

# Mark Scheme

## Sample Assessment Material

GCSE

GCSE in Mathematics Specification A  
Higher Tier

Paper 1: (Non-Calculator)

## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

*i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*

Comprehension and meaning is clear by using correct notation and labelling conventions.

*ii) select and use a form and style of writing appropriate to purpose and to complex subject matter*

Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

*iii) organise information clearly and coherently, using specialist vocabulary when appropriate.*

The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

Guidance on the use of codes within this mark scheme
M1 - method mark
A1 - accuracy mark
B1 - working mark
C1 - communication mark
QWC - quality of written communication
oe - or equivalent
cao - correct answer only
ft - follow through
sc - special case

Specification A: Paper 1 Higher Tier

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
1. (i)		$30x - 10y$	5	B2 cao (If no marks then B1 $30x$ , B1 $10y$ )
(ii)	$6 - 12x - 3x - 3 = 0$ $3 - 15x = 0$ $15x = 3$	$1 \frac{1}{5}$		M1 for correct multiplication of brackets to get $6 - 12x - 3x - 3$ A1 $3 - 15x = 0$ B1 ft for " $\frac{1}{5}$ "
Total for Question: 5 marks				
2. QWC iii FE	See table at end	Best month and supporting explanation	4	M1 Converts for at least 2 months to a common format (fractions, decimals or %age) A1 all correct  C1 for Council target: No (yes) dep on M1 and consistent with the candidates calculations QWC: Decisions should be stated, following through from working out  C1 March with all calculations correct for the 3 months QWC: Decisions should be stated, following through from working out
Total for Question: 4 marks				

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
3. FE	No of tiles around room $= 2 \times \text{lengths of room} = 8, 16, 16, 12$ Total number of tiles $= 8 \times 16 + 8 \times 12 = 224$ Cost = $4 \times 224$ <b>OR</b> Area of the room $= 4 \times 8 + 4 \times 6 = 56$ Area of a tile $= 0.5 \times 0.5 = 0.25$ Number of tiles = $56 \div 0.25 = 224$ Cost = $4 \times 224$	£ 896	6	M1 for doubling each length to show number of tiles for each side B1 for 8, 16, 16 and 12 M1 for a full method of finding the number of tiles ( $12 \times 16 + 8 \times 4$ ) A1 for at least one 'section' correct M1 for $4 \times '224'$ A1 cao <b>OR</b> M1 for full method for finding the area of the room A1 at least one area correct B1 for area of tile = $0.25\text{m}^2$ or $2500\text{ cm}^2$ or 4 tiles = $1\text{ m}^2$ M1 for area of room $\div$ area of a tile M1 for $4 \times$ number of tiles A1 cao
Total for Question: 6 marks				
4.	(a) $5p = 20$	$p = 4$	2	M1 add 16 to both sides A1 cao
	(b) $-9 = 3q$	$q = -3$	2	M1 correct method to isolate $\pm 3q$ A1 cao
	(c) $6x - 3 - 10 - 6x =$	-13	2	M1 at least one expansion correct A1 -13 or a statement that the answer is indep of $x$ depending on correct working
Total for Question: 6 marks				

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
5.				
(i)		32	1	B1 cao
(ii)	$2n^2 = 400, n^2 = 200, n$ not a whole number	No + explanation	2	M1 sets $2n^2 = 400$ C1 and concludes correctly <b>OR</b> M1 14th term is (392), 15th term is (450) C1 and concludes correctly
				<b>Total for Question: 3 marks</b>
6.				
FE	$15400 \div 70 \times 100 = 22000$ $22000 \times 2 \div 100$	440	4	M1 $15400 \div 70 \times 100$ oe A1 22000 M1 '22000' $\times 2 \div 100$ oe A1 cao
				<b>Total for Question: 4 marks</b>
7.				
(a)	$66 = 2 \times 33 = 2 \times 3 \times 11$	$2 \times 3 \times 11$	2	M1 Successive division by 2 and 3 either by a factor tree or by repeated division A1 cao
(b)	$132^2 = 4 \times 66^2$ $= 2^2 \times (2 \times 3 \times 11)^2$ <b>OR</b> $132^2 = 17424 = 2 \times 8712$ $= 2 \times 2 \times 4356 =$ $2^3 \times 2178 = 2^4 \times 1089$ $= 2^4 \times 3 \times 363 = \dots$	$2^4 \times 3^2 \times 11^2$	2	M1 $(2 \times 3 \times 11)^2$ A1 $2^2 \times 3^2 \times 11^2$ oe <b>OR</b> M1 $132^2 = 17424$ and at least 3 correct steps in for example the factor tree
				<b>Total for Question: 4 marks</b>

