Mark Scheme (Results)

Summer 2018

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 2H

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 2018
Publications Code 1MA1_2H_1806_MS

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 (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 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 E.g. 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 E.g. “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 E.g. [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
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
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: 1MA1/2H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1	(a)	m^7	B1	cao	
	(b)	$125n^3p^9$	B2	cao	Allow multiplication signs
			(B1	for 2 of 3 terms correct in a single product)	$125n^3p^x$ or $125n^xp^9$ where $x \neq 0$ or an^3p^9 where a is a number
	(c)	$8q^6r^3$	B2	cao	Allow multiplication signs
			(B1	for 2 of 3 terms correct in a single product)	$8q^6r^x$ or $8q^xr^3$ where $x \neq 0$ or aq^6r^3 where a is a number
2	(a)	280	M1	for listing at least 3 multiples of both 40 and 56 **OR** finds the prime factors of both 40 and 56	40, 80, 120, … 56, 112, 168, … **OR** 2,2,2,5 and 2,2,2,7
			A1	cao	
	(b)	60	B1	60 **or** $2^2 \times 3 \times 5$ oe	2^2, 3, 5 not enough ie must be a product
3		$y = 3x - 6$	M1	for a correct method to find the gradient of the line, or $m = 3$ **OR** identifies −6 as the intercept in words or in a partial equation **OR** $y - b = m(x - a)$ where $m \neq 3$ and (a, b) is a correct coordinate	Just ringing –6 is insufficient
			M1	for $y = 3x + c$ **or** (L=) $3x - 6$ **or** $y =$ "3"$x - 6$ **OR** $y - y_1 = 3(x - x_1)$ **or** $y - b =$ "3"$(x - a)$ where (a, b) is a correct coordinate	Award of this mark implies the first M1 c must be seen either as a letter or a number
			A1	accept $y = 3x +$ −6 oe	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
4	3 : 5	P1	for process to find 20% **or** 120% of the cost, eg 8500 × 0.2 (= 1700) oe **or** 8500 × 1.2 (= 10 200) oe	When partitioning all figures quoted must be correct or a full method shown eg 10% = 8500 ÷ 10 (=850) and 20% = "850" + "850" (=1700)
		P1	for process to find total cost of payments, eg 12 × 531.25 (= 6375)	
		P1	for complete process to find value of deposit, eg "10 200" – "6375" (= 3825) **or** 8500 – "6375" (=2125) **and** "2125" + "1700" (=3825) **OR** the deposit as a proportion of the total cost, eg $1 - \frac{"6375"}{"10200"}$ $(=\frac{3}{8})$	May be seen as a fraction of the total eg $\frac{3825}{10200}$ $(=\frac{3}{8})$
		P1	for finding a correct un-simplified ratio, eg "3825" : "6375" oe **or** 5:3 **or** $1.\dot{6}$: 1 **or** $\frac{5}{3}$: 1	Figures at this stage must be expressed as part of a ratio eg 51:85, $\frac{3}{8} : \frac{5}{8}$
		A1	Accept 1: $1.\dot{6}$, 1: $\frac{5}{3}$	Ignore consistent units
5 (a)	0, –4, –6, –4, 0	B2 (B1	fully correct figures at least 2 correct figures)	
(b)	Graph	M1 A1	(dep B1) for at least 5 points correctly plotted ft from (a) fully correct graph	Must be a curve
(c)	2.6 and –1.6	M1	for $y = –2$ drawn **or** intersections with $y = –2$ **or** $y = x^2 – x – 4$ drawn **or** 1 correct value	If answers stated as coordinates, award M1 for both coordinates and M0 for one coordinate
		A1	ft a quadratic graph **or** for answers in the range 2.5 to 2.7 **and** –1.5 to –1.7	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
6	No (supported)	P1 P1 A1	For a process to calculate the initial or new pressure, eg (70 +10) ÷ (20+10) (=2.6 to 2.7) **or** 80 ÷ 30 (=2.6 to 2.7) **or** 70 ÷ 20 (=3.5) For a complete process to make a comparison eg. 0.8 × "3.5" (=2.8) **OR** $\frac{("3.5"-"2.6")}{"3.5"} \times 100$ (=22 to 26) **OR** "3.5" × 0.2 (=0.7) **and** 80 ÷ 30 (=2.6 to 2.7) **OR** $\frac{"2.6"}{"3.5"}$ (× 100) (=0.74 to 0.78 **or** 74 to 78) for a correct conclusion supported by accurate figures eg 2.8 **and** 2.6(6…) **OR** decrease is 24% (or 22% to 26%) **OR** 0.7 **and** 2.6 to 2.7 **and** 3.5 **OR** 0.7 **and** 0.9 **OR** 0.76 (or 0.74 to 0.78) **OR** 76% (or 74% to 78%)	Accept any value in the range 2.6 to 2.7 if unsupported by working Allow truncation or rounding of figures
7	Enlargement	B2 (B1	for correct enlargement at (1,2) (2,3) (2,4) (1,4) for correct size **and** orientation in the wrong position **OR** 3 of 4 vertices correct and joined **OR** 4 correct vertices not joined)	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
8	$\frac{3}{22}$	P1 P1 P1 A1 SC B3 for $\frac{3}{60}$	for a process to find a first value eg male/Britain = 32 – 11 (=21) **or** Italy/total = 60 – (32+12) (=16) **or** female/total = 60 – 38 (=22) for process to find a secondary value, eg male/Spain = 38 – (“21” + 8) (=9) **or** female/Italy = “16” – 8 (=8) complete process to find female/Spain, eg 12 – “9” **or** “22” – (11 + “8”) (=3) oe accept 0.136 to 0.14	<table><tr><td></td><td>Br</td><td>Sp</td><td>It</td><td>Tot</td></tr><tr><td>M</td><td>21</td><td>9</td><td>8</td><td>38</td></tr><tr><td>F</td><td>11</td><td>3</td><td>8</td><td>22</td></tr><tr><td>Tot</td><td>32</td><td>12</td><td>16</td><td>60</td></tr></table> May be seen in a frequency tree Values attributed to a category or from method seen
9	12 508.7(0)	P1 P1 P1 A1	for start of process to find interest rate for year 1 eg 12336 ÷ 12000 (=1.028) **or** (12336 – 12000) ÷ 12000 (=0.028) **OR** forms a suitable equation, eg 12000 × (1 + $\frac{x}{100}$) = 12336 for complete process to find the interest rate for year 1 eg (“1.028” – 1) × 100 (=2.8) **or** “0.028” × 100 (=2.8) **OR** correct process to solve correct equation eg (12336 – 12000) ÷ 120 (=2.8) for complete process to find the value at the end of 2 years eg (“2.8” ÷ 2 + 100) ÷ 100 × 12336 accept 12508.7 to 12508.71 **or** 12509	Rate of interest = 2.8, or x = 2.8 implies P2 12509 must come from correct working

