



Mark Scheme (Results)

Summer 2018

Pearson Edexcel GCE AS Mathematics

Pure Mathematics (8MA0/01)

Edexcel and BTEC Qualifications

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Summer 2018

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General Marking Guidance

- x All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.
- x Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- x Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- x All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the answer does not match the mark scheme. This includes zero marks for answers that are incomplete or do not address the question.

FDQGLGDWH¶V UHVSQRVH LV QRW ZRUWK\ RI FUHGLW DFFR
- x Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification/indicative content will not be exhaustive.
- x When examiners are in doubt regarding the application of the mark scheme to a particular answer, they should refer to the mark scheme for the awarding of marks.

D FDQGLGDWH¶V UHVSQRVH D VHQLRU H[DPLQH ark BXVW EH
- x Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

General Instructions for Marking

1. The total number of marks for the paper is 100

2. These mark schemes use the following types of marks:

- x M PDUNV 0HWKRG PDUNV DUH DZDUGHG IRU μNQRZLQJ D PH WR DSSO\ LW¶ XQOHVV RWKHUZZLVH LQGLFDWHG
- x A marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
- x B marks are unconditional accuracy marks (independent of M marks)
- x Marks should not be subdivided.

3. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes.

- x bod ±benefit of doubt
- x ft ±follow through

- x the symbol will be used for correct ft
- x cao ±correct answer only
- x cso - correct solution only. There must be no errors in this part of the question to obtain this mark
- x isw ±ignore subsequent working
- x awrt ±answers which round to
- x SC: special case
- x o.e. ±or equivalent (and appropriate)
- x d or dep ±dependent
- x indep ±independent
- x dp decimal places
- x sf significant figures
- x ¿ The answer is printed on the paper or ag - answer given

4. All M marks are follow through.

\$ PDUNV DUH μFRUUHFW DQVZHU RQO\¶ FDR XQOHVV VKRZQ indicate that previous wrong working is to be followed through. After a misread KRZHYHU WKH VXEVHTXHQW \$ PDUNV DIIHFWHG DUH WUHDWHG logically make sense e.g. if an answer given for a probability is >1 or <0, should never be awarded A marks.

5. For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected.

6. Where a candidate has made multiple responses and indicates which response they wish to submit, examiners should mark this response.

If there are several attempts at a question which have not been crossed out, examiners should mark the final answer which is the answer that is the most complete.

General Principles for Core Mathematics Marking

(But note that specific mark schemes may sometimes override these general principles).

Method mark for solving 3 term quadratic:

1. Factorisation

, leading to «

, leading to «

2. Formula

Attempt to use correct formula (with values for a, b and c).

3. Completing the square

Solving : , leading to «

Method marks for differentiation and integration:

1. Differentiation

Power of at least one term decreased by 1. ()

2. Integration

Power of at least one term increased by 1. ()

Use of a formula

Where a method involves using a formula that has been learnt, the advice given is that the formula should be quoted first.

Normal marking procedure then as follows:

Method mark for quoting a correct formula and attempting to use it, even if there are small mistakes in the substitution of values.

Where the formula is not quoted, the method mark can be gained by implication correct working with values, but may be lost if there is any mistake in the working.

Exact answers

([D P L Q H U V | U H S R U W V K D Y H H P S K Exact answers are required for Z K H U H I R working with surds is clearly required, marks will normally be lost if the candidate resorts to using rounded decimals.

Answers without working

The rubric says that they can not gain full credit. Individual mark schemes will give details Z K D W K D S S H Q V L Q S D U W L F X O D U F D V H V * H Q H U D O S R O L F \ I detailed working would not be required. Most candidates do show working, but there are occasional awkward cases and if the mark scheme does cover this, please contact your team leader for advice.

