School Name
Mathematics Test 2017

Year 8

Data Analysis

Non Calculator Section

Skills and Knowledge Assessed:

- Investigate techniques for collecting data, including census, sampling and observation (ACMSP284)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)
- Investigate the effect of individual data values, including outliers, on the mean and median (ACMSP207)
- Describe and interpret data displays using median, mean and range (ACMSP172)
- Explore the variation of means and proportions of random samples drawn from the same population (ACMSP293)

Answer all questions in the spaces provided on this test paper by:

Writing the answer in the box provided.

or

Shading in the bubble for the correct answer from the four choices provided.

Show any working out on the test paper. Calculators are **not** allowed for this section.

1. Josie records the number of texts that she sends each day, for two weeks.

The results are listed below.

5, 8, 9, 12, 12, 13, 13, 15, 16, 17, 19, 20, 22, 25

What is the median of the data?

☐ 13 ☐ 14 ☐ 14.5 ☐ 15

2. The numbers of articles delivered by a postman each day for 10 days are listed below.

46, 37, 27, 48, 22, 25, 35, 32, 38, 48.

Find the modal number of articles.

3. Eight friends compare the ages of their older parent.

The ages (in years) are: 44, 36, 45, 55, 49, 51, 37, 43.

Calculate the mean age from the data.

4. The attendance at a series of gigs by The Marmosets are listed below.

185, 24, 80, 177, 65, 1 260, 705, 68, 84, 164.

The range was:

☐ 681 ☐ 1 192 ☐ 1 195 ☐ 1 236

5. Kayla records the make of every 20th car that passes a traffic light.

Which term best describes this statistical process?

☐ Taking a census which collects categorical data.

☐ Taking a census which collects numerical data.

☐ Taking a sample which collects categorical data.

☐ Taking a sample which collects numerical data.

6. Anna recorded the number of pupils in each of her last 12 dance classes.

The results were:

14, 7, 23, 11, 18, 25, 13, 27, 7, 15, 22, 19.

What is the median of the data?

☐ 16 ☐ 16.5 ☐ 17 ☐ 17.5

7. Kathy weighs each of her pet kittens.

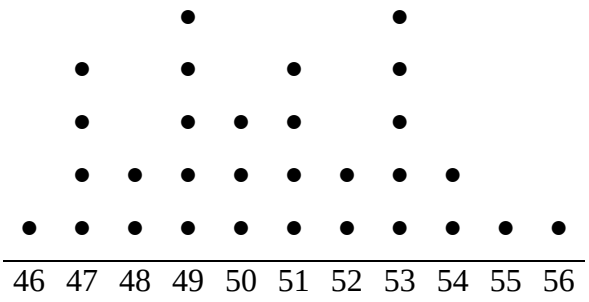
Their masses, in grams, are listed below.

900, 850, 1200, 1250, 1500, 900.

Calculate the mean of the data.

Questions 8 – 10 refer to the following.

The ages of 30 people are shown in the dot plot below.



8. What are the modal scores?

- ☐ 47 and 49
- ☐ 49 and 50
- ☐ 49 and 51
- ☐ 49 and 53

9. What is the median of the data?

☐

10. What is the range of the scores?

- ☐ 4
- ☐ 7
- ☐ 10
- ☐ 11

11. Michael and Kyle compare the number of music tracks on which they featured in the last six months.

Michael	3	4	6	6	8	9
Kyle	3	5	5	6	7	10

Which of these measures is the same for the two sets of data?

- ☐ The mean
- ☐ The median
- ☐ The mode
- ☐ The range

Questions 12 – 14 refer to the stem and leaf plot below.

	Rooms Vacant in Accommodation
0	0 0 0 1 2 4 5 6 7 8 9 9
1	0 1 1 2 3 4 6 8 9
2	0 9

The plot shows how many rooms were vacant in each of the 23 motels in a town on a certain night.

12. What is the median number of rooms vacant?

☐ 9 ☐ 9.5 ☐ 10 ☐ 10.5

13. What is the modal number of rooms vacant?

14. Which value is an outlier?

☐ 0 ☐ 9 ☐ 19 ☐ 29

15. Banjo played five games of *Road Trooper* on his tablet and worked out that his mean score was 1200 points.

He played another game and his mean score decreased to 1100 points.

What was his score on the sixth game?

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Data Analysis

Year 8

Calculator Allowed Short Answer Section

Name_____

Answer all questions in the spaces provided on this test paper by:

Writing the answer in the box provided.

or

Shading in the bubble for the correct answer from the four choices provided.

