

Paper: IMA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	682	M1 A1 A1	for a start to a method, eg $8184 \div 12$ (or $818.4 \div 1.2$) that leads to 6 as the first digit or for a complete method with no more than one arithmetic error for digits 682 ft (dep M1) for correct placement of the decimal point into their final answer	A start to a repeated subtraction method or build-up method is acceptable if a correct first digit of 6 is found
2 (a)	75	P1 P1 A1	for process to find sum of unknown probabilities eg $1 - (0.10 + 0.30 + 0.05 + 0.25) (= 0.3)$ oe or for process to find number of times dice lands on 3, 4, 5 or 6 eg $(0.10 + 0.30 + 0.05 + 0.25) \times 500 (= 350)$ oe for a complete process, eg $(“0.3” \div 2) \times 500$ oe or $(500 - “350”) \div 2$ oe cao	Award mark for any two probabilities that sum to 0.3 eg in the table or probability of 2 = 0.15 PIP1A0 for answer of 75:500 or $\frac{75}{500}$
(b)	Answer to part (a) will be greater	C1	for an explanation that the answer will be greater Acceptable examples It makes the answer an underestimate The number will be higher The answer will increase / will go up The number of 2s will increase It would be more than [75] Not acceptable examples My answer will change My answer is incorrect The calculation will change The probability will change It would make the probability of 2 go up My answer won't change	Where [75] is their answer to (a)

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3 (a)	$2\frac{1}{3}$	M1 A1	for a method to subtract by writing both fractions with a common denominator with at least one correct numerator, eg $3\frac{3}{6} - 1\frac{1}{6}$ or $\frac{3}{6} - \frac{1}{6} (= \frac{2}{6})$ or $\frac{21}{6} - \frac{7}{6} (= \frac{14}{6})$ or $\frac{42}{12} - \frac{14}{12} (= \frac{28}{12})$ for $2\frac{1}{3}$ or an equivalent mixed number	Do not isw incorrect further work from correct equivalent mixed number
(b)	Shown	M1 M1 C1	for conversion to improper fractions, eg $\frac{21}{4}$ or $\frac{7}{3}$ or $\frac{9}{4}$ (dep) for method to divide by a fraction, eg $\frac{21}{4} \times \frac{3}{7}$ or $\frac{63}{12} \div \frac{28}{12}$ for complete work showing each stage as far as $\frac{9}{4}$ or $2\frac{7}{28}$	Must see an intermediate step, eg $\frac{63}{28}$ must be seen and then cancelled or correct cancelling seen before the multiplication
4	$180 - 4e$ and reason	M1 A1 C1	for angle $ACD = e$ or for angle $ADC + \text{angle } BAD = 180$ or for angle $BAX = 3e$ (where X lies on DA extended) for $180 - 4e$ oe (dep M1) for an appropriate reason relating to parallel lines from eg <u>alternate</u> angles are equal or <u>allied</u> angles / <u>co-interior</u> angles add up to 180 or for <u>corresponding</u> angles are equal	Angles must be clearly labelled on the diagram or otherwise identified May be unsimplified Underlined words need to be shown Reason needs to be linked to their method, which can be implied from correctly identified angles (stated or written on the diagram)

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5	(a) Estimated time	P1	for rounding of distance = 5 (miles) or speed = 30 (mph)	
		P1	(dep) for using time = distance/speed eg $5 \div 30$ or for a complete process, eg $30 \div 60 (= 0.5)$ and $5 \div "0.5"$ or $30 \div 5 (= 6)$ and $60 \div "6"$ or $4.96 \times \frac{60}{30}$	
		A1	for a correct answer following through their correct rounded distance and/or speed	
	(b) Overestimate with reason	C1	ft from (a) for decision with correct reasoning, eg overestimate as dividing a larger number by a smaller number or overestimate as miles rounded up and speed rounded down	Ft the rounding and process from (a) Must relate to estimation and not rounding of their final answer and they must have a final answer to part (a)
6	55	P1	for process to find the sum of the interior angles of a pentagon, eg $180 \times (5 - 2) (= 540)$ oe	Can be implied by the shape correctly divided into triangle and quadrilateral or three triangles with correct angle sums marked
		P1	for the start to a process of giving each angle in a common form, eg $d = 3c$ or $e = 2c$ or $x, 3x, 2x$	Can be implied by division by 7 or 1, 1, 3, 2 given in a ratio eg 1 : 2 : 1 : 3
		P1	for process to find the value of c , eg $([540] - 155) \div 7$ oe or for a correct equation in one variable, eg $c + 155 + c + 3c + 2c = [540]$ oe	Where [540] is what they believe to be the angle sum of the pentagon
		A1	cao	