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
8.	$x + 4x + \frac{1}{2} = 1$ $5x = \frac{1}{2}, x = \frac{1}{10}$ <p>OR</p> <p>Chooses a suitable number of balls (say 10) 5 will be red The other 5 need to be shared out in the ratio 1:4, Hence 1 yellow and 4 blue</p>	$\frac{4}{10}$	3	<p>M1 <math>x + 4x + \frac{1}{2} = 1</math></p> <p>A1 <math>x = \frac{1}{10}</math></p> <p>A1 <math>\frac{4}{10}</math> oe</p>
Total for Question: 3 marks				

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
9.				
(a) (i)		$a^2$	3	B1 cao
(ii)		$6x^4y^3$		B2 $6x^4y^3$ (B1 for 2 out of 3 terms correct in a product)
(b)	$x^2 + 3x + 7x + 21$	$x^2 + 10x + 21$	2	M1 3 or 4 terms out of 4 correct in a 4 term expansion A1 cao
(c)		$3p(q - 4p)$	2	B2 cao (B1 $p(3q - 12p)$ , $12p(\frac{1}{4}q - p)$ , $p(aq + bp)$ where $a$ and $b$ are numbers)
(d)(i)	$(3(x + 2) - 1)(x + 2 - 3)$	$(3y - 1)(y - 3)$	4	B2 cao (B1 $(3y - m)(y - n)$ where $mn = \pm 3$ or $m + n = \pm 10$ )
(ii)	OR $3x^2 + 12x + 12 - 10x - 20 + 3$ $= 3x^2 + 2x - 5$	$(3x + 5)(x - 1)$		M1 use of the factorised form with $y$ replaced twice by $3x + 2$ A1 cao OR B1 $3x^2 + 2x - 5$ B1 cao
Total for Question: 11 marks				

1MA0/1H			
Question	Working	Answer	Mark
10.	Reds 6, 12, 18, 24, 30... Greens 9, 18, 27...	$\frac{1}{20}$	3
Additional Guidance			
B1 list of red and green multiples (both to at least 18) or explicitly states 'LCM'			
B1 works out highest number (90 seen)			
B1 $\frac{1}{20}$ (accept $\frac{5}{100}$ )			
Total for Question: 3 marks			
11.	$\frac{x}{5} = \frac{2}{4}$  $\frac{y}{x+5} = \frac{9}{6}$ or $\frac{y}{9} = \frac{x+5}{6}$	$x=2.5$  $y=11.25$	4
M1 a correct expression for x involving ratios of sides, e.g. $\frac{x}{5} = \frac{2}{4}$			
A1 cao			
M1 $\frac{y}{x+5} = \frac{9}{6}$ or $\frac{y}{9} = \frac{x+5}{6}$ oe			
A1 cao			
OR			
$\frac{y}{5} = \frac{9}{4}$			
A1 cao			
Total for Question: 4 marks			



1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
12. (a)	$\begin{array}{cccc} 4 & 6 & 8 & 10 \\ 6 & 8 & 10 & 12 \\ 8 & 10 & 12 & 14 \\ 10 & 12 & 14 & 16 \end{array}$ <p>OR</p> $\frac{1}{4} \times \frac{1}{4}$ $\frac{1}{4} \times \frac{1}{4} \times 4$	$\frac{4}{16}$	3	M1 Attempts to list all outcome pairs A1 all 16 found A1 cao OR M2 $\frac{1}{4} \times \frac{1}{4}$ (M1 $\frac{1}{4} \times \frac{1}{4} \times 1, 2 \text{ or } 3$ ) A1 $\frac{4}{16}$ oe
(b)	Prob Ali wins = $\frac{6}{16}$ Number of wins = $\frac{6}{16} \times 80$	30	3	B1 Prob Ali wins = $\frac{6}{16}$ oe M1 $\frac{6}{16} \times 80$ A1 ft
Total for Question: 6 marks				

