



Mark Scheme (Results)

Summer 2026

Pearson Edexcel GCSE
In Mathematics (1MA1)
Higher (Calculator) Paper 3H

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

Pearson: helping people progress, everywhere

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

Summer 2026

Question Paper Log Number

Publication Code 1MA1_3H_2606_MS

All the material in this publication is copyright

© Pearson Education Ltd

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 $2 \times 6 (= 12)$, 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” $\times 50$; 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] $\times 1.5$, 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
P	process mark awarded for a correct process as part of a problem solving question
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: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	3.827 to 3.828	M1	for a correct partial calculation, eg $(1.4^3 =) 2.74(4)$ oe eg $\frac{343}{125}$ or $(\sqrt{43.56} =) 6.6$ oe eg $\frac{33}{5}$ or $(\sqrt{43.56} - 3.1 =) 3.5$ oe eg $\frac{7}{2}$ or $(1.9 \times 1.7 =) 3.23$ oe eg $\frac{323}{100}$ or $\left(\frac{\sqrt{43.56} - 3.1}{1.9 \times 1.7} =\right) 1.08(\dots)$ oe or 3.8(...)	Allow non-terminating decimals to at least 3 significant figures rounded or truncated. Check first 3 significant figures only.
		A1	for answers in the range 3.827 to 3.828	Allow to at least 2 significant figures rounded or truncated. Check first 2 significant figures only. Ignore additional digits after the fourth digit.
		B1	for 3.83 or ft their answer to part (a) provided at least 4 sf in (a)	Accept consistent use of comma to indicate a decimal point. Do not accept trailing 0, eg 3.830
(b)	3.83	B1	for 3.83 or ft their answer to part (a) provided at least 4 sf in (a)	Do not accept trailing 0, eg 3.830

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
2	(a) $x \leq 3$	B1	for $x \leq 3$ oe eg $3 \geq x$	Allow a different letter to x eg $y \leq 3$ but letter must be present eg B0 for ≤ 3 Condone arrow heads or line ending to denote the end of the line
	(b) Diagram drawn	B2 (B1	for a fully correct diagram for drawing a line from -2 to 4 or (indep) for a closed circle at -2 or (indep) for an open circle at 4)	
3	(a) 5	B1	cao	Do not accept $\frac{1}{0.2}$ [2^a] is their $2^{10} \times 2^{20}$ [2^b] is their $2^{90} \div 2^{20}$ [2^c] is their $2^{90} \div 2^{10}$ Do not award this mark if a base has been incorrectly changed
	(b) 5^{210}	B1	cao	
	(c) 2^{60}	M1 A1	for using the laws of indices to simplify, eg ($2^{10} \times 2^{20} = 2^{10+20} (= 2^{30})$) or ($2^{90} \div 2^{10} = 2^{90-10} (= 2^{80})$) or ($2^{90} \div 2^{20} = 2^{90-20} (= 2^{70})$) or $2^{90} \div [2^a] = 2^{90-a}$ or $[2^b] \div 2^{10} = 2^{b-10}$ or $[2^c] \div 2^{20} = 2^{c-20}$ or $90 - 10 - 20 (= 60)$ cao	

Paper: 1MA1/3H																
Question	Answer	Mark	Mark scheme	Additional guidance												
4	23	M1	for a method to find 5 products within intervals (including end points), with no more than one error, may be seen near the table eg $5 \times 8 (= 40)$ $15 \times 16 (= 240)$ $25 \times 11 (= 275)$ $35 \times 8 (= 280)$ $45 \times 7 (= 315)$ or for 1150	Do not award this mark if the final answer comes from an alternative incorrect method, eg $50 \div 5 (= 10)$ or $\Sigma \text{midpts} \div \Sigma f (= 125 \div 50 (= 2.5))$ or $\Sigma \text{midpts} \div 5 (= 125 \div 5 (= 25))$ <table><tr><td>Min fx</td><td>Max fx</td></tr><tr><td>0</td><td>80</td></tr><tr><td>160</td><td>320</td></tr><tr><td>220</td><td>330</td></tr><tr><td>240</td><td>320</td></tr><tr><td>280</td><td>350</td></tr></table>	Min fx	Max fx	0	80	160	320	220	330	240	320	280	350
		Min fx	Max fx													
		0	80													
160	320															
220	330															
240	320															
280	350															
M1	for $\Sigma "fx" \div 50$ or $(5 \times 8 + 15 \times 16 + 25 \times 11 + 35 \times 8 + 45 \times 7) \div 50$ or $("40" + "240" + "275" + "280" + "315") \div 50$ or $"1150" \div 50$	$\Sigma "fx"$ must come from 5 products, fx within the intervals (including end points) Allow 50 to be Σf ie $8 + 16 + 11 + 8 + 7$														
A1	cao															