AS Mathematics
Paper 8MA0 01 June 2018 Mark Scheme

Question	Scheme	Marks	AOs
1			
	Attempts to integrate awarded for any correct power	M1	1.1a
	=	A1	1.1b
	=	A1	1.1b
	=	A1	1.1b
(4 marks)			
Notes			
<p>M1: Allow for raising power by one. Award for any correct power including sight of</p> <p>A1: Correct two non fractional terms (may be unsimplified at this stage)</p> <p>A1: Correct fractional power term (may be unsimplified at this stage)</p> <p>A1: Completely correct simplified and including constant of integration on one line Simplification is expected for full marks.</p> <p>Accept correct exact equivalent expressions such as</p> <p>Accept</p> <p>Remember to isw after a correct answer.</p> <p>Condone poor notation. Eg answer given as</p>			

Question	Scheme	Marks	AOs
3(a)	Attempts subtraction or similar	M1	1.1b
		A1	1.1b
		(2)	
(b)	Finds length using 'Pythagoras'	M1	1.1b
		A1ft	1.1b
		(2)	

(4 marks)

Notes

(a)

M1: Attempts subtraction either way around.

This may be implied by one correct component

There must be some attempt to write in vector form.

A1: cao (allow column vector notation but not the coordinate)

Correct notation should be used. Accept or but not

(b)

M1: Correct use of Pythagoras theorem or modulus formula using their answer to (a)

Note that is also correct.

Condone missing brackets in the expression

Also allow a restart usually accompanied by a diagram.

A1ft: ft from their answer to (a) as long as it has both i and j component.

It must be simplified, if appropriate. Note that would be M1 A0

Note that, in cases where there is no working, the correct answer implies M1A1 in each part of this question

Question	Scheme	Marks	AOs
4	States gradient of $y = 2x + 3$ is 2 or or rewrites as $y - 3 = 2x$	B1	1.1b
	Attempts to find gradient of line joining $(1, 2)$ and $(3, 4)$	M1	1.1b
		A1	1.1b
	States neither with suitable reasons	A1	2.4
		(4)	
(4 marks)			
Notes			
B1: States that the gradient of line is 2 or writes 2 in the form			
M1: Attempts to find the gradient of line using $\frac{y_2 - y_1}{x_2 - x_1}$ Condone one sign error. Eg allow			
A1: For the gradient of $y = 2x + 3$ or the equation of $y - 3 = 2x$			
Allow for any equivalent such as 2 or 2.0			
A1: CSO (on gradients)			
Explains that they are neither parallel as the gradients not equal or perpendicular as			
oe			
Allow a statement in words "they are not negative reciprocals " for a reason for not perpendicular and "they are not equal" for a reason for not being parallel			

Question	Scheme	Marks	AOs
5 (a)	Identifies one of the two errors "You cannot use the subtraction law without dealing with the 2 first terms" " They undo the logs incorrectly. It should be $\log(x^2) = 2\log(x)$ "	B1	2.3
	Identifies both errors. See above.	B1	2.3
		(2)	
(b)		M1	1.1b
	or	M1	1.1b
		A1	1.1b
		(3)	
(5 marks)			
<p>(a)</p> <p>B1: States one of the two errors. Error One Either in words states "You cannot use the subtraction law without dealing with the 2 first terms" or "They undo the logs incorrectly. It should be $\log(x^2) = 2\log(x)$" If they rewrite line two it must be correct. Do not accept an incomplete response such as "the student ignored the 2" there must be some reference to the subtraction law as well Error Two "They undo the logs incorrectly. It should be $\log(x^2) = 2\log(x)$" or "writes that $\log(x^2) = 2\log(x)$" If it is rewritten it must be correct. Eg $\log(x^2) = 2\log(x)$ is B0</p> <p>B1: States both of the two errors (See above)</p> <p>(b)</p> <p>M1: Uses a correct method of combining the two log terms. Either uses both the power law and the subtraction law to reach a form $\log(x^2) = 2\log(x)$ or uses both the power law and subtraction law to reach $\log(x^2) = 2\log(x)$</p> <p>M1: Uses correct work to "undo" the log. Eg moves from $\log(x^2) = 2\log(x)$ to $x^2 = 10^{2\log(x)}$ This is independent of the previous mark so allow following earlier error.</p> <p>A1: $\log(x^2) = 2\log(x)$ achieved with at least one intermediate step shown. Extra solutions would be A0</p> <p>SC: If the "answer" rather than the "solution" is given score 0,0.</p>			

