

IB Maths AA HL Unit 4 Statistics and Probability Practice Exam

IB Mathematics: Analysis and Approaches HL · 10 questions · 58 marks

Name _____

Date _____

Score / 58

- Answer every question. Show your working: most marks are for method.
- Section A no calculator; Section B calculator allowed. Includes core questions from the SL AA unit, which HL students also sit.
- Topics: Regression Line Properties; Probability Rules and Venn Diagrams; Box Plot Analysis; Binomial Probabilities; Data Organisation and Summaries; Conditional Probability and Trees; Cumulative Frequency Graphs; Finding Unknown Parameters; Calculating Probabilities.
- The mark scheme is a separate free PDF: ibmathrevision.com/downloads/practice-exams/hlaa/ib-maths-aa-hl-unit-4-statistics-probability-practice-exam-mark-scheme.pdf

Section A: no calculator

- The regression line of x on y for a data set is $x = 0.5y + 2$. The mean of the y -values is 12. [3]
 - Find the mean of the x -values. [2]
 - Estimate x when $y = 20$. [1]
- Events A and B are independent, with $P(A) = 0.3$ and $P(A \cup B) = 0.65$. [4]
 - Find $P(B)$. [3]
 - Find $P(A' | B)$. [1]
- The numbers of books read in a year by twelve students are: [8]

3, 5, 6, 8, 8, 9, 11, 12, 14, 15, 17, 30

 - Find the median and the quartiles. [3]
 - Show that 30 is an outlier. [3]
 - Draw a box-and-whisker plot for the data, showing the outlier. [2]



4. A fair six-sided die is rolled 4 times. Let X be the number of sixes. [4]
- a. Write down the distribution of X . [1]
 - b. Find $P(X = 2)$, giving your answer as a fraction. [2]
 - c. Find $E(X)$. [1]
5. A school has 1200 students: 420 in Year 10, 450 in Year 11 and 330 in Year 12. The head wants the views of a sample of 80 students on the canteen. [7]
- a. State whether 'number of meals bought per week' is discrete or continuous data. [1]
 - b. Find how many students from each year should be in a stratified sample of size 80. [3]
 - c. Describe how a systematic sample of 80 could be taken from an alphabetical list of all 1200 students. [2]
 - d. The head instead asks the first 80 students to arrive at the canteen one morning. Explain why this sample may be biased. [1]

Section B: calculator allowed

6. A factory has two machines. Machine X makes 70% of the items and 3% of its items are faulty. [4]
Machine Y makes the rest and 5% of its items are faulty. An item is chosen at random.
- a. Find the probability that it is faulty. [2]
 - b. Given that it is faulty, find the probability that it was made by machine Y . [2]



7. The times taken by 80 runners to complete a course are summarised in a cumulative frequency table [7]
(no runner took 0 minutes or less).

Time t (minutes)	$t \leq 10$	$t \leq 20$	$t \leq 30$	$t \leq 40$	$t \leq 50$	$t \leq 60$
Cumulative frequency	4	15	38	62	74	80

- Using linear interpolation within the classes, estimate the median time. [2]
- Estimate the interquartile range. [3]
- Find the number of runners who took more than 40 minutes but at most 50 minutes. [1]
- Write down the modal class. [1]

8. The lengths of bolts are normally distributed with mean 80 mm. 5% of the bolts are longer than 83 mm. [4]

- Find the standard deviation of the lengths. [3]
- Find the probability that a bolt is shorter than 78 mm. [1]

9. The heights of adult men in a city are normally distributed with mean 172 cm and standard deviation 8 cm. [8]

- Find the probability that a man chosen at random is taller than 185 cm. [1]
- Find the height exceeded by 25% of men. [2]
- A door is designed so that no more than 1% of men need to stoop. Find the minimum height of the door, to the nearest cm above. [3]
- Five men are chosen at random. Find the probability that exactly two of them are taller than 185 cm. [2]



- 10.** On a production line, 15% of items are defective, independently. Items are packed in boxes of 20. **[9]**
- a. Find the probability that a box contains exactly 3 defective items. **[2]**
 - b. Find the probability that a box contains more than 4 defective items. **[2]**
 - c. Find the expected number and the variance of the number of defective items in a box. **[2]**
 - d. A crate holds 10 boxes. Find the probability that at least 8 of the boxes contain at most 4 defective items. **[3]**

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