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
5	200	P1	for start of process to find mass of metal bar, eg $\frac{\text{mass}}{80} = 4$ or $80 \times 4 (= 320)$	$80 \times 2 (= 160)$ or 640 implies P1
		P1	for process to find volume of sphere, eg $\frac{"320" \div 2}{0.8}$ oe eg $\frac{"320"}{2 \times 0.8}$ or $\frac{[\text{mass of metal bar}] \div 2}{0.8}$ oe eg $\frac{[\text{mass of metal bar}]}{2 \times 0.8}$ or $\frac{"320" \div 2}{\text{volume}} = 0.8$ or $\frac{[\text{mass of metal bar}] \div 2}{\text{volume}} = 0.8$	[mass of metal bar] is what they believe is the mass – can be labelled as mass or m or come from a seen calculation involving 80 and 4
		A1	cao SCB2 for an answer of 800	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	75 000	B1	cao	
(b)	Shown	M1	for a method to convert between km and m, eg $450 \times 1000 (= 450\,000)$ or $125 \div 1000 (= 0.125)$ or $[their\ 0.125] \times 1000$ or $[their\ 450\,000] \div 1000$ or for a method to convert between hours and seconds, eg $450 \div (60 \times 60) (= 0.125)$ or $125 \times 60 \times 60 (= 450\,000)$ or $[their\ 450\,000] \div (60 \times 60)$ or $[their\ 0.125] \times 60 \times 60$ or for a correct conversion factor, eg $\frac{1000}{60 \times 60}$ or $\frac{60 \times 60}{1000}$	[their 0.125] is an incorrect attempt to convert 450 km/h to km/s [their 450 000] is an incorrect attempt to convert 125 m/s to m/h
		A1	(dep on M1) for showing that $450\text{ km/h} = 125\text{ m/s}$ OR $125\text{ m/s} = 450\text{ km/h}$ eg $(450\text{ km/h} =) 450 \times 1000 = 450\,000\text{ (m/h)}$ and $450\,000 \div 60 = 7500\text{ (m/min)}$ and $7500 \div 60 = 125\text{ (m/s)}$ or $(450\text{ km/h} =) 450 \times \frac{1000}{60 \times 60} = 125\text{ (m/s)}$ OR $(125\text{ m/s} =) 125 \times 60 = 7500\text{ (m/min)}$ and $7500 \times 60 = 450\,000\text{ (m/h)}$ and $450\,000 \div 1000 = 450\text{ (km/h)}$ or $(125\text{ m/s} =) 125 \times \frac{60 \times 60}{1000} = 450\text{ (km/h)}$	[their 450 000] is an incorrect attempt to convert 450 km/h to m/h and [their 0.125] is an incorrect attempt to convert 125 m/s to km/s May be within a complete method eg $450 \times \frac{1000}{60 \times 60}$ or $125 \times \frac{60 \times 60}{1000}$ Allow a complete method that converts both 450 km/h and 125 m/s to an equivalent speed eg 7500 (m/min) Only condone absence of operations if figures and units are present and correct and where $\times 60 \times 60$ are shown as separate calculations eg M1A1 for $(450\text{ km/h} =) 450\,000\text{ m/h} = 7500\text{ m/min} = 125\text{ (m/s)}$ If operations are shown then allow $\times 3600$ for $\times 60 \times 60$ throughout but not $\times 3.6$ for $60 \times 60 \div 1000$ or $\times 5 \div 18$ for $\times 1000 \div 60 \div 60$

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
7	9500	M1	for a complete method, eg $7600 \div 0.8$ oe eg 7600×1.25 or $7600 \div (100 - 20) \times 100$ oe eg $7600 \div 4 + 7600$ or for a correct equation, eg $0.8x = 7600$ oe	If further incorrect calculations are seen award M0 but allow M1 for “9500” $\times 0.2$ or “9500” $- 7600$
		A1	cao	If a student gets 9500 and gives their answer as 7600, eg $9500 \times 0.8 = 7600$ take this as a check and award M1A1

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
8	40.8	P1	for process to find length of one side of the triangle, eg $11 - 6 (= 5)$ or $6 - 11 (= -5)$ or $15 - 3 (= 12)$ or $3 - 15 (= -12)$ OR for process to find half length of one side of the triangle, eg $(6 + 11) \div 2 (= 8.5)$ and $"8.5" - 6 (= 2.5)$ or $6 - "8.5" (= -2.5)$ or eg $(15 + 3) \div 2 (= 9)$ and $"9" - 3 (= 6)$ or $3 - "9" (= -6)$	Working may be seen on the diagram Allow alternative notation eg (5, 12) or (12, 5) or (2.5, 6) or (6, 2.5) Implied by eg $\frac{\dots\dots}{15 - 3}$ or $\frac{11 - 6}{\dots\dots}$ even if using $\frac{\text{diff in } x}{\text{diff in } y}$
		P1	for start of process to find diameter, eg $"5" + "12" (= 169)$ or $("5")^2 + ("12")^2 (= 169)$ or $[\text{their } AC]^2 + [\text{their } CB]^2$ OR for start of process to find radius, eg $"2.5" + "6" (= 42.25)$ or $("2.5")^2 + ("6")^2 (= 42.25)$	Missing brackets only condoned if recovered. [their AC] and [their CB] are clearly identified as the lengths of AC and CB (may be seen on the diagram). Allow use of their half lengths for 2 nd and 3 rd P marks to find radius provided they are clearly identified. Allow use of trigonometry for 2 nd and 3 rd P marks.
		P1	for complete process to find diameter, eg $\sqrt{169} (= 13)$ or $\sqrt{[\text{their } AC]^2 + [\text{their } CB]^2}$ OR for complete process to find radius, eg $\sqrt{42.25} (= 6.5)$	P3 is implied by 13 or 6.5 Award P3 for $\sqrt{(11 - 6)^2 + (15 - 3)^2} (= 13)$
		P1	for process to find circumference, eg $\pi \times "13"$ or $2\pi \times ("13" \div 2)$ or $2\pi \times "6.5"$ or (dep on the 2nd P1) for eg $\pi \times [\text{diameter}]$ or $2\pi \times ([\text{diameter}] \div 2)$ OR $2\pi \times [\text{radius}]$	[diameter]/[radius] is their diameter/radius from a correct start of process to find diameter/radius
		A1	for 40.8 – 40.9	If correct answer is seen and then incorrectly rounded award full marks

