Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | | | | | |

Candidate Number | | | | |

Pearson Edexcel Level 2 Certificate

Sample Assessment Material

(Time: 1 hour 15 minutes)

Paper reference **7M20/01**

Extended Maths Certificate

PAPER 1 (Non-Calculator)

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*

Information

- There are 9 questions.
- The total mark for this paper is 60
- 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 ▶

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 $\mathrm{f}(x) = 4x + 6$

(a) Find f(–3)

....

(1)

(b) Find an equation for the line perpendicular to $y = 4x + 6$ that passes through the point (0, –8)

....

(2)

Point A with coordinates (a, 10) and point B with coordinates (3, b) both lie on $y = 4x + 6$

(c) Find the length of AB.
Give you answer in the form $c\sqrt{d}$ where c and d are integers.

....

(3)

(Total for Question 1 is 6 marks)

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2 (i) Simplify $\sqrt{18}$

....
(1)

(ii) Simplify $\sqrt{8} + \sqrt{18} - 3$

....
(2)

(iii) $\dfrac{\sqrt{2} + 6}{\sqrt{8} + \sqrt{18} - 3}$

Hence write in the form $\dfrac{a\sqrt{b} + c}{d}$

where a, b, c and d are integers.

....
(4)

(Total for Question 2 is 7 marks)

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3 Here are the first few rows of Pascal's Triangle.

$$\begin{array}{ccccccccccc}
 & & & & & 1 & & & & & \\
 & & & & 1 & & 1 & & & & \\
 & & & 1 & & 2 & & 1 & & & \\
 & & 1 & & 3 & & 3 & & 1 & & \\
 & 1 & & 4 & & 6 & & 4 & & 1 & \\
1 & & 5 & & 10 & & 10 & & 5 & & 1
\end{array}$$

(a) Using this information, expand $(e+f)^3$

....

(2)

Given that $(e+f)^4 = e^4 + 4e^3f + 6e^2f^2 + 4ef^3 + f^4$

(b) (i) work out $7^4 + 12 \times 7^3 + 6 \times 7^2 \times 3^2 + 28 \times 3^3 + 3^4$

....

(2)

(ii) expand and simplify $(2e+f)^4$

....

(3)

(Total for Question 3 is 7 marks)

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4 (a) (i) Simplify $81^{\frac{3}{4}}$

....

(1)

(ii) Write $\dfrac{1}{9^2}$ in the form 3^n

....

(1)

(b) $27^{-\frac{2}{3}} \times 3^{2y+1} \times \dfrac{1}{9^2} \times 81^{\frac{3}{4}} = 27$

Find the value of y.

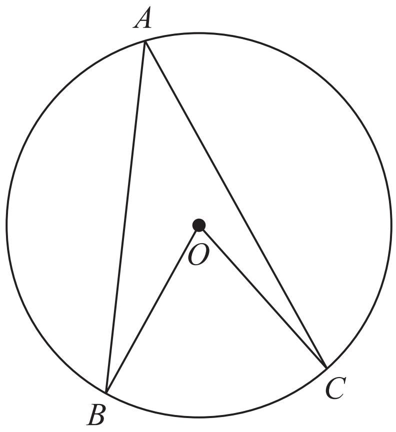
....

(4)

(Total for Question 4 is 6 marks)

5 The diagram shows a circle, centre O.

A, B and C are points on the circumference of the circle.



Prove that the angle subtended by the arc at the centre is twice the angle subtended at the circumference.

(Total for Question 5 is 4 marks)

6 The point Q with coordinates $(-2, 0)$ is on the curve $f(x)$

The transformation $f(x + a) + b$ of the curve $f(x)$ moves the point P from $(0, 0)$ to $(3, 4)$

(a) Write down the coordinates of Q after the transformation $f(x + a) + b$

(.......................... , ...)

(1)

(b) Work out the value of a and the value of b.

a = ...

b = ...

(2)

The transformation $kg(dx) + 1$ of the curve $g(x)$ moves the point R, from $(-3, 2)$ to $(-6, 7)$

(c) Work out the value of d and the value of k.

d = ...

