sqrt{x}$ , the <i>x</i> -axis and the lines $x = 2$ and $x = 8$ .					
<i>(a)</i>	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)			
( <i>c</i> )	Find the percentage error in the estimate made in part $(a)$ .	(2)			

#### END

9.