WMA01

This resource was created and owned by Pearson Edexcel

Surname		Other names	
Pearson Edexcel	Centre Number	Candidate Numb	ber
Advanced Subsidia	iemat ry		

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 question.

## 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 🕨



**P51404A** ©2018 Pearson Education Ltd. 1/1/1/1/1/



# Mathematics C12

(1)

WMA01 Leave

blank

1. The table below shows corresponding values of x and y for  $y = \frac{1}{\sqrt{(x+1)}}$ , with the values for y rounded to 3 decimal places where necessary.

x	0	3	6	9	12	15
У	1	0.5	0.378	0.316	0.277	

- (a) Complete the table by giving the value of *y* corresponding to x = 15
- (b) Use the trapezium rule with all the values of y from the completed table to find an approximate value for

<b>1</b> 5	1	_dr
	$\sqrt{(x+1)}$	[) <sup>(1)</sup>

giving your answer to 2 decimal places.

(4)



## June 2018 International A Level WMA01/01 Core Mathematics C12 Mark Scheme



mmer 2018 t Paper	www.mystudybro.com This resource was created and owned by Pearson Edexcel	Mathematic	CS C12 WMA0
			Leave
2.	$f(x) = ax^3 + 2x^2 + bx - 3$		UIAIIK
where $a$ and $b$	are constants.		
When $f(x)$ is d	ivided by $(2x - 1)$ the remainder is 1		
(a) Show that			
	a + 4b = 28	(2)	
When $f(x)$ is d	ivided by $(x + 1)$ the remainder is $-17$		
(b) Find the v	value of <i>a</i> and the value of <i>b</i> .		
		(4)	

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

www.mystudybro.com This resource was created and owned by Pearson Edexcel

Question Number	Scheme	Mai	·ks			
2.	$f(x) = ax^3 + 2x^2 + bx - 3$					
(a) (b)	Attempts $f(\pm \frac{1}{2})$ and puts expression equal to 1 or Use long division and sets remainder =1 $f(\frac{1}{2}) = a(\frac{1}{8}) + 2(\frac{1}{4}) + b(\frac{1}{2}) - 3 = 1$ so $a + 4b = 28^*$ or $-3 + b(\frac{1}{2}) + \frac{1}{2} + \frac{a}{8} = 1$ so $a + 4b = 28^*$ Attempts $f(\pm 1)$ and puts expression equal to $-17$ Or Use long division and sets remainder equal to $-17$ $\Rightarrow -3 - b - a + 2 = -17$ { so $a + b = 16$ } Solve simultaneous equations to give values for $a$ and $b$ a = 12 and $b = 4$	M1 A1 M1 A1 dM1 A1	[2]			
		6 ma	rks			
(0)	Notes					
M1: Puts Alter A1: cao No Accept	<ul> <li>(a)</li> <li>M1: Puts f(±1/2) = 1 or f(±1/2)-1=0 Alternatively uses long division and produces a remainder in a and b that is set equal to 1</li> <li>A1: cao Note that answer is printed so some working, which needs to be correct, (see scheme) needs to be seen. Accept 1a+4b=28 as well as 28=1a+4b</li> </ul>					
<ul> <li>(b)</li> <li>M1: Attempts f(±1)=±17 or may attempt f(±1)+17=0 Alternatively uses long division and produces a remainder in <i>a</i> and <i>b</i> that is set equal to -17</li> <li>A1: A correct un-simplified equation but the powers of -1 must have been processed correctly– does not need to be simplified to <i>a</i> + <i>b</i>=16</li> <li>dM1: Solves their equation with <i>a</i>+4<i>b</i> =28 to arrive at values for <i>a</i> and <i>b</i>. Do not be worried by the processing of this Allow the answer(s) to appear from two equations. It is dependent upon the previous M.</li> <li>A1: Correct values</li> </ul>						

ast Pape	This resource was created and owned by Pearson Edexcel	WMA
		Leav blan
3.	The line $l_1$ passes through the points $A(-1, 4)$ and $B(5, -8)$	
	(a) Find the gradient of $l_1$	
		(2)
	The line $l_2$ is perpendicular to the line $l_1$ and passes through the point $B(5,$	-8)
	(b) Find an equation for $l_2$ in the form $ax + by + c = 0$ , where a, b and c as	re integers.
		(4)
6		

www.mystudybro.com This resource was created and owned by Pearson Edexcel

WMA01	
-------	--

Question Number	Scheme	Marks		
<b>3.</b> (a)	Gradient = $\frac{4 - (-8)}{-1 - 5} = -2$	M1 A1 [ <b>2</b> ]		
(b)	Perpendicular line has gradient $\frac{-1}{m} \left(=\frac{1}{2}\right)$	M1		
	Line has equation $y - (-8) = \frac{1}{2}(x-5)$ or $y = \frac{1}{2}x + c$ , with $c = -8 - \frac{1}{2} \times 5$ so $y = \frac{1}{2}x - 10\frac{1}{2}$	M1 A1		
	So $x - 2y - 21 = 0$	A1 [ <b>4</b> ]		
		6 marks		
	Notes			
(a) <b>M1</b> : Attempts to use gradient formula $\frac{\Delta y}{\Delta x}$ You may condone only one sign slip even after a correct formula is quoted. It may be implied by $\frac{-12}{4}, \frac{12}{-4}, \frac{-4}{-6}, \frac{4}{6}, \frac{12}{6}, 2$ The correct answer of -2 implies both marks. Alternatively solves simultaneous equations $-8 = 5m + c$ and $4 = -1m + c$ and proceeds to find <i>m</i> . Allow one sign slip here. <b>A1: cao. Do not allow fractions</b>				
<ul> <li>(b)</li> <li>M1: Uses or states negative reciprocal of their gradient</li> <li>M1: Uses line equation with point (5,-8) and a changed gradient. Condone one sign slip Eg y-8=1/2(x-5)</li> <li>If the form y = mx + c is used they must proceed as far as c =</li> <li>A1: Any un-simplified form of correct line equation</li> <li>A1: cao - accept k(x-2y-21) = 0 where k is an integer ≠ 0 and accept any order of the terms = 0. Allow 1x-2y-21=0</li> <li>Allow the candidate to state a = 1, b = -2, c = -21 but do not penalise after a correct answer.</li> </ul>				

# Mathematics C12

WMA01 Leave

blank

**4.** Given that

$$y = \frac{64x^6}{25}, \ x > 0$$

express each of the following in the form  $kx^n$  where k and n are constants.