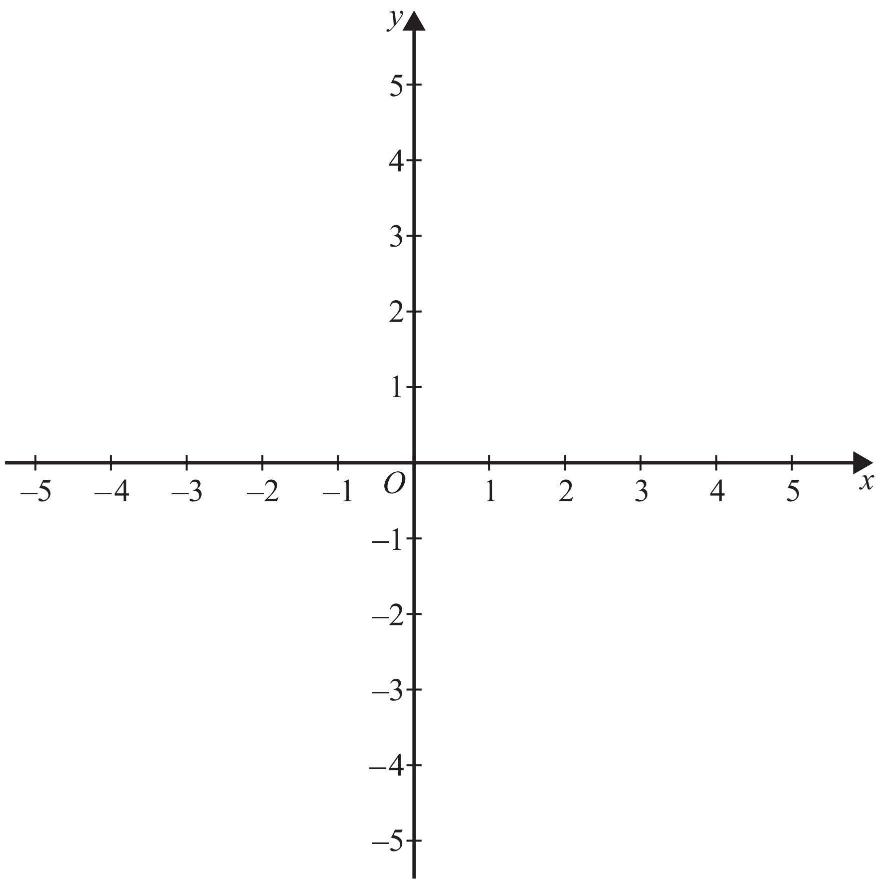
k = ...

(3)

(Total for Question 6 is 6 marks)

7 A circle **C** has centre (0, –3) and circumference 4π.

(a) Sketch the graph of **C**.



(2)

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The line **L** has equation $2x - y = 5$

(b) Find, algebraically, the coordinates of the points of intersection of **C** and **L**.

(5)

(Total for Question 7 is 7 marks)

8 Alex is standing on a tower and throws a ball to Chris who is standing on the ground.

The motion of the ball is modelled by the equation $s = -5t^2 + 20t + 7$ where s is the height of the ball above the ground, in metres, and t is the time, in seconds, from when Alex throws the ball.

(a) Write down the initial height of the ball?

.... metres

(1)

(b) Explain why the model is not valid when $t = 5$

....

....

(1)

(c) Work out the maximum height the ball reaches.

.... metres

(3)

Chris catches the ball when it is 2 metres above the ground.

(d) Work out the total amount of time the ball is in flight.
Give your answer in the form $a + \sqrt{b}$, where a and b are integers.

.... seconds

(4)

(Total for Question 8 is 9 marks)

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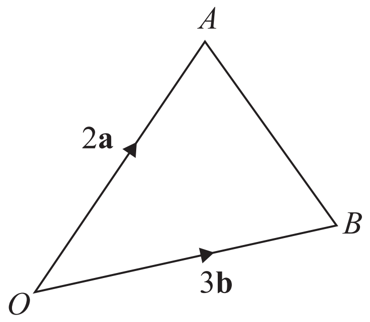
S 8 0 5 2 5 A 0 1 0 1 2

9



$\overrightarrow{OA} = 2\mathbf{a} \quad \overrightarrow{OB} = 3\mathbf{b}$

C is a point such that $\overrightarrow{AC} = \frac{5}{3}\overrightarrow{AB}$

D is a point such that $\overrightarrow{AD} = x\mathbf{a} + y\mathbf{b}$ and $\overrightarrow{CD} = -\frac{2}{3}x\mathbf{a} + \frac{13}{33}y\mathbf{b}$

Find the ratio $OB : BD$
Give your ratio in its simplest form.

....

(Total for Question 9 is 8 marks)

TOTAL FOR PAPER IS 60 MARKS

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Mark Scheme

Sample Assessment

Pearson Edexcel Level 2
Extended Mathematics Certificate
(Non-Calculator) Paper 1

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

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Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

October 2023
Question Paper Log Number S80525A

General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

1 All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first. Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.

2 All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no answer) indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

Questions where working is not required: In general, the correct answer should be given full marks.
Questions that specifically require working: In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

3 **Crossed out work**
This should be marked **unless** the candidate has replaced it with
an alternative response.

4 **Choice of method**
If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.
If no answer appears on the answer line, mark both methods **then award the lower number of marks.**

5 **Incorrect method**
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review for your Team Leader to check.

6 **Follow through marks**
Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question or its context. (eg an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

8 Probability

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

9 Linear equations

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

10 Range of answers

Unless otherwise stated, when an answer is given as a range (eg 3.5 – 4.2) then this is inclusive of the end points (eg 3.5, 4.2) and all numbers within the range

11 Number in brackets after a calculation

Where there is a number in brackets after a calculation eg 2 × 6 (=12) then the mark can be awarded **either** for the correct method, implied by the calculation **or** for the correct answer to the calculation.