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	$\frac{4}{x-2}$	B1	cao	
(b)	$F = \frac{9C}{5} + 32$	M1	for expanding the brackets, eg $5 \times F - 5 \times 32$ or $5F - 160$ or multiplying both sides by 9, eg $9C = 5(F - 32)$ as a first step or dividing both sides by 5, eg $\frac{C}{5} = \frac{F-32}{9}$ as a first step	May be within a separated fraction, eg $(C =) \frac{5F}{9} - \frac{160}{9}$ Condone $9C = 5F - 32$ Steps must be carried out not just intention seen
		M1	for $9C = 5F - 160$ oe or $9C + 160 = 5F$ oe or $\frac{9C}{5} = F - 32$ oe or $C + \frac{160}{9} = \frac{5F}{9}$ oe or $\frac{C}{5} + \frac{32}{9} = \frac{F}{9}$ oe	For M2 only, could be shown as a flow diagram but must have correct inverse operations
		A1	for $F = \frac{9C}{5} + 32$ oe eg $F = 1.8C + 32$ or $F = \frac{9C+160}{5}$	Accept statements with F on the right hand side eg $\frac{9C}{5} + 32 = F$

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
10 (a)	No and reason	C1	for No and reason, eg 40 cars have a speed less than 90 km/h Acceptable examples No, 40 cars have a speed less than 90 km/h (S)he is wrong, 40 is the cumulative frequency Chris is incorrect, the 40 includes the 10 Chris is not correct, the 10 has already been added No, (s)he added up the cumulative frequency No, speeds from 70 to 80 are also between 70 and 90 No, the 50 cars go into the 100km/h bracket No, a total of 50 cars would have a speed of less than around 100 No, it's not 50 cars No, (s)he's added 10 to 40 No, it is not a frequency table No, it is a cumulative frequency table No, the sum of the cumulative frequencies is 264 / not 80 40 cars have a speed less than 90(km/h) It's 40 not 50 The 40 should be 30 The 50 should be 40 It should be $10 + 30$ Not acceptable examples Yes, ... / Chris is correct, ... 40 is the cumulative frequency No, it is the cumulative frequency No, cumulative frequency doesn't represent specific number of cars No, it is them added together No, it's more than 40 cars No, it should be 30 No, $70 < s \leq 90$ is 30 No, 10 cars have a speed less than or equal to 80km/h No, with frequencies 10 and 30 written by the table	Accept any number greater than 90 but less than or equal to 100 in place of the 100

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
(b)	1.7	M1	for finding the difference between readings taken from the height axis at points from a cf of 15 and a cf of 45, eg $7.4 - 5.7$	SCB1 for an answer of 19
		A1	cao (answer of 1.7 from $7.4 - 5.7$)	
(c)	20	M1	for 40 or a clear method to read off the cf graph at height = 7	
		A1	cao	
11	76	P1	for one correct multiplier stated or clearly used eg 0.6 or 1.5 oe or $0.6m$ or $1.5p$ or $(0.6m)^2 (= 0.36m^2)$ or 0.6×100 or 1.5×100	m and p can be any letter or number Allow $0.6m^2$ and $0.36m$ for this mark Do not award for 60(%) or 150(%) alone But allow for eg $100 \rightarrow 150$
		P1	for substituting multipliers into the given formula eg $0.6^2 \div 1.5 (= 0.24)$ oe or $(0.6m)^2 \div 1.5p (= 0.36m^2 \div 1.5p = 0.24m^2 \div p)$ oe or $60^2 \div 150 (= 24)$ oe or $1 - 0.6^2 \div 1.5 (= 0.76)$ oe or for finding the difference in W when different start values have been used eg $100^2 \div 200 - 60^2 \div 300$	Implies the previous process mark Do not allow $0.6m^2$ for $0.36m^2$ but allow $0.36m$
		A1	cao	If using a numerical approach with different starting values for m and p then the working has to be shown and the difference found for the award of this mark Condone -76