(a) 
$$y^{-\frac{1}{2}}$$
  
(b)  $(25y)^{\frac{2}{3}}$  (3)

(2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

P 5 1 4 0 4 A 0 8 4 8

Question Number	Scheme	Marks
<b>4.</b> (a)	$y^{-\frac{1}{2}} = \left(\frac{64x^6}{25}\right)^{-\frac{1}{2}} = \frac{5}{8}x^{-3}$	M1 A1 A1 [ <b>3</b> ]
(b)	$(25y)^{\frac{2}{3}} = 16x^4$	B1, B1 [2]
		5 marks
	Notes	
(a) <b>M1:</b> Sight Do no <b>A1:</b> For ac <b>A1:</b> $\frac{5}{8}x^{-3}$ No D	of 5 or 0.2, 8 or 0.125, $x^3$ or $x^{-3}$ ot award if the 5 is 5 <sup>2</sup> or the $x^3$ is $(x^3)^{-2}$ hieving the correct coefficient $\frac{5}{8}x^p$ , $\frac{5}{8x^p}$ , $\frac{1}{1.6}x^p$ , 0.625 $x^p$ in their final answer or the correct index $qx^{-3}$ in their final answer. cao final answer . Accept 0.625 $x^{-3}$ ote that $\frac{0.625}{x^3}$ is not in the correct form. See the demand of the question o not withhold the mark if $\frac{5}{8}x^{-3}$ is followed by $\frac{5}{8x^3}$ in the candidate's response.	
(b) <b>B1:</b> 16 or <b>B1:</b> 16 x <sup>4</sup>	$x^4$ correct, in the final answer cao final answer. Allow $16 \times x^4$	

Leave blank

#### 5. (a) Find the first 4 terms, in ascending powers of x, of the binomial expansion of

 $\left(1+\frac{x}{3}\right)^{18}$ 

giving each term in its simplest form.

(b) Use the answer to part (a) to find an estimated value for  $\left(\frac{31}{30}\right)^{18}$ , stating the value of x

that you have used and showing your working. Give your estimate to 4 decimal places.

(4)

(3)



Question Number	Scheme	Marks				
5.	(a) $\left(1+\frac{x}{3}\right)^{18} = 1+\binom{18}{1}\cdot\binom{x}{3}+\binom{18}{2}\cdot\binom{x}{3}^2+\binom{18}{3}\cdot\binom{x}{3}^3\cdots$	M1 B1, A1, A1				
	$=1+6x,+17x^{2},+\frac{272}{9}x^{3}$	D1, 111, 111				
	(b) Use $x = 0.1$	[ <b>4</b> ] B1				
	=1+6×0.1+17×(0.1) <sup>2</sup> + $\frac{272}{9}$ ×(0.1) <sup>3</sup> or equivalent	M1				
	= 1.8002	A1cao [3]				
	Notes	7 mai K5				
(a)						
M1: The	method mark is awarded for an attempt at Binomial to get the second third or fourth term – need	to see $\frac{x}{3}$				
used with	a correct power of x and a correct binomial coefficient. Eg $\begin{pmatrix} 18\\ 3 \end{pmatrix} \cdot \begin{pmatrix} x^3\\ 3 \end{pmatrix}$ is fine for M1					
Accept	any notation for ${}^{18}C_1$ , ${}^{18}C_2$ and ${}^{18}C_3$ , e.g. $\begin{pmatrix} 18\\1 \end{pmatrix}$ , $\begin{pmatrix} 18\\2 \end{pmatrix}$ and $\begin{pmatrix} 18\\3 \end{pmatrix}$ (un-simplified) or 18, 153 and	d 816 from				
Pascal's t <b>B1:</b> For t	riangle. This mark may be given if no working is shown, but either or both of the terms including ne first two terms. The coefficient of x may be un simplified, but the 1 <sup>18</sup> must become 1.	g x correct.				
Acce	pt $1+18\left(\frac{x}{3}\right)$ or listed as $1, 6x$					
<b>A1:</b> For e	ither +17x <sup>2</sup> , or + $\frac{272}{9}x^3$ which must be in the simplified form					
A1: is ca	b and is for all of the terms correct and simplified –(ignore extra terms). Accept $30\frac{2}{9}x^3$ or 30.	$2x^{3}$				
It is	OK to write as a list $1, 6x, 17x^2, \frac{272}{9}x^3$					
Remembe	er to isw after the correct answer. (Some students will go on to multiply by 9)					
(b)	1 2					
B1: State M1: This	<b>B1:</b> States or uses $x = 0.1$ or equivalent such as $\frac{1}{10}$ or $\frac{3}{30}$ This must be seen, it is a demand of the question <b>M1:</b> This is for fully substituting their value into their series expansion with at least 4 terms.					
Accept sight of a value of x substituted into their expression as evidence of the M1 but do not allow $x = \frac{31}{30}$ or $\frac{31^{18}}{30}$						
A1: This is for 1.8002 and is cao.						
Note: The calculator answer to $\left(\frac{31}{30}\right)^{18}$ is 1.8044 This scores B0 M0 A0unless $x = 0.1$ is stated and then scores B1						
M0 A0						
Note: A c	Note: A candidate just writing $\left(\frac{31}{30}\right)^{18} = 1.8002$ , the correct answer, scores SC B0 M1 A1					

<b>mme</b> t Pape	Provide     www.mystudybro.com       Information     This resource was created and owned by Pearson Edexcel	
6.	Find the exact values of $x$ for which	
	$2\log_5(x+5) - \log_5(2x+2) = 2$	
	Give your answers as simplified surds.	