Question	Scheme	Marks	AOs
6 (a)	Attempts	M1	3.4
	not sensible as the company would make a loss	A1	2.4
		(2)	
(b)	Uses or	M1	3.1b
		dM1	1.1b
	Minimum Price = £7.2	A1	3.2a
		(3)	
(c)	States (i) maximum profit = £ 100 000 and (ii) selling price £9	B1	3.2a
		B1	2.2a
		(2)	

(7 marks)

(a)

M1: Substitutes into and attempts to calculate. This is implied by an answer of . Some candidates may have attempted to multiply out the brackets before to substitute in the $x = 15$. This is acceptable as long as the function obtained is quadratic. There must be a calculation seen or implied by the value of

A1: Finds or states that and explains that (this is not sensible) the company would make a loss

Condone followed by an explanation that it is not sensible as the company would make a loss of £125 rather than £125 000. An explanation that it is not sensible as "the profit cannot be negative", "the profit is negative" or "the company will not make any money", "they might make a loss" is incomplete/incorrect. You may ignore any misconceptions reference to the price of the toy being too cheap for this mark.

Alt: M1: Sets $P = 0$ and finds A1: States and states makes a loss

(b)

M1: Uses and proceeds to

where $k > 0$ and

Eg. Condone where $k > 0$ If the candidate

attempts to multiply out then allow when they achieve a form

dM1: Award for solving to find the two positive values for. Allow decimal answers

FYI correct answers are

Accept

Condone incorrect inequality work

Alternatively award if the candidate selects the lower of their two positive values

A1: Deduces that the minimum Price = £7.2 (£7.21 is not acceptable)

(c)

(i) B1: Maximum Profit = £ 100 000 with units. Accept 100 thousand pounds

(ii) B1: Selling price = £9 with units

SC1: Missing units in (b) and (c) only penalise once in these parts, withhold the final mark

SC 2: If the answers to (c) are both correct but in the wrong order score SC B1 B0

If (i) and (ii) are not written out score in the order given.

Question	Scheme	Marks	AOs
7 (a)	Uses	M1	1.1b
	oe	A1	1.1b
	Uses	M1	2.1
		A1	1.1b
		(4)	
(b)	Uses	M1	3.1a
		A1	1.1b
		(2)	

(6 marks)

Notes

(a)

M1: Uses the formula in an attempt to find the value of or

A1: oe This may be implied by or awrt 0.644 (radians)

M1: Uses their value of to find two values of This may be scored via the formula or by a triangle method. Also allow the use of a graphical calculator candidates may just write down the two values. The values must be symmetrical

A1: or Condone these values appearing from

(b)

M1: Uses a suitable method of finding the longest side. For example chooses the negative value (or the obtuse angle) and proceeds to BC using the cosine rule. Alternatively works out BC using both values and chooses the larger value. If stated the cosine rule should be correct (with minus sign). Note if the sign is +ve and the acute angle is chosen the correct value will be s is however M0 A0

A1:

Question	Scheme	Marks	AOs
8 (a)(i)		M1 A1	3.1b 1.1b
	Sets	M1	1.1b
		A1	1.1b
(ii)	For substituting their in	M1	3.4
	Minimum cost =awrt(£) 93	A1 ft	1.1b
		(6)	
(b)	Finds at	M1	1.1b
	hence minimum(cost)	A1 ft	2.4
		(2)	
(c)	It would be impossible to drive at this speed over the whole journey	B1	3.5b
		(1)	

(9 marks)

Notes

(a)(i)

M1: Attempts to differentiate (deals with the powers correctly)

Look for an expression for in the form

A1:

A number of students are solving part (a) numerically or graphically. Allow these students to up the M1 A1 here from part (b) when they attempt the second derivative.