12 Use of inverted commas

Some numbers in the mark scheme will appear inside inverted commas eg "12" × 50 ; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

13 Word in square brackets

Where a word is used in square brackets eg [area] × 1.5 : the value used for [area] does **not** have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

14 Misread

If a candidate misreads a number from the question. eg uses 252 instead of 255; method or process marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.

Guidance on the use of abbreviations within this mark scheme

M	method mark awarded for a correct method or partial method
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
C	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

Paper: 1					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1	(a)	−6	B1	cao	
	(b)	$y = -\frac{1}{4}x - 8$	M1	for use of $-\frac{1}{m}$, eg $(y=)\ -\frac{1}{4}x + c$	
			A1	for $y = -\frac{1}{4}x - 8$ oe	
	(c)	$2\sqrt{17}$	M1	for a method to find both *a* **and** *b*, eg $(10-6) \div 4\ (=1)$ **and** $3\times 4+6\ (=18)$	
			M1	for correct use of Pythagoras, eg $\sqrt{(3-"a")^2+("18"-10)^2}$	
			A1	cao	
2	(i)	$3\sqrt{2}$	B1	cao	
	(ii)	$5\sqrt{2}-3$	B2	oe	
			(B1	for correctly simplifying $\sqrt{8}$, eg $2\sqrt{2}$)	
	(iii)	$\frac{33\sqrt{2}+28}{41}$	M1	for method to rationalise the denominator, eg clear intention to multiply both numerator and denominator by $(5\sqrt{2}+3)$	ft their answer to (a)(ii) for all method marks
			M1	for expanding the numerator with at least 3 terms correct, eg $10+30\sqrt{2}+3\sqrt{2}+18\ (=33\sqrt{2}+28)$	
			M1	for expanding the denominator with at least 3 terms correct, eg $50+15\sqrt{2}-15\sqrt{2}-9\ (=41)$	
			A1	oe	eg

Paper: 1				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
3 (a)	$e^3 + 3e^2f + 3ef^2 + f^3$	B2	for a fully correct response	
		(B1	for identifying the correct row to use from the triangle)	
(b)(i)	10 000	M1	for $e = 7$ and $f = 3$	
		A1	cao	
(ii)	$16f^4 + 32e^3f + 24e^2f^2 + 8ef^3 + f^4$	B3	for a fully correct simplified response	
		(B2	for at least 3 correct terms from $16e^4 + 32e^3f + 24e^2f^2 + 8ef^3 + f^4$)	
		(B1	for correct substitution, eg $(2e)^4 + 4(2e)^3f + 6(2e)^2f^2 + 4(2e)f^3 + f^4$)	
4 (a)(i)	27	B1	cao	
(ii)	3^{-4}	B1	3^{-4} or $n = -4$	
(b)	2.5	B1	for simplifying $27^{-\frac{2}{3}}$, eg $= \frac{1}{9}$	
		M1	for $\frac{1}{9} \times 3^{2y+1} \times 3^{-4} \times 27 = 27$ oe	
		M1	(dep on M1) for forming an equation in y, eg $-2 + 2y + 1 - 4 + 3 = 3$	
		A1	oe	

Paper: 1					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
5		Proof	M1	for connecting centre to angle at the circumference and defining one angle, eg obtuse angle at centre = x	
			M1	for continuing proof by recognising two isosceles triangles	
			M1	for defining remaining angles at the centre as $180 - \frac{x}{2}$ and base angles as $\frac{1}{2}(180 - (180 - \frac{x}{2}))$	
			A1	for completing proof to show angle at circumference is $\frac{x}{2}$ with reasoning, all geometric properties used are stated.	
6	(a)	(1, 4)	B1	cao	
	(b)	$a = -3$ and $b = 4$	B2	for both correct	
			(B1	for one correct)	
	(c)	$c = \frac{1}{2}$ and $k = 3$	B1	for $c = \frac{1}{2}$	
			M1	for forming a suitable equation, eg $2k + 1 = 7$	
			A1	for $k = 3$	

Paper: 1				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
7 (a)	Sketch	B2	For a circle drawn with centre (0, −3) and radius 2	
		(B1	For a circle drawn with centre (0, −3) or a circle drawn with radius 2	
(b)	(0, −5) $\left(\frac{8}{5}, \frac{-9}{5}\right)$	M1	For the equation of the circle, eg $x^2 + (y + 3)^2 = 4$	ft their r
		M1	For substitution to eliminate one variable, Eg $x^2 + (2x - 5 + 3)^2 = 4$	
		M1	For rearrangement into a form ready for solving, eg $5x^2 - 8x (= 0)$	
		M1	For both correct values of x, eg $x = 0$ **and** $x = \frac{8}{5}$ **OR** for one correct coordinate	
		A1	For both correct coordinates	