(7)

Leave blank

Question Number	Scheme	Marks
6.	Use or state $2\log_5(x+5) = \log_5(x+5)^2$	M1
	Use or states $\log_5(x+5)^2 - \log_5(2x+2) = \log_5\frac{(x+5)^2}{(2x+2)}$ or $\log_5(2x+2) + \log_5 5^2 = \log_5 5^2(2x+2)$ etc	M1
	Use or state $\log_5 25 = 2$	M1
	$(x+5)^2 = 25(2x+2)$ or equivalent	A1
	$x^2 - 40x - 25 = 0$	A1
	Solves their quadratic to give $x = ($ use formula, calculator or completing the square $)$ $x = 20 \pm 5\sqrt{17}$	M1 A1 [7] 7 marks
	Notes	
M1: Uses of M1: Uses of M1: Uses a This may fol $\log_5 10 + \log_5$ incorrect su M1: Conne A1: Correc A1: Obtain M1: Solves A1: CSO x If they Chere are stu Eg $2\log_5(x)$ This studen As they hav Students w	or states $2\log_5(x+5) = \log_5(x+5)^2$ Can be scored without sight of the base 5 of the log ddition (or subtraction) law correctly at least once. Can be scored without sight of the base 5 on the bollow an incorrect line. Eg. $\log_5 2(x+5) - \log_5(2x+2) = \log_5 \frac{2(x+5)}{(2x+2)}$ would be fine for this mark $g_5(2x+2) = \log_5 10(2x+2)$ but $2\log_5(x+5) - \log_5(2x+2) = 2\log_5 \frac{(x+5)}{(2x+2)}$ would not score this mark abtraction law. If the lhs is going to score this mark, the coefficient of "2" must have been dealt with. cts 2 with 25 OR 5 <sup>2</sup> correctly t equation, not involving logs, in any form (un-simplified). <b>Dependent upon all 3 M's being awarded</b> . a 3 TQ <b>Dependent upon all 3 M's being awarded</b> . a 3 TQ by formula, calculator or completing the square to give a surd answer. $= 20\pm 5\sqrt{17}$ reject one of the solutions, usually $x = 20 - 5\sqrt{17}$ then withhold the final mark. dents who make two or more errors and fortuitously manage to form the correct equation. $x+5) - \log_5(2x+2) = 2 \Rightarrow \frac{2\log_5(x+5)}{\log_5(2x+2)} = 2 \Rightarrow \frac{\log_5(x+5)^2}{\log_5(2x+2)} = 2 \Rightarrow \frac{(x+5)^2}{(2x+2)} = 5^2$ t scores M1 (shown) M0 (incorrect subtraction law), M1 (shown). e not scored the 3 M marks they only have access to the final M for a total 3 out of 7 ho start $2\log_5(x+5) = 2\log_5 2 + 2\log_5 5$ will only have access to M3	log as would c as it is led.

Summe Past Paper	r 2018 www.mystudybro r This resource was created and owned	<b>.com</b> by Pearson Edexcel	Mathematic	cs C12 WMA01
7.	A sequence is defined by $u_1 = 3$ $u_{n+1} = u_n - 5$ ,	$n \ge 1$		Leave blank
	Find the values of			
	(a) $u_2, u_3$ and $u_4$		(2)	
	(b) $u_{100}$		(3)	
	(c) $\sum_{i=1}^{100} u_i$		(3)	

16

Quastian		
Number	Scheme	Marks
Tumber		
7.		
(a)	$u_2 = -2$ , $u_3 = -7$ and $u_4 = -12$	M1, A1
	2 2 3 4	[2] B1
(b)	d = -5 and arithmetic	DI
	Uses $a + (n-1) d$ with $a = 3$ and $n = 100$ to give $-492$	M1, A1
		[3]
(c)	n n	
	$S_{100} = \frac{\pi}{2}(2a + (n-1)d) \text{ or } \frac{\pi}{2}(a+l)$	M1
	$S = \frac{100}{(6+99\times-5)} or \frac{100}{(3+-492)}$	dM1
	$S_{100} = 2 \begin{pmatrix} (0 + 3) + (0 + 3) \end{pmatrix} \begin{pmatrix} 0 + 3 \end{pmatrix} $	
	-24 450	A 1
		[3]
		8 marks
	Notes	
(a)		
1		

M1: Attempt to use formula correctly at least twice. ("Subtract 5") Follow through on an incorrect  $u_2$  or  $u_3$  A1: three correct answers

**(b)** 

- **B1:** Assumes AP and uses or states that d = -5. Hence B0 if you see for example d = -5, followed by  $3 \times (-5)^{99}$ . You may assume an AP if you see any AP formula.
- **M1**: Correct formula used and processed correctly. Look for  $3+99\times"d"$  or  $-2+98\times"d'$  with their *d*. The (*n*-1) must be multiplied by *d*.

So, students that write  $S_{100} = a + (n-1)d = 3 + (100-1) - 5 = 97$  score B1 M0 A0 for incorrect processing A1: -492 (cao)

(c)

- M1: States or uses a correct sum formula for an AP with n = 100 with any values for a, d and l
- **dM1**: Uses and processes a correct sum formula for an AP with a = 3 or -2,  $d = \pm 5$  and ft on their l

Note that students who write  $S_{100} = \frac{n}{2} (2a + (n-1)d) = \frac{100}{2} (6 + (100 - 1) - 5) = 5000$  score M1 dM0 A0

A1: Obtains -24 450

Paper	2010	This resource was created and owned by Pearson Edexcel	WMA01
0 7			Leave
<b>8.</b> 1	The equation	$(k-4)x^2 - 4x + k - 2 = 0$ , where k is a constant, has no real roo	ots.
(	(a) Show the	at $k$ satisfies the inequality	
		$k^2 - 6k + 4 > 0$	
			(3)
(	(b) Find the	exact range of possible values for <i>k</i> .	
			(4)