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
10 (a)	Diagram	B1	for correct vector drawn including arrow	May be drawn anywhere on the grid. Condone missing label
(b)	$\begin{pmatrix} 3 \\ -4 \end{pmatrix}$	M1	for **a** + 2**b** drawn with resultant vector **or** for writing **a** and **b** as column vectors **and** attempt to add **a** + 2**b** , eg $\begin{pmatrix} 1 \\ 2 \end{pmatrix} + 2 \times \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ **or** $\begin{pmatrix} 1+2 \\ c \end{pmatrix}$ **or** $\begin{pmatrix} d \\ 2+-6 \end{pmatrix}$ **or** $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$	Accept consistent incorrect notation for M1
		A1	cao	
11 (a)	$\frac{2}{25}$	B1	accept 0.08	
(b)	$\frac{1}{8}$	M1	fg(x) = $\frac{2}{(4x^3)^2}$ oe **or** g(1) = 4 **or** $\frac{2}{(4\times1^3)^2}$ oe	
		A1	oe	All powers and products must be evaluated
12	BDAC	B2	all correct	
		(B1	for at least 2 correct)	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
13 (a)	Shown	M1	for finding one missing angle eg $BDE = y$ **or** $ODE = 90$ **or** $ODF = 90$ **or** $DBO = x$ **or** $BCD = 180 - y$ **or** (reflex) $BOD = 2y$	Could be shown on the diagram or in working
		A1	for a complete correct method leading to $y - x = 90$	
		C1	(dep on A1) for all correct circle theorems given appropriate for their working eg The tangent to a circle is perpendicular (90^o) to the radius (diameter) Alternate segment theorem **OR** Angle at the centre is twice the angle at the circumference Opposite angles in a cyclic quadrilateral sum to 180°	
(b)	Explanation	C1	for explanation eg No as y must be less than 180 as it is an angle in a triangle	
14	11 – 19	P1	for drawing a tangent to the curve at time = 5	
		P1	for process to find the gradient, eg $70 \div 5$	Using their drawn tangent, eg change in y ÷ change in x
		A1	(dep on 1st P1) for answer in the range 11 - 19 m/s	Must come from gradient of a tangent.