1MA0/1H					
Question	Working	Answer	Mark	Additional Guidance	
13. (a)		$3.4 \times 10^7$	1	B1 cao	
(b)	$2.4 \times 10^{12} \times \frac{5}{100} (\div 10^6)$	$1.2 \times 10^5$	2	M1 $2.4 \times 10^{12} \times \frac{5}{100}$ A1 cao	
Total for Question: 3 marks					

1MA0/1H				Additional Guidance	
Question	Working	Answer	Mark		
14.	<p>Let <math>AB = x</math>, <math>AD = y</math>  Area of rectangle = <math>xy</math>  Area <math>AXD = \frac{xy}{4}</math>  Area <math>CYZ = \frac{xy}{8}</math>  Shaded area = <math>\frac{5xy}{8}</math></p>	$\frac{5}{8}$	4	<p>M1 a full method to find the unshaded area and subtracting from 1  B1 area of <math>AXD = \text{area of } ABCD \div 4</math>  B1 area of <math>CYZ = \text{area of } ABCD \div 8</math>  A1 cao  <b>OR</b>  <b>Diagram</b>  M1 for dividing left into 2 congruent triangles  for dividing right into 4 congruent triangles  B1 left = <math>2A</math> and <math>2A</math> or  shaded = <math>\frac{1}{2}</math> of <math>\frac{1}{2} = \frac{1}{4} = \frac{2}{8}</math>  B1 right = <math>2A</math> and <math>A</math> and <math>A</math> or  shaded = <math>\frac{3}{4}</math> of <math>\frac{1}{2} = \frac{3}{8}</math>  A1 cao  <b>Substitution</b>  M1 for deciding upon suitable side lengths for <math>AD</math> and <math>AB</math> and calculating dimensions of internal shapes  B1 for area of <math>DZX</math>  B1 for area of <math>ZXBY</math>  A1 cao  <b>OR</b>  M1 for deciding upon suitable side lengths for <math>AD</math> and <math>AB</math> and calculating dimensions of internal shapes  B1 for area <math>ADX</math>  B1 for area <math>ZCY</math>  A1 cao</p>	
				Total for Question: 4 marks	

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
15.			4	
(a) (i)	$\vec{BC} = \vec{CO} + \vec{OB}$	$12a - 4b$		$\vec{BC} = \vec{CO} + \vec{OB}$ M1 A1 cao
(ii)	$\vec{AQ} = \vec{AO} + \vec{OB} + \vec{BQ}$ $= -4a + 4b + \frac{1}{4}(12a - 4b)$	$3b - a$		$-4a + 4b + \frac{1}{4}$ '(12a - 4b)' A1 cao
(b)	$\vec{OX} = 12b, \vec{AX} = -4a + 12b$ $= 4(-a + 3b)$	Correct reason, with correct working	3	$\vec{OX} = 12b$ $\vec{AX} = -4a + 12b$ C1 convincing explanation
				Total for Question: 7 marks

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
16.	$\frac{4}{10} \times \frac{6}{9} \times \frac{5}{8} = \frac{120}{720}$ $\frac{120}{720} + \frac{6}{10} \times \frac{5}{9} \times \frac{4}{8} + \frac{6}{10} \times \frac{4}{9} \times \frac{5}{8}$	$\frac{360}{720}$	4	<p>M1 for <math>\frac{4}{10} \times \frac{6}{9} \times \frac{5}{8}</math></p> <p>A1 for <math>\frac{120}{720}</math> oe</p> <p>M1 <math>\frac{120}{720}</math> + 2 correct cases (M1 any 2 correct cases)</p> <p>or <math>\frac{120}{720} \times 3</math></p> <p>A1 cao</p> <p>SC with replacement</p> <p>M1 <math>\frac{4}{10} \times \frac{6}{10} \times \frac{6}{10}</math></p> <p>M1 <math>\frac{4}{10} \times \frac{6}{10} \times \frac{6}{10} \times 3</math></p>
Total for Question: 4 marks				
17.	$\frac{(3x+5)(x-7)}{(3x-5)(3x+5)}$	$\frac{x-7}{3x-5}$	3	<p>B1 <math>(3x+5)(x-7)</math></p> <p>B1 <math>(3x-5)(3x+5)</math></p> <p>B1 <math>\frac{x-7}{3x-5}</math></p>
Total for Question: 3 marks				