P 5 1 4 0 4 A 0 1 8 4 8

Question Number	Scheme	Marks				
<b>8.</b>	$(h - 4)r^2 - 4rr + h - 2 = 0$					
(a)	(k-4)x - 4x + k - 2 = 0	N/1				
	Uses $b^2 - 4ac$ with $a = k - 4$ , $b = -4$ and $c = k - 2$ Uses $b^2 - 4ac < 0$ or $b^2 < 4ac \rightarrow Ec - 16 - 4(k - 4)(k - 2) < 0 - 16 < 4k^2 - 24k + 32 - cc$	MI dM1				
	Uses $b = 4ac < 0$ of $b < 4ac \Rightarrow Eg$ . $10 = 4(k - 4)(k - 2) < 0$ , $10 < 4k = 24k + 32$ of	Al*				
	proceeds concerny to $\kappa = 0\kappa + 4 > 0 *$	[3]				
(b)	Attempts to solve $k^2 - 6k + 4 = 0$ to give $k =$	M1				
	$\Rightarrow$ Critical values, $k = 3 \pm \sqrt{5}$	A1				
	$k^2 - 6k + 4 > 0$ gives $k > 3 + \sqrt{5}$ (or) $k < 3 - \sqrt{5}$	M1 A1cao				
		[4]				
		7 marks				
<b>X</b> 7	Notes					
You may r (a)	nark (a) and (b) as one whole question					
M1: Attem	pts $b^2 - 4ac$ with $a = k - 4$ , $b = -4$ and $c = k - 2$ condoning one slip. Eg $a = k + 4$					
or use	es the quadratic formula to solve equation					
or use	es the discriminant on two sides of an equation or inequation e.g. $b^2 < 4ac$ or $b^2 = 4ac$ or $b^2 > 4a$	С				
This	cannot be awarded with $a = (k-4)x^2$ , $b = -4x$ and $c = k-2$					
dM1: Use	$b^2 - 4ac < 0$ or $b^2 < 4ac$ with correct a, b and c and forms a correct inequality, in any form, see	n at least				
once before	e the given answer.					
A1*: CSO on the last	. Uses discriminant condition and proceeds to given answer with no errors. The inequality cannot j line. Condone missing bracket on $-4^2 = 16$	ust appear				
(b) M1: Uses f They f	Formula, or completion of square method to find two answers to the given quadratic. may use their calculator to find the answers, implied by awrt 5.24 and 0.76					
A1: Obtain	is the correct critical values $3\pm\sqrt{5}$ (which may be un simplified $\frac{6\pm\sqrt{20}}{2}$ and may be within an	inequality)				
M1: Choose Do not region expr	<b>M1:</b> Chooses outside region ( $k <$ Their Lower Limit $k >$ Their Upper Limit ) for their critical values. Do not award simply for diagram or table. Condone (for this mark) the inclusion of the boundary, or the outside region expressed as $x$ not $k$ .					
A1: $k > 3 + \frac{1}{\sqrt{2}}$ Withhore $3 + \sqrt{2}$	A1: $k > 3 + \sqrt{5}$ (or) $k < 3 - \sqrt{5}$ must be exact. Allow $k > 3 + \sqrt{5} \cup k < 3 - \sqrt{5}$ Withhold if this is given in terms of x, has " <b>and</b> " or " <b>&amp;</b> " between the two inequalities or is just one inequality. $3 + \sqrt{5} < k < 3 - \sqrt{5}$ scores M1 A0					

WMA01

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Leave blank 9. A cyclist aims to travel a total of 1200km over a number of days. He cycles 12km on day 1 He increases the distance that he cycles each day by 6% of the distance cycled on the previous day, until he reaches the total of 1200km. (a) Show that on day 8 he cycles approximately 18 km. (3) He reaches his total of 1200km on day N, where N is a positive integer. (b) Find the value of N. (4) The cyclist stops when he reaches 1200km. (c) Find the distance that he cycles on day N. Give your answer to the nearest km. (2) 20 P 5 1 4 0 4 A 0 2 0 4 8

	Notes	
		9 marks
	= awrt 32km	A1 [2]
(c)	Distance on day N is $1200 - \frac{12((1.00)^{-1})}{1.06 - 1} =$	M1
	10g 1.00 $12((1.06)^{N-1} - 1)$	
	$N = \frac{\log(7)}{\log 1.06} = 33.395 \Longrightarrow N = 34$	[4]
	$(1.06)^N = 7$	Al
	1.06-1	
(b)	$\frac{12(1.06^{N} - 1)}{12} = 1200 \implies r^{N} = k,  k > 0$	M1
	$=12 \times (1.06)^{\prime}$ = 18.04 so approximately 18*.	[3]
	$u_8 - u_7 - 12 \wedge (1.00) =$	A1*
	$u_{1} = ar^{7} = 12 \times (1.06)^{7}$	M1
(a)	Assumes GP and uses or states $r = 1.06$	B1
9.		
Question Number	Scheme	Marks
Quastian		

**B1:** Assumes GP (implied by any GP formula or term by term increase  $\times 1.06$ ) and uses or states r = 1.06 or 106% or 1+6%

**M1:** Uses **correct** formula with **correct** *a*, *r* and *n* 

A1: Obtains awrt 18.0 or awrt 18.04 before writing =  $/ \approx 18$ (km)

You may see just terms. 12, 12.72, 13.48, 14.29, 15.15, 16.06, 17.02, 18.04

Three values correct to 1 dp scores B1. Eight values correct to 1 dp scores M1, with conclusion scores all three marks (b) Now marked M1 A1 M1 A1

**M1:** Uses correct sum formula with their *r* and 1200 and proceeds to  $r^N = k$ , k > 0.

 $\frac{12(1-1.06^{N})}{1-1.06} = 1200$  is also a correct starting point

**A1:** 
$$(1.06)^N = 7$$

M1: Uses a correct method using logs to solve power equation.

May be scored from  $\frac{12(1.06^{N-1}-1)}{1.06-1} = 1200$  or even a term equation

A1: *N*=34 cao It cannot be scored via incorrect inequality work.

It is possible you may see a trial and improvement solution. It is possible to use a tighter interval.

Score M1: Uses GP sum formula with a = 13, r = 1.06 and a value of n,  $33 \le n \le 34$ 

A1: Finds an accurate value for the sum. Note: S (33)= 1168 and S (34) =1250 respectively

M1: Substitutes both 33 and 34 (or a tighter interval spanning 33.395) into the formula and achieves awrt 1168 and awrt 1250 respectively

A1: *N*=34 cao

(c)

M1: For a correct expression or for using 1200 – (sum of their first (*N*-1) days) or 1200 – '1168' via trial and improvement.

