Educational Worksheet

Answer Key: Organizing and Presenting Data

Grade 7 Mathematics - Hard Difficulty
Total Marks: 100

Section A: Theoretical Understanding

1. Data Representation Theory (7 marks)

a) Why pie chart over histogram (3 marks): - Pie charts show parts of a whole/categorical data ✓ - Histogram shows frequency distribution of continuous data ✓ - Subject preferences are categorical, not continuous measurements ✓

b) Pie chart angles (4 marks): - Mathematics: (125/500) × 360° = 90° ✓ - Science: (100/500) × 360° = 72° ✓ - English: (75/500) × 360° = 54° ✓ - History: (50/500) × 360° = 36° ✓ - Art: (75/500) × 360° = 54° ✓ - PE: (75/500) × 360° = 54° ✓ (Total should equal 360°)

2. Waffle Diagram Analysis (4 marks)

a) Percentages (2 marks): - Excellent: 23% ✓ - Good: 45% ✓ - Satisfactory: 27% ✓ - Needs Improvement: 5% ✓

b) Advantage of waffle diagram (2 marks): Accept any valid advantage such as: - Easier to read exact percentages ✓ - Better for audiences who struggle with angles ✓ - More intuitive visual representation ✓

Section B: Data Interpretation Puzzles

3. Scatter Diagram Mystery (5 marks)

a) Explanation for contradiction (3 marks): Accept reasonable explanations such as: - Different study methods/quality of study ✓ - Natural ability differences ✓ - External factors (health, stress, distractions) ✓ - Test anxiety or performance on the day ✓

b) Additional data question (2 marks): Accept relevant questions such as: - "What study methods did you use?" ✓ - "How many hours of sleep did you get?" ✓ - "Did you have any distractions while studying?" ✓

4. Histogram Frequency Puzzle (8 marks)

a) Correct drawing analysis (4 marks): - Bar height should be proportional to frequency ✓ - 155-159 cm has frequency 12, 150-154 cm has frequency 8 ✓ - Ratio should be 12:8 = 1.5:1 ✓ - The histogram IS correctly drawn ✓

b) Symmetric distribution frequencies (4 marks): If symmetric with total 40: - Possible pattern: 4, 8, 12, 12, 4 ✓✓ - Or: 2, 8, 20, 8, 2 ✓✓ - Must show working and total = 40 ✓✓

Section C: Complex Problem Solving

5. Multi-representation Challenge (10 marks)

a) Calculations (4 marks): **Pie chart angles:** - Car: (96/240) × 360° = 144° ✓ - Public Transport: (72/240) × 360° = 108° ✓ - Walking: (48/240) × 360° = 72° ✓ - Cycling: (24/240) × 360° = 36° ✓

Waffle diagram: - Car: 40 squares, Public Transport: 30 squares ✓ - Walking: 20 squares, Cycling: 10 squares ✓

b) Audience-appropriate representations (6 marks): - **City planners**: Bar chart or histogram for clear comparison of usage numbers ✓✓ - **Environmental activists**: Pie chart to emphasize proportion using cars vs. eco-friendly options ✓✓ - **School children**: Waffle diagram for easy visual understanding ✓✓

6. Data Detective (6 marks)

a) Error identification (4 marks): - Check pie chart: 90° + 135° + 90° + 45° = 360° ✓ - Check percentages: 25% + 37.5% + 25% + 12.5% = 100% ✓ - Check bar chart with table: If total = 80, then A should be 20, B should be 30, C should be 20, D should be 10 ✓ - ERROR in table: Shows A=25% of 80 = 20 ✓ but percentages don't match frequencies

b) Correction (2 marks): - Correct frequencies: A=20, B=30, C=20, D=10 (total=80) ✓ - Correct percentages: A=25%, B=37.5%, C=25%, D=12.5% ✓

7. Scatter Diagram Construction (6 marks)

a) Correlation prediction (3 marks): - Strong positive correlation expected ✓ - As temperature increases, ice cream sales increase ✓ - Logical reasoning based on real-world experience ✓

b) Sales estimation for 26°C (3 marks): - Method: interpolation between 25°C (75 units) and 28°C (88 units) ✓ - Calculation: approximately 79-82 units ✓ - Justification of interpolation method ✓

8. Histogram Intervals Decision (8 marks)

a) Interval comparison (4 marks): 5% intervals: - Advantages: More detailed view, better for large datasets ✓ - Disadvantages: Too many bars, harder to see overall pattern ✓

10% intervals: - Advantages: Clearer overall pattern, easier to read ✓ - Disadvantages: Less detail, might miss important features ✓

b) Recommendation (4 marks): - Recommend 10% or 20% intervals ✓ - Reasoning: Current data naturally clusters in these ranges ✓ - Suggested intervals: 20-39%, 40-59%, 60-79%, 80-89%, 90%+ ✓ - Justification based on data distribution ✓

9. Critical Analysis (6 marks)

a) Missing information (3 marks): Accept any three of: - Sample size ✓ - Comparison data (before/after) ✓ - Response rate ✓ - How satisfaction was measured ✓ - Time period of survey ✓ - Demographics of respondents ✓

b) Better evidence suggestions (3 marks): - **Scatter diagram**: Customer satisfaction vs. time since product launch ✓ - **Histogram**: Distribution of satisfaction scores over time ✓ - Show trend data rather than single snapshot ✓

10. Data Transformation Challenge (6 marks)

a) Pie chart calculations (3 marks): - Total frequency = 50 ✓ - Angles: 0-19: 21.6°, 20-39: 50.4°, 40-59: 108°, 60-79: 144°, 80-100: 36° ✓ - Show working: (frequency/total) × 360° ✓

b) Waffle diagram challenges (3 marks): - Challenge: 50 total doesn't divide evenly into 100 squares ✓ - Modification: Use 50 squares (each = 1 student) or multiply all by 2 ✓ - Alternative: Use percentages and round to nearest whole square ✓

Teaching Notes

Common Mistakes to Watch For:

- **Pie chart calculations**: Students often forget to multiply by 360° or use wrong total
- **Correlation confusion**: Assuming correlation implies causation
- **Histogram vs. bar chart**: Using gaps when data is continuous
- **Scale misunderstanding**: Not considering sample size when interpreting percentages

Extension Activities:

- **Real data collection**: Have students survey classmates and create multiple representations
- **Media analysis**: Find examples of misleading data presentations in newspapers/online
- **Technology integration**: Use spreadsheet software to create different chart types
- **Cross-curricular connections**: Apply to science experiments or social studies surveys

Assessment Criteria:

- **Excellent (90-100 marks)**: Demonstrates deep understanding of when and why to use different representations, shows sophisticated reasoning, makes connections between concepts
- **Good (75-89 marks)**: Shows solid understanding with minor gaps, can solve most problems with appropriate methods
- **Satisfactory (60-74 marks)**: Basic understanding of data representations, can complete routine calculations with some support
- **Needs Support (≤60 marks)**: Requires significant support with concept understanding and application

Differentiation Strategies:

- **For advanced learners**: Ask them to create their own data interpretation puzzles

- **For struggling learners**: Provide step-by-step templates for calculations
- **Visual learners**: Use actual manipulatives or online interactive tools
- **Kinesthetic learners**: Have them physically sort data or create human bar charts

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This answer key corresponds to: organizing-presenting-data.md