Surname	Other nar	nes
Pearson Edexcel International Advanced Level	Centre Number	Candidate Number
Core Math Advanced Subsidiar		s C12
Tuesday 13 January 2015 – Time: 2 hours 30 minutes	•	Paper Reference WMA01/01

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided - there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- The total mark for this paper is 125.
- The marks for **each** question are shown in brackets
 - use this as a guide as to how much time to spend on each guestion.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶



- 1. Simplify the following expressions fully.
 - (a) $(x^6)^{\frac{1}{3}}$

(1)

(b) $\sqrt{2}(x^3) \div \sqrt{\frac{32}{x^2}}$

(2)



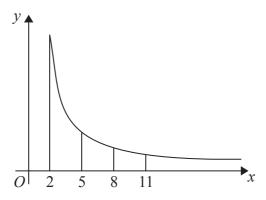


Figure 1

Figure 1 shows a sketch of part of the graph of $y = \frac{12}{\sqrt{(x^2 - 2)}}, x \ge 2$

The table below gives values of y rounded to 3 decimal places.

X		2	5	8	11
y	,	8.485	2.502	1.524	1.100

(a) Use the trapezium rule with all the values of *y* from the table to find an approximate value, to 2 decimal places, for

$$\int_{2}^{11} \frac{12}{\sqrt{(x^2 - 2)}} \, \mathrm{d}x \tag{4}$$

(b) Use your answer to part (a) to estimate a value for

$$\int_2^{11} \left(1 + \frac{6}{\sqrt{(x^2 - 2)}}\right) \mathrm{d}x$$

(3)

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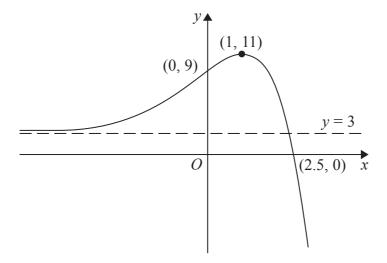


Figure 2

Figure 2 shows a sketch of part of the curve with equation y = f(x). The curve crosses the coordinate axes at the points (2.5, 0) and (0, 9), has a stationary point at (1, 11), and has an asymptote y = 3

On separate diagrams, sketch the curve with equation

(a)
$$y = 3f(x)$$
 (3)

(b)
$$y = f(-x)$$
 (3)

On each diagram show clearly the coordinates of the points of intersection of the curve with the two coordinate axes, the coordinates of the stationary point, and the equation of the asymptote.

4. (a) Find the first 4 terms in ascending powers of x of the binomial expansion of
$\left(2+\frac{x}{4}\right)^{10}$
giving each term in its simplest form. (4)
(b) Use your expansion to find an estimated value for 2.025¹⁰, stating the value of x which you have used and showing your working.(3)



5. (a) Prove that the sum of the first n terms of an arithmetic series is given by the formula

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

where a is the first term of the series and d is the common difference between the terms.

(4)

(b) Find the sum of the integers which are divisible by 7 and lie between 1 and 500

(3)



6. Given that

$$2\log_4(2x+3) = 1 + \log_4 x + \log_4(2x-1), \quad x > \frac{1}{2}$$

(a) show that

$$4x^2 - 16x - 9 = 0$$

(5)

(b) Hence solve the equation

$$2\log_4(2x+3) = 1 + \log_4 x + \log_4(2x-1), \quad x > \frac{1}{2}$$

(2)



7.	The	circle	C	has	equation
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$$x^2 + y^2 + 10x - 6y + 18 = 0$$

Find

(a) the coordinates of the centre of C,

(2)

(b) the radius of *C*.

(2)

The circle C meets the line with equation x = -3 at two points.

(c) Find the exact values for the *y* coordinates of these two points, giving your answers as fully simplified surds.

(4)



8. A sequence is defined by

$$u_1 = k$$

 $u_{n+1} = 3u_n - 12, \quad n \geqslant 1$

where k is a constant.

(a) Write down fully simplified expressions for u_2 , u_3 and u_4 in terms of k.

(4)

Given that $u_4 = 15$

(b) find the value of k,

(2)

(c) find $\sum_{i=1}^{4} u_i$, giving an exact numerical answer.