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
(b)	Shown	M1	for setting up an equation with a constant term, eg $p = kr^3$ oe or $13.5 = k \times n^3$ oe or $k = \frac{13.5}{n^3}$ oe	Condone the use of “ α ” instead of “=” for the M marks eg condone $p \propto kr^3$ for $p = kr^3$ for M1 k can be on the left hand side of the equation throughout eg $kp = r^3$ for $p = kr^3$
		M1	for substituting two of $r = 2n$, $k = \frac{13.5}{n^3}$ " $p = 108$, into $p = kr^3$ eg $(p =) \frac{13.5}{n^3} \times (2n)^3$ or $108 = k(2n)^3$ or $108 = \frac{13.5}{n^3} r^3$ oe	Allow $8n^3$ for $(2n)^3$ Do not condone missing brackets around the $2n$ unless recovered
		C1	for a complete method to use the equation, the value of k and $r = 2n$ to show $p = 108$, including eg $k = \frac{13.5}{n^3}$ and $(p =) \frac{13.5}{n^3} \times 8n^3 = 108$ oe or $kn^3 = 13.5$ and $(p =) k \times 8n^3$ and $(p =) 13.5 \times 8 = 108$ oe or for a complete method to use the equation, the value of k and $p = 108$ to show $r = 2n$, including eg $k = \frac{13.5}{n^3}$ and $r^3 = 108 \div \frac{13.5}{n^3}$ and $r^3 = 8n^3$ leading to $(r =) 2n$ or $(r =) \sqrt[3]{8n^3} = 2n$ oe or for a complete method using $p = kr^3$ and substituting $r = n$ when $p = 13.5$ and $r = 2n$ when $p = 108$ to form identical equations eg $13.5 = kn^3$ and $108 = k \times 8n^3$ that both lead to $kn^3 = 13.5$	Must show all steps clearly and show $(2n)^3 = 8n^3$ oe Do not condone missing brackets around the $2n$ unless recovered

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	3.6, -0.6	M1 M1 A1	for $(y =) -x + 2$ or $(y =) x^2 - 4x - (x^2 - 3x - 2)$ or $x^2 - 4x + x - 2 (= 0)$ or $x^2 - 4x = -x + 2$ for drawing $y = -x + 2$ intersecting the graph in two places (dep on M2) for answers in the range -0.5 to -0.6 oe and 3.5 to 3.6 oe	Could be a label on the graph Implies the previous method mark Award A0 for coordinate pairs (unless $y = 0$) or solutions given as an inequality eg $-0.5 < x < 3.6$
14	$x = -1$ $y = -0.5$	M1 A2 (A1)	for $20^{\frac{1}{2}}$ or for writing $\sqrt{20}$ as $\sqrt{4 \times 5}$ or $\sqrt{4}\sqrt{5}$ or $(4 \times 5)^{\frac{1}{2}}$ or $4^{\frac{1}{2}} \times 5^{\frac{1}{2}}$ or $2 \times 5^{\frac{1}{2}}$ or $2\sqrt{5}$ or for writing $\frac{\sqrt{5}}{10}$ as $\frac{\sqrt{5}}{2 \times 5}$ oe eg $\frac{5^{\frac{1}{2}}}{2 \times 5}$ or for writing 20 as $2 \times 2 \times 5$ or $2^2 \times 5$ for $x = -1$ and $y = -0.5$ oe for $x = -1$ or $y = -0.5$ oe)	May be within fraction eg $\frac{1}{2\sqrt{5}}$ or $\frac{2\sqrt{5}}{20}$ Maybe embedded eg $\frac{1}{20} = \frac{1}{2^2 \times 5}$ or $\frac{1}{20} = 2^{-2} \times 5^{-1}$ Allow $2^{-1} \times 5^{-\frac{1}{2}}$ for M1A1 only

