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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 29

Equation of a circle and tangents

Higher tier

Answers and examiner comments

11	2017-2025	Higher
question groups	available papers	tier

Using this booklet

1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

Name _____ **Date** _____

Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

23		$y = \frac{-3}{\sqrt{7}}x + \frac{8}{\sqrt{7}}$	M1 M1 A1	for method to find gradient of OP, eg $\frac{\sqrt{7}}{2} \div \frac{3}{2} \left(= \frac{\sqrt{7}}{3} \text{ or } 0.88 \ldots\right)$ oe (dep) for method to find gradient of tangent, m, eg. $\frac{\frac{\sqrt{7}}{2}}{\frac{3}{2}} \times m = -1 \left(m = \frac{-3}{\sqrt{7}} \text{ or } -1.13..\right)$ for $y - \frac{\sqrt{7}}{2} = \frac{-3}{\sqrt{7}}(x - \frac{3}{2})$ or $y = \frac{-3\sqrt{7}}{7}x + \frac{8\sqrt{7}}{7}$ oe or $y - 1.32.. = -1.13..(x - 1.5)$

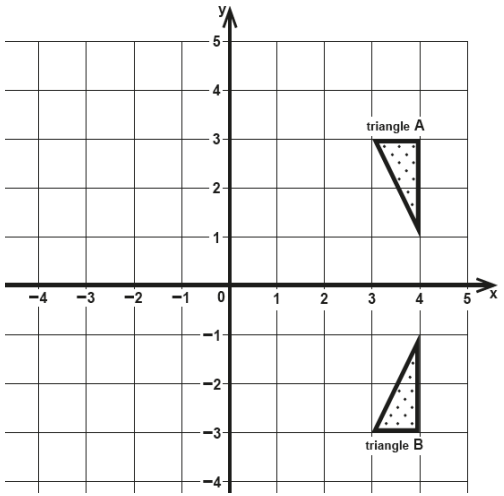
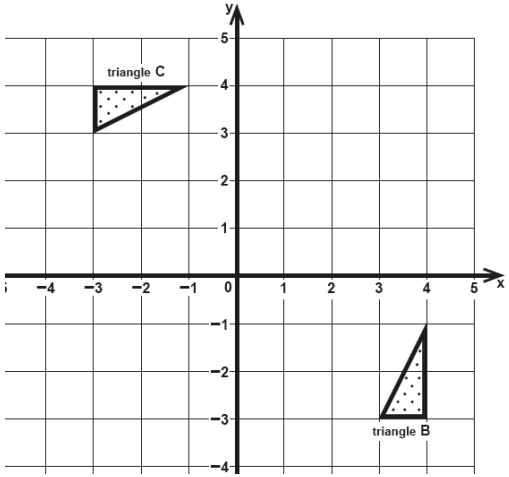
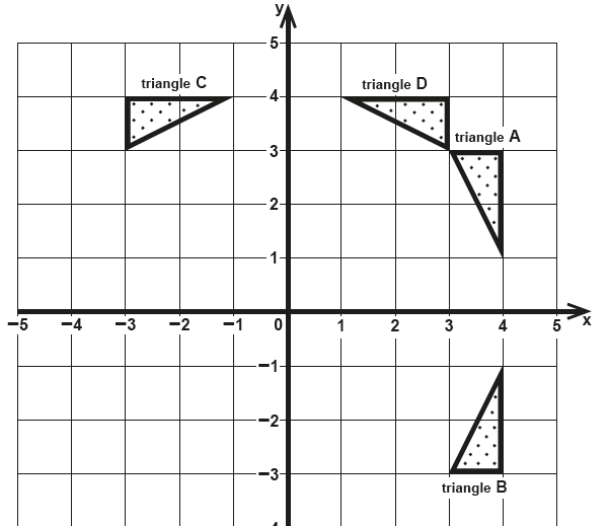
Modifications to the mark scheme for Modified Large Print (MLP) papers.

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PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1		Table turned to vertical format.	Standard mark scheme
3		Alternative question. Model has been provided for all candidates. Diagram enlarged and also provided for MLP. The measurements on the prism have been doubled. Wording added next to the diagram of the trapezium 'Diagram NOT accurately drawn'. Four shapes have been provided below the trapezium labelled A to D. Wording added above the four shapes 'scale: 2 cm to 1 metre'. Question wording has changed and has been split into two parts: 'Look at the model or at the diagrams for Question 19 in the Diagram Book. They show a prism with a cross section in the shape of a trapezium. All measurements are in metres. Below the prism there are four shapes A, B, C and D. (i) Which shape shows the front elevation of the prism? (ii) Which shape shows the side elevation of the prism?'	Mark scheme amended as follows: (i) B2 for C (ii) B2 for A (B1 for B or D)
5		Diagram enlarged. Measurements '2.6 cm' and '5.4 cm' added to the diagram.	Standard mark scheme
8		Grid enlarged. Right axis labelled	Standard mark scheme but allow an answer in the range 11 to 13.

