

IB Maths AI HL Unit 4 Statistics and Probability Practice Exam: Mark Scheme

IB Mathematics: Applications and Interpretation HL · 12 questions · 60 marks

- M marks are for a correct method; A marks for an accurate answer that follows a correct method; R marks are for clear reasoning.
- Accept any correct method that reaches a correct answer, unless the question says which method to use.
- Practise these topics online with instant feedback: ibmathrevision.com/HLAIUnit4

Question 1

3 marks

- it is a leading question that encourages students to agree, so the responses would be biased **R1**
- a neutral question with non-overlapping response categories, e.g. 'How many hours of homework did you do last week? 0-4, 5-9, 10-14, 15 or more' **A1**
- e.g. year group (homework load changes with age), so results can be compared between year groups **A1**

Question 2

3 marks

$$48.2 \pm 1.96 \times \frac{6}{\sqrt{25}} \text{ (z-interval, } \sigma \text{ known) (M1)}$$

(45.8, 50.6) **A1A1**

Question 3

3 marks

- $\frac{12.4 + 15.8}{2} = 14.1$ **A1**
- $15.8 - 14.1 = 1.7$ **A1**
- if many samples were taken and an interval found from each, about 95% of the intervals would contain the population mean **R1**

Question 4

4 marks

- test-retest **A1**
- $r = 0.929$ **A2**
- r is close to 1 (strong positive correlation), so students score consistently: the test appears reliable **R1**

Question 5

5 marks

- $\bar{x} = 153.7$ **A1**
 $s_{n-1} = 5.33$ **A1**
- t -interval with 9 degrees of freedom (σ unknown) **(M1)**
(149.9, 157.5) **g A1A1**

Question 6

4 marks

- 10.5 lies outside the interval **R1**
so there is evidence that the mean lifetime is less than advertised **A1**
- wider **A1**
greater confidence needs a larger critical value, so a larger margin of error **R1**



Question 7

4 marks

- a. t -interval, 19 degrees of freedom **(M1)**
 (69.11, 75.69) **A1**
- b. (66.96, 77.84) **A1**
- c. a higher confidence level uses a larger critical t -value, so the margin of error is larger **R1**

Question 8

6 marks

- a. validity **A1**
 criterion-related validity (comparison with an accepted measure) **A1**
- b. $r = 0.992$ **A1**
 $r_s = 0.976$ **A1**
- c. very strong positive correlation with the accepted measure, so the field test appears valid **R1**
- d. that only shows the test is consistent (reliable); it could consistently measure something other than fitness **R1**

Question 9

4 marks

- a. $2 \times 1.96 \times \frac{7.5}{\sqrt{n}}$ **A1**
- b. $\frac{29.4}{\sqrt{n}} < 2$ **M1**
 $n > 216.09$ **A1**
 $n = 217$ **A1**

Question 10

9 marks

- a. $\bar{x} = 496.8$ **A1**
 $s_{n-1} = 4.41$ **A1**
- b. the population standard deviation is unknown and is estimated from a small sample **R1**
- c. t -interval with 11 degrees of freedom **(M1)**
 (494.0, 499.6) **A1A1**
- d. (492.9, 500.8) **A1**
- e. 500 is above the 95% interval, so at this level there is evidence that the mean is less than 500 g **R1**
 but 500 is inside the 99% interval, so the evidence is not strong at that level **R1**

Question 11

10 marks

- a. $\frac{0(30) + 1(36) + 2(20) + 3(10) + 4(4)}{100}$ **(M1)**
 $= 1.22$ **A1**
- b. 36.02, 21.97 **A1**
 3 or more: $100 - (\text{sum}) = 12.49$ **A1**
- c. the expected frequency for 4 or more would be 3.55, which is less than 5 **R1**
- d. 4 categories, minus 1, minus 1 more because the mean was estimated from the data **R1**
 $\nu = 2$ **A1**
- e. $\chi^2_{\text{calc}} = 0.368$ **A1**
 $p = 0.832$ **A1**
 $p > 0.05$ (or $\chi^2_{\text{calc}} < 5.991$): do not reject H_0 ; the Poisson model is consistent with the data **R1**



Question 12

5 marks

a. 74 **A1**

b. $1.96 \times \frac{\sigma}{\sqrt{40}} = 2.8$ **M1**
 $\sigma = 9.04$ **A1**

c. $74 \pm 1.645 \times \frac{\sigma}{\sqrt{40}}$ **M1**
(71.65, 76.35) **A1**

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