Paper: 1MA1/2H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
15	(a)	0.55, 0.67, 0.33, 0.35, 0.65	B1	for 0.55 in correct position	Can be seen as fractions or percentages
			B1	for the branches for the second game correct	
	(b)	0.341	M1	for one correct product, eg 0.45 × "0.33" (=0.1485) **or** "0.55" × "0.35" (=0.1925) **or** 0.45 × "0.67" (=0.3015) **or** "0.55" × "0.65" (=0.3575)	Follow through acceptable for method marks from their tree in part (a) providing probabilities are less than 1. Accept fractional equivalents
			M1	for correct method eg (0.45 × "0.33") + ("0.55" × "0.35") **or** 1 – (0.45 × "0.67") – ("0.55" × "0.65")	
			A1	answer in range 0.34 – 0.341 oe	
16	(a)	Correct graph	B2	for a circle radius 3.5, centre (0, 0)	Circle could be drawn freehand as long as it approximates to a circle
			(B1	for a circle centre (0, 0) of a different radius, **or** for a circle drawn of radius 3.5 centre not (0, 0) **or** incomplete correct circle)	
	(b)	$x = 2.0, y = -2.9$ $x = -1.2, y = 3.3$	M1	for $2x + y = 1$ drawn, **or** for correctly eliminating one variable, eg $x^2 + 1 - 4x + 4x^2 = 12.25$ or $x^2 + (1 - 2x)^2 = 12.25$	
			A1	for the pair of x values, **or** the correct pair of y values, **or** one correct pair of x/y values ft from (a) (dep on B1)	$2x + y = 1$ does not have to be shown Use professional judgment
			A1	for both correct pair of x/y values, unambiguously matched ft from (a) (dep on B1)	Accept values given as coordinates. Check graph for answers