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7	Rate of change of volume	C1	for a correct explanation Acceptable examples The rate of water poured Speed of pouring water out from the tank How fast the water is being used (in the tank over time) Amount of water decreasing in the tank each second Not acceptable examples Negative correlation / negative gradient Amount of water decreasing in the tank in seconds As time increases the volume of water in the tank decreases It is negative, the volume of litres is going down It represents the deceleration or changing speed	Allow amount of water increasing in the tank each second
8	4.5	P1	for process to find the area, eg $80 = \frac{720}{A}$ or (area =) $\frac{720}{80} (= 9)$ or $80 = \frac{720}{2x}$ or $2x = \frac{720}{80}$	
		P1	for complete process to find the length, eg " 9 " $\div 2$ or $720 \div (2 \times 80)$	
		A1	for 4.5 oe	
9	(a) Box plot	B3	for a fully correct box plot	Box can be any height. Accept ends that are marked (eg line, cross, dot) or defined by the ends of the whiskers if clear
		(B2	for a box drawn and at least three correctly plotted values from 8, 25, 34, 42, 74)	For LQ accept value in range 24 to 26
		(B1	for correctly identifying one of LQ (25), Median (34), UQ (42) from the cf graph)	May be implied by one of these values being correctly plotted

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(b)	Yes with supporting evidence	M1 M1 C1 M1 M1 C1	for $30 \div 100 \times 60 (= 18)$ for reading from the graph at cf = $60 - "18" (= 40)$ for correct decision and correct figures Alternative for reading from the graph at mark = $40 (= 42)$ for $(60 - "42") \div 60 \times 100 (= 30)$ or for $60 - "42" (= 18)$ and $30 \div 100 \times 60 (= 18)$ for correct decision and correct figures	
10 (a)	10	M1 A1	for $25^{\frac{1}{2}} = 5$ or $8^{\frac{1}{3}} = 2$ cao	Accept $25^{\frac{1}{2}} = -5$ for M1 only
(b)	$\frac{1}{8}$	M1 A1	for $\left(\frac{1}{\sqrt[3]{32}}\right)^3$ or $\left(\frac{1}{2}\right)^3$ or $\sqrt[3]{\frac{1}{32}}$ or $\sqrt[3]{\frac{1}{32768}}$ for $\frac{1}{8}$ oe SCB1 for answer of 8 if M0 scored	

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Question	Answer	Mark	Mark scheme	Additional guidance
11 (a)	Explanation	C1	for explanation Acceptable examples the sum must be 5 and the product must be 6 she had the sum and the product the wrong way round it should be the other way around a and b must be multiplied together to make 6 Not acceptable examples the answer should be $(x + 3)(x + 2)$ the product of a and b is not 5	
(b)	$2(m - 1)(m + 1)$	M1 A1	for a correct partial factorisation, eg $2(m^2 - 1)$ or $(2m - 2)(m + 1)$ or $(m - 1)(2m + 2)$ cao	
(c)	$(a + b)(x - y)$	M1 A1	for a correct partial factorisation, eg $x(a + b) - y(a + b)$ or $x(a + b) + y(-a - b)$ or $a(x - y) + b(x - y)$ for $(a + b)(x - y)$ oe	
12	64 : 25	P1 P1 P1 A1	for start of process to find ratio of lengths of A to B , eg $\sqrt[3]{64} (= 4)$ or $\sqrt[3]{125} (= 5)$ or 4 : 5 for $\sqrt[3]{125} \div 2 (= 2.5)$ oe or $\left(\sqrt[3]{64}\right)^2 (= 16)$ for process to find ratio of areas of A to C , eg $"4"^{*2} : "2.5"^{*2} (= 16 : 6.25)$ for 64 : 25 oe in form $a : b$ where a and b are integers	

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13	7	P1	for setting up an equation using volumes, eg $(x+2)(2x-1)(x-1) = 2x(x+3)(x-3) + 142$	May occur later in the process Must use expressions for volumes but these may have been incorrectly expanded and simplified
		P1	for process to find an expanded expression for the area of one face, eg $(x+2)(2x-1) = 2x^2 - x + 4x - 2$ or $2x^2 + 3x - 2$ or $(x+2)(x-1) = x^2 - x + 2x - 2$ or $x^2 + x - 2$ or $(2x-1)(x-1) = 2x^2 - 2x - x + 1$ or $2x^2 - 3x + 1$ or $2x(x+3) = 2x^2 + 6x$ or $2x(x-3) = 2x^2 - 6x$ or $(x+3)(x-3) = x^2 - 3x + 3x - 9$ or $x^2 - 9$	Condone one incorrect term in expansion of two brackets
		P1	for a complete process to find a fully expanded expression for the volume of one cuboid, eg $2x^3 + 3x^2 - 2x - 2x^2 - 3x + 2$ or $2x^3 + x^2 - 5x + 2$ or $2x^3 + 6x^2 - 6x^2 - 18x$ or $2x^3 - 18x$	Expression need not be fully simplified, but must be correct
		P1	(dep P3) for correct rearrangement of the expanded terms in their equation leading to a 3-term quadratic eg $x^2 + 13x - 140 (=0)$ or $x^2 + 13x = 140$	
		A1	cao	

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14	6	M1	for either $\sin 30 = 0.5$ oe or $\sin 45 = \frac{1}{\sqrt{2}}$ or $\frac{\sqrt{2}}{2}$	
		M1	for $\frac{AB}{\sin 45} = \frac{3\sqrt{2}}{\sin 30}$ oe	
		A1	cao	
15	4 : 1	P1	for $\overrightarrow{OM} = \frac{1}{4}\mathbf{a}$ or $\overrightarrow{MO} = -\frac{1}{4}\mathbf{a}$ or $\overrightarrow{ON} = \frac{1}{3}\mathbf{b}$ or $\overrightarrow{NO} = -\frac{1}{3}\mathbf{b}$ $\overrightarrow{OX} = \mathbf{a} - \mathbf{b}$ or $\overrightarrow{XO} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{ZY} = \mathbf{a} - \mathbf{b}$ or $\overrightarrow{YZ} = -\mathbf{a} + \mathbf{b}$	
		P1	for $\overrightarrow{XN} = \mathbf{b} - \mathbf{a} + \frac{1}{3}\mathbf{b}$ ($= \frac{4}{3}\mathbf{b} - \mathbf{a}$) oe or $\overrightarrow{MN} = \frac{1}{3}\mathbf{b} - \frac{1}{4}\mathbf{a}$ oe or $\overrightarrow{XM} = \mathbf{b} - \mathbf{a} + \frac{1}{4}\mathbf{a}$ ($= \mathbf{b} - \frac{3}{4}\mathbf{a}$) oe	Implies 1 st P1
		P1	for $\overrightarrow{XN} = \mathbf{b} - \mathbf{a} + \frac{1}{3}\mathbf{b}$ oe and $\overrightarrow{MN} = \frac{1}{3}\mathbf{b} - \frac{1}{4}\mathbf{a}$ or $\frac{4}{3}\mathbf{b} - \mathbf{a} - \mathbf{b} + \frac{3}{4}\mathbf{a}$ oe	
		A1	for 4 : 1 oe	A correct answer with no supportive working gets 0 marks

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	$3\sqrt{5}$	M1	for $\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ or $\frac{15}{\sqrt{5}} \times \frac{-\sqrt{5}}{-\sqrt{5}}$	This mark can be awarded whenever this is seen, which might be later in the process.
		A1	for $3\sqrt{5}$ or $\sqrt{45}$	
	$\frac{32-9\sqrt{3}}{11}$	M1	(indep) for writing $\sqrt{75}$ as $5\sqrt{3}$	
		M1	for method to rationalise the denominator, eg $\frac{\sqrt{75}-2}{1+2\sqrt{3}} \times \frac{1-2\sqrt{3}}{1-2\sqrt{3}}$ or $\frac{5\sqrt{3}-2}{1+2\sqrt{3}} \times \frac{1-2\sqrt{3}}{1-2\sqrt{3}}$	
		M1	(dep on previous M1) for expanding terms, condone one error in numerator or denominator eg $\frac{\sqrt{75}-2\sqrt{75}\sqrt{3}-2+4\sqrt{3}}{1-2\sqrt{3}+2\sqrt{3}-4\sqrt{3}\sqrt{3}}$ or $\frac{5\sqrt{3}-10\sqrt{3}\sqrt{3}-2+4\sqrt{3}}{1-2\sqrt{3}+2\sqrt{3}-4\sqrt{3}\sqrt{3}}$	
		A1	for $\frac{32-9\sqrt{3}}{11}$ oe eg $\frac{-32+9\sqrt{3}}{-11}$	
(b)				Accept $a = 32, b = 9, c = 11$

