

Statistics and probability – supported focus

Pearson Edexcel · International GCSE · Mathematics A

Supported teaching and tier boundary

4MA1: Statistics and probability. Version: Issue 2, November 2017; first assessment June 2018; linear Mathematics A.

Foundation teaching and Higher additions are labelled below. This reference packages the existing native-lesson crosswalk. It does not certify unreviewed specification rows or a whole qualification. Original diagnostics are separate and are not reproduced.

■ Centre, spread and data displays · Foundation

The mean is total divided by count. The median is the central value after sorting. The range is maximum minus minimum. Use frequency tables, bar charts and suitable comparisons.

$$\bar{x} = \frac{\sum x_i}{n}$$

For 2,4,4,6,9, total=25 and count=5, so mean=5. The central value is 4, so median=4. The range is 9-2=7. Explain both a typical value and the spread.

The tallest histogram bar need not contain the most observations. A grouped mean is an estimate. Correlation does not prove causation, and extrapolation extends beyond the observed range.

A bar chart uses separate bars for categories. Unequal-class-width histograms and formal density calculations are outside this Foundation/Core lesson.

■ Data summaries, histograms and interpretation · Higher

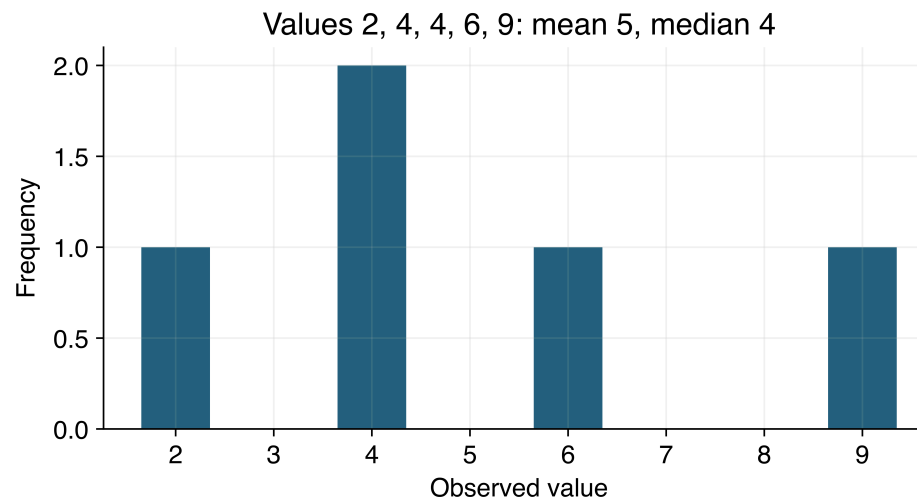
Compare an appropriate average and spread in context. A histogram uses area for frequency, so height=frequency/class width. Grouped estimates assume representative values within intervals.

$$\bar{x} = \frac{\sum x_i}{n}, \quad \text{density} = \frac{\text{frequency}}{\text{class width}}$$

A class from 10 to 20 with frequency 30 has density 30/10=3. A class from 20 to 40 with frequency 20 has density 20/20=1. Its wider bar must not be mistaken for a larger density. For values 2,4,4,6,9, the median is 4 and mean is 5.

The tallest histogram bar need not contain the most observations. A grouped mean is an estimate. Correlation does not prove causation, and extrapolation extends beyond the observed range.

Choose a display that fits the data type. Give both a numerical comparison and what it means for the population; do not infer more precision than the sample supports.



Original native-lesson illustration; labels belong to its worked example.

■ Probability trees and outcomes · Foundation

A probability lies between 0 and 1. Exhaustive, mutually exclusive outcomes have probabilities summing to 1. Multiply successive branch probabilities and add separate routes to an outcome.

$$P(RR) = P(R_1)P(R_2 | R_1)$$

A bag contains 3 red and 2 blue counters. With replacement, $P(\text{two red}) = 3/5 \times 3/5 = 9/25 = 0.36$. Without replacement, the red-red branch is $3/5 \times 2/4 = 0.3$. Label each branch before multiplying.

Mutually exclusive means no overlap; independent means that knowing one event does not change the other's probability. Two disjoint events with positive probability are not independent.

Use a frequency table or a simple tree before calculating. Formal conditional probability formulae are outside this Foundation/Core support lesson.

■ **Probability, trees and conditional reasoning** · Higher

Multiply along a tree branch and add disjoint branches. With replacement, the composition stays fixed. Conditional probability is $P(A \text{ given } B) = P(A \cap B) / P(B)$, for $P(B) > 0$.