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
17 (a)	4, 6, 5, 4	M1	for a correct method to find at least 2 frequencies from bars of different widths, eg 10 × 0.4 (=4), 10 × 0.6 (=6), 5 × 1 (=5), 20 × 0.2 (=4)	
		A1	cao	
(b)	10	M1	for $\frac{23+1}{4}$ (=6) **or** $\frac{23}{4}$ (=5.75) could ft from their table in (a)	
		A1	for 10 or 9.375	Be aware of 10 coming from incorrect working ft does not apply to the A1
18	39.5	P1	for a start to a process eg, for a correct trigonometric statement, eg $\sin 48 = \frac{7.3}{AC}$ **or** $\cos 42 = \frac{7.3}{AC}$ **or** $\frac{AC}{sin90} = \frac{7.3}{sin48}$ **OR** angle *CAH* unambiguously identified on a diagram	Must include correct values
		P1	for a complete correct process to find *AC*, eg $(AC =) \frac{7.3}{\sin(48)}$ (=9.8..) **or** $(AC =) \frac{7.3}{\cos(42)}$ (=9.8..) **or** $(AC =)$ $\sin 90 \times \frac{7.3}{sin48}$ (=9.8..)	
		P1	for a correct statement using angle *CAH*, eg $\tan(CAH) = \frac{8.1}{"9.8..."}$ **OR** $\sqrt{8.1^2 + "9.8"^2}$ (=12.7…) **and** $\frac{\sin CAH}{8.1} = \frac{sin90}{"12.7"}$	
		A1	for answer in the range 39.5 – 39.51	If an answer is given in the range but then incorrectly rounded award full marks.

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
19	905	P1	for correct use of formula for the volume of a sphere eg $\frac{1}{4} \times \frac{4}{3} \times \pi \times r^3$ (= 576π or 1809…) **OR** $576\pi \times 4$ **or** 2304π **or** 7238…($=\frac{4}{3} \times \pi \times r^3$)	We do not need to see what is in the brackets to award this mark. The contents of the bracket alone would score P0
		P1	for a complete correct process to find r, eg $r = \sqrt[3]{\frac{576 \times 4 \times 3}{4}}$ **or** $r = 12$	Could be shown in several stages $\sqrt[3]{\frac{576 \times 4 \times 3}{4}} = \sqrt[3]{1728}$
		P1	for a process to find the curved surface area eg $\frac{4 \times \pi \times [radius]^2}{4}$ (=144π or 452…) **OR** the surface area of both flat surfaces eg $(2 \times \frac{\pi \times [radius]^2}{2})$ **OR** complete expression for the total surface area eg $\frac{4\pi r^2}{4} + \frac{\pi r^2}{2} \times 2$ oe	Radius used must be clearly identified as their radius of the solid
		P1	for process to find the complete surface area eg $\frac{4 \times \pi \times [radius]^2}{4} + (2 \times \frac{\pi \times [radius]^2}{2})$	
		A1	answer in the range 904.7 – 905 or 288π (SCB2 for an answer in the range 358.1 – 359.2)	If an answer is given in the range but then incorrectly rounded, award full marks.
20 (a)	explanation	C1	for a correct explanation, eg $\sqrt{3} \times -\sqrt{3} = -3$, not 3	
(b)	explanation	C1	for correct explanation, eg $\sqrt{12} = 2\sqrt{3}$, not $3\sqrt{2}$	

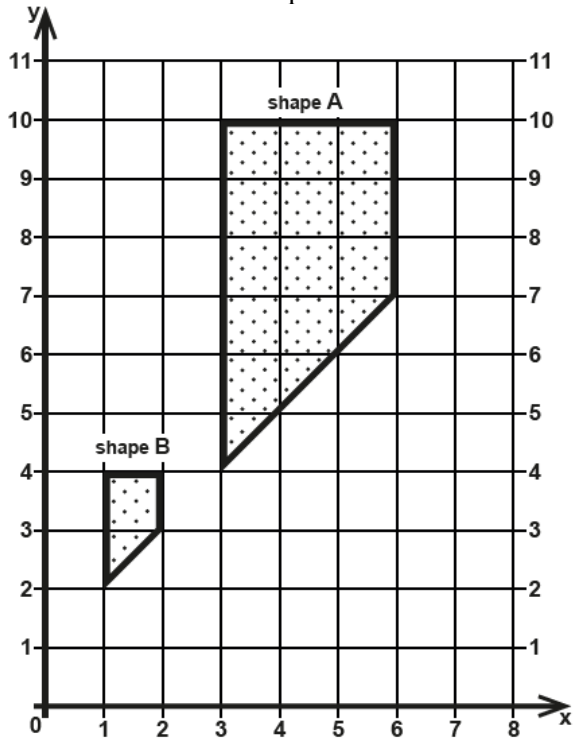
Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
21	0.43	B1	for one correct bound for mass or length eg 1967.5 **or** 1972.5 **or** 13.15 **or** 15.95 **or** 21.65 **or** 13.25 **or** 16.05 **or** 21.75	Can work in any units
		P1	for a correct process to find a bound for the volume, eg 13.15 × 15.95 × 21.65 (=454(0.925125)) **or** 13.25 × 16.05 × 21.75 (=462(5.409375))	Accept volumes truncated or rounded to at least 3 sig fig
		P1	for a correct process to find a bound for density, eg [mass LB] ÷ "462(5.409375)" (=0.425(367755)) where 1965 ≤ mass LB < 1970 **or** [mass UB] ÷ "454(0.925125)" (=0.434(3828506)) where 1970 < mass UB ≤ 1975	Accept densities truncated or rounded to at least 3 sig fig
		A1	for both correct bounds, 0.425(367755) **and** 0.434(3828506)	Accept bounds truncated or rounded to at least 3 sig fig At this point correct units must be used
		C1	(dep on A1) for a correct statement on degree of accuracy e.g. UB and LB both round to 0.43 to 2 decimal places or 2 significant figures	Must be 0.43 not 0.4