A1: 31.88 km or awrt 32km (they do not need to state km)

Please note that there are alternative ways of finding this:Eg.Finds  $12 \times 1.06^{33} - \left(\frac{12(1.06^{34} - 1)}{1.06 - 1} - 1200\right)$ 



A

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question Number	Scheme	Marks
<b>10.</b> (a)	$XZ^{2} = 3^{2} + 3^{2} - 2 \times 3 \times 3\cos 1.3$ , or $\sin 0.65 = \frac{x}{3}$ so $XZ = 2 \times x$	M1
	XZ = 3.63	A1
(b)	Arc length $ZY = 3 \times \theta$ ,= 3 × ( $\pi$ – 1.3 ) (= 5.52 / 5.53)	M1, A1
	Perimeter = $3 + 3 + \operatorname{arc} ZY + \operatorname{chord} XZ = 15.2 \text{ (cm)}$	dM1 A1 [4]
(c)	Area of triangle $OXZ = \frac{1}{2} \times 3 \times 3 \times \sin 1.3$ (=4.34)	M1
	Area of sector is $\frac{1}{2}r^2\theta = \frac{1}{2} \times 3^2 \times (\pi - 1.3)$ (= 8.28 / 8.29)	M1
	Total area is $\frac{1}{2} \times 3^2 \times (\pi - 1.3) + \frac{1}{2} \times 3 \times 3 \times \sin 1.3$	dM1
	$= 12.6 \text{ (cm}^2)$	A1
		[4] 10 marks
	Notes	TO Marks
MI: Uses Or sj Uses A1: awrt (b) M1: Arc le If the A1: Uses a Allow dM1: Com A1: awrt15 (c)	cosine rule – must be correct. Allow $XZ = 3 + 3 - 2 \times 3 \times 3 \cos(3.5)$ , for the M1 plits into right angled triangles correctly, uses sin 0.65 and then doubles the result angles in a triangle rule with the sine rule to find the required side. Eg $\frac{x}{\sin(1.3)} = \frac{3}{\sin(0.92)}$ 3.63 ength formula $r \theta$ with r = 3 and $\theta = 1.3, (\pi - 1.3)$ or $(2\pi - 1.3)$ If decimals are seen accept 1.8 or degree formula is being used look for $\frac{\theta}{360} \times 2\pi r$ with $\theta = 74^{\circ} - 75^{\circ}$ or $\theta = 105^{\circ} - 106^{\circ}$ urc length formula with a correct angle. It does not need to be processed $\sqrt{3(\pi - 1.3), 3 \times 1.84}$ , awrt 5.52/5.53 In degrees look for the minimum accuracy of $\frac{105.5}{360} \times 2\pi \times 10^{\circ}$ uplete method for perimeter. It is dependent upon the previous M. Look for $6 + (a) + \operatorname{arc}$ length 5.2 (cm) – you do not need to see units	5.0
M1: Uses	area formula for triangle correctly. If $\frac{1}{2}bh$ is used it must be the correct combinations found using a	a correct
method	i. 1	
M1: Uses	the formula $\frac{1}{2}r^2\theta$ to find the area of the correct sector. There must be some valid attempt to use the	e correct
an dM1: Add A1: Accep Alt (c)	gle. Allow as a minimum awrt 1.8 radians $(3.1-1.3)$ Is two correct area formulae together. Both M's must have been awarded of awrt 12.6 (do not need units)	
M1: Atten	npts to find the area of the segment $\frac{1}{2} \times 3^2 (1.3 - \sin 1.3)$	
M1: Atten	npts area of semi circle <b>along with</b> the area of segment	
dM1: Fin	ds area of the semi circle - segment $\frac{\pi \times 3^2}{2} - \frac{1}{2} \times 3^2 (1.3 - \sin 1.3)$	
<b>A1:</b> awrt 1	2.6	
-		

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

This resource was created and owned by Pearson Edexcel Past Paper WMA01 Leave blank 11. The curve *C* has equation y = f(x), x > 0, where  $f'(x) = \frac{5x^2 + 4}{2\sqrt{x}} - 5$ It is given that the point P(4, 14) lies on C. (a) Find f(x), writing each term in a simplified form. (6) (b) Find the equation of the tangent to C at the point P, giving your answer in the form y = mx + c, where *m* and *c* are constants. (4) 28 P 5 1 4 0 4 A 0 2 8 4 8

Question		
Number	Scheme	Marks
11. (a)	$\frac{5x^2+4}{2\sqrt{x}} = \frac{5}{2}x^{\frac{3}{2}} + 2x^{-\frac{1}{2}}$	B1
	$f(x) = \frac{\frac{5}{2}x^2}{\frac{5}{2}} + \frac{2x^{\frac{1}{2}}}{\frac{1}{2}} - 5x  (+c)$	M1 A1A1
	Uses $f(4) = 14$ to find $c =$	
	$c = -6$ and so $f(x) = x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 5x - 6$ o.e. e.g $x^{\frac{1}{2}}(x^2 + 4) - 5x - 6$	dM1A1
(b)	Gradient of curve at (4, 14) is $f'(4) = \frac{84}{4} - 5 = 16$	[6] M1 A1
	So $(y - 14) = `16' (x - 4)$ and $y = 16x - 50$	dM1 A1 [ <b>4</b> ]
		10 marks
B1: $2\sqrt{3}$ implied M1: Attem Allow Do no A1: Two of The in A1: All the dM1: Uses A1cao: All	$x^{-1} = \frac{1}{2}x^{2} + 2x^{-2}$ which may have un simplified coefficients. Allow decimal indices. This B mark is by later work. by to integrate - one power, even if incorrect, increased by one. Usually scored for $-5 \rightarrow -5x$ for $x^{\frac{3}{2}} \rightarrow x^{\frac{3}{2}+1}$ at award if the candidate integrates the numerator and denominator without first attempting division of the three terms in <i>x</i> correct un-simplified or simplified– (ignore no constant here). dices must now be simplified. There is no need to have + <i>c</i> x = 4 when $f(x) = 14$ to find numerical value for <i>c</i> (may make slips). They must have attempted to four terms correct simplified with -6 included. You may condone the omission of $f(x) =$	may be n. integrate.
( <b>b</b> ) <b>M1:</b> For an	attempt to substitute $x = 4$ into $f'(x) = \frac{5x^2 + 4}{2\sqrt{x}} - 5$ or their 'simplified' function from (a). Also all	low a
candida Look incorre	the to differentiate their answer to part (a) and substitute $x = 4$ in the result. for evidence but allow f ' (4) = Condone slips (eg. forgetting to subtract 5) BUT do not allow the ct value just appears from nowhere. (4) = 16	iis if an
<b>dM1:</b> Line	ar equation with their gradient through (4,14). It must be their $f'(4)$ and not a "normal"	
If th A1: cao: y	ey use the form $y = mx + c$ they must proceed as far as $c =$ = $16x - 50$	