Show any working out on this test paper. Calculators are allowed for this section.

1. What is the median of these scores?

13, 15, 18, 22, 25, 30, 30, 31, 32

☐ 24 ☐ 25 ☐ 27 ☐ 30

2. Justin records the temperature every day for a year.

Which measure would it be best to find for each month, to compare the monthly temperatures?

☐ The mean. ☐ The median. ☐ The mode. ☐ The range.

3. Twenty students record the number of pages that they have completed in their workbook.

10, 12, 12, 23, 14, 18, 14, 23, 24, 16, 11, 21, 18, 26, 31, 14, 21, 14, 13, 25.

The mode was :

☐ 12 ☐ 14 ☐ 17 ☐ 18

4. The rainfall totals (in mm) each day over a week at Clarence are shown below.

6.5, 12.2, 25.6, 28.4, 11.4, 0.0, 17.4

Find the mean daily rainfall for the week.

5. Kristy records the number of accidents that are reported in a locality each day for 10 days.

The results were:

4 12, 3, 12, 13, 26, 7, 5, 18, 9

What was the range?

6. Sarah keeps chickens and collects their eggs. She made the following note for the month of September.

> Sarah's Egg collection for September.
> Eggs collected every day.
> Total number collected. - 255
> Most collected on a day. – 12
> Least collected on a day. - 4

Which statistical measures about the daily egg collection could be found from the information on the note?

- ☐ The mean and the mode
- ☐ The mean and the median.
- ☐ The mean and the range.
- ☐ The mode and the range.

7. Hannah records the number of calls that she makes on her mobile each day for two weeks.

The numbers were: 12, 18, 24, 23, 26, 13, 26, 15, 23, 19, 15, 26, 33 and 17.

On the next day she makes 13 calls.

When the extra day is included in the data, which is true?

- ☐ The median will remain the same.
- ☐ The mode will remain the same.
- ☐ The median will increase.
- ☐ The mode will increase.

8. The mass of 8 mineral samples are given below.

12 g, 25 g, 11 g, 17 g, 22 g, 18 g, 30 g, 22 g

What is the median mass?

☐ 18.5 g ☐ 19.0 g ☐ 19.5 g ☐ 20.0 g

Questions 9 and 10 refer to the following:

Score (x)	Frequency (f)	fx	Cumulative frequency
2	6	12	6
3	0	0	6
4	9	36	15
5	4	20	19
6	3	18	22
7	3	21	25
	$\Sigma f =$	$\Sigma fx =$	

9. What is the mean of the scores in the table?

10. What is the median of the scores in the table?

11. Lisa compares the age of 15 cars in the teacher's car park.

The ages (to the nearest year) were: 4, 2, 8, 4, 3, 6, 3, 6, 5, 3, 9, 15, 5, 3 and 7.

Which is true?

- ☐ The mean is equal to the mode.
- ☐ The median is equal to the mode.
- ☐ The mean is less than the mode.
- ☐ The mode is less than the median.

12. Jane and Maura record their sleep hours for 5 days.

Jane: 6.5, 7.5, 8.5, 7.0, 6.0

Maura: 7.0, 9.0, 7.5, 8.5, 7.0

Who has the higher median and what is the difference?

13. Guy has 11 buckets on the shelves in his artist's studio.

The mean number of items in each bucket is 9.

How many items does Guy have in the buckets altogether?

14. Jo compares the times of two runners over 8 athletics meets.

Usain 9.6, 9.1, 9.6, 10.4, 11.0, 9.2, 9.3, 9.6.

Dwayne 10.4, 8.9, 9.7, 10.4, 9.0, 9.8, 9.2, 9.5

Which is true?

- ☐ Usain has the higher median, but Dwayne has the higher mode.
- ☐ Usain has the higher mode, but Dwayne has the higher median.
- ☐ Usain has the higher mode and their medians were equal.
- ☐ Dwayne has the higher mode and their medians were equal.

15. Four separate samples of 20 people were taken from a town's population of 40 000.

The people were asked to rate a local attraction on a scale of 1 – 10.

The results showed the following:

	Sample A	Sample B	Sample C	Sample D
Mean	8.5	8.2	5.5	7.9
Range	6	5	3	7

The method of selecting one of the samples was biased, and the other three were random.

Which sample was most likely to be biased?