1MA0/1H				
Question	Working	Answer	Mark	Additional Guidance
18.	(a)	$\frac{1}{2}$	1	B1
	(b)	$(2 + \sqrt{3}) \times (1 + \sqrt{3})$ $= 2 + 2\sqrt{3} + \sqrt{3} + \sqrt{9}$	2	M1 4 term expansion with 3, 4 terms correct and sign of 3 or $\sqrt{9}$ A1 cao
Total for Question: 3 marks				
19.	(a)	Smooth curve	2	B1 correct plot of their values B1 smooth curve through their points
	(b)	$x = 3$ $y = 0$	3	M1 attempts to draw circle at origin M1 uses radius 3 cm (using graph scale correctly) A1 cao  OR  B1 for substituting a value of $x$ into $y = x(x - 3)$ and $x^2 + y = r^2$ B1 for substituting $y$ into $x = 3$ into $x(x - 3)$ and $x^2 + y = r^2$ B1 cao
Total for Question: 5 marks				

1MA0/1H				Additional Guidance	
Question	Working	Answer	Mark		
20. QWC ii, iii	$\begin{aligned} & (2n+1)^2 - (2n-1)^2 \\ &= 4n^2 + 4n + 1 - (4n^2 - 4n + 1) \\ &= 8n \end{aligned}$ <p>OR</p> $\begin{aligned} & (2n+1)^2 - (2n-1)^2 = \\ & ((2n+1) - (2n-1))(2n+1 + 2n-1) \\ &= 2 \times 4n = 8n \end{aligned}$	Fully algebraic argument, set out in a logical and coherent manner	6	<p>B2 the <math>n</math>th term for consecutive odd numbers is <math>2n - 1</math> oe            (B1 <math>2n + k</math>, <math>k \neq -1</math> or <math>n = 2n - 1</math> or <math>2x - 1</math>            B1 use of <math>2n + 1</math> and <math>2n - 1</math> oe            M1 <math>(2n + 1)^2 - (2n - 1)^2</math>            M1 <math>4n^2 + 4n + 1 - (4n^2 - 4n + 1)</math></p> <p>C1 conclusion based on correct algebra QWC: Conclusion should be stated, with correct supporting algebra.</p> <p>OR</p> <p>B1 use of <math>2n + 1</math> and <math>2n - 1</math> oe            M1 <math>(2n + 1)^2 - (2n - 1)^2</math>            M1 <math>((2n + 1) - (2n - 1))(2n + 1 + 2n - 1)</math></p> <p>C1 conclusion based on correct algebra QWC: Conclusion should be stated, with correct supporting algebra.</p>	
				Total for Question: 6 marks	

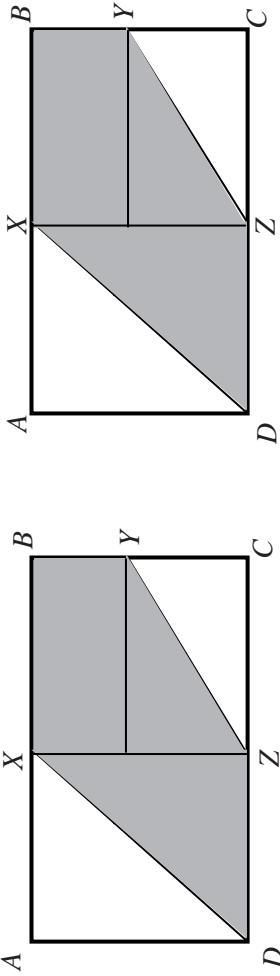
1MA0/1H																													
Question	Working		Answer	Mark	Additional Guidance																								
21.	<table><tr><th>L</th><th>F</th><th>FD</th><th>CF</th></tr><tr><td>0-10</td><td>40</td><td>4</td><td>40</td></tr><tr><td>10-20</td><td>60</td><td>6</td><td>100</td></tr><tr><td>20-40</td><td>90</td><td>4.5</td><td>190</td></tr><tr><td>40-80</td><td>60</td><td>1.5</td><td>250</td></tr><tr><td>&gt;80</td><td>0</td><td>0</td><td>250</td></tr></table>		L	F	FD	CF	0-10	40	4	40	10-20	60	6	100	20-40	90	4.5	190	40-80	60	1.5	250	>80	0	0	250	Histogram OR Cumulative Frequency polygon         82%	6	B1 Scales labelled and also marked on the vertical axis with frequency density or with cumulative frequency M1 frequency densities calculated, at least one non-trivial one correct. A1 all correctly plotted (M1 cumulative frequencies correct)    M1 Use 50 on the horizontal scale of CF diagram read off vertical axis (200-210) or Use 50 on the horizontal scale of a histogram and covert area to the left to a frequency M1 convert to a percentage A1 80 – 85
L	F	FD	CF																										
0-10	40	4	40																										
10-20	60	6	100																										
20-40	90	4.5	190																										
40-80	60	1.5	250																										
>80	0	0	250																										
					Total for Question: 6 marks																								



