

A Level Maths Statistics Practice Exam

Pearson Edexcel A Level Mathematics (9MA0) · 27 questions · 60 marks

Name _____

Date _____

Score / 60

- Answer every question. Show your working: most marks are for method.
- Calculator allowed.
- Topics: Venn diagrams; Populations, samples and census; Simple random sampling; Systematic, stratified, quota and opportunity sampling; Measures of central tendency; Measures of spread; Coding data; Box plots and outliers; Cumulative frequency; Scatter diagrams and correlation; Linear regression and interpretation; Basic probability and sample space; Mutually exclusive and independent events; Two-way tables; Discrete random variables and distributions; The binomial distribution; The normal distribution; Normal approximation to the binomial; Hypothesis testing with the binomial distribution; Hypothesis testing for a mean; Hypothesis testing for correlation; Histograms and frequency density; Conditional probability; Probability tree diagrams; Binomial cumulative probabilities; Standardising and z-values; Critical regions.
- The mark scheme is a separate free PDF: alevelmathrevision.com/alevel-frontend/downloads/practice-exams/9ma0/a-level-maths-statistics-practice-exam-mark-scheme.pdf

1. A member of a leisure centre is chosen at random. A is the event that the member uses the pool and B is the event that the member uses the sauna. $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.15$. Find the probability that the member uses at least one of the two, $P(A \cup B)$, and the probability that the member uses neither, $P(A' \cap B')$. [2]

2. A primary school with 84 pupils wants to know how every pupil travels to school. A city council wants to know how the 92000 adults living in the city travel to work. For each, state with a reason whether a census or a sample is more appropriate. [2]

3. A teacher uses the random integer function on her calculator, set between 1 and 250, to choose 12 of the 250 raffle tickets sold at a school fair. The third number she gets is the same as the first. Explain what she should do with the repeated number and why, and give one disadvantage of simple random sampling when the population is very large. [2]

4. A quality inspector checks every 50th bottle filled by a machine. Explain why this systematic sample is not a simple random sample, and give one advantage of systematic sampling. [2]



5. In a test, the 18 students in class A have a mean mark of 64 and the 12 students in class B have a mean mark of 71. Find the mean mark of all 30 students. [2]
6. Two machines fill bags of flour. For machine P the masses have mean 500.4 g and standard deviation 1.2 g; for machine Q the mean is 501.1 g and the standard deviation is 3.8 g. Compare the two machines, and state which is more consistent. [2]
7. A student takes a sample of daily mean temperatures from a large data set of weather records. In degrees Celsius, the sample has mean 14.5 and standard deviation 3.5. Temperatures in degrees Fahrenheit are given by $F = 1.8C + 32$. Find the mean and the standard deviation of the sample in degrees Fahrenheit. [2]
8. Box plots of the times, in minutes, that two groups of pupils took to finish a puzzle show: group A has median 14 and IQR 6; group B has median 19 and IQR 3. Make two comparisons between the times of the two groups, in context. [2]
9. The cumulative frequencies of the scores, s , of 120 players in a quiz are:
 $s < 40$: 26; $s < 50$: 60; $s < 60$: 100; $s < 70$: 120
 Estimate the number of players who scored more than 55. [2]
10. For a sample of towns, the product moment correlation coefficient between the number of libraries and the number of road accidents in a year is 0.81. A councillor says that building libraries causes road accidents. Explain why this conclusion is not justified. [2]
11. For a kiosk, the regression line of daily ice-cream sales, y , on the maximum temperature, x °C, is $y = -20 + 8.5x$, for $12 \leq x \leq 30$. Estimate the sales on a day when the maximum temperature is 22 °C. The manager also uses the line to estimate the temperature on a day when 150 ice creams were sold. Give a reason why this is not appropriate. [2]



- 12.** The letters of the word STATISTICS are written on ten cards, and one card is chosen at random. Find the probability that the letter is a vowel, and the probability that it is S or C. [2]
- 13.** Events A and B are mutually exclusive, and $P(A) > 0$ and $P(B) > 0$. Explain why A and B cannot be independent. [2]
- 14.** A table of probabilities for events A and B shows [2]
 $A: B$ 0.12, not B 0.28
 not $A: B$ 0.18, not B x
 Find x and $P(B | A')$. [2]
- 15.** The discrete random variable X has $P(X = x) = \frac{x}{15}$ for $x = 1, 2, 3, 4, 5$. Show that this is a valid probability distribution, and find the probability that X is even. [2]
- 16.** A fair six-sided die is rolled 30 times and X is the number of sixes. Write down the distribution of X . Explain why the number of rolls needed to get the first six is not binomially distributed. [2]
- 17.** The random variable $X \sim N(\mu, \sigma^2)$ and $P(X > \mu + a) = 0.2$, where $a > 0$. Use symmetry to find $P(\mu - a < X < \mu + a)$ and $P(X < \mu - a)$. [2]
- 18.** The random variable $X \sim B(40, 0.05)$. Explain why a normal approximation would not be suitable for X . [2]
- 19.** A hypothesis test at the 5% level of significance gives a p-value of 0.073. State the conclusion of the test, and explain what the p-value tells you. [2]



20. A test for the mean of a normal population uses $\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$. State two conditions needed for this distribution to be valid. [2]
21. A test finds significant positive correlation between the number of ice creams sold and the number of people treated for sunburn on a beach. Explain why this does not show that eating ice cream causes sunburn, and state what the test does show. [2]
22. On a histogram, the bar for the class $10 \leq x < 15$ is 2 cm wide and 6 cm high, and it represents 24 students. The bar for the class $15 \leq x < 25$ is 4.5 cm high. Find the width of this bar and the number of students it represents. [3]
23. A holidaymaker in a town is chosen at random. A is the event that they visit the castle and B that they visit the museum. The probabilities are: castle only 0.25, both 0.15, museum only 0.3, neither 0.3. Find the probability that a museum visitor also visits the castle, $P(A | B)$, and the probability that someone who does not visit the castle visits the museum, $P(B | A')$. [3]
24. A bag contains 4 red and 6 blue beads. Two beads are taken at random without replacement. Find the probability that both are blue, and the probability that they are different colours. [3]
25. The random variable $X \sim B(25, 0.2)$. Find $P(3 \leq X \leq 7)$. [3]
26. The random variable Y is normally distributed with mean 100. Exactly 5% of the values of Y are greater than 115. Find the standard deviation of Y , to 3 significant figures. [3]



- 27.** A coin is to be tossed 20 times to test $H_0 : p = 0.5$ against $H_1 : p \neq 0.5$, where p is the probability of heads, at the 5% level of significance. Find the critical region and the actual significance level. [3]

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