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
9		The question has changed and has been split into 3 parts, (a), (b) and (c). There is a separate grid with different triangles on each grid: (a) Triangles A and B have been drawn on the grid. (b) Triangles B and C have been drawn on the grid. (c) Triangles A, B, C and D have been drawn on the grid. The questions for each part now is: (a) It shows triangle A and triangle B given on a grid. Describe the single transformation that maps triangle A onto triangle B. (b) It shows triangle B and triangle C given on a grid. Describe the single transformation that maps triangle B onto triangle C. (c) It shows triangles A, B, C and D given on a grid. Amy reflects triangle A in the line $y = x$ to get triangle D She is then going to reflect triangle D in the x–axis to get triangle E Amy says that triangle E should be in the same place as triangle C. Is Amy correct? You must show how you get your answer. There is a cut out shape available for you to use	The mark scheme for this amended question is as follows: (a) B1 for "reflection in the x-axis" (b) B1 for "reflection in the line $y = x$" (c) Standard mark scheme: for No with correct supporting evidence eg showing C and E in the correct positions or stating C is a reflection in the y-axis rather than the x-axis
10		Rows 'Mars' and 'Saturn' removed. Wording 'eight' changed to 'six'	Standard mark scheme.
11		MLP only: x changed to y.	Standard mark scheme but x changed to y.
12		Diagram enlarged. Wording added 'It shows a probability tree diagram.' Wording added 'Mr Lear drew a probability tree diagram to show the information	Standard mark scheme.
13		Diagram enlarged. Right axis has been labelled. Lines on the histogram moved. 50-60 moved to 2.0; 60-90 moved to 0.5	Standard mark scheme.
14		Diagram enlarged. Wording added 'There are four spaces to fill.' Graphs labelled 'Graph A, Graph B, Graph C' etc.	Standard mark scheme.
15		Diagram enlarged.	Standard mark scheme.
17		Diagram enlarged. Shading changed to dotty shading.	Standard mark scheme.
19		MLP only: x changed to y.	Standard mark scheme but x changed to y.
20		Diagram enlarged.	Standard mark scheme.
21		Diagram enlarged.	Standard mark scheme.

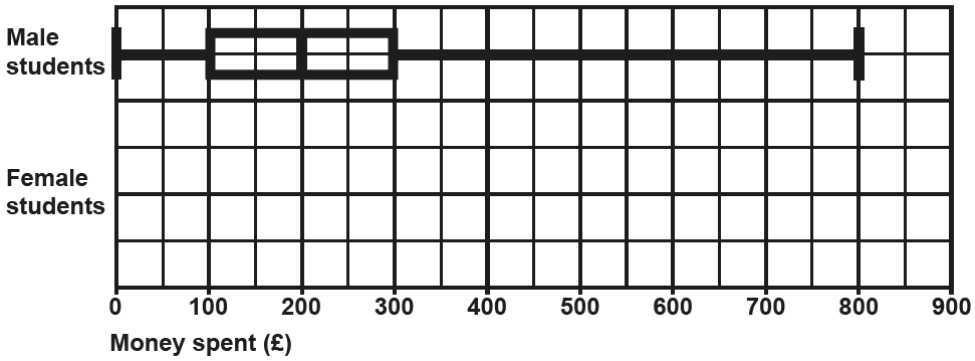
9		(a)  (b)  (c)  	

20	(a)		(0,1)	B1	(0,1)
	(b)		Circle radius 4 Centre (3,0) and (−1,0) and (7,0) labelled	M1	For centre (3,0) implied by drawing or label or a circle of radius 4 or intersections on the x-axis at −1or 7 implied by drawing or labels
				M1	for 2 of centre (3,0) implied by drawing or label intersections on the x-axis at −1 and 7 implied by drawing or label circle drawn with radius 4
				A1	for a fully correct answer

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PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
1		Diagram enlarged. Braille only: will label the circles 'Set A' and 'Set B' and will label all the places which need to be answered (i) to (iv).	Standard mark scheme accept for Braille award C2 for a fully correct diagram.
5		Diagram enlarged.	Standard mark scheme
7		Diagrams enlarged. The smaller triangle on the right has been rotated so it is facing the opposite triangle. Braille only: will give information about the triangles in written form.	Standard mark scheme
9	(a)	Diagram enlarged. Points on the Male box plot changed to: 0, 100, 200, 300 and 800. Horizontal axis label has been moved to the left of the horizontal axis. Label 'Female students' added to the left of the grid below 'Male students'. Axis has been cut so the horizontal axis finishes at 900. 	Amend mark scheme to read: M1 "for evidence of taking & using readings at LQ and UQ eg 300 – 100" A1 for 200 [as the answer to (a)] Median 200, IQR 200