Paper: 1				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
8 (a)	7	B1	cao	
(b)	Explanation	C1	suitable explanation, eg the height would be negative	
(c)	27	M1	for starting to complete the square, eg $-5[(t-2)^2-4]+7$	
		M1	for completing the square fully, eg $-5(t-2)^2+27$	
		A1	cao	
(d)	$2+\sqrt{5}$	M1	for forming a suitable equation, eg $-5t^2+20t+7=2$	Alternative method needed using completing the square (c)
		M1	for start to method to solve, eg rearranges and substitutes into formula, eg $\frac{-20\pm\sqrt{20^2-4\times(-5)\times5}}{2\times(-5)}$	
		M1	for simplifying as far as $\frac{-20\pm\sqrt{500}}{-10}$ oe	
		A1	cao	If both solutions given, withhold the A mark

Paper: 1				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
9	4 : 7	M1	for $\overrightarrow{AC} = \frac{5}{3}(-2\mathbf{a} + 3\mathbf{b})$ $\left(= \frac{-10}{3}\mathbf{a} + 5\mathbf{b}\right)$	
		M1	for a correct expression for $\overrightarrow{AC} + \overrightarrow{CD}$ eg $\frac{-10}{3}\mathbf{a} + 5\mathbf{b} - \frac{2}{3}x\mathbf{a} + \frac{13}{33}y\mathbf{b}$	
		M1	for equating coefficients for x or y eg $x = \left(\frac{-10 - 2x}{3}\right)$ or $y = 5 + \frac{13}{33}y$	
		A1	for $x = -2$	
		A1	for $y = \frac{33}{4}$ oe	
		M1	for working out $\overrightarrow{BD}$ eg $-2\mathbf{a} + \frac{33}{4}\mathbf{b} - (-2\mathbf{a} + 3\mathbf{b})$	
		M1	for a correct unsimplified ratio eg $3\mathbf{b} : \frac{33}{4}\mathbf{b} - 3\mathbf{b}$	
		A1	cao	

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Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 2 Certificate

Sample Assessment Material

Time: 1 hour 15 minutes

Paper reference **7M20/02**

Extended Maths Certificate

PAPER 2 (Calculator)

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used**.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- There are 10 questions.
- The total mark for this paper is 60
- 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

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Factorise $x^2 - 25$

....

(1)

(b) Write $(x - 3)(x + 7)(x + 3)(x - 6)$ in the form $(x^2 - d)(ax^2 + bx + c)$ where a, b, c and d are integers.

....

(3)

(Total for Question 1 is 4 marks)

2 w, x, y and z are four consecutive integers.

Prove algebraically, that for any set of four consecutive integers

$yz - wx$ is equal to the sum of the four consecutive integers.

(Total for Question 2 is 5 marks)

3 Triangles ABC and PQR are similar.

Triangle ABC is an isosceles triangle where

one of the angles is 40°
one of the angles is obtuse
two of the sides are each 10 cm.

Length $PQ = 1.5 \times$ length AB

Work out the area of triangle PQR.
Give your answer correct to 3 significant figures.

.... cm^2

(Total for Question 3 is 4 marks)

4 The graph of $y = ab^{-x}$ passes through the points (0, 0.7) and (3, 0.0875)

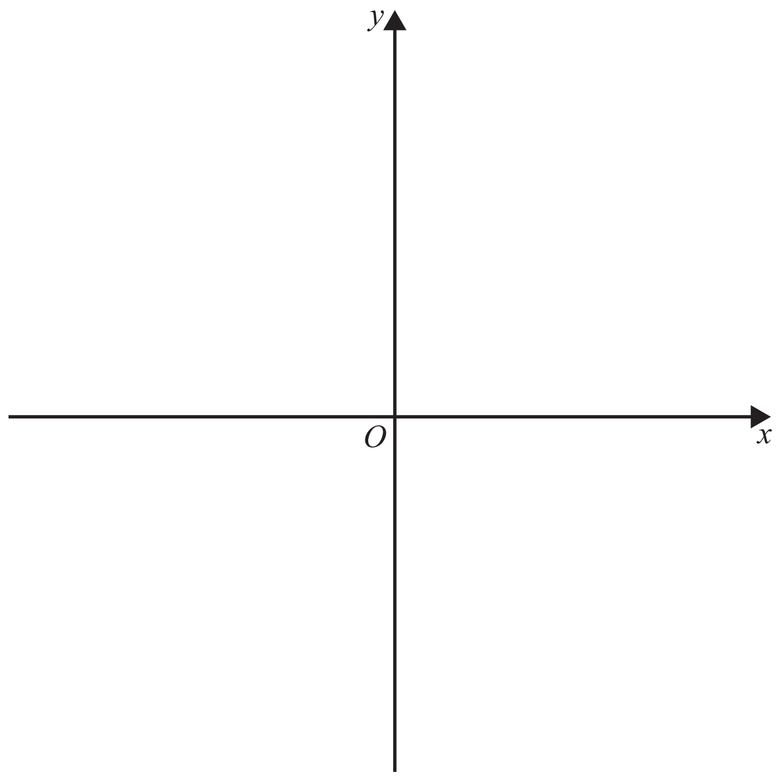
(i) Find the value of a and the value of b.

