UNIT TEST #023 | Australian Curriculum Mathematics | UTM9T4U7

ACACIA TUTORING

Data Representation and Interpretation

9 Unit 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:

a) The following time series data shows monthly rainfall (mm) over 6 months:
Jan: 50 **, Feb:** 60 **, Mar:** 55 **, Apr:** 70 **, May:** 65 **, Jun:** 80 **. What is the overall trend in the rainfall data?**

A. Decreasing **B.** Increasing **C.** Constant **D.** No clear trend

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1a…

b) The box plot below represents the test scores of a Year 9 class:
[Assume a box plot with $Q_1 = 40$, $Median = 55$, $Q_3 = 70$, $Min = 25$, $Max = 85$]

What is the interquartile range (IQR) of the scores?

A. 15 **B.** 30 **C.** 45 **D.** 60

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 1b…

Question 2:

a) In a time series plot, seasonal variation is best described as:

A. A long-term increase or decrease
B. Random fluctuations with no pattern
C. Regular, repeating patterns over a fixed period
D. A sudden, unexpected change

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2a…

b) Which of the following measures is NOT represented directly on a box plot?

A. $Median$ **B.** $Mean$ **C.** Lower Quartile (Q_1) **D.** Upper Quartile (Q_3)

◯ **A** ◯ **B** ◯ **C** ◯ **D**

Space for question 2b…

Part 2: Short Answer (4 marks)

Question 3:

The table below shows the daily temperature ($^\circ C$) over a week:

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temp ($^\circ C$)	22	24	23	25	26	24	23

a) Plot the time series data or describe key points.

b) Calculate the $3-day$ moving average for Wednesday.

Question 4:

a) Explain the purpose of using a moving average in time series data.

b) The following data set represents the hours 10 students spent studying:
$\{3, 5, 2, 8, 6, 4, 7, 5, 9, 1\}$**. Calculate the five-number summary (**$minimum$**,** Q_1**,** $median$**,** Q_3**,** $maximum$**) for a box plot.**

Part 3: Problem Solving (4 marks)

Question 5:

a) The table below shows the number of ice creams sold daily over 10 days:

Day	1	2	3	4	5	6	7	8	9	10
Sold	20	22	25	28	30	32	35	33	36	38

I) Describe the trend in the data.

II) Calculate the 3-day moving averages for days $1-10$.

III) Interpret what the moving averages suggest about sales.

b) Two groups recorded their $100-metre$ **race times (seconds):**

Group A: $\{ 12, 14, 15, 16, 18, 20, 22 \}$
Group B: $\{ 11, 13, 17, 19, 21, 23, 25 \}$

I) Find the five-number summary for each group.
II) Describe (key features) or draw a box plot for each, *on the same scale*.
III) Compare the distributions, including centre, spread, and shape.

Question 6:

a) A time series of monthly sales ($) shows:

Jan: 200 **, Feb:** 210 **, Mar:** 250 **, Apr:** 240 **, May:** 260 **, Jun:** 270 **.**

I) Identify any patterns or variations.

II) Predict the sales for July, justifying your reasoning.

b) A box plot has: Min $= 10$ **,** $Q_1 = 15$ **, Median** $= 20$ **,** $Q_3 = 30$ **, Max** $= 50$ **.**
Using the $1.5 \times IQR$ **rule, is** 5 **an outlier?**

Solutions

1a. (0.5 marks)

B. Increasing.

The values generally rise from $50\,mm$ to $80\,mm$ over the $6\,months$.

b. (0.5 marks)

B. 30.

$$\begin{aligned} IQR &= Q_3 - Q_1 \\ &= 70 - 40 \\ &= 30. \end{aligned}$$

2a. (0.5 marks)

C. Regular, repeating patterns over a fixed period.

Seasonal variation refers to predictable cycles (e.g., yearly weather patterns).

b. (0.5 marks)

