



Level 3 Certificate
MATHEMATICAL STUDIES
1350/1

Paper 1

Mark scheme

June 2020

Version: 1.0 Final

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Q	Answer	Mark	Comments
1	secondary data	B1	must be the only box ticked
	Additional Guidance		
	multiple boxes ticked is zero marks		
	accept a single cross instead of a tick		

Q	Answer	Mark	Comments
2(a)	No ticked and Not everyone/not every sample has the same chance of being chosen/she hasn't got a random starting point	B1	
	Additional Guidance		
	No ticked and because It's a systematic sample		B0
	No ticked and She's selecting which person to choose, Its not based on chance		B1
	No as the first student on each page is not random		B1
	No If it was random every person would have the same chance of being picked (and they don't)		B1
	No. She chose where to start		B1
	No. The position of the student on the page was pre-determined		B1
	No. Only those students with surnames beginning with A will be picked		B0
	No. Only students with surnames at the beginning of the alphabet will have a chance of being picked		B1
	No. Students with names at the end of the alphabet will not have a chance of being chosen		B1
	No. Random sampling would use a number generator to decide which person to choose on each page		B1
	No. Random sampling would be using a number generator to pick the students		B0
	No. Its using a fixed pattern to choose the students		B0

	When several statements are given award B1 for a correct statement if the others are non-contradictory	B1
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Q	Answer	Mark	Comments
2(b)	Quota (sampling)	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
2(c)	Stratified (sampling) and The number from each year group in the sample are in proportion to the number in each year group	B2	oe description B1 stratified stated with no description or incorrect description or no or incorrect sampling method named but correct description of stratified sampling
	Additional Guidance		
	Ignore incorrect spelling of stratified if unambiguous		
	Stratified which means taking a % from each group which is the same as the % of the group in the whole school		B2
	Stratified. Based on the amount of students per year group work out year group size/total population x sample size		B2
	Stratified and works out the correct number for each year group based on a stratified sample of say 100		B2
	Stratified. The sample is taken so that it is representative of the population		B2
	Stratified. Each groups sample size is representative of the population		B2
Stratified. The ratios of each year group would be actual representation of the whole population		B2	

Q	Answer	Mark	Comments
3(a)	3	B1	

Q	Answer	Mark	Comments
3(b)	Median for female sprinters 14.5 (sec) or Mean for female sprinters 14.3(8...) (sec) or 14.39 or 14.4	B1	
	Median for male sprinters 14.1 (sec) or Mean for male sprinters 14.1(8...) (sec) or 14.19 or 14.2	B1	To gain B2 they must use the same type of average for females and males
	On average the male sprinters were faster than the female sprinters or the males performed better	B1ft	oe correct conclusion for their two medians with at least one correct median or correct conclusion for their means with at least one correct mean
	Additional Guidance		
	Using one mean and one median scores B1 only		
	Ignore reference to range, IQR or sd unless they use these to compare average speed. Eg correct means and sds seen and statement the mean of males is lower so they are faster. The sd for males is also lower so that also means they are faster		B1B1 B0
	If means and medians are calculated award the higher mark.		
	Simple totals may be used with a correct statement comparing averages. eg female total = 273.4, males total = 269.6 This means that the males average would be lower so they were faster		B3

Q	Answer	Mark	Comments
3(c)	IQR for the female sprinters = 2.2 (sec) or range for female sprinters = 3.2 (sec) or SD for the female sprinters 1.05(...) or 1.08(...) or 1.1	B1	
	IQR for the male sprinters = 1.1 (sec) or range for male sprinters = 2.9 (sec) or SD for the male sprinters 0.79(...) or 0.8 or 0.81(...) or 0.82	B1	To gain B2 they must use the same measure of spread for females and males
	The IQR/range/SD for the male sprinters was less than the female sprinters showing males were more consistent/less varied	B1ft	oe correct conclusion for their IQR/range/SD with at least one correct IQR/range/SD and consistent measures of spread
	Additional Guidance		
	The two different pairs of sd values are for using n or n – 1 respectively		
	Using 2 different measures of spread to compare scores B1 only		
	conclusion- bigger/larger/wider spread for females		B1
	conclusion- tighter spread for males/more compact / males less spread out		B1
	Ignore reference to median or mean unless they use these to compare spread Eg correct IQR's and medians seen and statement the IQR of males is lower so they are more consistent. The median for males is also lower so that also means they are more consistent		B1B1B0
	If more than one pair of measures is calculated award the higher mark		