$a =$ ....

$b =$ ....

(4)

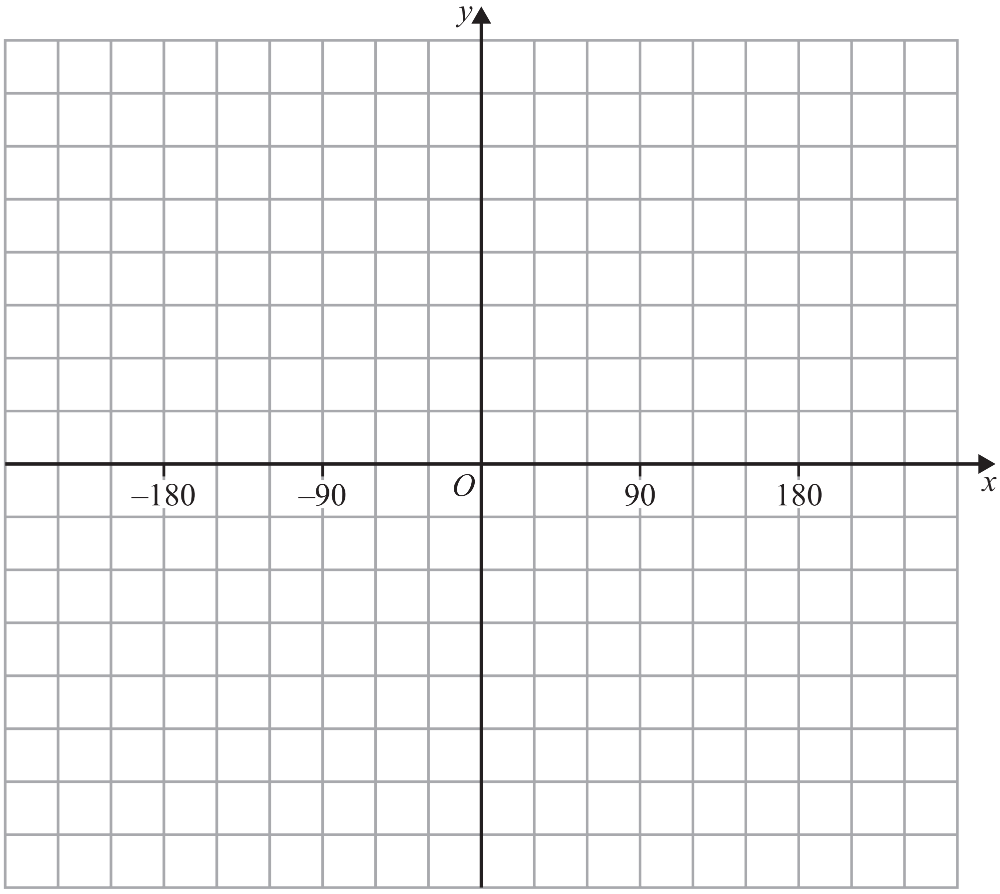
(ii) Hence, on the grid below, sketch the graph of $y = ab^{-x}$



(2)

(Total for Question 4 is 6 marks)

5 (a) Sketch the graph of $y = \sin x°$ for $-180 \leqslant x \leqslant 180$



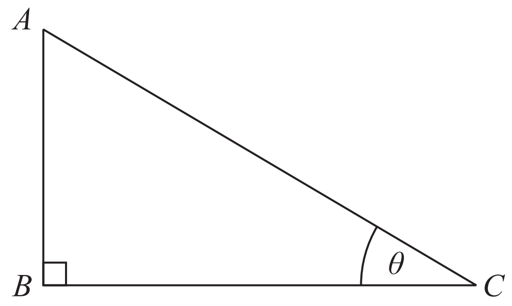
(2)

(b) Solve $2w^2 + 3w + 1 = 0$

....

(2)

ABC is a right-angled triangle.



(c) Use Pythagoras' theorem to show that $\sin^2\theta° + \cos^2\theta° = 1$

(3)

Given that $\sin^2 x° + \cos^2 x° = 1$ is true for all values of x

(d) solve $3 - 2\cos^2 x° + 3\sin x° = 0$ for $-180 \leqslant x \leqslant 180$

....

(4)

(Total for Question 5 is 11 marks)

6 (a) Use the factor theorem to show that $(x - 2)$ is a factor of $x^3 - x^2 - 14x + 24$

(2)

Hence or otherwise, given that $x = 2y$

(b) write the expression $8y^3 - 4y^2 - 28y + 24$ as a product of its linear factors.

....