☐ Sample A ☐ Sample B ☐ Sample C ☐ Sample D

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Data Analysis

Calculator Allowed

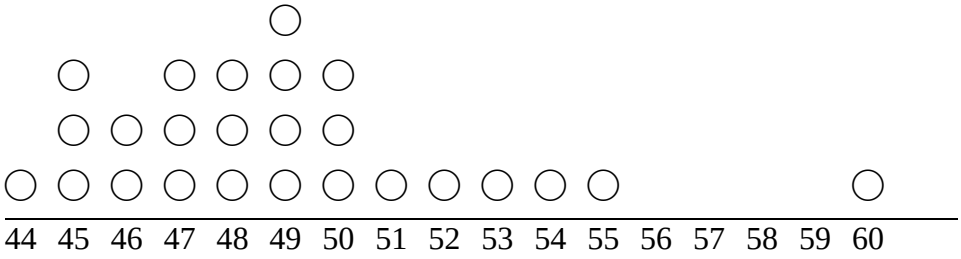
Longer Answer Section

Name_____

Write all working and answers in the spaces provided on this test paper.
Marks may not be awarded if working out and/or answers are not clear.
Marks allocated are shown beside each question.
Calculators are allowed.

Marks

1. The scores of 25 students on a test out of 60 marks are shown in the dot plot below.



(a) What was the median score on the test? **1**

……..

(b) Which score is an outlier, and what affect does it have on the range? **2**

……..

……..

(c) What is the mean mark on the test? **1**

……..

……..

2. The frequency distribution table represents the number of hours at the wheel reported by drivers involved in traffic incidents.

Hours at Wheel (x)	Tally	Frequency (x)	fx	Cumulative Frequency
1	𝍸			
2	𝍸			
3	𝍸			
4	𝍸			
5	𝍸			
6	𝍸			
		$\Sigma f = 24$	$\Sigma fx =$	

(a) Complete the remaining columns and sums in the table above. **4**

(b) Calculate the mean of the data. **1**

……..

……..

(c) Find the median score for the data. **1**

……..

……..

3. Rachael and Mulan collected the data in the stem and leaf plot below.

It shows the number of phone calls made by 40 people in a week.

1	**1**	*2*	2	2	**2**	8	*9*	
2	0	**2**	4	6	*6*	**6**	7	8
3	0	***1***	1	2	4	**5**	*9*	
4	2	6	**7**	8	*9*	9		
5	**1**	3	5	*7*	**7**	7	7	
6	0	***2***	4	6	8			

(a) Both girls chose samples from the data to analyse. **2**

Rachael started with the first score of 12 and took every 5th score from there onward, which gave her a total of 8 scores. (Her choices are in italics).

Mulan started with the score of 11 and took every 4th score from there onward, which gave her a total of 10 scores. (Her choices are in bold).

Find the mean for both samples.

……..

……..

(b) Find the median of both girl's samples. **2**

……..

……..

(c) The mean for the whole group of forty people was 37.875 and the median was 34.5. **2**

Discuss how choosing different samples can affect the statistical results obtained.

……..

……..

……..

……..

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Year 8 — *Data Analysis* — Non Calculator Section

ANSWERS

Question	Working and Answer
1.	Median is between the 7th and 8th of 14 scores which are 13 and 15 **Median = 14**. **2nd Answer**
2.	**48** occurs twice, so is the mode.
3.	$\text{Mean} = \frac{44 + 36 + 45 + 55 + 49 + 51 + 37 + 43}{8}$ $= \frac{80 + 100 + 100 + 80}{8}$ $= \frac{360}{8}$ $=$ **45 years**
4.	Range = 1 260 – 24 = **1 236** **4th Answer**
5.	It is a sample as only some of the cars are recorded, and the data is categorical as it is the names of the maker. **3rd Answer**
6.	Arranged in order scores are : 7, 7, 11, 13, 14, 15, 18, 19, 22, 23, 25, 27. Median is average of 6th and 7th scores ie of 15 and 18 **Median = 16.5** **2nd Answer**