Q	Answer	Mark	Comments
4	Alternative method 1		
	1850 × 1.23 or (\$)2275.5	M1	
	their 2275.5 – 1625 or 650.5	M1dep	dollars left
	their 650.5 ÷ 1.23 or (£)528.(...)	M1	pounds left 1850 – (1625 ÷ 1.23) implies M3 1625 ÷ 1.23 implies M2
	(1000 – their 528.(...)) × 24.12	M1	
	[11 360,11 365]	A1	
	Alternative method 2		
	1850 × 1.23 or (\$)2275.5	M1	
	their 2275.5 – 1625 or 650.5	M1dep	dollars left
	their 650.5 × 19.61 or 12 756.(...) (pesos)	M1	pesos left
	(1000 × 24.12) – their 12 756.(...)	M1	
	[11 360,11 365]	A1	
	Alternative method 3		
	1850 × 1.23 or (\$)2275.5	M1	
	their 2275.5 – 1625 or 650.5	M1dep	dollars left
	1000 × 1.23 – their 650.5 or 579.5	M1	pounds needed
	their 579.5 × 19.61	M1	
	[11 360,11 365]	A1	

Q	Answer	Mark	Comments
5	Alternative method 1		
	Makes assumption about population of the UK	B1	accept 60 million to 75 million
	Makes assumption about proportion or number of 15-year-olds in the UK (P) or Makes assumption about proportion or number of 11 to 16/18 year olds in the UK (P) or Makes an assumption about the proportion or number of children in the uk	B1	1% to 2% of their population accept 0.6 million to 1.25 million 5% to 10% of their population or 3 million to 7.5 million 15% to 25% of their population or 9 million to 18.75 million
	Makes assumption about average number of 15-year-old students per school (S) or Makes assumption about average number of students per school (S)	B1	accept 100 to 300 accept 500 to 1500
	Total number of 15-year-olds ÷ Number of 15 year-old students per school or Total number of 11 to 16/18 year olds ÷ Number of students per school their P ÷ their S	M1	
	Accurate answer for their values	A1	must be an integer

5 cont'd	Alternative method 2		
	Makes an assumption about the number of secondary schools in a town or county or states the number of schools in their town	B1	
	Makes a valid assumption of the number of counties or towns in the UK or Makes an assumption of the population of their/a town or county and Makes assumption about population of the UK	B2	for counties accept 90 – 110 for towns accept 43 000 to 44 000 for UK population accept 60 million to 75 million B1 makes an assumption of the population of their/a town or county or makes assumption about population of the UK
	Number of secondary schools per town or county × their number of towns or counties or their population of UK ÷ their population of a town/county × their number of schools per town/county	M1	
	Accurate answer for their values	A1	must be an integer
	Additional Guidance		
	Note 'town' is taken to include cities		

Q	Answer	Mark	Comments
6(a)	cf values calculated 1, 8, 21, 26, 30	B1	in table or implied by heights.
	plotted at upper class values	B1ft	ft their cf values if increasing
	heights correct and joined with curve or straight lines	B1ft	ft their cf values if increasing if graph extended to the left it must be consistent spacing for cf of 0 eg correct graph must start at (30, 0) I or (35, 1) must end at cf of 30
	Additional Guidance		
	Consistent spacing is required for any part of the graph stating before the first plotted point eg If correct upper-class boundaries are used then it must start at (30, 0) or (35, 1) If midpoints are used then the graph must start at (27.5, 0) or (32.5, 1)		