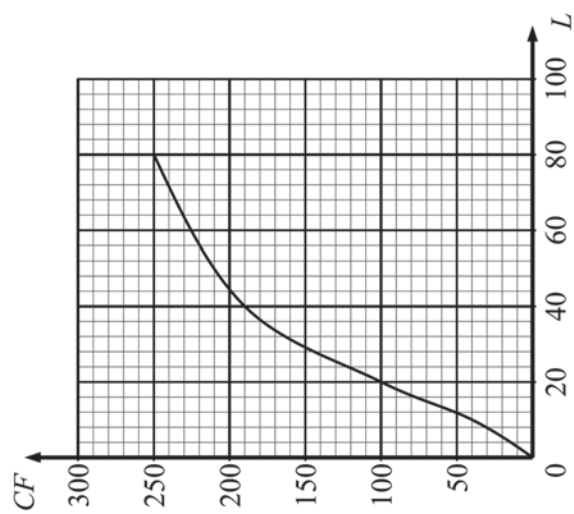
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	Fraction	Decimal	%	kg
Jan	$\frac{1}{10}$	0.1	10%	Not known
Feb	$\frac{1}{8}$	0.125	12.5%	15 kg
Mar	$\frac{13}{100}$	0.13	13%	14.56 kg

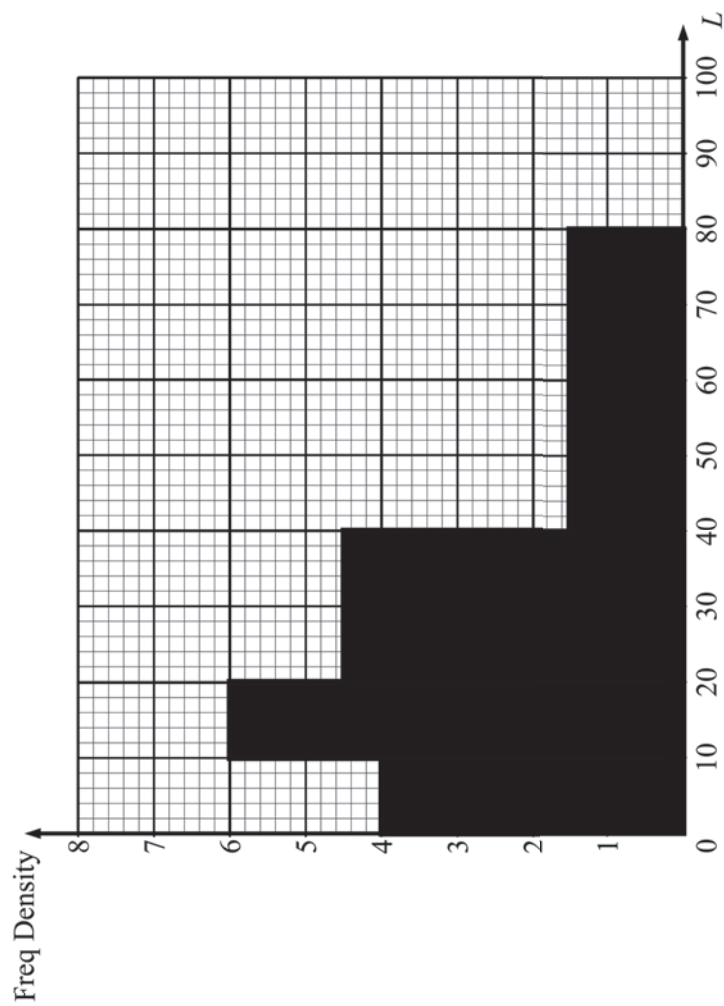
14.



21.



OR



November 2009

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