DO NOT WRITE IN THIS AREA

	т
<b>12.</b> [ <i>In this question solutions based entirely on graphical or numerical methods are not acceptable.</i> ]	blan
(i) Solve for $0 \le x < 360^\circ$ ,	
$5\sin(x+65^\circ)+2=0$	
giving your answers in degrees to one decimal place.	(4)
(ii) Find, for $0 \leq \theta < 2\pi$ , all the solutions of	
$12\sin^2\theta + \cos\theta = 6$	
giving your answers in radians to 3 significant figures.	(6)
32	

Question Number	Scheme	Marks	
12 (i)	$\sin() = -\frac{2}{-1}$	M1	
	5		
	$\dots = -23.6^{\circ} \text{ (or } 203.6^{\circ} \text{ or } 336.4^{\circ} \text{)}$	A1	
	So $x = 138.6^{\circ}$ or 271.4° (allow awrt)	dM1 A1	-
		[4	J
( <b>ii</b> )	$12(1 - \cos^2 \theta) + \cos \theta = 6$	M1	
	$12(1 + \cos \theta) + \cos \theta = 0$	dM1	
	Solves their three term quadratic " $12\cos^2\theta - \cos\theta - 6 = 0$ " to give roots	CIVI I	
	$S_{0}(\cos \theta -) -\frac{2}{2} \text{ or } \frac{3}{2}$		
	$30(\cos \theta - \frac{1}{3})^{-1}$	Al	
	0, 220, 200, 0.702  or  5.56	M1 A1 A1	
	$\theta = 2.50, 5.98, 0.72501, 5.50$	[6	]
		10 marks	
	Notes		
(i)			
<b>M1:</b> As in s	cheme. Allow for invsin $\left(\frac{2}{5}\right) = 23.6^{\circ}$ or one of the given angles.		
(In radi	ans allow for awrt 0.41, 2.73)		
A1: Require	es one of the answers given in the scheme. This is implied by a correct final answer		
dM1. Requires one of the answers given in the scheme. This is implied by a correct rinar diswer $dM1$ . For subtracting 65 from any of <b>their</b> answers. Dependent upon the first M. Allow for $-88.6$			
This may be implied by one of the final answers			
A1: cao (	Work in radians gets first M mark only unless all converted inc 65). Withhold this mark if		
there are any extra solutions within the range 0 to 360 degrees.			
(ii)			
<b>M1:</b> Attempts to use $\sin^2 \theta = (1 - \cos^2 \theta)$			
dM1 · Solve	s three term quadratic and proceeds to find roots		
This is implied by the sight of $+$ the correct values			
2 $3$			
<b>A1</b> : For –	$\frac{2}{3}$ or $\frac{3}{4}$		
M1: Uses inverse cosine to obtain a correct value of $\theta$ for their $\cos \theta$ Allow in degrees (nearest			
degree) or radians (to 1 dp) Do not allow this on trivial values such as $\cos \theta = 0$ or $\pm 1$			
A1: Two angles correct in degrees or radians. Degree answers are awrt 41 4 319 132 228			
A1: All four correct (awrt) and no extra's. Condone 2.3 for 2.30			
Allow multiples of $\pi$ So allow awrt $0.732\pi, 1.267\pi, 0.230\pi, 1.770\pi$			

DO NOT WRITE IN THIS AREA

aper	This resource was created and owned by Pearson Edexcel		WMA
			Lea
<b>13.</b> The point $A($	9, $-13$ ) lies on a circle <i>C</i> with centre the origin and radius <i>r</i> .		
(a) Find the	a avaat value of r		
(a) rind the		(2)	
(b) Find an	equation of the circle C.	(1)	
		(1)	
A straight lin	he through point A has equation $2y + 3x = k$ , where k is a constant.		
(c) Find the	e value of k.		
		(1)	
This straight	line cuts the circle again at the point $B$		
Tine Straight	and the there again at the point <i>D</i> .		
(d) Find the	e exact coordinates of point <i>B</i> .		
		(0)	
			1
36			

Scheme	Marks	
See $(9)^2 + (\pm 13)^2 = r^2$	M1	
$r = \sqrt{250} = 5\sqrt{10}$	A1	[0]
		[2]
$x^2 + y^2 = 250$	B1	[1]
	<b>D</b> 1	[1]
Substitute $x = 9$ when $y = -13$ to give $k = 1$	DI	[1]
Attempts to combine $2y + 3r - k$ and their $r^2 + y^2 - r^2$	M1	[-]
Attempts to combine $2y + 3x = k$ and then $x + y = k$		
i.e. $13x^2 - 6x - 999 = 0$ or when $13y^2 - 4y - 2249 = 0$	A1	
Solve to give $x = (or y = )$	M1	
Substitute to give $y = (or x = )$	M1	
(111 173)	. 1 . 1	
$\left[-\frac{111}{12},\frac{173}{12}\right]$	AI AI	[(1)
		[0]
	(10	
	marks)	)
Notes		
	Scheme See $(9)^2 + (\pm 13)^2 = r^2$ $r = \sqrt{250} = 5\sqrt{10}$ $x^2 + y^2 = 250$ Substitute $x = 9$ when $y = -13$ to give $k = 1$ Attempts to combine $2y + 3x = k$ and their $x^2 + y^2 = r^2$ i.e. $13x^2 - 6x - 999 = 0$ or when $13y^2 - 4y - 2249 = 0$ Solve to give $x = (or y = )$ Substitute to give $y = (or x = )$ $\left(-\frac{111}{13}, \frac{173}{13}\right)$ Notes	Scheme         Marks           See $(9)^2 + (\pm 13)^2 = r^2$ M1 $r = \sqrt{250} = 5\sqrt{10}$ A1 $x^2 + y^2 = 250$ B1           Substitute $x = 9$ when $y = -13$ to give $k = 1$ B1           Attempts to combine $2y + 3x = k$ and their $x^2 + y^2 = r^2$ M1           i.e. $13x^2 - 6x - 999 = 0$ or when $13y^2 - 4y - 2249 = 0$ A1           Solve to give $x = (or y = )$ M1         M1 $\left(-\frac{111}{13}, \frac{173}{13}\right)$ M1         A1 A1           (10         marks)         Notes

(a)

**M1** : Allow for a correct expression for  $r^2$  or r Implied by awrt 15.8

The method is scored for the distance from (9, -13) to the origin. Some candidates are finding the formula for a circle centre (9, -13) passing through the origin.

