ACACIA TUTORING

Data Analysis

8

μnit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

Which measure of central tendency is least affected by extreme values in a dataset?

A. Mean **B. Median** **C. Range** **D. IQR**

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Question 2:

The interquartile range (IQR) measures:

A. The spread of the middle 50% of the data.
B. The total spread of the data.
C. The average of the highest and lowest values.
D. How many times the mode value appears.

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Part 2: Short Answer (4 marks)

Question 3:

Given the dataset: $\{ 2, 3, 4, 5, 6, 7, 8, 9 \}$ **, calculate the mean, median, mode, range, and interquartile range (IQR).**

Question 4:

Explain how the median and interquartile range can be used to describe the distribution of data.

Part 3: Problem Solving (4 marks)

Question 5:

A dataset shows the ages of participants in a study: $\{14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24\}$ **.**

I. **Find the median age.**
II. **Calculate the interquartile range.**

Question 6:

The following are test scores for a class: $\{ 60, 70, 75, 80, 80, 85, 90, 95 \}$ **.**

I. **Determine the mode of these scores.**

II. **Calculate the mean score.**

Solutions

1. (1 mark)

B. Median.

- The median is the middle value and is less influenced by outliers than the mean.

2. (1 mark)

A. The spread of the middle $50\,\%$ of the data.

- IQR is calculated as $Q_3 - Q_1$, where Q_3 is the third quartile and Q_1 is the first quartile.

3. (2 marks)

Mean:

$$\begin{aligned}\text{Mean} = \frac{\sum_{i=1}^{n} x_i}{n} &= \frac{\text{Sum of scores}}{\text{Number of Scores}} \\ &= \frac{2+3+4+5+6+7+8+9}{8} \\ &= \frac{44}{8} \\ &= 5.5\,.\end{aligned}$$

Median: Middle value is 5 and 6, so the median is:

$$\begin{aligned}&\rightarrow \frac{5+6}{2} \\ &= 5.5\,.\end{aligned}$$

Mode: There is no mode since all numbers appear only once.

Range:

$$\begin{aligned}\text{Range} &= \text{Highest} - \text{Lowest} \\ &= 9 - 2 \\ &= 7\,.\end{aligned}$$

IQR:

$$\begin{aligned}Q_1 \text{ (First Quartile) - average of } 2nd \text{ and } 3rd \text{ value} &= \frac{3+4}{2} \\ &= 3.5\,.\end{aligned}$$

$$\begin{aligned}Q_3 \text{ (Third Quartile) - average of } 6th \text{ and } 7th \text{ value} &= \frac{7+8}{2} \\ &= 7.5\,.\end{aligned}$$

$$\begin{aligned}\text{IQR} &= Q_3 - Q_1 \\ &= 7.5 - 3.5 \\ &= 4\,.\end{aligned}$$

4. (2 marks)

The median gives an idea of the central value of the dataset, showing where the middle of the data lies. The interquartile range (IQR) describes the spread of the middle half of the data, providing insight into the variability by excluding the highest and lowest quarters of the data. Together, they give a robust picture of the data's distribution, less sensitive to outliers than the mean and range.

5. (2 marks)

Median, arrange in ascending order:

$$\{ 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 \}$$

$$\rightarrow \text{Median is the } (\frac{n+1}{2})^{th} \text{ number.}$$

$$[n = \text{number of scores.}]$$

$$= (\frac{11+1}{2})^{th} \text{ number}$$

$$= (\frac{12}{2})^{th} \text{ number}$$

$$= 6^{th} \text{ number.}$$

$$= 19 .$$

IQR:

Q_1 is the median of the lower half:

$$\rightarrow \{14, 15, 16, 17, 18 \}$$

$$= 16 .$$

Q_3 is the median of the upper half:

$$\rightarrow \{ 20, 21, 22, 23, 24 \}$$

$$= 22 .$$

$$\text{IQR} = Q_3 - Q_1$$

$$= 22 - 16$$

$$= 6 .$$

6. (2 marks)

Mode: The score 80 appears twice, making it the mode.

Mean:

$$\text{Mean} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{\text{Sum of scores}}{\text{Number of Scores}}$$

$$= \frac{60 + 70 + 75 + 80 + 80 + 85 + 90 + 95}{8}$$

$$= \frac{635}{8}$$

$$= 79.375 .$$

$$\sum = \frac{}{10} = \quad \%$$

Probability 8

μnit Test

Free and always will be!

Instructions: Read all questions carefully to ensure you understand what is being asked. When completing your official tests / exams, your grade will be based upon your: **understanding, fluency, reasoning, and problem solving,** so ensure you show all lines of working and draw accurate, labelled diagrams where necessary. (ACiQ|9.0 Mathematics standard elaborations found on final page (general assessment marking standards)). [Practise tests are marked out of a score of 10]. For multiple choice questions, tick or fill in the circle next to the corresponding letter under the question.

Check your work if you have time. *Remember:* you don't have to start at question one, it's always best to firstly look through the test, highlight the easy looking questions and complete them first, then secondly, go back through and work on the harder questions. Good luck! And remember to breathe!

$$\sum = \frac{\quad}{10} = \quad \%$$

Part 1: Multiple Choice (2 marks)

Question 1:

If event A and event B are independent, and $P(A) = 0.4$ and $P(B) = 0.3$, what is $P(A \text{ and } B)$?

A. 0.12 **B. 0.7** **C. 0.07** **D. 0.1**

◯ A ◯ B ◯ C ◯ D

Question 2:

In a Venn diagram representing two events A and B, the area where A and B overlap represents:

A. The probability of A or B.
B. The probability of neither A nor B.
C. The probability of both A and B happening.
D. The probability of A happening but not B.