PAPER: 1MA1_3H			
Question		**Modification**	**Mark scheme notes**
9	(b)	Numbers on the table changed to: 50, 150, 300, 350 and 650. Wording changed to: 'On the grid for Question 9, draw a box plot for the information in the table. Draw this below the box plot for the Male students.'	Standard mark scheme Median 300, IQR 200
13		Diagram enlarged. Shading changed to dotty shading.	Standard mark scheme
15		Diagram enlarged. Angle size moved outside of the angle arc and the arc has been made smaller. MLP only: x changed to y.	Standard mark scheme except using y instead of x.
18		Diagram enlarged.	Standard mark scheme
20	(b)	A blank set of x and y axes have been provided.	Standard mark scheme

19		Proof (supported)	M1 M1 M1 M1 C1	starts process to find point of intersection by substituting, eg $(10 + 2y)^2 + y^2$ (= 20) for expanding, eg $4y^2 + 20y + 20y + 100$ (3 out of 4 terms correct) (dep M2) for 3-term quadratic equation ready for solving, eg $5y^2 + 40y + 80 = 0$ (dep on previous M1) for method to solve an equation of the form $ay^2 + by + c = 0$, eg by factorising or correct substitution into quadratic formula fully correct method leading to $y = –4$ or $x = 2$ or $(y + 4)^2 = 0$ or $(x – 2)^2 = 0$ and statement, eg only one point of intersection so the line is a tangent to the circle

15	6.5	B1	oe	Accept (eg) $6\frac{1}{2}$ and $\sqrt{42.25}$

Paper: 1MA1/2H

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
22	$x^2 + y^2 = 80$	P1	for process to find gradient of tangent eg $\frac{10-0}{0--20}$ $(=\frac{1}{2})$ **or** for $20^2 + 10^2$ (= 500) **or** start to method to find angle between tangent and x axis, eg $\tan\theta = \frac{10}{20}$	
		P1	for process to find gradient of normal/radius eg $\frac{-1}{"0.5"}$ $(=-2)$ **or** for $\sqrt{20^2+10^2}$ or $\sqrt{500}$ or 22.36... or 22.4 **or** completes process to find angle between tangent and x axis. eg $\theta = \tan^{-1}\left(\frac{10}{20}\right)$ (=26.565…)	
		P1	for equation of tangent eg y = "0.5"x + 10 oe or for equation of radius eg y = "–2"x oe **or** for using similar triangles eg $\frac{r}{10} = \frac{20}{"\sqrt{500}"}$ **or** for sin("26.565…) = $\frac{r}{20}$	
		P1	for process to find the x coordinate eg "0.5"x + 10 = "–2"x (x = –4) **or** for $r = \frac{20}{"\sqrt{500}"} \times 10$ **or** r = 20 × sin("26.565…")	
		A1	oe	Accept $(4\sqrt{5})^2$ for 80

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 2H

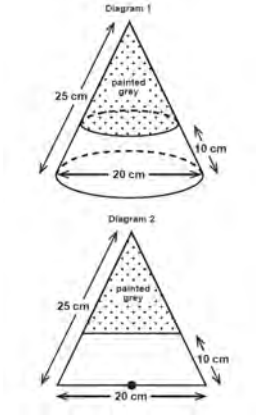
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PAPER: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
2		Wording added "Look at the diagram for Question 22 in the Diagram Book. It shows an incomplete Venn diagram." Diagram enlarged. Labels "set A" and "set B" moved above the circles. Braille only: The Venn diagram labelled (i) to (iv).	Standard mark scheme
4	(a)	Wording added "There are four spaces to fill." Table enlarged and turned to vertical format.	Standard mark scheme
4	(b)	Wording added "Look at the diagram for Question 24(b) in the Diagram Book. It shows a grid." Diagram enlarged. Small squares removed and intermediate lines added.	Standard mark scheme
5		Wording added "Look at the diagram for Question 25 in the Diagram Book. It shows a right-angled triangle ABC." Triangle labelled ABC. Wording added "Angle ABC is a right angle, Angle ACB = 34°, AB = x mm, AC=178 mm." Diagram enlarged. Right angle made thicker. Angle moved outside of the angle arc, and the arc has been made smaller.	Standard mark scheme
7		Wording added "Look at the diagram for Question 27 in the Diagram Book." Wording "The diagram shows…" removed and replaced with "It shows…" Wording added "AC = 9 metres, AB = 6 metres" Wording added "Angle BCD=90°". Diagram enlarged. Right angles made thicker.	

