F_WORKSHEET # 007 | Australian Curriculum Year 7 Mathematics | FWM7T4U7

ACACIA TUTORING

Data Representation, and Interpretation 7

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Focus: A set of questions and solutions for Year 7 students on Data Representation and Interpretation, tailored to the Australian Curriculum under the strand 'Statistics and Probability':

1. Data Collection

a) Explain what data collection means and give an example of one method.

b) List three different ways to collect data in a classroom setting.

2. Types of Data

a) Distinguish between qualitative and quantitative data with examples.

b) Give an example of discrete and continuous data from a school context.

3. Graphical Representation

a) Describe how to create a bar graph to show the number of students who prefer different types of music.

b) When would you use a pie chart instead of a bar graph?

4. Interpreting Data

a) From the bar graph showing students' favourite sports, identify which sport is least popular.

b) If a pie chart shows that 25% of students voted for soccer, how many students voted for soccer in a class of 40?

5. Data Misrepresentation

a) Explain how a misleading scale can affect the interpretation of a bar graph.

b) Describe one way data might be presented to mislead the audience.

6. Practical Application

a) Create a simple data set and represent it using a pictograph.

b) How could you use data representation to plan a school event based on student preferences?

7. Mean

a) Calculate the mean of the numbers $4,\ 7,\ 9,\ 12$ **, and** 18 **.**

b) What happens to the mean if you add 20 to each number in the dataset above?

8. Median

a) Find the median of the numbers: $3,\ 5,\ 1,\ 6,\ 4,\ 2$.

b) What is the median of $10,\ 15,\ 18,\ 22$?

9. Mode

a) Identify the mode in the dataset: { 5, 2, 5, 1, 5, 3 **}.**

b) What would happen to the mode if we add another '2' to the dataset above?

10. Range

a) Determine the range of the dataset: { 10, 5, 15, 20, 8 **}.**

b) If the highest number in this dataset was changed to 25, what would the new range be?

11. Practical Application

a) A teacher records the following test scores: { $78, 82, 85, 78, 90, 88, 77$ }. Calculate the mean, median, mode, and range of these scores.

b) Explain why the median might be a better measure of central tendency than the mean for a dataset with extreme values.

Solutions

1a.

Data collection refers to gathering information to answer questions or understand patterns. An example method is a survey where you ask people a series of questions, like a questionnaire about their favourite sports.

b.

Survey/Questionnaire: Ask students to fill out a form about their study habits.
Observation: Note how many students raise their hands during a Q&A session.
Experiment: Conduct a simple experiment like timing how long it takes for students to solve a math problem.

2a.

Qualitative data (categorical) describes qualities or characteristics:
Example: Types of fruits students like (apples, bananas, oranges).
Quantitative data (numerical) involves numbers where you can perform arithmetic operations:
Example: Number of books read by each student in a month.

b.

Discrete data: Number of students in each class (whole numbers only).
Continuous data: The height of students in centimetres (can take any value within a range).

3a.

Steps:
Collect data on music preferences.
Decide categories (e.g., rock, pop, classical).
Count votes for each category.
Draw axes: x-axis for music types, y-axis for number of students.
Draw bars with height corresponding to the number of students for each type of music.

b.

Use a pie chart when you want to show parts of a whole, particularly useful when comparing proportions or percentages of a single whole, like showing how much of the student body prefers each type of music.

4a.

Look for the bar with the lowest height; that sport would be the least popular.

b.

$25\,\%$ of 40 students:
0.25×40
$= 10$ students voted for soccer .

5a.

If the y-axis scale does not start at zero or if the intervals are uneven, it can exaggerate differences between bars, making trends or differences seem more significant than they are.

b.

Presenting only a part of the data that supports a particular view or omitting outliers that might give a different picture of the data distribution.

6a.

Data Set:

Number of books read by students in one week:

Alice: 3 books
Bob: 2 books
Charlie: 4 books
Dana: 1 book

Pictograph:

Use a picture of a book to represent each book read:

Alice: [book][book][book]
Bob: [book][book]
Charlie: [book][book][book][book]
Dana: [book]

b.

Collect data on what types of events students enjoy through surveys or polls. Represent this data in a bar graph or pie chart to see which events are most popular. Use this information to decide on the type of event, activities, or even timing based on when students have indicated they are most likely to attend.

7a.

Sum of the numbers: $4 + 7 + 9 + 12 + 18 = 50$
Number of data points: 5

Mean

$$= \frac{\text{Sum of numbers}}{\text{Number of data points}}$$

$$= \frac{50}{5}$$

$$= 10\,.$$

b.

The new dataset would be $24,\ 27,\ 29,\ 32,$ and 38
Sum becomes $24 + 27 + 29 + 32 + 38 = 150$
New mean $= \frac{150}{5} = 30$
Adding 20 to each number increases the mean by 20 (from 10 to 30) .

8a.

First, arrange the numbers in ascending order: $1,\ 2,\ 3,\ 4,\ 5,\ 6\,.$
Since there's an even number of values, the median is the average of the two middle numbers:

Median

$$= \frac{3 + 4}{2}$$

$$= 3.5\,.$$

b.

Arrange in order: $10,\ 15,\ 18,\ 22$.

With an even number of values, the median is $\frac{15+18}{2} = 16.5$.

9a.

The number that appears most frequently is 5, so the mode is 5.

b.

The new dataset would be 5, 2, 5, 1, 5, 3, 2. Now, both 5 and 2 appear twice, making the dataset bimodal with modes 5 and 2 .

10a.

Arrange in order: 5, 8, 10, 15, 20.
Range = highest value - lowest value = 20 - 5 = 15 .

b.

New dataset: 5, 8, 10, 15, 25.
New range = 25 - 5 = 20 .

11a.

Mean: Sum $= 78 + 82 + 85 + 78 + 90 + 88 + 77 = 578$. Mean $= \frac{578}{7} \approx 82.57$.

Median: Ordered: $77,\ 78,\ 78,\ 82,\ 85,\ 88,\ 90$. Median $= 82$.
Mode: 78 appears twice, so mode is 78.
Range: $90 - 77 = 13$.

b.

The median is less affected by outliers or extreme values. If there are one or two very high or very low scores, the mean would be pulled towards these extremes, possibly misrepresenting the typical score. The median, being the middle value, remains more representative of the central tendency for such datasets.

Additional Notes for Teachers

Learning Outcomes:
Students should be able to collect, represent, and interpret data effectively, understanding the significance of different types of data representation. Students should develop the ability to calculate and understand the significance of mean, median, mode, and range, recognising when each measure is most appropriate.

Teaching Strategies:
Use real-world data from class activities or school events. Engage students in creating their own surveys and graphs to make the learning process interactive. Use real-life scenarios or classroom data for students to practice these calculations. Discuss how each measure tells a different story about the data.

Assessment:
Evaluate through practical tasks where students must choose the best method to represent data, interpret given data representations, and discuss potential misrepresentations. Test through exercises where students must calculate these measures from given datasets and explain the implications of each value.

Resources:
Use software like Excel or Google Sheets for data representation, or simple tools like graph paper for manual plotting. Online resources for interactive graphing can also be beneficial. Use interactive tools or apps where students can input data and see changes in mean, median, mode, and range. Physical or digital manipulatives can help visualise these concepts.

This set of questions aligns with the Australian Curriculum for Year 7, focusing on developing skills in data representation and interpretation in statistics and probability.