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	100	M1	for angle $BAC = 40$	angle $AOB = 120$ gets M1M1 Award M3C0 for answer of 100 with no correct appropriate circle theorem Underlined words need to be shown Reason needs to be linked to their method, which can be implied from correctly identified angles (stated or written on the diagram)
		M1	for angle OAC or angle $OCA = 10$ or angle OAB or angle $OBA = 30$	
		M1	for angle $ACB = (180 - 30 - 30) \div 2 (= 60)$ or angle $OCD = 90$ or angle $OCB = 50$	
		C1	for angle $ACD = 100$ and one correct appropriate circle theorem from <u>alternate segment</u> theorem angle at the <u>centre</u> is <u>twice</u> the <u>angle</u> at the <u>circumference</u> the <u>tangent</u> to a circle is perpendicular to the <u>radius</u>	
18 (a)	$\frac{4x+3}{5}$	M1	for first step to change the subject of $y = \frac{5x-3}{4}$ or $x = \frac{5y-3}{4}$ eg $4y = 5x-3$ or $4x = 5y-3$	Answer of $\frac{4y+3}{5}$ gets M1A0
		A1	oe	
	100	M1	for $h(5) = 1 - 2 \times 5 (= -9)$ and a clear intention to find $g(-9)$ or for $((1 - 2 \times 5) - 1)^2$ or for stating $gh(x)$, eg $(1 - 2x - 1)^2$ oe	
		A1	cao	
(b)				

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Question	Answer	Mark	Mark scheme	Additional guidance
19	0.204	P1	for a process to find a correct product, eg P(A plays C in the final) = 0.6×0.2 (= 0.12) or P(A plays D in the final) = 0.6×0.8 (= 0.48) or P(A wins against B and C) = 0.6×0.5 (= 0.3) or P(A wins against B and D) = 0.6×0.3 (= 0.18)	Could work with fractions Could be seen as part of a correct triple product
		P1	for a process to find the probability of A winning against C or winning against D in the final, eg P(A wins against C in the final) = " 0.12 " $\times$ 0.5 (= 0.06) or P(A wins against D in the final) = " 0.48 " $\times$ 0.3 (= 0.144) or P(A wins against C in the final) = " 0.3 " $\times$ 0.2 (= 0.06) or P(A wins against D in the final) = " 0.18 " $\times$ 0.8 (= 0.144)	
		P1	for a complete process, eg P(A wins the tournament) = " 0.06 " + " 0.144 "	
		A1	for 0.204 oe	

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Question	Answer	Mark	Mark scheme	Additional guidance
20	$y + \sqrt{3}x = 4$	P1	for process to find the value of p , eg $\sqrt{4-1^2}$ (= $\sqrt{3}$)	May occur later in the process
		P1	for a start of a process to find gradient of tangent, eg gradient of normal/radius = $\frac{1}{p}$ or $\frac{1}{\sqrt{3}}$ or $\frac{1}{[p]}$ or for gradient of tangent = $-p$ or $-\sqrt{3}$ or $-[p]$	Where $[p]$ is their stated value of p
		P1	(dep P1) for substituting (" $\sqrt{3}$ ", 1) into $y = -\sqrt{3}x + c$ or for $y - 1 = -\sqrt{3}(x - \sqrt{3})$ oe or for $1 = -p \times p + c$ or for substituting ($[p]$, 1) into $y = -[p]x + c$ or for substituting (" $\sqrt{3}$ ", 1) into $y = -\frac{1}{[m]}x + c$	Where $[m]$ is clearly their gradient of the normal/radius
		A1	for $y + \sqrt{3}x = 4$	A correct answer with no supportive working gets 0 marks

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

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_1H		
Question	Modification	Mark scheme notes
2	Wording changed: Look at the table for Question 2 in the Diagram Booklet. It shows ... Table turned vertically and enlarged.	Standard mark scheme
4	Wording changed: Look at the diagram for Question 4 in the Diagram Booklet. It shows parallelogram ABCD. Angle BAC is marked p. Angle ADC is marked 3p. Letter 'e' changed to 'p'. Diagram enlarged. Angles moved outside of angle arcs and angle arcs made smaller.	Standard mark scheme but note change of letter
6	Wording changed: Look at the diagram for Question 6 in the Diagram Booklet. It shows a pentagon. Angles p, q, r, s and t are marked. Letters changed: 'a' changed to 'p', 'b' changed to 'q', 'c' changed to 'r', 'd' changed to 's', 'e' changed to 't'. Diagram enlarged. Angles moved outside angle arcs and angle arcs made smaller.	Standard mark scheme but note change of letters
7	Wording changed: Look at the diagram for Question 7 in the Diagram Booklet. It is a graph showing the volume of water, V litres, in a tank at time t seconds. Diagram enlarged. Open headed arrows.	Standard mark scheme
8	Wording changed: 'Look at Diagram 1, Diagram 2 and Diagram 3 for Question 8 in the Diagram Booklet. You may be provided with a model. They are NOT accurate. Diagram 1 and the model show a solid triangular prism on a horizontal floor. Diagram 2 shows the rectangle base of the prism. Diagram 3 shows the triangular side of the prism.' 'm' changed to 'metres' Model provided. Diagram enlarged. Floor added to 3D diagram. Label added 'length'. 2 new 2D views added.	Standard mark scheme