A1: For  $\sqrt{250}$  or  $5\sqrt{10}$  Either value implies the previous M. (See above).

(b)

**B1:** Accept any multiple of  $x^2 + y^2 = 250$ 

Even accept  $(x \pm 0)^2 + (y \pm 0)^2 = 250$ ,  $x^2 + y^2 = (\sqrt{250})^2$ ,  $x^2 + y^2 = (5\sqrt{10})^2$  and  $x^2 + y^2 = \sqrt{250}^2$ 

(c)

**B1:** k = 1 stated or implied by 2y + 3x = 1 (d)

M1: Eliminates x or y from their two equations to get an equation in just one variable. Allow with a numerical or algebraic k

The two equations must be of the form 2y + 3x = k and  $(x \pm a)^2 + (y \pm b)^2 = r^2$ 

Do not allow the circle equation to be incorrectly simplified to  $y = 5\sqrt{10} - x$ 

A1: Correct 3TQ equation in x or in y. The three terms need not be on the same side of the equation, just look

for the correct 3 terms. You may see "  $\frac{13}{4}y^2 - y = \frac{2249}{4}$  " for instance

**M1:** Solve a 3TQ, using a correct method, to give at least one value of *x* or *y*.

If a calculator is used 2sf is OK. You will have to use a calculator to check.

M1: Substitute x or y (in either equation) to give a value for y or x that is not -13 or 9.

It is dependent upon having started with allowable equations and having solved a 2 or 3 term quadratic equation by a correct method.

A1: One correct coordinate  $x = -\frac{111}{13} or - 8\frac{7}{13}$ ,  $y = \frac{173}{13} or 13\frac{4}{13}$ 

A1: Both correct answers. See above. Allow separately (not in coordinate form)

NOTE: It is possible to solve this question by geometry where *M*, the mid-point of the chord *AB* is found by solving 2y + 3x = 1 and  $y = \frac{2}{3}x$  simultaneously.

Past Paper

14.

## Mathematics C12

WMA01



- (c) Use your answer to part (b) to find the coordinates of the point where the curve  $C_{2}$ meets the *y*-axis.
- (d) Write down the coordinates of the two turning points on the curve  $C_2$
- (e) Sketch the curve  $C_2$ , with equation y = f(x + 1), giving the coordinates of the points where the curve crosses or touches the *x*-axis.

(3)

(1)

(2)

(2)



Question Number	Scheme	Marks
<b>14.</b> (a)	$f(x) = (x-2)^2(2x+1) = 2x^3 - 7x^2 + 4x + 4$	M1
	So $f'(x) = 6x^2 - 14x + 4$	M1 A1
	Puts $f'(x) = 0$ and solves three term quadratic to obtain for example $2(3x - 1)(x - 2) = 0$ so $x =$	M1
	$x = \frac{1}{3}  (\text{with } x = 2)$	A1
	Calculates f(their x) and find y $\Rightarrow \left(\frac{1}{3}, \frac{125}{27}\right)$ Allow $x = \frac{1}{3}, y = 4\frac{17}{27}$	dM1 A1 [7]
(b)	$y = (x-1)^2(2x+3)$	B1
(c)	When $x = 0, y = 3$	[1] M1 A1 [2]
(d)	$(1, 0) \text{ and } \left(-\frac{2}{3}, \left(\frac{125}{27}\right)\right)$	M1 A1ft [ <b>2</b> ]
(e)	M1: Shape same as before, +ve cubic, but moved. Don't be overly concerned about the position of the maximum point. A1: Shape same as before but moved to the <b>left</b> (maximum must be in second quadrant and minimum on +ve <i>x</i> - axis) and graph lies in three quadrants A1: (1,0) and (-1.5,0) or marked on the x axis as 1 and -1.5	M1 A1 A1 [3]
		15 marks
	Notes	

(a) M1: Expand brackets, must have a four term cubic with or without collected terms. M1: Differentiates to a quadratic-reduction of a power by one seen at least once A1: Completely correct  $f'(x) = 6x^2 - 14x + 4$ M1: Puts their derivative = 0 and solves to find the other root to '2'. The derivative must be a 3TQ expression. A1: Allow exact equivalences including recurring decimals. May include x = 2**dM1:** Substitutes their 1/3 into f(x) to find the y coordinates. Implied by y = awrt 4.63 Dependent upon previous M A1:  $x = \frac{1}{3}$ ,  $y = \frac{125}{27}$  must be exact. Allow mixed numbers, allow recurring decimals The first 3 marks could be done by the product rule **M1:** For  $f'(x) = A(x-2)^2 + B(2x+1)(x-2)$ **M1 A1**: For  $f'(x) = 2(x-2)^2 + 2(2x+1)(x-2)$ (b) **B1:** cao. Must be in the form  $y = \dots$  or f(x) = or f(x+1) =Allow  $y = 2(x+1)^3 - 7(x+1)^2 + 4(x+1) + 4$  You may isw after seeing this Do not allow the mark if the function is left in the form  $y = (x+1-2)^2(2(x+1)+1)$ (c) M1: Puts x = 0 into their new function. Allow embedded values or correct ft. A1: y = 3 The function must have been correct, but not necessarily simplified, to score this mark. Condone lack of y = if the candidates work implies that y is being found at x = 0(d) M1: Either coordinate pair correct. Follow through their point P. So (1,0) or (a - 1, b) where P had coordinates (a, b)A1ft: Both pairs correct, follow through only on the y coordinate of P You may condone a decimal approximation such as 0.33 So if  $P = \left(\frac{1}{3}, 2\right)$  the answer of (1, 0) and  $\left(-\frac{2}{3}, 2\right)$  would score M1 A1ft Note: If they do differentiate again they only score the marks as above. They cannot be awarded from the sketch in (e) (e) M1: Curve moved in any way. Evidence could be, for example, the maximum to the left of the y axis or the minimum not on the x axis or a point adapted. Be tolerant on slips in shape. A1: Shape same as before but translated to the left (maximum must be in second quadrant and minimum on +ve x - axis) and graph lies in three quadrants. If the maximum looks on the y - axis, do not allow. A1: For the new curve having a minimum point on the x axis at (1,0) and passing through the x axis at -1.5. Allow this mark if it just stops at the x axis at -1.5. (It would lose the earlier A1 for not appearing in quadrant 3) Watch for the curve been superimposed on Figure 2. If it appears twice, on blank page and on Figure 2, the blank page takes precedence. Be tolerant of slips on shape especially for the M1. Also do not penalise changes in height as we need to mark this attempt in exactly the same way as an attempt on its own.