<table>
<tr><th colspan="4">PAPER: 1MA1/2H</th></tr>
<tr><th colspan="2">Question</th><th>Modification</th><th>Mark scheme notes</th></tr>
<tr><td>9</td><td></td><td>Wording added “Look at the diagram for Question 9 in the Diagram Book. It shows a box plot.”
Wording added “She used her results to work out the information in the table below.”
Table values changed as shown:
<table><tr><td>Least height</td><td>140 cm</td></tr><tr><td>Lower quartile</td><td>155 cm</td></tr><tr><td>Interquartile range</td><td>17 cm</td></tr><tr><td>Median</td><td>162 cm</td></tr><tr><td>Range</td><td>40 cm</td></tr></table>
Wording “Aisha drew this box plot…” removed and replaced with “Aisha drew the box plot in the Diagram Book…” Diagram enlarged. Axis label moved to the left of the horizontal axis.
Box plot values changed as below:
Least height: 140; Lower quartile: 155; Median: 160; Upper quartile: 175; Greatest height: 180</td><td>Standard mark scheme but with the numerical values changed:
C1 plot the median at 162, not 160 oe
C1 plot the upper quartile at 175, not 172 oe</td></tr>
<tr><td>12</td><td></td><td>Wording added “Look at the diagram for Question 12 in the Diagram Book.”
Wording “The graph gives information…” removed and replaced with “It shows a graph which gives information…” Diagram enlarged. Graph line made thicker. Right axis has been labelled. Axes labels moved to the left of the horizontal axis and to the top of the vertical axis.</td><td>Standard mark scheme but in part (a) allow some leeway in the award of the A mark.</td></tr>
</table>

PAPER: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
13		Wording added "Look at the diagram for Question 13 in the Diagram Book." Wording "Here is triangle ABC" removed and replaced with "It shows a triangle ABC. Diagram enlarged. Angle ACB = 34° Angle ABC = 26° CB = 23.8 cm". Angles moved outside of the angle arcs, and the arcs has been made smaller.	Standard mark scheme
14		Wording added "Look at the diagram for Question 14 in the Diagram Book." Diagram enlarged. Wording "Here are two squares, A and B" removed, replaced with "It shows two squares, A and B." Labels removed and replaced with "square A" and "square B" above the squares.	Standard mark scheme
15		Two labelled cut out shapes provided for all candidates. The grid reduced in size and cut at $x = 6$ and $y = -6$. Wording added "Look at the diagram for Question 15 in the Diagram Book. It shows triangle A and triangle B on a grid. Two cut out shapes may be available if you wish to use them." Diagram enlarged. Shading changed to dotty shading. Shape outlines made thicker. Shapes labelled "triangle A" and "triangle B". Labels moved above the shapes.	Standard mark scheme

PAPER: 1MA1/2H			
Question		**Modification**	**Mark scheme notes**
18		Model provided for all candidates. Wording added "Look at the two diagrams for Question 18. You may be provided with a model." "The diagram represents a solid cone" removed and replaced with "Diagram 1 and the model represent a solid cone. Diagram 2, below Diagram 1, shows a 2D view of the cone." Diagram enlarged. Diagram 2 provided as a 2D representation of the cone. Grey shading removed and replaced with dotty shading. The diagrams labelled 'painted grey' where it is shaded. Dashed lines longer and thicker. 	Standard mark scheme
21	(a)	Wording added "Look at the diagram for Question 21(a) in the Diagram Book." Wording "The graph of the curve with equation … is shown on the grid below" removed and replaced with "It shows the graph of the curve with equation … on a grid." Diagram enlarged. Curve made thicker. Wording "On the grid above,…" removed and replaced with "On the same grid, …"	Standard mark scheme
21	(b)	Wording added "Look at the diagram for Question 21(b) in the Diagram Book." Diagram enlarged. Curves made thicker. Crosses changed to solid dots/circles.	Standard mark scheme

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
20	$7x + 5y - 82 = 0$	P1	for process to work out the gradient of the line from the centre of the circle to the point (6,8) eg $\frac{8-3}{6--1}$ $(= \frac{5}{7})$	
		P1	(dep P1) for using $mn = -1$ eg $-1 \div$ "$\frac{5}{7}$" $(= -\frac{7}{5})$	
		P1	for substituting (6, 8) into $y =$ "$-\frac{7}{5}$" $x + c$ **or** for $(y - 8) =$ "$-\frac{7}{5}$"$(x - 6)$ **or** for $y = -\frac{7}{5}x + \frac{82}{5}$ oe	
		A1	$7x + 5y - 82 = 0$ oe SC B2 for answer of $5x + 7y - 86 = 0$ oe in any form	Must be in form $ax + by + c = 0$ with integer coefficients, eg $82 - 7x - 5y = 0$