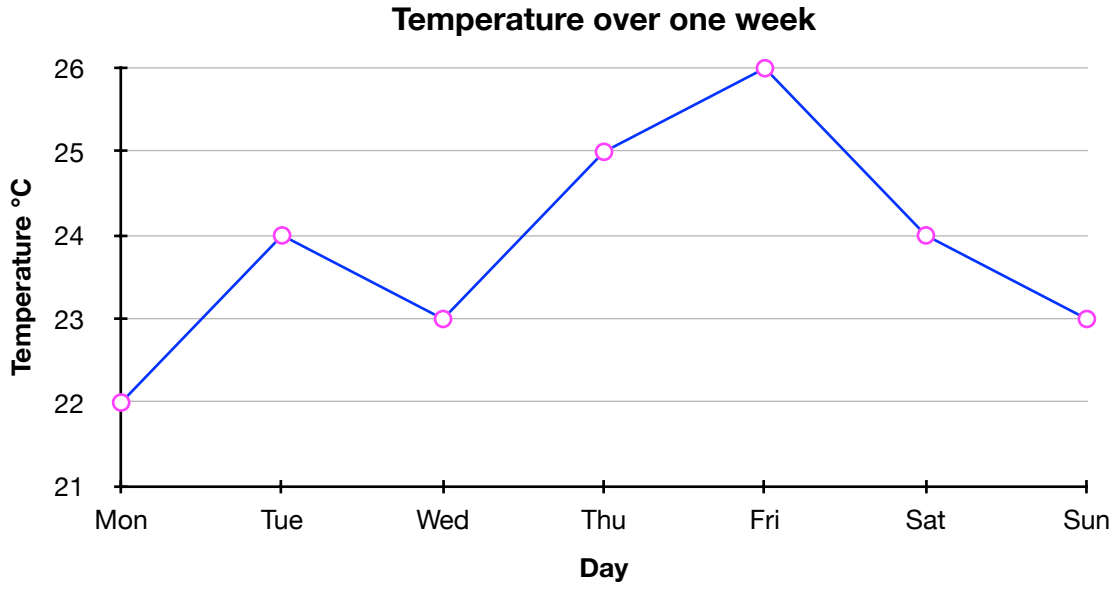
B. Mean.

Box plots show median, quartiles, and range, not the mean.

3a. (1 mark)

Plot: Points at (Mon, 22), (Tue, 24), (Wed, 23), (Thu, 25), (Fri, 26), (Sat, 24), (Sun, 23).

Description: Starts at $22°C$, peaks at $26°C$ on Friday, dips to $23°$ C by Sunday.



b. (1 mark)

$3-day$ moving average for Wednesday:

$$= \frac{(\text{Tue} + \text{Wed} + \text{Thu})}{3}$$
$$= \frac{(24+23+25)}{3}$$
$$= \frac{72}{3}$$
$$= 24°C.$$

4a. (0.5 marks)

A moving average smooths out short-term fluctuations in time series data, making it easier to identify long-term trends or patterns by reducing the impact of random variations.

b. (0.5 marks)

Ordered: $1, 2, 3, 4, 5, 5, 6, 7, 8, 9$.

$$\text{Min} = 1,$$
$$Q_1 = 2.5,$$
$$Q_2 = \text{Median} = 5,$$
$$Q_3 = 7.5,$$
$$\text{Max} = 9.$$

5a.

I. (0.5 marks)

Trend: Increasing.

Sales rise from 20 to 38 over 10 days.