PAPER: 1MA1_1H		
Question	Modification	Mark scheme notes
9	Wording changed: 'Look at the diagram for Question 9 in the Diagram Booklet. It is a cumulative frequency graph giving ...' 74 changed to 45 and 8 changed to 5. Diagram enlarged. Open headed arrows. Intermediates added on the horizontal axis. Graph cropped at 50 on the horizontal axis. Line changed to go through the points (5, 0), (15, 15), (25, 30), (30, 45), (35, 50), and (45, 60)	
(a)	Wording changed: 'Look at the diagram for Question 9(a) in the Diagram Booklet. It shows a grid.' Wording changed: 'below' changed to 'in the Diagram Booklet' For Braille: sentence added Bumpson and drawing film are provided if you wish to use them Diagram enlarged. Intermediates added on the horizontal axis. Top axis labelled. Open headed arrow. Graph cropped at 50 on the horizontal axis.	Standard mark scheme but note change in values: lowest mark = 5 LQ in the range 14 to 16 Median in the range 24 to 26 UQ in the range 29 to 31 highest mark = 45
(b)	'40' changed to '35'. '30%' changed to '1/6'.	M1 for $1/6 \times 60 (= 10)$ M1 for reading from the graph at $cf = 60 - "10" (= 35)$ C1 for correct decision and correct figures OR M1 for reading from the graph at mark = 35 (= 50) M1 for $(60 - "50") (= 10)$ and $10/60 = 1/6$ C1 for correct decision and correct figures

PAPER: 1MA1_1H		
Question	Modification	Mark scheme notes
11	(a) Letters changed: 'a' changed to 'p' and 'b' changed to 'q' (c) Letters changed: 'a' changed to 't' and 'b' changed to 'u'	Standard mark scheme but note change of letters M1 for $x(t + u) - y(t + u)$ or $x(t + u) + y(-t - u)$ or $t(x - y) + u(x - y)$ A1 for $(t + u)(x - y)$ oe
12	Letters changed: 'a' changed to 'p' and 'b' changed to 'q'	Standard mark scheme
13	Wording changed: 'Look at Diagrams 1-6 for Question 13 in the Diagram Booklet. You may be provided with two models. They are NOT accurate. The models show cuboid A and cuboid B. Cuboid A has height $x + 2$, length $2x - 1$ and width $x - 1$. Cuboid B has height $x + 3$, length $2x$ and width $x - 3$. Diagram 1 shows the 3D view of cuboid A. Diagram 2 shows the front of cuboid A. Diagram 3 shows the side of cuboid A. Diagram 4 shows the 3D view of cuboid B. Diagram 5 shows the front of cuboid B. Diagram 6 shows the side of cuboid B.' Models provided. Diagrams enlarged. 4 additional 2D diagrams added.	Standard mark scheme
14	Wording changed: 'Look at the diagram for Question 14 in the Diagram Booklet. It shows triangle ABC $AC = 3\sqrt{2}$ cm Angle $ACB = 45^\circ$ Angle $ABC = 30^\circ$ Diagram enlarged. Angles moved outside of angle arcs and angle arcs made smaller.	Standard mark scheme

PAPER: 1MA1_1H			
Question		Modification	Mark scheme notes
15		Wording changed: 'Look at the diagram for Question 15 in the Diagram Booklet. It shows parallelogram OXYZ' Vector 'a' changed to vector 'p' and vector 'b' changed to vector 'q' Diagram enlarged. M and N lines made longer.	Standard mark scheme but note change of letters
16	(b)	Letters changed: 'a' changed to 'p', 'b' changed to 'q' and 'c' changed to 'r'	Standard mark scheme
17		Wording added: 'Look at the diagram for Question 17 in the Diagram Booklet. It shows ...' Wording changed: 'are' to 'three' Diagram enlarged. Angle BCD labelled on the diagram.	Standard mark scheme
20		Letters changed: 'a' changed to 'm' and 'b' changed to 'n'	Standard mark scheme