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	Proof	M1	for correct expressions for three consecutive multiples of 4, eg $4n - 4$, $4n$, $4n + 4$ oe or $4n$, $4n + 4$, $4n + 8$ oe	For both M marks accept use of linear expressions with a difference of 4, eg $(x - 4)$, x , $(x + 4)$
		M1	(dep M1) for multiplying the smallest and largest, eg $(4n - 4)(4n + 4) = 16n^2 + 4n - 4n - 16 (= 16n^2 - 16)$ or $4n(4n + 8) = 16n^2 + 32n$ and for squaring the middle number, eg $(4n)^2 = 16n^2$ or $(4n + 4)^2 = 16n^2 + 16n + 16n + 16 (= 16n^2 + 32n + 16)$	Expressions need not be simplified for this mark When expanding double brackets, allow 4 terms correct without considering signs or 3 terms out of 4 correct with correct signs eg $16n^2 + 32n$ or $32n + 16$ can be considered 3 terms out of 4 correct with correct signs
		C1	for a complete proof without any errors in expansion or simplification or missing brackets even if recovered eg from $4n - 4$, $4n$, $4n + 4$ $(ac + 16 \Rightarrow) (4n - 4)(4n + 4) + 16 = 16n^2 - 16 + 16 = 16n^2 = (4n)^2 (= b^2)$ or $(b^2 - 16 \Rightarrow) (4n)^2 - 16 = 16n^2 - 16 = (4n - 4)(4n + 4) (= ac)$ or $(b^2 - ac \Rightarrow) (4n)^2 - (4n - 4)(4n + 4) = 16n^2 - (16n^2 - 16) = 16$ or $(ac \Rightarrow) (4n - 4)(4n + 4) = 16n^2 - 16$ and $(b^2 \Rightarrow) (4n)^2 = 16n^2$ and ac is 16 less than b^2 oe OR from $4n$, $4n + 4$, $4n + 8$ $(ac + 16 \Rightarrow) 4n(4n + 8) + 16 = 16n^2 + 32n + 16 = (4n + 4)^2 (= b^2)$ or $(b^2 - 16 \Rightarrow) (4n + 4)^2 - 16 = 16n^2 + 32n + 16 - 16 = 4n(4n + 8) (= ac)$ or $(b^2 - ac \Rightarrow) (4n + 4)^2 - 4n(4n + 8) = 16n^2 + 32n + 16 - (16n^2 + 32n) = 16$ or $(ac \Rightarrow) 4n(4n + 8) = 16n^2 + 32n$ and $(b^2 \Rightarrow) (4n + 4)^2 = 16n^2 + 32n + 16$ and ac is 16 less than b^2 oe	Use of $(x - 4)$, x , $(x + 4)$ oe scores maximum of M1M1 unless $x = 4n$ or x is a multiple of 4 is explicitly seen Use of a , b or c does not need a , b or c is a multiple of 4 explicitly seen Allow a complete proof that meets in the middle eg $(b^2 - 16 \Rightarrow) (4n + 4)^2 - 16 = 16n^2 + 32n + 16 - 16 = 16n^2 + 32n$ with $(ac \Rightarrow) 4n(4n + 8) = 16n^2 + 32n$ For the C mark (not the second M): $(4n - 4)(4n + 4) + 16$ must be seen no more simplified than $16n^2 - 16 + 16$ before $16n^2$ $(4n + 4)^2 - 16$ must be seen no more simplified than $16n^2 + 32n + 16 - 16$ before $16n^2 + 16n$

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
16	108π	P1	for process to find volume of cylinder, eg $\pi \times 8^2 \times 9$ (= 576π or 1809.5(5...))	
		P1	for start of process to find radius of hemisphere, eg $\frac{4}{3} \times \pi \times r^3 = "576\pi" \div 2$ oe eg $\frac{4}{3} \times \pi \times r^3 = 288\pi$ or 904.7(...) or $\frac{2}{3} \times \pi \times r^3 = "576\pi" \div 4$ oe eg $\frac{2}{3} \times \pi \times r^3 = 144\pi = 452.3(8...)$	Allow consistent omission of π in the equation eg $\frac{4}{3} \times r^3 = "576" \div 2$
		P1	for process to isolate r from the volume of a sphere or hemisphere, $(r =) \sqrt[3]{\frac{"576\pi" \div 4 \times 3}{2\pi}} (=6) \text{ oe}$ or for solving $\frac{2}{3}\pi r^3 = n\pi$ eg $(r =) \sqrt[3]{\frac{n\pi}{\frac{2}{3} \times \pi}}$ or for solving $\frac{4}{3}\pi r^3 = n\pi$ eg $(r =) \sqrt[3]{\frac{n\pi}{\frac{4}{3} \times \pi}}$	P3 can be implied by $r = 6$ Allow if ($r =$) 6 from correct working and embedded in a calculation to find the area or volume of the (hemi)sphere With full working shown to isolate r where n is a numerical value, $n\pi$ could have been evaluated to a decimal number
		P1	(dep on the third process mark) for process to find total surface area of hemisphere, eg $4 \times \pi \times "6"'^2 \div 2 + \pi \times "6"'^2$ oe or $4 \times \pi \times [\text{radius}]^2 \div 2 + \pi \times [\text{radius}]^2$ oe or answer in range 339 to 339.3	[radius] is their radius of hemisphere If radius is incorrect then full working must be shown
		A1	cao	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	2.54	B1	for stating any correct bound, eg 34.5 or 35.5 or 2.25 or 2.35 or 12.55 or 12.65	Accept 35.49 or 35.499(9...) for 35.5 Accept 2.349 or 2.3499(9...) for 2.35 Accept 12.649 or 12.6499(9...) for 12.65
		M1	for a correct method to find the lower bound, eg $\frac{[\text{LB of } a] - [\text{UB of } c]}{[\text{UB of } m]}$ or $\frac{34.5 - 2.35}{12.65}$	$34.5 \leq [\text{LB of } a] < 35$ and $2.3 < [\text{UB of } c] \leq 2.35$ and $12.6 < [\text{UB of } m] \leq 12.65$
		A1	(dep on all previous marks) for an answer in range 2.54 to 2.542 clearly coming from working with correct values eg $\frac{34.5 - 2.35}{12.65}$	If correct answer is seen and then incorrectly rounded award full marks Award 0 marks for a correct answer with no (or incorrect) supportive working