(4)

(Total for Question 6 is 6 marks)

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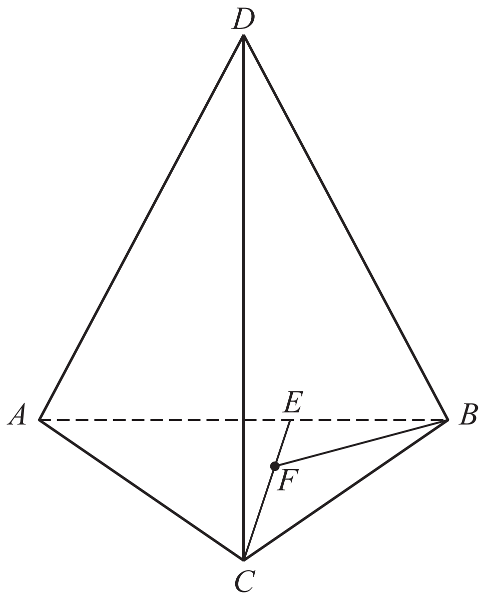
7 Use the trapezium rule to find an estimate for the area of the region under the curve $y = 2^x$ and between $x = 1$, $x = 7$ and the x-axis.

Use 4 strips of equal width.
Give your answer correct to 3 significant figures.

....

(Total for Question 7 is 4 marks)

8 *ABCD* is a triangular based pyramid.



E is a point on the line *AB*.
F is a point on the line *CE*, such that $CF:FE = 3:2$

$BC = 7.2$ cm
$BF = 4.1$ cm
angle $CBF = 49°$
angle $CED = 109°$
angle $CDE = 32°$

Find the length of *CD*.
Give your answer correct to 3 significant figures.

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.... cm

(Total for Question 8 is 6 marks)

9 Savio is buying base cupboards for a catering kitchen.

The cupboards come in two sizes, 600 mm wide and 900 mm wide.

Let x be the number of 600 mm cupboards and y be the number of 900 mm cupboards.

Two constraints are $x > 2$ and $0 < y \leqslant 9$

(a) Explain in context what $0 < y \leqslant 9$ represents.

....

....

....

....

(2)

A 600 mm cupboard costs £210
A 900 mm cupboard costs £240

Savio has a maximum budget of £3600

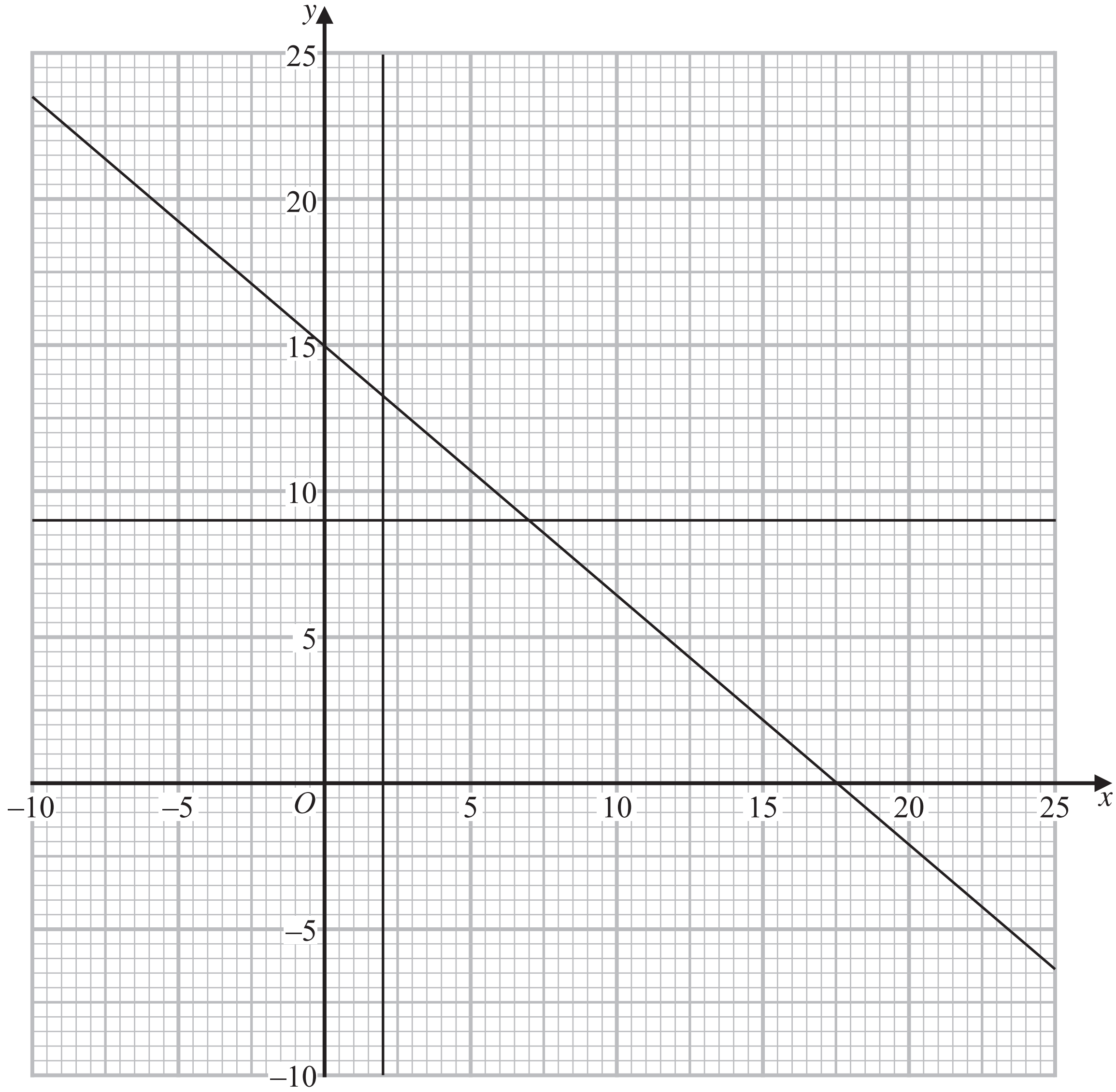
The total width of all the cupboards is 12 m or less.