Paper: 1MA1/1H

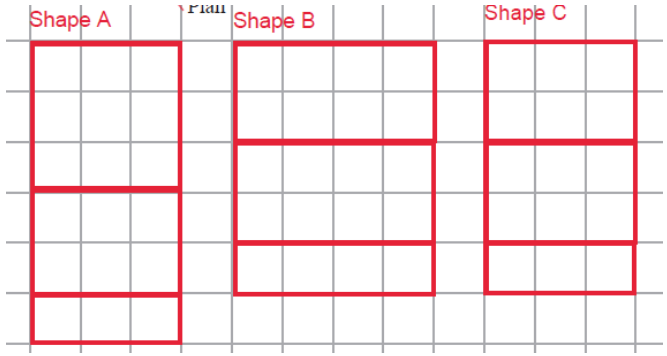
Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
24	$6x + 8y = 35$	M1	for a process to find the gradient of the radius, eg $\frac{2.8-0}{2.1-0}$ $(=\frac{4}{3})$	
		M1	for process to find the gradient of the tangent, eg uses $\frac{-1}{"m"}$	
		M1	for substitution of (2.1, 2.8) into $y =$ "$\frac{-3}{4}$"$x + c$ or into $(y - y_1) = "\frac{-3}{4}"(x - x_1)$	
		A1	oe as long as in the form $ax + by = c$, where a, b and c are integers	

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PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1		Wording added 'Look at the diagram for Question 1 in the Diagram Booklet.' Diagram enlarged and intermediates marked. Crosses changed to dots. Axes labels moved above the vertical axis and left on the horizontal axis. Open headed arrows. Small squares removed.	Standard mark scheme but in part (c) widen the range to consider 2.5 to 4.5
2		Wording added 'Look at the diagram for Question 19 in the Diagram Booklet. It shows a grid with shapes.' The wording 'and the plan of a solid are shown on the grid' removed and replaced with 'of a solid is shown in the Diagram Booklet.' The wording 'On the grid, draw the' removed and replaced with 'Choose which of the shapes A to C shows the side elevation of the solid from the direction of the arrow. 'Front elevation' and 'Plan' labels moved above. Shapes labelled 'Shape A' to 'Shape C'. Grid and diagrams enlarged. Shape outlines made thicker. Open headed arrow. Arrow made thicker. Model provided. 	Shape C is the correct shape for 2 marks. The dotted line was removed to avoid confusion to visually impaired candidates.
3		The wording 'Here' removed and replaced with 'Below'. Terms left aligned	Standard mark scheme
4		Wording added 'Look at the diagram for Question 4 in the Diagram Booklet.' Diagram enlarged. Dashed lines made longer and thicker. Right angles made more obvious. Wording added: 'All the marked angles are right angles.' 'AB = 11 metres'; 'BC = 7 metres'; 'DE = 7 metres'; 'EF = 9 metres'	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
5		Wording added 'Look at the diagram for Question 5 in the Diagram Booklet. It shows shape ABC.' Shape labelled with A, B and C. Wording added: 'ABC is the right angle'; 'AC = 14.5 cm'; 'BC = *x* cm'; 'angle ACB = 53° Diagram enlarged. Right angle made more obvious. Angle moved outside smaller angle arc.	Standard mark scheme
7		Wording added 'Look at the diagram for Question 7 in the Diagram Booklet.' The wording 'Here is' removed and replaced with 'It shows'. Diagram enlarged and intermediates marked. Axes labels moved above the vertical axis and right on the horizontal axis. Open headed arrows. Small squares removed.	Standard mark scheme
9		Equations stacked vertically and left aligned.	Standard mark scheme
11		Wording added 'Look at Diagram 1 and Diagram 2 for Question 11 in the Diagram Booklet.' Wording added 'in Diagram 1 of the Diagram Booklet'. Graphs enlarged. Axes labels moved to above the vertical axis and left on the horizontal axes. Right axis labelled on Diagram 1. Small squares removed. Open headed arrows. Curve values changed to pass through grid lines (20,0), (40,15), (50,30), (65,45) and (90,60). Information left aligned. Values changes: 24 to 20; 96 to 90 Wording added 'in Diagram 2 of the Diagram Booklet'.	Standard mark scheme but B1 changed to correctly identifying one of the LQ (40) Median (50) or UQ (65) from the CF graph and the box plot drawn with lower value 20 and upper value 90
12		Equation left aligned.	Standard mark scheme
16		Wording added 'Look at the diagram for Question 16 in the Diagram Booklet.' Wording added 'in the Diagram Booklet'. Axes labels moved to above the vertical axis and right on the horizontal axis. Diagram enlarged. Shading changed. Graph lines thickened. Open headed arrows.	Standard mark scheme
17		Wording added 'Look at the diagram for Question 17 in the Diagram Booklet. You may be provided with models. They are not accurate.' The wording 'The diagram shows' removed and replaced with 'The diagram and the models show'. Diagrams enlarged, stacked vertically and left aligned. Right angles made more obvious. Shading changed. Models provided with labels.	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
18		Wording added 'Look at the diagram for Question 18 in the Diagram Booklet.' The wording 'Here is' removed and replaced with 'It shows'. Diagram enlarged and made horizontal along the longest side. Triangle points labelled A, B and C. Angle moved outside angle arc and arc made smaller. Wording added: 'AB = 11.2 cm'; 'BC = 4.3 cm'; 'Angle ABC = 118º'	Standard mark scheme
20		Wording added 'Look at Diagram 1, Diagram 2 and Diagram 3 for Question 20 in the Diagram Booklet. You may be provided with a model. It is not accurate.' Diagram 2 and Diagram 3 added. Thick line AH added to Diagram 1 and angle arc. Diagrams enlarged. Dashed lines made	Standard mark scheme
21		Wording added 'Look at the diagram for Question 21 in the Diagram Booklet.' Diagram enlarged. Small squares removed. Axes labels moved above the vertical axis and left on the horizontal axis. Curve moved down to pass through (17.5,10) to allow visually impaired students to use grid lines. Right axis labelled.	Standard mark scheme

