

GCE AS Level Mathematics (8MA0) – Shadow Paper (Set 1)

8MA0-21 Statistics

June 2022 Shadow Paper mark scheme

Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide, indicating where marks are given for correct answers. As such, it may not show follow-through marks (marks that are awarded despite errors being made) or special cases.

It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme from the original paper.

This document is intended for guidance only and may differ significantly from the examiners' final mark scheme for the original paper, which was published in August 2022.

Guidance on the use of codes within this document

M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.

Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Qu	Scheme	Marks	AO
1. (a)	Positive (since gradient of regression line is positive)	B1 (1)	1.2
(b)	m/hour (o.e. e.g. m hours ⁻¹)	B1 (1)	2.2a
(c)	$4 \times [\pm]2.1$ = increase of 8.4 [m]	M1 A1 (2)	3.4 1.1b
(d)	25 is (well) outside the range [1, 20] or involves extrapolation (o.e.) so (possibly) unreliable/ inaccurate (o.e.)	B1 (1)	2.4
		(5 marks)	

Qu	Scheme	Mark	AO
2. (a)	[$D =$ number of bags that are damp] $D \sim B(45, 0.07)$	M1	3.3
(i)	$P(D = 3) = 0.23097254\dots$ awrt 0.231	A1	3.4
(ii)	$P(D > 6) = [1 - P(D \leq 6) = 1 - 0.96426\dots] = 0.03574\dots$ awrt 0.0357	A1 (3)	1.1b
(b)	$H_0 : p = 0.07$ $H_1 : p < 0.07$ [$X \sim B(90, 0.07)$ $[P(X \leq 5)] = 0.391574\dots$ awrt 0.392 [$0.3924 > 0.05$ so not significant, do not reject H_0 so...] there <u>is insufficient</u> evidence to <u>support</u> supplier <u>B's claim</u> (o.e.)	B1 M1 A1 A1 (4)	2.5 2.1 1.1b 2.2b
		(7 marks)	

Qu	Scheme	Mark	AO															
3. (a)	<table border="1"> <thead> <tr> <th>Class</th> <th>Frequency</th> <th>Cum. Frequency</th> </tr> </thead> <tbody> <tr> <td>0 – 1</td> <td>30</td> <td>30</td> </tr> <tr> <td>1 – 2</td> <td>70</td> <td>100</td> </tr> <tr> <td>2 – 3.5</td> <td>150</td> <td>250</td> </tr> <tr> <td>3.5 – 4.5</td> <td>110</td> <td>360</td> </tr> </tbody> </table>	Class	Frequency	Cum. Frequency	0 – 1	30	30	1 – 2	70	100	2 – 3.5	150	250	3.5 – 4.5	110	360	M1	2.1
	Class	Frequency	Cum. Frequency															
0 – 1	30	30																
1 – 2	70	100																
2 – 3.5	150	250																
3.5 – 4.5	110	360																
		A1	1.1b															
	$[Q_2 =] (3.5) + \frac{\frac{512 - "250"}{110}}{2} \times (4.5 - 3.5) \quad \text{or} \quad [Q_2 =] (4.5) - \frac{"360" - 512}{2 \times 110} \times (4.5 - 3.5)$ $= 3.5545 \dots \text{ awrt } \underline{3.55}$	M1	2.1															
		A1	1.1b															
		(4)																
(b)	Need area under curve to be 512 so $\int_{(0)}^{(8)} kx(8-x) dx = 512$	M1	3.1a															
	$k \left[4x^2 - \frac{x^3}{3} \right]_{(0)}^{(8)} = 512$	M1	1.1b															
	$\left\{ k \left[4 \times 8^2 - \frac{8}{3} \times 8^2 \right] = 512 \Rightarrow \right\} \quad k = 6$	A1	1.1b															
		(3)																
(c)	[By symmetry median =] <u>4</u>	B1	2.2a															
		(1)																
		(8 marks)																

	Scheme	Marks	AO
4. (a)	Accept 15 to 27 inclusive	B1 (1)	1.1b
(b)	Any range between 20 and 40 inclusive	B1 (1)	1.1b
		(2 marks)	

Qu	Scheme	Mark	AO
5. (a)(i)	Require $R = 2$ and $G = 4$ so probability is $\frac{1}{6} \times \frac{1}{5}$	M1	2.1
	$= \frac{1}{30}$	A1	1.1b
(ii)	Require $R = 2$ and $G = 1$ or $R = 3$ and $G = 1$ so probability is $\frac{5}{6} \times \frac{1}{5} + \frac{4}{5} \times \frac{5}{6}$	A1	1.1b
	$= \frac{5}{6}$ or <u>0.833</u>		(3)
(b)	$P(X = 12) = \frac{1}{30}$ must mean $R = 2$ and $G = 4$	M1	3.1a
	so $2m - 4n = 12$	A1	1.1b
	$P(X = 28) = \frac{2}{3} \Rightarrow R = 3, G = 1$ so $3m - n = 28$	A1	2.1
	Solving: $2m + 4(-28 + 3m) = 12$ (o.e.)	M1	1.1b
	<u>m = 10</u> and <u>n = 2</u>	A1	3.2a
		(5)	
		(8 marks)	