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

Paper: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
3		Diagram enlarged	Standard mark scheme
5	(a)	Table has been turned to vertical format and left aligned. Wording added 'There are five spaces to fill.' Braille will label answer spaces (i) to (v) from left to right.	Standard mark scheme
5	(b)	Diagram enlarged	Standard mark scheme

Paper: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
7		Shape B has been drawn on the grid and the question has been changed to: 'It shows shape A and shape B given on a grid. Describe fully the single transformation that maps shape A onto shape B.' 3 answer lines have been provided. The cross has been removed from the y axis.  	B2 for all three aspects: enlargement scale factor 1/3 centre (0,1) (B1 for just two of these aspects)

Paper: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
10		Diagram enlarged. Right axis has been labelled. Arrows have been made longer. Intermediate labels have been added to the axes.	Standard mark scheme
12		Diagrams enlarged. Wording added 'There are four spaces to fill.' Braille will label answer spaces (i) to (iv) from top to bottom.	Standard mark scheme
13		Diagram enlarged. Angles moved outside of the angle arcs and the arcs have been made smaller. Wording added 'Angle BAD = y^o Angle BDO = x^o	Standard mark scheme
14		Diagram enlarged. Axes labels have been moved to the left of the horizontal axis and above the vertical axis. Right axis has been labelled. Graph line moved to go through (5, 40).	Standard mark scheme applied to the given graph, which will likely result in figures such as 40/2 =20; apply normal MLP tolerances, likely to result in an answer in the range 16 - 24 m/s
15		Wording added 'It shows a probability tree diagram.' Diagram enlarged. Wording added in (a): 'There are five spaces to fill.' Braille will label answers as shown below. (ii) 0.45 (iii) (iv) (i) (v)	Standard mark scheme
16		Diagram enlarged.	Standard mark scheme, but apply usual MLP tolerances to reading off the answers.
17		Diagram enlarged. Axes labels have been moved to the left of the horizontal axis and above the vertical axis. Right axis has been labelled. Shading has been changed to dotty shading. In part (a) wording added 'There are four spaces to fill.' Braille will label answer spaces (i) to (iv) from top to bottom.	Standard mark scheme

Paper: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
18		Model provided for all candidates. Diagram enlarged and also provided for MLP. Wording added 'marked x on the model.'	Standard mark scheme
19		2 Models provided for all candidates. Diagrams enlarged and also provided for MLP. No diagram given for the formulae for braille candidates. Shape label has been moved above the diagram. Wording added 'Model 1 is a solid sphere. Model 2, shape S is one quarter of a solid sphere, centre O.'	Standard mark scheme

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom