



Mark Scheme

Mock Set 2

Pearson Edexcel GCE Mathematics
Advanced Subsidiary Level in Mathematics
Paper 21 8MA0/21 Statistics

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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.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- 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.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

EDEXCEL GCE MATHEMATICS

General Instructions for Marking

1. The total number of marks for the paper is 30.
2. The Edexcel Mathematics mark schemes use the following types of marks:
 - **M** marks: method marks are awarded for 'knowing a method and attempting to apply it', unless otherwise indicated.
 - **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
 - **B** marks are unconditional accuracy marks (independent of M marks)
 - Marks should not be subdivided.
3. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes.

- bod – benefit of doubt
 - ft – follow through
 - the symbol $\surd$ will be used for correct ft
 - cao – correct answer only
 - cso - correct solution only. There must be no errors in this part of the question to obtain this mark
 - isw – ignore subsequent working
 - awrt – answers which round to
 - SC: special case
 - oe – or equivalent (and appropriate)
 - dep – dependent
 - indep – independent
 - dp decimal places
 - sf significant figures
 - * The answer is printed on the paper
 - $\square$ The second mark is dependent on gaining the first mark
4. All A marks are 'correct answer only' (cao.), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.

Question	Scheme	Marks	AOs
1(a)	Upper limit $6 + 1.5 \times 2 = 9$	M1	1.1b
	Therefore any 10s would be outliers	A1	2.4
		(2)	
(b)	Total frequency = $20 + 40 + 95 - n + n + 25 + 15 (=195)$	M1	3.1a
	Median = $\frac{('195'+1)}{2}$ th value (98 th)	M1	1.1b
	Maximum frequency of 5 is 38 so $n = 95 - 38$		
	= 57	A1	1.1b
		(3)	
(c)	$\frac{15}{'195'} = \frac{1}{13}$ oe	B1ft	1.1b
		(1)	

(6 marks)

Notes:

(a)

M1: Attempt at upper (or lower) limit (lower limit $4 - 1.5 \times 2 = 1$)

A1: correct limit and conclusion that outliers are possible

(b)

M1: attempt to find total frequency (implied by sight of 195)

M1: Using their total frequency to find position of median (condone $\frac{'195'}{2}$)

A1: 57 cao

(c)

B1: ft their total frequency, (awrt 0.0769)

Question	Scheme	Marks	AOs
2(a)	$H_0 : p = 0.2 \quad H_1 : p < 0.2$	B1	2.5
		(1)	
(b)(i)	$Y \sim \text{Bin}(25, 0.2)$	B1	3.3
	$(P(Y = 0) = 0.003777\dots)$	M1	3.4
	$P(Y \leq 1) = 0.027389\dots$		
	$(P(Y \leq 2) = 0.0982\dots)$	A1	1.1b
	Critical region is $Y \leq 1$		
(ii)	$Y = 1$ is in critical region	A1ft	2.2b
	Evidence to support Marco's claim/evidence that less than 20% of letters are by 1 st class post/evidence that Bea is not correct		
		(4)	
(5 marks)			
Notes:			
(a)			
B1: both correct, must be in terms of parameter p or π			
(b)(i)			
B1: setting up a binomial model			
M1: attempt to use $\text{Bin}(25, 0.2)$ to find a relevant probability (to at least 1 sf)			
A1: correct critical region with correct probability seen, awrt 0.03			
(ii)			
A1ft: correct conclusion in context (dependent on M1 only, ft their critical region, must be consistent with their (a))			