Question	Answer	Mark	Mark scheme	Additional guidance
23	No (supported)	P1	for a first step, eg to find the gradient of the line (normal) joining (0, 0) to (–3, 4), eg $\frac{4-0}{-3-0}$ $(=-\frac{4}{3})$ **OR** finds the length^2 for one side of triangle, eg $(-3--8)^2+(4-0)^2$ $(=41)$ or $(-3-0)^2+(4-0)^2$ $(=25)$ or 64	Alternative processes may be seen and should be duly credited.
		P1	for a second step, eg to find the gradient of the tangent, eg $-1\div$ "$\frac{-4}{3}$" $(=\frac{3}{4})$ **OR** finds the length^2 for two sides of triangle, two of 25, 41 and 64	
		P1	for a third step, eg to find the gradient of the line joining (–8, 0) to (–3, 4), $\frac{4-0}{-3--8}$ $(=\frac{4}{5})$ or finds the equation of the tangent, eg $y=\frac{3}{4}x+\frac{25}{4}$ or $y-4=\frac{3}{4}(x--3)$ **OR** for process to use Pythagoras' rule, eg $41+25$ $(=66)$ or $64-25$ $(=39)$ or $64-41$ $(=23)$	
		C1	for No from correct figures and a complete process from comparison of gradients, eg $\frac{3}{4}$ and $\frac{4}{5}$ or showing the equation of the tangent does not pass through (–8, 0), eg when $x=-8$, $y=\frac{1}{4}$ (not 0) or when $y=0$, $x=-\frac{25}{3}$ (not –8) **OR** correct figures from Pythagoras' rule, eg $41+25$ $(=66)\neq 64$ or $64-41\neq 25$ or $64-25\neq 41$ oe	Award 0 marks for No without complete and correct supportive working

Paper: 1MA1/3H

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

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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 Bumpons 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 × 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’	Standard mark scheme but note change of letters
	(c)	Letters changed: ‘a’ changed to ‘t’ and ‘b’ changed to 'u’	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° Angle ABC = 30°’ 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

22	Circle radius 5 centre (0, –2) and (0, 3) and (0, –7) labelled	B3 (B2 (B1	for a correct sketch of a circle with centre (0, –2) **and** intercepts (0, 3) and (0, –7) labelled for a sketch of a circle with two of the 3 points indicated, or for a sketch of a circle with correct centre **and** radius of 5 labelled or stated) for a sketch of a circle with the correct centre **or** states correct centre **and** radius, but does not sketch)	See diagram at end of scheme Allow freehand circles Ignore intersections with x axis for all marks Accepts points marked with correct y-coordinate, eg -2 on y-axis for centre

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
22	(12, –8)	P1	for process to rearrange the equation to give y in terms of x, eg $y = \frac{3x-52}{2}$ **or** $y = \frac{3}{2}x - 26$ **or** $m = \frac{3}{2}$	Condone an incorrect value for the y intercept (= c)
		P1	for process to find gradient of OP, eg $-1 \div$ "$\frac{3}{2}$" $(= -\frac{2}{3})$ **or** $-1 \div [m]$	Where $[m]$ is clearly identified as the gradient of the straight line $3x - 2y = 52$ Allow 0.66(6…) or 0.67 for $\frac{2}{3}$ throughout
		P1	(dep on equation of the form $y = \frac{-1}{[m]}x$ for the radius may be implied in subsequent working) for starting to solve $3x - 2y = 52$ with $y = \frac{-1}{[m]}x$ simultaneously to find the value of x or y eg substituting $y = \frac{-2}{3}x$ or $y = \frac{-1}{[m]}x$ into $y = \frac{3}{2}x - 26$ or $3x - 2y = 52$ or an equation of the form $y = \frac{3}{2}x + c$ eg $-\frac{2}{3}x = \frac{3}{2}x - 26$ **or** $3x - 2\left(-\frac{2}{3}x\right) = 52$ **or** $-\frac{2}{3}x = \frac{3}{2}x + c$ **or** $-\frac{1}{[m]}x = \frac{3}{2}x - 26$ **or** $3x - 2\left(-\frac{1}{[m]}x\right) = 52$ **or** $-\frac{1}{[m]}x = \frac{3}{2}x + c$	Where $[m]$ is clearly identified as the gradient of the straight line $3x - 2y = 52$ Can be done by elimination 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 eg $9x - 6y = 156$ $\quad$ $6x - 4y = 104$ $+ 4x + 6y = 0$ $\quad$ $- 6x + 9y = 0$ $(13x = 156)$ $\quad$ $(-13y = 104)$
		A1	cao	

Paper: 1MA1/3H

Question 22

The unstructured nature of this Grade 9 problem caused issues for many. However, it was really pleasing to see so many students attempting to draw diagrams to help them structure their response. Those who did often then started the problem by finding the gradient of the tangent and gained the first mark. In fact, a good number were able to find this gradient and the perpendicular gradient, and in a good number of cases the complete equation of either the tangent or the radius. This resulted in students gaining one, two or three marks. Some students also picked up two marks for a complete process to find the length of the chord between (−20, 0) and (0, 10) e.g. $\sqrt{20^2+10^2}$.
Very few students were then able to take the next step to find either the x coordinate of the point of intersection of the tangent and the normal or the length or r. This meant that a complete equation was rarely seen.

Summary

Based on their performance on this paper, students should:

- ensure they read questions carefully so they answer the question being asked.
- make sure they understand key terms like multiple and factor fully
- continue to use efficient calculator methods on a calculator paper.
- use formulae that are provided within a question
- further practise questions involving vectors
- have more practise at setting up equations from problems.
- include working out to support their answers, particularly in questions that state “You must show all your working”.

Question 20

It was pleasing to see many students attempting to draw diagrams to help them structure their response. Those who did often then started by finding the gradient of the line from the centre of the circle to the point A and gained the first mark. A good number were then able to find the gradient of the tangent and use $y = mx + c$ to find an equation of the tangent. Those who got this far and gained the first three marks often failed to gain the accuracy mark. Sometimes this was due to an error when finding the value of c but more commonly it was because the

final equation was not given in the form $ax + by + c = 0$ that was required by the question. A common error at the first stage was for students to attempt to work out a gradient without using both (–1, 3) and (6, 8) and give gradients such $\frac{8}{6}$ or $\frac{1}{3}$. These students gained no marks as did students who changed the circle centre to the origin. A minority of students found an incorrect gradient from using change in x divided by change in y but they could still get two marks if their final equation was $5x + 7y – 86 = 0$.

Question 24

As with some of the other higher grade questions, a pleasing number of candidates gained some credit on Question 24. The first mark here was to find the gradient of the radius, and was seen both as 43 and as 2.82.1. The second mark was for a method to find the gradient of the tangent using -1m where the *m* came from the correct method. The final method mark was for substitution of the given coordinate into a suitable equation. In these first steps, many who gained the first went on to gain the second, and often the third mark. The most common errors were to forget the minus sign when working with the gradient of the tangent, or for using the wrong gradient when substituting in.

Very few candidates were then able to gain the accuracy mark as they were unable to rearrange the equation into the stated form, normally with *a*, *b* and *c* being left as fractions or decimals. It is unclear if this was due to not reading the question correctly or for being unable to complete the manipulation.

Summary

Based on their performance on this paper, students/ centres should:

- Make use of calculators where applicable rather than relying on mental method
- Understand the difference between standard and reverse percentage and the method for compound percentages
- Not prematurely round
- Encourage pupils to mark significant points and lines on diagrams and graphs, in order to gain method marks that are available
- Further practice finding length and gradient between two given points, emphasising the difference between the two things being found
- Learn to use and apply basic geometrical formulae such as the area of a triangle = ½ × base × height. This will be particularly important once the use of the formulae sheet is no longer available for students
- Interpreting values such as the median and quartiles from cumulative frequency graphs
- Understand that to estimate the gradient of a curve, a tangent must be drawn at the point in question to gain any credit

Question 23

This question was accessible to and discriminated well between the highest attaining students sitting this paper. There were a number of routes through the question available to students. The most concise route was for students to find the gradient of the tangent at the point $(-3, 4)$ on the circle and compare it with the gradient of the line joining the point $(-8, 0)$ to the point $(-3, 4)$. Few students chose this route, instead opting to find the equation of the tangent at the point $(-3, 4)$, then show that the tangent would not pass through the point with coordinates $(-8, 0)$ but through one of the points $(-\frac{25}{3}, 0)$ or $(-8, \frac{1}{4})$. Though this was the most frequently seen route, a significant number of students did not get as far as a correct conclusion supported by correct reasoning and necessary values. A number of students opted to approach the problem by using Pythagoras' rule to show the triangle with vertices $(-8, 0)$,$(-3, 4)$ and $(0, 0)$ was not right-angled. It was rare to find a complete solution from students using this strategy.

Question 20

Very few learners showed any understanding of what was required to answer this question. There were some excellent responses from the most able learners taking this paper but these were few and far between. Some made a successful start by substituting into $x^2 + y^2 = 4$ to find the value of p and earned the first mark but often they made no further correct progress. Some earned the second mark for finding the gradient of the normal/radius or the gradient of the tangent. Mistakes were often made at this stage. Instead of finding the value of p a few learners chose to start by finding the gradient of the tangent in terms of p and then substituted $x = p$, $y = 1$ and the gradient into $y = mx + c$. Finding the value of p then enabled them to complete the solution. Learners should be encouraged to sketch the circle and tangent in questions like this as showing the key values could help them find the gradients of the radius and the tangent.

Summary

Based on their performance on this paper, learners should:

- practise their arithmetic skills, particularly division by a decimal number and negative number arithmetic
- consider whether or not an answer to a calculation is of a sensible size
- practise finding missing angles using angles on parallel lines and giving correctly worded reasons
- know how to calculate the sum of the interior angles of a polygon
- practise using the relationships between lengths, areas and volumes in similar figures
- practise finding angles using the circle theorems and stating the circle theorems used

Question 22

This question looked to combine the understanding of the equation of a circle along with a translation of a graph. The strongest responses showed a circle of radius 5 and a centre at $(0, -2)$, showing the two intercepts on the y-axis at 3 and -7. If the drawn circle was not fully correct, 2 marks could be awarded if two of the correct points were indicated on the sketch, or we had a sketch with the correct centre and radius stated. Finally, a single mark could be awarded for a sketch with the correct centre, or no sketch but the correct centre and radius stated. For all the marks, the intersections did not need to be given as coordinates. Performance was mixed, as would be expected on a question of this grade, but it was pleasing to see so many responses gaining at least some marks and having some idea of the nature of the graph and the transformation.

Question 22

This question assessed understanding of tangents and circles, alongside algebraic skills involving gradients and equations of lines. Many responses recognised the presence of a circle but attempted to link the straight-line equation directly to the general equation of a circle. These responses often substituted into the circle's equation and solved the resulting quadratic, without recognising that this would represent a single point of contact rather than directly identifying the coordinates of the tangent point.

More successful responses began by rearranging the linear equation into the form $y = mx + c$, allowing identification of the gradient of the tangent. This step was frequently completed accurately and led to correct identification of the perpendicular gradient. These responses typically progressed to forming and solving equations to find the point of intersection, demonstrating a clear understanding of the geometric relationship between the radius and the tangent. Working was generally shown step by step, with accurate application of algebraic techniques.

In some responses, the rearrangement of the tangent equation was incorrect or incomplete, such as writing $-y = -\frac{3}{2}x + 26$, which led to the use of an incorrect gradient. Diagrams were occasionally used to support working, though some were misleading and not well integrated into the problem-solving process. Where the negative reciprocal of the tangent's gradient was identified, some responses did not proceed further, either omitting to equate equations or not recognising that the perpendicular line would pass through the centre of the circle, implying a y-intercept of 0.

Most responses used fractional gradients correctly, though some used decimals, which occasionally introduced rounding errors. To improve performance, learners should develop a secure understanding of the geometric relationship between tangents and circles, specifically that the radius meets the tangent at a right angle and that the point of contact lies on both the circle and the tangent line. Centres may wish to focus practice on solving simultaneous equations involving gradients and coordinates and encourage clear working that links algebraic methods with geometric reasoning.