Q	Answer	Mark	Comments
6(b)	Alternative method 1		
	Vertical line from $d = 48$ to their increasing curve	M1	implied by mark at correct point on curve or vertical axis
	correct value from their increasing curve	A1	
	Alternative method 2		
	$1 + 7 + 13 + \left(\frac{3}{5} \times 5\right)$ or 24 or $4 + \left(\frac{2}{5} \times 5\right)$	M1	
	6	A1	
	Additional Guidance		
	Answer 24		M1
Answer 6 with no working		M1A1	

Q	Answer	Mark	Comments
6(c)	$\frac{\text{their } 6}{30}$ or 0.2 or 20%	M1	oe ft their (b) or correct
	$(\frac{2}{5} \times 5) 13$ or 2×3 or 6 or 10×0.2 or 2	M1	oe check histogram for values
	$2 \times 3 + 10 \times 0.2$ or $6 + 2$ or 8	M1dep	dep on 2nd M1
	$\frac{\text{their } 8}{50}$ or 0.16 or 16%	M1	oe
	$\frac{30}{150}$ and $\frac{24}{150}$ and Kerry or 20% and 16% and Kerry or 0.2 and 0.16 and Kerry	A1ft	oe any equivalent fractions with the same denominator ft their (b) or correct

Q	Answer	Mark	Comments
7(a)	Makes an assumption about average attendance per day eg 38 000	B1	allow 30 000 to 40 000
	Makes an assumption about the proportion of people buying strawberries eg 35%, 1/3	B1	allow 25% to 45 %
	their attendance per day \times their proportion \times 13 eg $38\,000 \times 0.35 \times 13$	M1	
	Makes an assumption about the number of strawberries per portion	B1	allow between 8 and 12 strawberries per portion
	Makes an assumption about the average mass per strawberry eg 15g	B1	allow mass from 12 g to 16 g
	calculates mass per portion eg their 15×10 or 150	M1	
	multiplies their total portions by mass per portion eg their $172\,900 \times 150$ or 25 935 000g	M1	may convert to kg here eg 25 935 kg any number of days including one may be used
	converts to tonnes eg their $25\,935\,000 \div 1000 \div 1000$ or 25.935	M1	
26	A1ft	answers must be rounded or truncated to integer or 1dp ft their assumed values must have used 13 days	

Q	Answer	Mark	Comments	
7(b)	Correct comment eg Attendance figures may be higher so more strawberries would be needed or the percentage buying strawberries may be lower than I assumed so the number of tonnes would decrease or the number of strawberries per portion may be higher so my answer should be higher or the weight of strawberries per portion may be less than I assumed so the tonnes would be lower	B1	oe must state how their answer would change	
	Additional Guidance			
	More people may buy strawberries than I assumed		B0	
	More people may buy strawberries than I assumed so the number of tonnes would increase		B1	
	There may be more or less strawberries per portion so my answer would increase if there were more and decrease if there were less		B1	
	The attendance may be different so my answer would be different		B0	

Q	Answer	Mark	Comments
8	4.2 ÷ 100 or 0.042 seen	M1	
	190 000 × (their 0.042 ÷ 12) or 190 000 × 0.0035 or 665	M1	oe their 0.042 must include the digits 42
	$1 - \left(1 + \frac{\text{their } 0.042}{12}\right)^{-12 \times 25}$ or $1 - 1.0035^{-300}$ or 0.649(...)	M1	oe condone one substitution error
	their 665 ÷ their 0.649(...) or [1023,1024]	M1dep	dep on 2nd and 3rd M1
	3800 × 0.3 or 1140 or their [1023,1024] ÷ 3800 × 100 or 26.(9...) % or 27% or their [1023,1024] ÷ 0.3 or 3413	M1	
	[1023,1024] and 1140 and Yes or 26.(9...) % or 27% and Yes or 3413 and Yes	A1	