Question	Scheme	Marks	AOs	
3(a)(i)	$133 = 2311 - \frac{(\sum x)^2}{8}$	M1	3.1a	
	$\sum x = \sqrt{8 \times (2311 - 133)}$ (=132)	M1	2.1	
	$\bar{x} = \frac{132}{8} = 16.5^*$	A1*	1.1b	
		(3)		
	(ii)	$\sqrt{\frac{S_{xx}}{n}} = \sqrt{\frac{133}{8}} = \sqrt{16.625}$ $= 4.07737\dots$ awrt 4.08	M1 A1	1.1b 1.1b
			(2)	
(b)(i)	$10.6 = \frac{\bar{v}}{100} - 20$	M1	2.1	
	$\bar{v} = 100 \times (10.6 + 20) = 3060 \text{ (dam)}^*$	A1*	1.1b	
		(2)		
	(ii)	$\sigma_v = 100 \times \sigma_y = 1260 \text{ (dam)}$	B1	3.4
			(1)	
(c)(i) (ii)	Decametres or dam (accept Dm)	B1	1.2	
	Beijing, Jacksonville or Perth and Daily Mean Visibility is not available for overseas locations	B1	2.4	
		(2)		
(10 marks)				
Notes:				
(a)(i)				
M1: Use of $S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$				
M1: Solving to find $\sum x$				
A1*: $\bar{x} = 16.5$ cso				
(ii)				
M1: Use of $\sqrt{\frac{S_{xx}}{n}}$ (may be implied by sight of 16.625)				
A1: awrt 4.08				

(b)(i)

M1: Use of $\bar{y} = \frac{\bar{v}}{100} - 20$

A1: cso*

(ii)

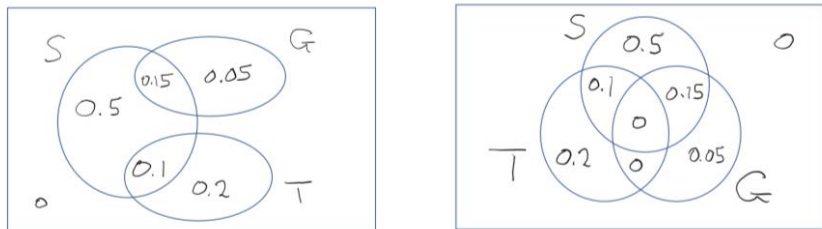
B1: 1260 (dam) (Note may see the equivalent 12 600 m)

(c)(i)

B1: knowledge and understanding of the units used in lds

(ii)

B1: one of the locations and awareness that the data is not available

Question	Scheme	Marks	AOs
4(a)	A survey of all of the members of the club	B1	1.1b
		(1)	
(b)	Use of $P(S \text{ and } G) = P(S) \times P(G) = \frac{3}{4} \times \frac{1}{5}$	M1	2.1
	$P(S \text{ and } G) = \frac{3}{20} = 0.15^*$	A1*cso	1.1b
		(2)	
(c)(i)	$P(S \text{ and } T' \text{ and } G') = 1 - P(T) - P(G) = 1 - \frac{3}{10} - \frac{1}{5}$	M1	3.1b
	$= \frac{1}{2}$	A1	2.2a
		(2)	
(ii)	Structure, Venn diagram with 3 circles and 0 probability for none of S, T and G	B1	2.2a
	$P(S \text{ and } T \text{ and } G) = 0$ and $P(T \text{ and } G) = 0$		
	Shown by 0s on Venn Diagram or G and T circles not intersecting		
	$P(S' \text{ and } G) = \frac{1}{5} - \frac{3}{20} = \frac{1}{20}$	B1	1.1b
	$P(S \text{ and } T) = \frac{3}{4} - \frac{1}{2} - \frac{3}{20} = \frac{1}{10}$	B1ft	2.1
	$P(S' \text{ and } T) = \frac{3}{10} - \frac{1}{10} = \frac{1}{5}$	B1ft	1.1b
	e.g.		
			
	or		
		(4)	
(9 marks)			
Notes:			
(a)			
B1:	Must make reference to club members and indicate whole population used.		
(b)			
M1:	Use of formula for independent events		
A1:	0.15 oe cso*		

(c)(i)

M1: correct expression

A1: $\frac{1}{2}$

(c)(ii)

1st B1: correct Venn diagram structure and zeros

2nd B1: cao

3rd B1ft: ft their 0.5 must be answer in range $0 < p < 0.3$

4th B1ft: ft their 0.1 must be answer in range $0 < p < 0.3$