(3)



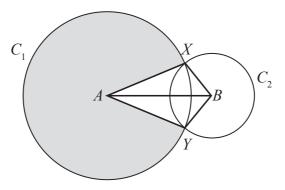


Figure 3

In Figure 3, the points A and B are the centres of the circles C_1 and C_2 respectively. The circle C_1 has radius 10 cm and the circle C_2 has radius 5 cm. The circles intersect at the points X and Y, as shown in the figure.

Given that the distance between the centres of the circles is 12 cm,

(a) calculate the size of the acute angle *XAB*, giving your answer in radians to 3 significant figures,

(2)

(b) find the area of the major sector of circle C_1 , shown shaded in Figure 3,

(3)

(*)	(c) find the area of the kite AYBA
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(3)





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$$f(x) = 6x^3 + ax^2 + bx - 5$$

where a and b are constants.

When f(x) is divided by (x + 1) there is no remainder.

When f(x) is divided by (2x - 1) the remainder is -15

(a) Find the value of a and the value of b.

(5)

(b)	Factorise	f(x)	comp	letely	7
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(4)

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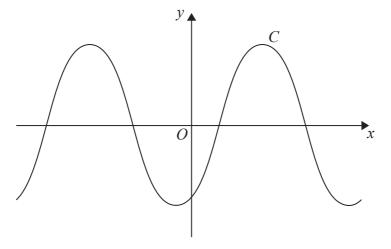


Figure 4

Figure 4 shows a sketch of the curve C with equation $y = \sin(x - 60^\circ)$, $-360^\circ \le x \le 360^\circ$

(a) Write down the exact coordinates of the points at which C meets the two coordinate axes.

(3)

(b) Solve, for $-360^{\circ} \leqslant x \leqslant 360^{\circ}$,

$$4\sin(x - 60^{\circ}) = \sqrt{6} - \sqrt{2}$$

showing each stage of your working.

(5)



2. A business is expected to have a yearly profit of £275 000 for the year 2016. The p expected to increase by 10% per year, so that the expected yearly profits form a geo sequence with common ratio 1.1	rofit is ometric
(a) Show that the difference between the expected profit for the year 2020 and the exprofit for the year 2021 is £40 300 to the nearest hundred pounds.	pected (3)
(b) Find the first year for which the expected yearly profit is more than one million p	ounds. (4)
(c) Find the total expected profits for the years 2016 to 2026 inclusive, giving your a to the nearest hundred pounds.	answer (3)
	(3)







13. The curve C has equation

$$y = 3x^2 - 4x + 2$$

The line l_1 is the normal to the curve C at the point P(1, 1)

(a) Show that l_1 has equation

$$x + 2y - 3 = 0$$

The line l_1 meets curve C again at the point Q.

(b) By solving simultaneous equations, determine the coordinates of the point Q.

(4)

(5)

Another line l_2 has equation kx + 2y - 3 = 0, where k is a constant.

(c) Show that the line l_2 meets the curve C once only when

$$k^2 - 16k + 40 = 0$$

(4)

	(d)	Find	the two	exact	values	of k for	which	l_2 is	a tangent	to (
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(2)



estion 13 continued		



1. In this question, solutions based entirely on graphical or numerical methods are acceptable.	e not
(i) Solve, for $0 \leqslant x < 360^\circ$,	
$3\sin x + 7\cos x = 0$	
Give each solution, in degrees, to one decimal place.	
	(4)
(ii) Solve, for $0 \le \theta < 2\pi$,	
$10\cos^2\theta + \cos\theta = 11\sin^2\theta - 9$	
Give each solution, in radians, to 3 significant figures.	
	(6)





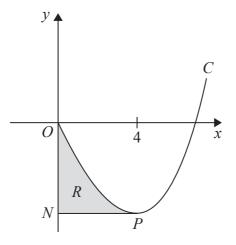


Figure 5

Figure 5 shows a sketch of part of the curve C with equation

$$y = x^3 + 10x^{\frac{3}{2}} + kx, \quad x \geqslant 0$$

where k is a constant.

(a) Find
$$\frac{dy}{dx}$$
 (2)

The point P on the curve C is a minimum turning point. Given that the x coordinate of P is 4

(b) show that
$$k = -78$$
 (2)

The line through P parallel to the x-axis cuts the y-axis at the point N.

The finite region R, shown shaded in Figure 5, is bounded by C, the y-axis and PN.

(c) Use integration to find the area of R. (7)



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Question 15 continued	blank
	Q15
(Total 11 marks)	
TOTAL FOR PAPER: 125 MARKS	
END	