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	17.5	P1	for start of process to find angle CAB , eg $\frac{\sin A}{7.8} = \frac{\sin 130}{12.4}$ oe eg $\frac{7.8}{\sin A} = \frac{12.4}{\sin 130}$ or start of process to find BA , eg $12.4^2 = 7.8^2 + AB^2 - 2 \times 7.8 \times AB \times \cos 130$	Can be implied by $BCA = 21.1(9\dots)$
		P1	for a complete process to find angle CAB , eg $(A =) \sin^{-1} \left(\frac{\sin 130}{12.4} \times 7.8 \right)$ oe $(= 28.8\dots)$ or $\sin^{-1} 0.4818\dots (= 28.8\dots)$ or a complete process to find BA , eg $(BA =) \frac{2 \times 7.8 \times \cos 130 + \sqrt{(-2 \times 7.8 \times \cos 130)^2 - 4 \times 1 \times (7.8^2 - 12.4^2)}}{2}$ $\left(= \frac{-10.0(2\dots) + \sqrt{100.5(5\dots) + 371.68}}{2} = 5.85(1\dots) \right)$	
		P1	for process to find area of triangle, eg $\frac{1}{2} \times 7.8 \times 12.4 \times \sin(180 - 130 - "28.8")$ oe or $\frac{1}{2} \times 7.8 \times 12.4 \times \sin(180 - 130 - [CAB])$ oe or $\frac{1}{2} \times 7.8 \times 12.4 \times \sin[ACB]$ oe OR eg $\frac{1}{2} \times 7.8 \times "5.85" \times \sin 130$ oe or $\frac{1}{2} \times 7.8 \times [AB] \times \sin 130$ oe	
		A1	for answer in range 17.4 to 17.5	If correct answer is seen and then incorrectly rounded award full marks

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	Proof	M1	for stating $AB = BC$ they are sides of a <u>square</u>	Reasons must be present with the relevant statement
		M1	for stating angle $CBM = \text{angle } BAN$ it is an angle in a <u>square</u> or it is a <u>right angle</u> or is 90^0 or is <u>perp</u> (endicular) or stating angle $CBN = \text{angle } ANB$ they are <u>alternate</u> angles OR for stating two angles in one of the four triangles (not including 90^0 degree angle), with reason, eg $NBA = x$ and $BNA = 90 - x$ oe or $MCB = x$ and $BMC = 90 - x$ oe or $PBM = x$ and $BMP = 90 - x$ oe or $PCB = x$ and $CBP = 90 - x$ oe and <u>angles</u> in a <u>triangle</u> add up to 180 OR $NBA = x$ and $NBC = 90 - x$ oe, it is an angle in a <u>square</u> or it is a <u>right angle</u> or is 90^0 or is <u>perp</u> (endicular) OR $\tan MCB = \frac{MB}{CB}$ oe and $\tan ABN = \frac{AN}{AB}$ oe (no reason required) OR $m_{CM} = \frac{MB}{CB}$ oe and $m_{BN} = -\frac{AB}{NA}$ oe (no reason required)	Underlined words need to be shown; reasons need to be linked to their method Allow alternative angle names throughout eg angle BCP for angle BCM Three letter labels throughout except for angle A Accept " $\angle s$ " for "angles" Accept a triangle symbol for 'triangle' Accept standard notation for perpendicular Allow <u>angles</u> in a <u>quadrilateral</u> for <u>angles</u> in a <u>triangle</u> Allow use of the same numerical value for CB and AB but only for the method marks Implies the previous method mark

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
		M1	for stating two angles on triangle ABN are equal to two of the angles on triangle BCM, with reasons two of: angle CBM = angle BAN with reason(s) angle MCB = angle NBA with reason(s) angle ANB = angle BMC with reason(s) OR $\tan MCB = \frac{MB}{CB}$ oe and $\tan ABN = \frac{AN}{AB}$ oe and angle ABN = angle MCB with reason(s) OR $m_{CM} = \frac{MB}{CB}$ oe and $m_{BN} = -\frac{AB}{NA}$ oe and $\frac{MB}{CB} \times -\frac{AB}{NA} = -1$ oe <u>right angle</u> or is 90° or is <u>perp</u>(endicular)	
		C1	(dep M3) concludes proof by stating triangle CBM and triangle BAN are congruent with reference to <u>ASA</u> or triangle CBM and triangle BAN are congruent with reference to <u>AAS</u> or stating triangle CBM and triangle BAN are similar and common side and therefore <u>$BM = AN$</u> or concludes proof using trig ratios and therefore <u>$BM = AN$</u> or concludes proof using gradients and therefore <u>$BM = AN$</u>	Reference For ASA $AB = BC$, $NBA = MCB$, $CBM = BAN$ For AAS $AB = BC$, $BMC = BNA$ and $NBA = MCB$ or $CBM = BAN$