Q	Answer	Mark	Comments
9(a)	Alternative method 1		
	42 000 – 12 500 or 29 500	M1	
	their 29 500 × 0.2 or 5900	M1dep	
	42 000 – (5900 + 4004.16) = 32 095.84	A1	
	Alternative method 2		
	42 000 – 12 500 or 29 500	M1	
	their 29 500 × 0.8 or 23 600	M1dep	
	23 600 + 12 500 – 4004.16 = 32 095.84	A1	
	Additional Guidance		
	For the A1 the full equivalent calculation must be seen but may be done in steps eg 42 000 – 5900 = 36 100 and 36 100 – 4004.16 = 32 095.84		

Q	Answer	Mark	Comments
9(b)	Alternative method 1		
	84 000 – 12 500 – 37 500 or 84 000 – 50 000 or 34 000	M1	may be implied
	their 34 000 × 0.4 or 13 600 and 37 500 × 0.2 or 7500	M1dep	oe higher rate tax and standard rate tax 21 100 total tax implies M2
	(84 000 – 50 000) × 0.02 or their 34 000 × 0.02 or 680	M1	oe higher rate NI implies 1st M1
	(50 000 – 8632) × 0.12 or 4964.16	M1	oe basic rate NI 5644.16 total NI implies 1st, 3rd, and 4th M1
	their 13 600 + their 7500 + their 4964.16 + their 680 or 26 744.16	M1	totals all deductions must include standard and higher rate for both tax and NI 26 744.16 implies M6
	84 000 – their 26 744.16	M1	their 26 744.16 must include at least one amount of tax and at least one amount of NI
	57 255.(84) or 57 256	A1	Paul's household net pay per year implied by correct final answer
	(32 095.84 × 2) – their 57 255.(84) or [6935, 6937] or (32 095.84 × 2) and their 57 255.(84)+ 7000 or 64 191.68 and 64 255.84 or (32 095.84 × 2) – 7000 or 57191.68	M1	

9(b) cont'd	[6935, 6937] and No or 64 191.68 and 64 255.(84) and No or 57191.68 and 57 255.(84) and No	A1ft	ft their 57 255.(84)
	Alternative method 2 -calculating NI monthly		
	84 000 – 12 500 – 37 500 or 84 000 – 50 000 or 34 000	M1	may be implied
	their 34 000 × 0.4 or 13 600 and 37 500 × 0.2 or 7500	M1	oe higher rate tax and standard rate tax 21 100 total tax implies M2
	(84 000 ÷ 12 – 4167) × 0.02 or their 2833 × 0.02 or 56.66	M1	oe higher rate NI per month
	(4167 – 719) × 0.12 or 413.76	M1	oe basic rate NI per month 470.42 total NI implies 3rd, and 4th M1
	(their 13 600 ÷ 12) + (their 7500 ÷ 12) + their 56.66 + their 413.76 or 2228.75 or their 13 600 + their 7500 + (their 56.66 × 12) + (their 413.76 × 12) or 26745.04	M1	oe totals all deductions must include standard and higher rate for both tax and NI 2228.75 (monthly) or 26745.04(annual) implies M6
	(7000 – their 2228.75) × 12 or 84 000 – their 26745.04	M1	their 2228.75 or their 26 745.04 must include at least one amount of tax and at least one amount of NI
	57254.(..) or 57255	A1	Paul's household net pay per year implied by correct final answer

9(b) cont'd	(32 095.84 × 2) – their 57 254.(84) or [6935, 6937] or (32 095.84 × 2) and their 57 255.(84)+ 7000 or 64 191.68 and 64 255.84 or (32 095.84 × 2) – 7000 or 57191.68	M1		
	[6935, 6937] and No or 64 191.68 and 64 255.84 and No or 57191.68 and 57 255.(84) and No	A1ft	ft their 57 255.(84)	
	Additional Guidance			
	For Alt 2 the tax may also be worked out monthly for the first 2 marks giving a total tax of 1758.33 per month This must then be added to their total NI per month			