M1: Sets (which may be implied) and proceeds to an equation of the type

Allow here equations of the type

A1: or awrt 90.8 .

As this is a speed withhold this mark for answers such as

* Condone appearing as or perhaps not appearing at all. Just look for the rhs.

(a)(ii)

M1: For a correct method of finding $C =$ from their solution to .

Do not accept attempts using negative values of

Award if you see where they used is their solution to (a)(i)

A1ft: Minimum cost = awrt (£) 93. Condone the omission of units

Follow through on sensible values of

v	C
60	95.9
65	94.9
70	94.2
75	93.6
80	93.3
85	93.1
90	93.0
95	93.1
100	93.2
105	93.4
110	93.6

(b)

M1: Finds (following through on their which must be of equivalent difficulty) and attempts to find its value / sign at their

Allow a substitution of their answer to (a) (i) their

Allow an explanation into the sign of from its terms ($as > 0$)

A1ft: hence minimum (cost) Alternatively $asv > 0$

Requires a correct calculation or expression, a correct statement and a correct conclusion

Follow through on their ($v > 0$) and their

* Condone appearing as or not appearing at all for the M1 but for the A1 the correct notation must be used (accept notation).

(c)

B1: Gives a limitation of the given model, for example

x It would be impossible to drive at this speed over the whole journey

x The traffic would mean that you cannot drive at a constant speed

Any statement that implies that the speed could not be constant is acceptable.

Question	Scheme	Marks	AOs
9(a)		M1	1.1b
	is a factor	A1	2.4
		(2)	
(b)		M1	1.1b
		A1	1.1b
		M1	1.1b
		A1	1.1b
		(4)	
(c)	(i)	M1 A1ft	1.1b 1.1b
	(ii)	B1ft	2.2a
		(3)	

(9 marks)

(a)

M1: Attempts Some sight of () embedded or calculation is required.

So expect to see embedded

Or condoning slips for the M1

Any attempt to divide or factorise is M0. (See demand in question)

A1: is a factor.

Requires a correct statement and conclusion both " " and" is a factor must be seen in the solution. This may be seen in a preamble before but in these cases there must be a minimal statement ie QED, "Proved", tick etc.

Also accept, in one coherent sentence $H [S O D Q D W L R Q x y = 0 \text{ when } D V, \mu D V$ is a factor.¶

(b)

M1: Attempts to divide by May be seen and awarded from part (a)

If inspection is used expect to see

If algebraic / long division is used expect to see

A1: Correct quadratic factor is may be seen and awarded from part (a)

M1: Attempts to factorise their usual rule

A1: oeseen on a single line is also correct

Allow recovery for all marks for

(c)(i)

M1: For identifying that the solution will be where the curve is on or below the axis. Award for either or Follow through on their only where (that is a positive root) Condone See SC below for

Question	Scheme	Marks	AOs
10	Considers	B1	2.1
	Expands	M1	1.1b
	so gradient(of chord)=	A1	1.1b
	States as	A1*	2.5

(4 marks)

B1: Gives the correct fraction for the gradient of the chord either or

It may also be awarded for oe. It may be seen in an expanded form

It does not have to be linked to the gradient of the chord

M1: Attempts to expand or Look for two correct terms, most likely

This is independent of the B1

A1: Achieves gradient (of chord) is or exact un simplified equivalent such as . Again, there is no requirement to state that this expression is the gradient of the chord

A1*: CSO. Requires correct algebra and making a link between the gradient of the chord and gradient of the curve. See below how the link can be made. The words "gradient of the chord" do not need to be mentioned but derivative, should be

Condone invisible brackets for the expansion of as long as it is only seen at the side as intermediate working.