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
20	$y = \frac{3}{2}x - \frac{1}{2}$	P1	for process to rearrange $2x + 3y = 18$ to give y in terms of x , eg $y = \frac{18-2x}{3}$ or $y = -\frac{2}{3}x + 6$ or $m = -\frac{2}{3}$	Condone an incorrect value for the y intercept Allow 0.66(6...) or 0.67 for $\frac{2}{3}$
		P1	for process to find gradient of perpendicular, eg $-1 \div -\frac{2}{3}$ ($= \frac{3}{2}$) or $-1 \div [m]$	throughout [m] is 2 or -2 or clearly identified as the gradient of $2x + 3y = 18$
		P1	for start of process to find coordinates of A , by substitution eg $2x + 3(2x - 2) = 18$ or $y + 2 + 3y = 18$ or $2x - 2 = -\frac{2}{3}x + 6$ or $2x - 2 = -\frac{2}{3}x + c$ or by elimination eg $\begin{array}{rcl} 2x - y = 2 & 6x - 3y = 6 & \\ -2x + 3y = 18 & + 2x + 3y = 18 & \\ \hline (-4y = -16) & (8x = 24) & \end{array}$	Can be implied by one correct coordinate of A , eg $x = 3$ or $(3, b)$ or $y = 4$ or $(a, 4)$ ($c \neq 0$ and must be a number) Award P1 for a correct method to eliminate x or y : coefficient of x or y the same and correct operator to eliminate selected variable
		P1	(dep on the previous P1) for substituting in their coordinates of A into $y = \frac{3}{2}x + c$ or $y = -\frac{1}{[m]}x + c$ or $(y - y_1) = -\frac{3}{2}(x - x_1)$ or $(y - y_1) = -\frac{1}{[m]}(x - x_1)$	(x_1, y_1) are the coordinates of A
		A1	for $y = \frac{3}{2}x - \frac{1}{2}$ oe eg $(y - 4) = \frac{3}{2}(x - 3)$ or $3x - 2y - 1 = 0$	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
21		B2	for reflection (in) $x = \frac{1}{2}k - 2$ oe	Award no marks if more than one transformation is given
		(B1	for reflection or $x = \frac{1}{2}k - 2$ oe or $\left(\frac{1}{2}k - 2, y\right)$ oe)	where y is a letter or constant

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	$\frac{2}{21}$	P1	for a correct product, eg for two yellow sweets $\frac{y}{y+5} \times \frac{y-1}{y+4} (= \frac{3}{7})$ oe or $\frac{x-5}{x} \times \frac{x-6}{x-1} (= \frac{3}{7})$ oe or eg for two red sweets $\frac{5}{y+5} \times \frac{4}{y+4}$ oe or $\frac{5}{x} \times \frac{4}{x-1}$ oe or eg for one yellow and one red sweet $\frac{5}{y+5} \times \frac{y}{y+4}$ oe or $\frac{5}{x} \times \frac{x-5}{x-1}$ oe	y = number of yellow sweets x = total number of sweets Variables do not need to be defined If product is in terms of two variables then one variable must be defined in terms of the other eg $\frac{y}{x} \times \frac{y-1}{x-1}$ and $x = y + 5$
		P1	(dep on first P1) for multiplying out all brackets and collecting terms to form a simplified three term quadratic in any form of $ax^2 + bx + c (= 0)$ where at least 2 coefficients (a, b, c) are correct eg $4y^2 - 34y - 60 (= 0)$ or $2y^2 - 17y - 30 (= 0)$ or $4x^2 - 74x + 210 (= 0)$ or $2x^2 - 37x + 105 (= 0)$	Look out for signs reversed The quadratic does not have to equal 0, ie accept $4y^2 - 34y = 60$
		P1	(dep on first P1) ft for a process to solve their 3 term quadratic equation, eg $(y - 10)(2y + 3) (= 0)$ or $(y =) \frac{- -17 \pm \sqrt{(-17)^2 - 4 \times 2 \times -30}}{2 \times 2}$ or $(2x - 7)(x - 15) (= 0)$ or $(x =) \frac{- -37 \pm \sqrt{(-37)^2 - 4 \times 2 \times 105}}{2 \times 2}$	Can be implied by (y =) 10 (and $y = -1.5$ oe) or (x =) 15 (and $x = 3.5$ oe) from a correct quadratic If the quadratic and/or values are incorrect then working must be shown If using the quadratic formula: allow + for $\pm$, condone one sign error and omission of brackets around the b in the $b^2 - 4ac$ and the fraction line not being under the - in the $-b$. Allow some simplification – as far as eg $\frac{17 \pm \sqrt{289 + 240}}{4}$