(b) Use this information to show that

$$7x + 8y \leqslant 120$$
$$2x + 3y \leqslant 40$$

(4)

(c) Draw a line on the grid and identify the feasible region.
Label the feasible region **R**.



(1)

Savio decides to buy 7 of the 600 mm cupboards and the maximum number of 900 mm cupboards possible.

(d) Work out the total amount of money Savio will spend buying these cupboards.

£..

(2)

(Total for Question 9 is 9 marks)

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10 A bag contains only red counters and yellow counters.
There are more yellow counters than red counters.

A counter is taken at random from the bag, the colour noted, and then the counter is put back into the bag.
This process is repeated one more time.

The probability that exactly one of the two counters taken from the bag was red is 0.255

Simon then takes one counter from the bag.

Find the probability that Simon takes a yellow counter from the bag.

....

(Total for Question 10 is 5 marks)

TOTAL FOR PAPER IS 60 MARKS

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Mark Scheme

Sample Assessment

Pearson Edexcel Level 2
Extended Mathematics Certificate
(Calculator) Paper 2

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October 2023
Question Paper Log Number S80526A

General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

1 All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.
Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.

2 All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no answer) indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

Questions where working is not required: In general, the correct answer should be given full marks.
Questions that specifically require working: In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

3 Crossed out work
This should be marked **unless** the candidate has replaced it with an alternative response.

4 Choice of method
If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.
If no answer appears on the answer line, mark both methods **then award the lower number of marks.**

5 Incorrect method
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review for your Team Leader to check.

6 Follow through marks
Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question or its context. (eg an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

8 Probability

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

9 Linear equations

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

10 Range of answers

Unless otherwise stated, when an answer is given as a range (eg 3.5 – 4.2) then this is inclusive of the end points (eg 3.5, 4.2) and all numbers within the range

11 Number in brackets after a calculation

Where there is a number in brackets after a calculation eg 2 × 6 (=12) then the mark can be awarded **either** for the correct method, implied by the calculation **or** for the correct answer to the calculation.

12 Use of inverted commas

Some numbers in the mark scheme will appear inside inverted commas eg “12” × 50 ; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

13 Word in square brackets

Where a word is used in square brackets eg [area] × 1.5 : the value used for [area] does **not** have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

14 Misread

If a candidate misreads a number from the question. eg uses 252 instead of 255; method or process marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.

Guidance on the use of abbreviations within this mark scheme	
M	method mark awarded for a correct method or partial method
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
C	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

Paper: 2				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1 (a)	$(x - 5)(x + 5)$	B1	for $(x - 5)(x + 5)$	
(b)	$(x^2 - 9)$ $(x^2 + x - 42)$	M1	for grouping $(x - 3)(x + 3)$ and $(x + 7)(x - 6)$	May be implied by a complete method
		M1	for expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs for any 2 brackets	First two marks may be awarded in either order
		A1	for $(x^2 - 9)(x^2 + x - 42)$	
2	Proof shown	M1	for any consecutive integers expressed algebraically eg $n, (n + 1), (n + 2)$ and $(n + 3)$	
		M1	for adding all four terms eg $n + (n + 1) + (n + 2) + (n + 3)$	
		M1	for "$(n + 2)(n + 3) - n(n + 1)$"	
		M1	(dep on the previous M1) for correct expansion with or without simplification	
		C1	for correct fully simplified equivalent expressions	
3	110.8	M1	for working with angles eg 180−40−40(= 100) or for a sketch of an isosceles triangle with at least one angle clearly labelled	May be seen in a diagram
		M1	for working with scale factor eg 1.5 × 10 (=15) or 1.5 × 1.5× "49.24.." (= 110.79..)	May be awarded in either order
		M1	for using ½ ab sin θ eg 0.5 × 10 × 10 × sin 100 (= 49.24..) or 0.5 × "15" × "15" × sin 100 (=110.79..)	
		A1	awrt 111	