Requires either

x

x Gradient of chord As Gradient of chord tends to the gradient of curve so derivative is

x

x Gradient of chord = when gradient of curve

x Do not allow alone without limit being considered somewhere:

V R Gacp W

Alternative: B1: Considers

M1: As above A1:

Question	Scheme	Marks	AOs
11(a)		M1	1.1b
		B1	1.1b
		A1	1.1b
		A1	1.1b
		(4)	
(b)	Sets	M1	1.1b
	oe	A1 ft	1.1b
		(2)	
(c)	Sets	M1	2.2a
	oe	A1	1.1b
		(2)	
			(8 marks)
11(a) alt		M1	1.1b
		B1	1.1b
		A1	1.1b
		A1	1.1b
Notes			
<p>(a)</p> <p>M1: Attempts the binomial expansion. May be awarded on either term two and/or term three Scored for a correct binomial coefficient combined with a correct power of 2 and a correct p of Condone for term three.</p> <p>Allow any form of the binomial coefficient. Eg</p> <p>In the alternative it is for attempting to take out a factor of 2 (may allow outside bracket) and having a correct binomial coefficient combined with a correct power of</p>			

B1: For 512

A1: For

A1: For Allow even following

Listing is acceptable for all 4 marks

(b)

M1: For setting their and proceeding to find a value for Alternatively they could substitute into both sides of the identity and proceed to find a value a. for

A1 ft: oe Follow through on

(c)

M1: Condone following through on their 512, their and using their value of "a" to find a value for "b"

A1: oe

Question	Scheme	Marks	AOs
12 (a)		M1	1.2

	oe	A1	1.1b
		M1	1.1b
	*	A1*	2.1
		(4)	
(b)	For attempting to solve given quadratic	M1	1.1b
		B1	1.1b
		M1	1.1b
		A1	2.2a
		(4)	

(8 marks)

Notes

(a)

M1: Recall and set the identity Note that it cannot just be stated.

A1: oe

This is scored for a correct line that does not contain fractional terms

It may be awarded later in the solution after the identity has been used Eg for or equivalent

M1: Attempts to set the correct identity to form an equation in just

A1*: Proceeds to correct answer through rigorous and clear reasoning. No errors in notation bracketing For example is an error in notation

(b)

M1: For attempting to solve the given quadratic" " where y could be or even just. When factoring look for where and

This may be implied by the correct roots (even award for), an attempt at factorising, an attempt at the quadratic formula, an attempt at completing the square and the correct roots.

B1: For the roots oe

M1: Finds at least one solution for x from within the given range for their

A1: only Withhold this mark if there are any other values even if they are outside the range. Do not award 40 and 80 appearing as 40.0 and 80.0

Question	Scheme	Marks	AOs
13(a)	For a correct equation in p or q or	M1	1.1b

	For or	A1	1.1b
	For correct equations p and q and	M1	3.1a
	For and	A1	1.1b
		(4)	
(b)	(i) The value of the painting on 1st January 1980	B1	3.4
	(ii) The proportional increase in value each year	B1	3.4
		(2)	
(c)	Uses or leading to $V =$	M1	3.4
		A1	1.1b
		(2)	

(8 marks)

Notes

(a)
M1: For a correct equation in p or q . This is usually or but may be or
A1: For or
M1: For linking the two equations and forming correct equations p and q . This is usually and but may be and
A1: For and Both these values implies M1 M1
«
ALT I(a)
M1: Substitutes and states that
A1:
M1: Uses the found value of p and another value q to find form an equation in q
A1: and