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
		P1	(dep on one positive integer solution from a correct quadratic) for process to find probability of two red sweets, eg $\frac{5}{[y]+5} \times \frac{4}{[y]+4}$ oe or $\frac{5}{[x]} \times \frac{4}{[x]-1}$ oe or $\frac{5}{\text{"10"}+5} \times \frac{4}{\text{"10"}+4}$ oe or $\frac{5}{\text{"15"}} \times \frac{4}{\text{"15"}-1}$ oe	or if factorising allow brackets which expand to give 2 out of 3 correct terms for their quadratic Where [y] is an integer solution from $4y^2 - 34y - 60 (= 0)$ oe Where [x] is an integer solution from $4x^2 - 74x + 210 (= 0)$ oe
		A1	for $\frac{2}{21}$ oe	Accept any equivalent fraction, decimal form 0.09(5...) or percentage form 9(.5...) rounded or truncated to 2 decimal places (allow 0.1 or 10% if from correct working) If correct answer is seen and then incorrectly converted (and rounded) award full marks SCB2 for $\frac{15 \pm 5\sqrt{21}}{4} = 9.47(8...)$ oe or $\frac{35 \pm 5\sqrt{21}}{4} (= 3.02(1...), 14.4(7...))$ oe, allow + for $\pm$ and $\sqrt{525}$ for $5\sqrt{21}$

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 3H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme. Notes apply to both MLP papers and Braille papers unless otherwise stated.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: $\pm 5^\circ$

Measurements of length: ± 5 mm

PAPER: 1MA1/3H			
Question		Modification	Mark scheme notes
2	(a)	Wording changed: ‘Look at the diagram for Question 2(a) in the Diagram Booklet. It shows a number line.’ Diagram enlarged. Open headed arrows. Braille: wording added ‘Drawing film and bumpons are provided if you wish to use them.’	Standard mark scheme
	(b)	Wording added: ‘Look at the diagram for Question 2(b) in the Diagram Booklet. It shows another number line.’ Wording changed: ‘below’ to ‘in the Diagram Booklet’. Diagram enlarged. Open headed arrows.	Standard mark scheme
4		Wording added: ‘Look at the table for Question 4 in the Diagram Booklet.’	Standard mark scheme
8		Wording changed: ‘Look at the diagram for Question 8 in the Diagram Booklet.’ Diagram enlarged. Open headed arrows. Braille: wording added ‘Angle ACB is a right angle.’	Standard mark scheme
9	(b)	Braille: letters changed, ‘C’ to ‘m’ and ‘F’ to ‘p’.	Braille: standard mark scheme but not the change of letters
10	(a)	Wording changed: ‘Look at the diagram for Question 10(a) in the Diagram Booklet. It is a cumulative frequency table showing ...’	Standard mark scheme

	(b)	Wording changed: 'Look at the diagram for Question 10(b) in the Diagram Booklet. It is a cumulative frequency graph showing ...' Diagram enlarged. Open headed arrows. Vertical axis cropped so it ends at 60. Horizontal axis cropped so it ends at 10. Line changed to pass through points (5.5, 15) and (7, 45)	M1 for finding the difference between readings taken from the height axis at at points from a cf of 15 and a cf of 45, eg $7 - 5.5$ A1 for 1.5
	(c)	Value changed: 7 metres changed to 6 metres.	M1 for 20 or a clear method to read off the cf graph at height = 6 A1 for 40
12	(a)	Wording added: 'Look at the table for Question 12(a) in the Diagram Booklet.' Wording added: 'in the Diagram Booklet. There are two spaces to fill.' Braille: letters changed, 'g' to 'm' and 'h' to 'n' Wording changed 'Complete the table below by writing the missing values labelled (i) and (ii).'	MLP: Standard mark scheme Braille: Standard mark scheme but note the change of letters leading to (i) $n = 6$ and (ii) $m = 30$
13		Wording changed: 'Look at the diagram for Question 13 in the Diagram Booklet. It shows ...' Diagram enlarged. Open headed arrows.	Standard mark scheme but note the change of range to -0.4 to -0.7 and 3.4 to 3.7 or ft graph
15		Letters changed: 'a' to 'p', 'b' to 'q' and 'c' to 'r'	Standard mark scheme but note the change of letters

16		Wording changed: ‘Look at Diagram 1, Diagram 2, and Diagram 3 for Question 16 in the Diagram Booklet. There may be a model available for this question, if ordered. Diagram 1 and the model show a 3D view of a solid hemisphere and a solid cylinder. Diagram 2 shows a front view of the hemisphere and cylinder. Diagram 3 shows a top view of the hemisphere and cylinder.’ Diagrams enlarged. Open headed arrows. 2D view added. Models provided. Braille: wording added ‘You are also provided with two models.’ 3D view removed. Models provided.	Standard mark scheme
17		Letters changed: ‘a’ to ‘p’ and ‘c’ to ‘r’	Standard mark scheme but note the change of letters
18		Wording changed: ‘Look at the diagram for Question 18 in the Diagram Booklet. It shows ...’ Wording added: ‘AC = 12.4 cm BC = 7.8 cm Angle ABC = 130°’ Diagram enlarged. Angle moved outside of angle arc and angle arc made smaller.	Standard mark scheme
19		Wording changed: ‘Look at the diagram for Question 20 in the Diagram Booklet. It shows square ABCD.’ Wording added: ‘A right angle is marked at P.’ Diagram enlarged.	Standard mark scheme
21		Wording added: ‘Look at the diagram for Question 21 in the Diagram Booklet. It shows triangle ABC on a grid.’ Wording added: ‘There may be a shape available for this question, if ordered. The shape is triangle ABC’ Diagram enlarged. Cutout shape provided.	Standard mark scheme