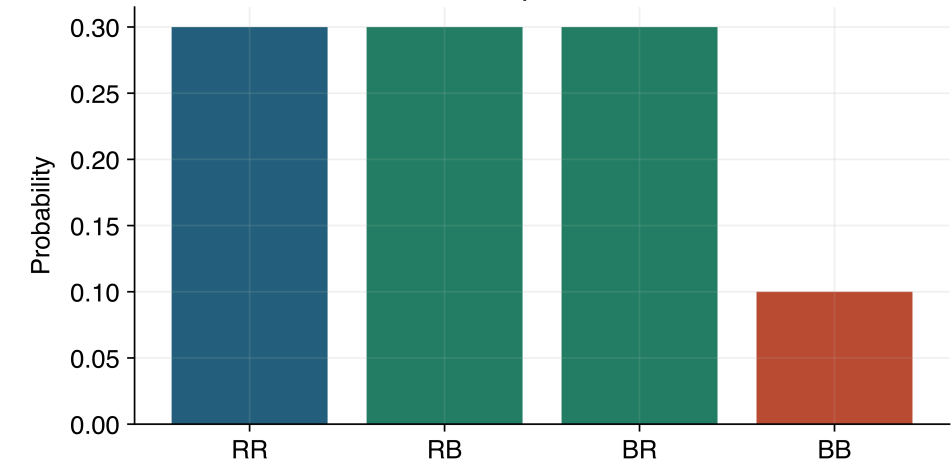
$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}, \quad P(B) > 0$$

Without replacement, $P(\text{two red}) = 3/5 \times 2/4 = 3/10$. $P(\text{one of each}) = 3/5 \times 2/4 + 2/5 \times 3/4 = 3/5$. If $P(A \cap B) = 0.12$ and $P(B) = 0.3$, $P(A \text{ given } B) = 0.4$.

Mutually exclusive means no overlap; independent means that knowing one event does not change the other’s probability. Two disjoint events with positive probability are not independent.

A two-way table makes the restricted denominator visible. Before using a product $P(A)P(B)$, justify independence from the context or the supplied information.

Two draws without replacement: 3 red, 2 blue



Original native-lesson illustration; labels belong to its worked example.

■ **Cumulative frequency and box plots** · Higher

A cumulative frequency counts observations below successive class boundaries. Read quartiles at one quarter, one half and three quarters of the total frequency. A box plot represents minimum, lower quartile, median, upper quartile and maximum.

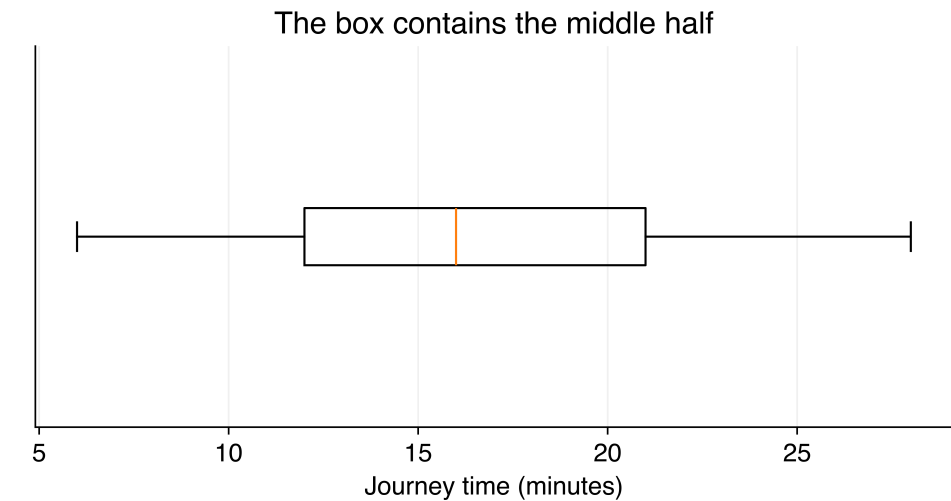
$$IQR = Q_3 - Q_1$$

For 80 observations, read Q1 at cumulative frequency 20, median at 40 and Q3 at 60.

If $Q_1 = 12, Q_3 = 21$, then $IQR = 9$. Compare the medians for typical journey time and the IQRs for consistency.

Plot against class boundaries rather than midpoints. Grouped quartiles are estimates. The range is sensitive to extremes; the IQR describes only the middle half.

Explain a comparison in the context of the measured quantity. An outlier rule may use $Q_1 - 1.5IQR$ and $Q_3 + 1.5IQR$; use the rule specified in the task rather than assuming every graph follows it.



Original native-lesson illustration; labels belong to its worked example.

Remaining qualification limits

Official question-bank boundaries, scheme alignment and all objective-level teaching coverage require the recorded review; no practice registry promotion.

The authored diagnostic assessments are not full-length qualification mocks.

Only the mapped native skills are supplied here. Objective rows marked formula-review-required are not promoted to complete coverage by these print companions.

Terms

- range .
- frequency density .
- conditional probability .
- interquartile range .