(b)(i)
B1: The value of the painting on 1st January 1980 is £63 100)
Accept the original value cost of the painting or the initial value cost of the painting
(b)(ii)
B1: The proportional increase in value each year Eg Accept an explanation that explains that the value of the painting will rise 12.2% a year. (Follow through on their value of
Accept "the rate" by which the value is rising or "the price is changing" 1.122 is the decimal multiplier representing the year on year increase in value"
Do not accept "the amount" by which it is rising or "how much" it is rising by
If they are not labelled (b)(i) and (b)(ii) mark in the order given but accept any way around as long as clearly labelled 'p is.....' and 'q is

(c)
M1: For substituting into using their values for p and q or substituting $t = 30$ into and proceeds to
A1: For awrt either million or million. Condone the omission of the £ sign
Remember to isw after a correct answer

Question	Scheme	Marks	AOs
14 (a)	Attempts to complete the square	M1	1.1b

	(i) Centre	A1	1.1b
	(ii) Radius 5	A1	1.1b
		(3)	
(b)	Uses a sketch or otherwise to deduce k is a critical value	B1	2.2a
	Substitute k in $x^2 + 2kx + k^2 = 0$	M1	3.1a
	Collects terms to form correct 3TQ	A1	1.1b
	Attempts $\frac{d}{dx}(x^2 + 2kx + k^2)$ for their a, b and c leading to values for k	M1	1.1b
	Uses k and chooses the outside region (see note 1) for their critical values (Both a and b must have been expressions in k)	dM1	3.1a
	Deduces $\frac{d}{dx}(x^2 + 2kx + k^2) = 0$ or $2x + 2k = 0$	A1	2.2a
		(6)	

(9 marks)

Notes

(a)

M1: Attempts

This mark may be implied by candidates writing down a centre of $(-k, k)$ or (k, k)

(i) A1: Centre

(ii) A1: Radius 5 Do not accept

Answers only (no working) scores all three marks

(b)

B1: Uses a sketch or their subsequent quadratic to deduce that k is a critical value.

You may award for the correct k but award if $k = 0$ or even with greater than symbols

M1: Substitute k in $x^2 + 2kx + k^2 = 0$ or their $x^2 + 2kx + k^2 = 0$ to form an

equation in just x and k . It is possible to substitute k into their circle equation to form an equation in just y and k .

A1: Correct 3TQ $x^2 + 2kx + k^2 = 0$ with the terms in x collected. The " $= 0$ " can be

implied by subsequent work. This may be awarded from an equation such as

$x^2 + 2kx + k^2 = 0$ so long as the correct values of a, b and c are used in $ax^2 + bx + c = 0$.

FYI The equation in y and k is $y^2 - 2ky + k^2 = 0$ or $y^2 - 2ky + k^2 = 0$

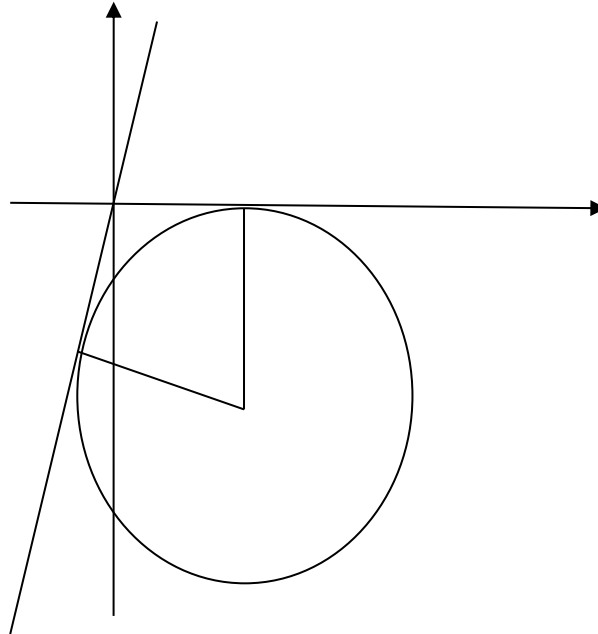
M1: Attempts to find two critical values for k using $\frac{d}{dx}(x^2 + 2kx + k^2) = 0$ or $\frac{d}{dy}(y^2 - 2ky + k^2) = 0$ where ... could be " $=$ " or any inequality

dM1: Finds the outside region using their critical values. Allow the boundary to be included. It is dependent upon all previous M marks and both a and b must have been expressions in k .