II. (1 mark)

$$
\begin{aligned}
\text{Day } 3: &= (20+22+25)/3 \\
&= 67/3 \\
&\approx 22.33\,.\\
\text{Day } 4: &= (22+25+28)/3 \\
&= 75/3 \\
&= 25\,.\\
\text{Day } 5: &= (25+28+30)/3 \\
&= 83/3 \\
&\approx 27.67\,.\\
\text{Day } 6: &= (28+30+32)/3 \\
&= 90/3 \\
&= 30\,.\\
\text{Day } 7: &= (30+32+35)/3 \\
&= 97/3 \\
&\approx 32.33\,.\\
\text{Day } 8: &= (32+35+33)/3 \\
&= 100/3 \\
&\approx 33.33\,.\\
\text{Day } 9: &= (35+33+36)/3 \\
&= 104/3\,. \\
&\approx 34.67\\
\text{Day } 10: &= (33+36+38)/3 \\
&= 107/3 \\
&\approx 35.67\,.
\end{aligned}
$$

Moving averages: $\{\, N/A,\ N/A,\ 22.33,\ 25,\ 27.67,\ 30,\ 32.33,\ 33.33,\ 34.67,\ 35.67 \,\}$.

III. (0.5 marks)

The moving averages increase steadily, confirming a consistent upward trend in ice cream sales, with smoothed values reducing daily fluctuations.

b. (1 mark)

I)

Group A:

Min $= 12$, $Q_1 = 14$, Median $= 16$, $Q_3 = 20$, Max $= 22$.

Group B:

Min $= 11$, $Q_1 = 13$, Median $= 19$, $Q_3 = 23$, Max $= 25$.

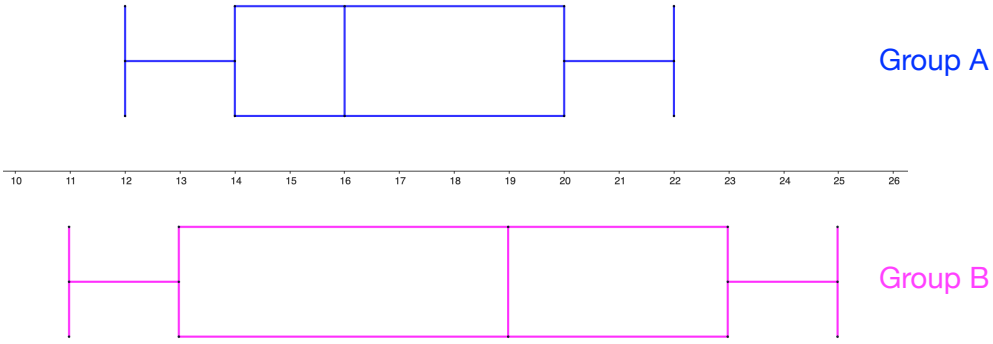
II)

Group A:

Whisker $12 - 14$, box $14 - 20$ (median 16), whisker $20 - 22$.

Group B:

Whisker $11 - 13$, box $13 - 23$ (median 19), whisker $23 - 25$.



III)

Centre:

Group A median $(16) <$ Group B (19).

Spread:

Group A $IQR = 6$, range $= 10$;

Group B $IQR = 10$, range $= 14$ (B more spread).

Shape:

Group A symmetric (equal whiskers, box halves);

Group B right-skewed (longer upper whisker, smaller upper box half).

6a.

I. (0.5 marks)

Pattern: Overall increasing trend (200 to 270).

Variation: Slight dip in April (250 to 240), but the upward trend resumes. No clear seasonal pattern in $6\ months$.

II. (0.5 marks)

Prediction: $\approx 280 \rightarrow 290$

Justification: The general trend is increasing, with an average monthly increase of about $(270 - 200)/5 = 14$. The last two months (May–Jun) show a consistent rise of $10 \rightarrow 20$, so extending this trend suggests sales around $280 \rightarrow 290$.

b. (1 mark)

$$\begin{aligned} IQR &= 30 - 15 \\ &= 15\,. \\ \text{Lower bound} &= 15 - 1.5 \times 15 \\ &= -7.5\,. \\ \text{Upper bound} &= 30 + 1.5 \times 15 \\ &= 52.5\,. \end{aligned}$$

$\therefore 5 > -7.5$ and < 52.5 , so not an outlier (though below Min, it fits the rule).

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

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 9 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

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