Paper: 2				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
4 (i)	$a = 0.7$, $b = 2$	M1	for correct substitution of (0, 0.7) into equation eg, $0.7 = ab^0$	May just see $0.7 = a$
		M1	for correct substitution of "a" and (3, 0.0875) into equation, eg $0.0875 = 0.7 \times b^{-3}$	
		M1	for a method to isolate b^3 eg $b^3 = 0.7 \div 0{,}0875$	
		A1	for $a = 0.7$, $b = 2$	
(ii)	Graph drawn	C2 (C1	fully correct graph with label on y-axis at 0.7 for correct general shape)	
5 (a)	Graph drawn	C2 (C1	fully correct graph with all labels for correct general shape)	
(b)	-1 and $-\frac{1}{2}$	M1	for $(2w + 1)(w + 1)$	
		A1	for -1 and $-\frac{1}{2}$	
(c)	Shown	B1	States Pythagoras' theorem eg $\text{Hyp}^2 = \text{opp}^2 + \text{adj}^2$	Accept in any format or may be implied by substitution
		B1	States appropriate trig ratios eg $\cos = \frac{adj}{hyp}$ and $\sin = \frac{opp}{hyp}$	
		C1	Identity shown combining trig ratios and Pythagoras' theorem	
(d)	–150, –90 and −30	M1	for substituting $\cos^2 x = 1 - \sin^2 x$ into the equation eg $3 - 2(1 - \sin^2 x) + 3\sin x = 0$	
		M1	for simplifying to $2\sin^2 x + 3\sin x + 1 = 0$	
		M1	for showing roots are $\sin x = -1$ and $\sin x = -\frac{1}{2}$ or ft part (b)	
		A1	for –150, –90 and −30	

Paper: 2				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
6 (a)	Shown	M1 C1	for substituting 2 into the eqn eg $2^3 - 2^2 - 14 \times 2 + 24$ shown eg $8 - 4 - 28 + 24 = 0$ and so $(x - 2)$ is a factor	
(b)	$(2y-2)(2y+4)(2y-3)$	M1 M1 A1 A1	for using the substitution of $x = 2y$ eg $8y^3 - 4y^2 - 28y + 24$ as $(2y)^3 - (2y)^2 - 14(2y) + 24$ for setting up a method to use polynomial division as far as an answer of $x^2 + x$ for $x^2 + x - 12$ or $(x - 2)(x + 4)(x - 3)$ for $(2y - 2)(2y + 4)(2y - 3)$ oe	$2(y - 1)2(y + 2)(2y - 3)$ acceptable $4(y - 1)(y + 2)(2y - 3)$ acceptable
7	198	B1 M1 M1 A1	for 2, 5.65..., 32, 128, 512 for stating the trapezium rule or one correct area using a trapezium for full substitution eg $\frac{2}{2}(2 + 512 + 2(8 + 32 + 128))$ AWRT	
8	16.3	M1 A1 M1 M1 M1 A1	for substituting into cosine rule to find CF. eg, $(CF^2 =)\ 4.1^2 + 7.2^2 - 2 \times 4.1 \times 7.2 \times \cos 49°$ for $(CF^2 =)$ 29.9(16…) or $(CF =)$ 5.4(69...) for method to find CE, eg $\sqrt{"29.916..."} \times \frac{5}{3} (= 9.115...)$ for substituting into sine rule to find CD, eg $\frac{CD}{\sin 109} = \frac{"9.115..."}{\sin 32}$ for rearranging to find CD, eg $(CD =) \frac{"9.115..."}{\sin 32} \times \sin 109$ for answer in the range 16.26 to 16.3	

Paper: 2					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
9	(a)	Description	C2	for a full description eg the number of 900 mm cupboards must be greater than 0 and 9 or less	
			(C1	for a partial description in context eg the number of 900 mm cupboards is greater than 0 **or** full description not in context eg y is bigger than 0 and less than or equal to 9)	
	(b)	Shown	M1	for beginning to work with either set of constraints eg 210x + 240y **or** 600x + 900y	
			M1	for a complete constraint eg 210x + 240y ≤ 3600 **or** 600x + 900y ≤ 12000	
			A1	for two unsimplified accurate inequalities eg 210x + 240y ≤ 3600 **and** 600x + 900y ≤ 12000	
			C1	for simplifying both to the given format	
	(c)	Feasible region labelled	C1	for correctly show the region	Accept clear shading
	(d)	3390	M1	for reading off 8 **or** using 8 eg 8 ×240 (= 1920)	
			A1	cao	

Paper: 2				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
10	0.85	M1 M1 M1 M1 A1	for using P(RY) + P(YR) = 0.255 or P(R)P(Y) + P(Y)P(R) = 0.255 for using $x + y = 1$ for writing an equation in one variable eg $x(1 - x) + (1 - x)x = 0.255$ oe for arriving at and showing a method to solve $x^2 - x + 0.1275 = 0$ oe oe	Note P(R) and P(Y) may be represented by a letter eg P(R) = x and P(Y) = y Note $(1 - x)x = 0.1275$ is oe

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