Note that it is possible that the correct region could be the inside region if the coefficient of $4ac$ is larger than the coefficient of b^2 . Eg. $x^2 + 2kx + k^2 = 0$

A1: Deduces . This must be in terms of
 Allow exact equivalents such as
 but not allow or the above with AND, & or between the two inequalities

Alternative using a geometric approach with a triangle with vertices at and



Alt (b)	Uses a sketch or otherwise to deduce is a critical value	B1	2.2a
	Distance from to is 3	M1	3.1a
	Tangent and radius are perpendicular	M1	3.1a
	Solve simultaneously, (dependent upon both M's)	dM1	1.1b
		A1	1.1b
	Deduces	A1	2.2a
		(6)	

Question	Scheme	Marks	AOs
15.	For the complete strategy of finding where the normal cuts the x-axis. Key points that must be seen are x Attempt at differentiation	M1	3.1a

	<ul style="list-style-type: none"> x Attempt at using a changed gradient to find equation of normal x Correct attempt to find where normal cuts the x-axis 		
		M1 A1	1.1b 1.1b
	<p>For a correct method attempting to find</p> <p>Either the equation of the normal this requires substituting in their \quad, then using the perpendicular gradient rule to find the equation of normal</p> <p>Or where the equation of the normal (4,6) cuts the x-axis. As above but may not see equation of normal. Eg \quad or an attempt using just gradients</p>	dM1	2.1
	Normal cuts the x-axis at \quad	A1	1.1b
	<p>For the complete strategy of finding the values of the two key areas</p> <p>Points that must be seen are</p> <ul style="list-style-type: none"> x There must be an attempt to find the area under the curve by integrating between 2 and 4 x There must be an attempt to find the area of a triangle using \quad or \quad 	M1	3.1a
		M1 A1	1.1b 1.1b
	Area under curve = \quad	dM1	1.1b
	Total area = $10 + 36 = 46^*$	A1*	2.1
		(10)	

(10 marks)

(a)

The first 5 marks are for finding the normal to the curve cuts the x-axis

M1: For the complete strategy of finding where the normal cuts the x-axis. See scheme

M1: Differentiates with at least one index reduced by one

A1:

dM1: Method of finding

either the equation of the normal at (4, 6)

or where the equation of the normal at (4, 6) cuts the x-axis

See scheme it is dependent upon having gained the M mark for differentiation.

A1: Normal cuts the x -axis at

The next 5 marks are for finding the area R

M1: For the complete strategy of finding the values of two key areas See scheme

M1: Integrates \int raising the power of at least one index

A1: \int which may be unsimplified

dM1: Area

It is dependent upon having scored the M mark for integration, for substituting in both 4 and subtracting either way around. The above line shows the minimum allowed working for a correct answer.

A1*: Shows that the area under curve = 46. No errors or omissions allowed

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A number of candidates are equating the line and the curve (or subtracting the line from the curve). The last 5 marks are scored as follows.

M1: For the complete strategy of finding the values of the two key areas Points that must be seen are

x There must be an attempt to find the area BETWEEN the line and the curve either way around by integrating between 2 and 4

x There must be an attempt to find the area of a triangle using $\frac{1}{2} \times \text{base} \times \text{height}$ or

via integration

M1: Integrates \int either way around and raises the power of at least one index by one

A1: \int must be correct

dM1: Area = \int =either way around

A1: Area =

NB: Watch for candidates who calculate the area under the curve between 2 and 4 = 10 and subtract this from the large triangle = 56. They will lose both the strategy mark and the answer mark.