◯ A ◯ B ◯ C ◯ D

Part 2: Short Answer (4 marks)

Question 3:

Explain the difference between independent and dependent events with an example.

Question 4:

Draw a Venn diagram for two sets, A and B, where:
Set A has 10 elements,
Set B has 5 elements,
3 **elements are in both A and B.**

Part 3: Problem Solving (4 marks)

Question 5:

A bag contains 4 red balls and 6 blue balls. You draw two balls without replacement.

I. **What is the probability that the first ball is red?**
II. **What is the probability that both balls drawn are red?**

Question 6:

In a school, $60\,\%$ of students play football, $40\,\%$ play basketball, and $25\,\%$ play both.
What percentage of students play either football or basketball or both?

Solutions

1. (1 mark)

A. 0.12 .

- For independent events,

$$\begin{aligned} P(A \cap B) &= P(A) \times P(B) \\ &= 0.4 \times 0.3 \\ &= 0.12 . \end{aligned}$$

2. (1 mark)

C. The probability of both A and B happening.

- This is the intersection $(A \cap B)$.

3. (2 marks)

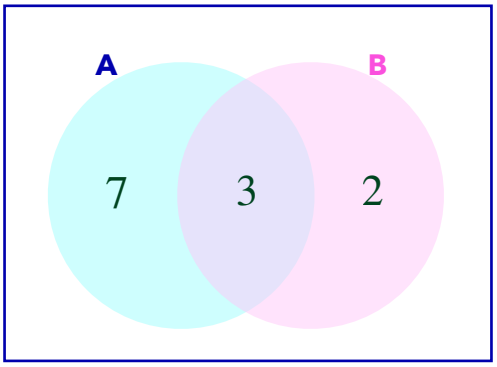
Independent events are events where the occurrence of one does not affect the probability of the other. Example: Rolling a die twice; the result of the first roll doesn't affect the second roll.
Dependent events are events where the outcome of the first event influences the probability of the second. Example: Drawing two cards from a deck without replacement; the first card drawn changes the probability for the second.

4. (2 marks)

Description for drawing: Two overlapping circles, labelled A and B,

Circle A contains 10 elements, Circle B contains 5 elements, and there is an overlap of 3 elements,

Therefore, 3 elements are in A ∩ B, 7 elements are only in A ($10 - 3$), and 2 elements are only in B ($5 - 3$).



5. (2 marks)

$$\text{First ball red: } \frac{4}{10} = 0.4$$

Both red: After drawing one red ball, there are 3 red balls left out of 9 :

$$\begin{aligned} P(\text{second red} \mid \text{first red}) &= \frac{3}{9} \\ &= \frac{1}{3}. \end{aligned}$$

$$\begin{aligned} P(\text{both red}) &= 0.4 \times \frac{1}{3} \\ &= \frac{4 \div 2}{30 \div 2} \\ &= \frac{2}{15} \\ &\approx 0.1333. \end{aligned}$$

6. (2 marks)

Let F be football players, B be basketball players.

$$\begin{aligned} |F| &= 60\%, \\ |B| &= 40\%, \\ |F \cap B| &= 25\%. \end{aligned}$$

Using the principle of inclusion-exclusion for union:

$$\begin{aligned} |F \cup B| &= |F| + |B| - |F \cap B| \\ &= 60\% + 40\% - 25\% \\ &= 75\% \end{aligned}$$

$$\sum = \frac{}{10} = \quad \%$$

General Assessment Marking Standards

Remember: When your official tests are marked, they won't be a score out of 10, they will be a grade (A,B,C,D,E) based on the following standards:

ACiQ | v9.0

Year 8 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	Understanding	accurate and consistent identification, representation, description and connection of mathematical concepts and relationships in complex unfamiliar, complex familiar, and simple familiar situations	accurate identification, representation, description and connection of mathematical concepts and relationships in complex familiar and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	Fluency	choice, use and application of comprehensive facts, definitions, and procedures to find solutions in complex unfamiliar, complex familiar, and simple familiar situations	choice, use and application of effective facts, definitions, and procedures to find solutions in complex familiar and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	detailed explanation of mathematical thinking, strategies used, and conclusions reached in complex familiar and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	Problem-solving	purposeful use of problem-solving approaches to find solutions to problems.	effective use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	partial use of problem-solving approaches to make progress towards finding solutions to problems.	fragmented use of problem-solving approaches to make progress towards finding solutions to problems.

Key	shading emphasises the qualities that discriminate between the A–E descriptors

IMPORTANT: At Acacia Tutoring we believe all educational resources should be free, as education, is a fundamental human right and a cornerstone of an equitable society. By removing financial barriers, we ensure that all students, regardless of their socioeconomic background, have equal access to high-quality learning materials. This inclusivity promotes fairness, helps bridge achievement gaps, and fosters a society where every individual can reach their full potential.

Furthermore, free resources empower teachers and parents, providing them with tools to support diverse learners and improve outcomes across communities. Education benefits everyone, and making resources universally accessible ensures we build a more informed, skilled, and prosperous future for all.

All documents are formatted as a **.pdf** file, and are completely **FREE** to use, print and distribute - as long as they are not sold or reproduced to make a profit.

N.B. Although we try our best to produce high-quality, accurate and precise materials, we at Acacia Tutoring are still human, these documents may contain errors or omissions, if you find any and wish to help, please contact Jason at info@acaciatutoring.com.au .