# **Mathematics C12**







Question Number	Scheme	Marks
15.	Line $y = 8x + 38$ and curve $y = 4x^2 + 6$ , $-2 < x < 5$	
	Way 1: Integrates separately	
(a)	Attempts integration $\int (4x^2 + 6)dx = \frac{4x^3}{3} + 6x$	M1 A1
	Uses limits and finds area under curve $\left[\frac{4x^3}{3}+6x\right]_{-2}^4 = \left((109\frac{1}{3})-(-22\frac{2}{3})=132\right)$	dM1 A1
	Full method: Area under trapezium $\frac{1}{2} \times (4+2)(22+70) - "132"$ or	M1
	$\left[4x^{2}+38x\right]^{4}$ -"132"	
	So area = $276 - 132 = 144$	A1
(b)		[6]
(0)	Attempts to find area of $R_2$ <i>i.e.</i> $\left  \frac{4x^3}{2} + 6x \right ^2 - \frac{(5-4)(70+78)}{2}$	
		M1
	So area of $R_2 = 196\frac{2}{3} - (109\frac{1}{3}) - 74 = 13\frac{1}{3}$	A1
	Total Area shaded = $144 + 13\frac{1}{3} = 157\frac{1}{3}$	A1
		[3]
(c)	(k) = 10.8 oe Way 2: Integrates line - curve	BI [I]
(a)	Subtracts, and integrates: $\pm \int \{(8x+38) - (4x^2+6)\} dx = \pm \left\{8\frac{x^2}{2} + 38x - \frac{4x^3}{3} - 6x\right\}$	M1 A1
	Uses correct limits $\pm \left[ +4x^2 + 32x - \frac{4x^3}{3} \right]_{2}^{4} = \left( 106\frac{2}{3} \right) - \left( -37\frac{1}{3} \right)$	dM1 A1
	Full method (awarded on line 1) So area $R_1 = 144$	M1 A1
(b)		[6]
	Attempts to find the area of $R_2$ using correct limits $\pm \left[-4x^2 - 32x + \frac{4x^3}{3}\right]_4 = \left(106\frac{2}{3}\right) - \left(93\frac{1}{3}\right)$	M1
	So area of $R_2 = 13\frac{1}{3}$	A1
	Total Area shaded = $144 + 13\frac{1}{3} = 157\frac{1}{3}$	A1 [3]
(c)	(k) = 10.8 oe	B1 [1]
	Notes	

Way 1: Integrates separately. Note that this is now scored M1 A1 M1 A1 M1 A1 (a) M1: Correct integration method for  $\int (4x^2 + 6)dx$  – increase power by one A1:  $\frac{4x^3}{3} + 6x$ **dM1**: Uses limits 4 and -2 within an integrated function – see some embedded values unless implied by correct answer A1: For achieving 132 **M1**: For a full attempt at the area of  $R_1$ Look for the area of the trapezium or the area under line (by integration) and subtract their 132  $\frac{1}{2} \times 6 \times (22 + 70) - "132"$  or  $\left[ 4x^2 + 38x \right]^4 - "132"$  either way around. Eg. A1: 144 (b) M1: Uses limits 5 and 4 either way round in their  $\frac{4x^3}{3} + 6x$  and subtracts (or subtracts from) the area of a trapezium  $\frac{1}{2} \times 1 \times ("78"+70)$  The 78 must have been attempted using a correct method. (Not using the quadratic function) Alternatively Uses limits 5 and 4 either way round in their  $\frac{4x^3}{3} + 6x$  and their  $4x^2 + 38x$  and subtracts either way A1: For  $\pm 13\frac{1}{3}$  (may be implied by final answer) Allow alternative/international forms 13.3 and 13.3 for recurring **A1:** For  $157\frac{1}{2}$ (c) B1: For 10.8 oe Way 2 : Integrates a combined function (Eg. line -curve) Note that this is now scored M1 A1 M1 A1 M1 A1 M1: Attempts to combine (hopefully subtract) and integrate. Correct integration method – increase power by one seen at least once. Condone bracketing error. It can be scored if they add. (Penultimate M mark is not scored) A1: For  $\pm \left( 4x^2 + 32x - \frac{4}{3}x^3 \right)$  This may be left un-simplified dM1: Uses the limits 4 and -2 within an integrated function- see some working either embedded value or (...) - (...) A1: Correct values seen, either embedded or as in scheme (...) - (...) for  $\pm \left(4x^2 + 32x - \frac{4}{3}x^3\right)$ M1: For a full method. This is implied by line 1 with the functions subtracted. Condone bracketing issues A1: For 144 following correct work. (b) M1: Uses limits 5 and 4 either way round in their  $\pm \left(4x^2 + 32x - \frac{4}{3}x^3\right)$  or the result of their subtracted functions A1: For  $\pm 13\frac{1}{3}$  (may be implied by final answer) You may see the alternative forms for recurring. **A1:** For  $157\frac{1}{3}$ (c) **B1**: For 10.8 oe Note the demand of the question is "use integration" If candidate writes Area =  $\int_{-2}^{4} \left\{ (8x+38) - (4x^2+6) \right\} dx = 144$  they can score SC M0 A0 M1 A0 M1 A0 If candidate writes Area =  $\int_{-2}^{4} \{(8x+38) - (4x^2+6)\} dx = \left[4x^2 + 38x - \frac{4}{3}x^3 - 6x\right]^4 = 144$  they can score M1 A1 M1 A1 M1 A1