<table>
<tr><th>Question</th><th>Working and Answer</th></tr>
<tr><td>7.</td><td>$\text{Mean} = \dfrac{900 + 850 + 1200 + 1250 + 1500 + 900}{10}$
$= \dfrac{6600}{6}$
Mean = 1100</td></tr>
<tr><td>8.</td><td>49 and 53 both occur 5 times which is more than any other score.
The modal scores are 49 and 53
4th Answer</td></tr>
<tr><td>9.</td><td>For 30 scores, the median is between the 15th and 16th scores which are 50 and 51 respectively.
Median = 50.5</td></tr>
<tr><td>10.</td><td>$\text{Range} = 56 - 46 = 10$
3rd Answer</td></tr>
<tr><td>11.</td><td>Scores are already in order:
<table>
<tr><td>Michael</td><td>3</td><td>4</td><td>6</td><td>6</td><td>8</td><td>9</td></tr>
<tr><td>Kyle</td><td>3</td><td>5</td><td>5</td><td>6</td><td>7</td><td>10</td></tr>
</table>
<table>
<tr><th></th><th>Mean</th><th>Median</th><th>Mode</th><th>Range</th></tr>
<tr><td>Michael</td><td>$\frac{36}{6} = 6$</td><td>$\frac{6+6}{2} = 6$</td><td>6</td><td>9 – 3 = 6</td></tr>
<tr><td>Kyle</td><td>$\frac{36}{6} = 6$</td><td>$\frac{5+6}{2} = 5.5$</td><td>5</td><td>10 – 3 = 7</td></tr>
</table>
The mean is the same.
1st Answer</td></tr>
<tr><td>12.</td><td>For 23 scores, the median is the 12th scores (11 greater and 11 lesser) which is 9.
Median = 9
1st Answer</td></tr>
<tr><td>13.</td><td>0 (zero) occurs three times which is more than any other score.
The mode is 0</td></tr>
</table>

Question	Working and Answer
14.	All of the scores either ave a score next to them or separated by two except 29 which is 9 away from the nearest score. **29 is the outlier** **4th Answer**
15.	Total score on 5 games = $5 \times 1200 = 6000$ Total score on 6 games = $6 \times 1100 = 6600$ Sixth score = $6600 - 6000$ = **600 points**

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Data Analysis

Year 8

Calculator Allowed
Short Answer
Section

ANSWERS

Question	Working and Answer
1.	For 9 scores, the median is the 5th scores (4 greater and 4 lesser) which is 25. **2nd Answer**
2.	The mean would be the best, as the mode could be affected by a few equal scores, and median is in the middle but does not represent all temperatures and the range is a measure of spread. **1st Answer**
3.	10, 11, 12, 12, 13, 14, 14, 14, 14, 16, 18, 18, 21, 21, 23, 23, 24, 25, 26, 31. Mode = 14 **2nd Answer**
4.	$\text{Mean} = \frac{6.5 + 12.2 + 25.6 + 28.4 + 11.4 + 0.0 + 17.4}{7}$ $= 101.57$ $= \mathbf{14.5}$
5.	4 12, 3, 12, 13, 26, 7, 5, 18, 9 Range = 26 – 3 **Range = 23**

6.	Mean can be found by dividing total eggs by number of days (30 in Sept) Range can be found from the most – the least collected. **3rd Answer**
7.	12, 13, 15, 15, 17, 18, 19, 23, 23, 24, 26, 26, 26, 33 For 14 scores, the median is between the 7th and 8th scores (19 and 23) which is 21. The new median will be the 8th of 15 scores, so 19. Median will decrease There are 3 26's and adding a 13 makes only 2 of these, so mode remains the same. **2nd Answer**
8.	11g, 12g, 17g, 18g, 22g, 22g, 25g, 30g Median is between 4th and 5th scores, so between 18 and 22. Median = 20g **4th Answer**.
9.	$\Sigma f = 25 \qquad \Sigma fx = 107$ $\text{Mean} = \frac{107}{25}$ $= \mathbf{4.28}$
10.	For 25 scores, the median is the 13th scores (12 greater and 12 lesser). Scores from 7th to 15th are all 4. **Median = 4**
11.	2, 3, 3, 3, 3, 4, 4, 5, 5, 6, 6, 7, 8, 9, 15. The mode is 3. The median is 5 and the mean is 5.5333…. (Can be answered without calculating the last two, as they will be near the centre) **The mode is less than the median** **4th Answer**.
12.	Jane: 6.0, 6.5, 7.0, 7.5, 8.5, Maura: 7.0, 7.0, 7.5, 8.5, 9.0 Maura's median is higher by 0.5

13.	Total items = mean × number of buckets = 9 * 11 = 99 items
14.	Usain 9.1, 9.2, 9.3, 9.6, 9.6, 9.6, 10.4, 11.0. Median = 9.6 Dwayne 8.9, 9.0, 9.2, 9.5, 9.7, 9.8, 10.4, 10.4 Median = 9.6 Their medians were equal. Usain's mode = 9.6 and Dwaynes mode = 10.4 Dwayne's mode was higher **4th Answer**
15.	The random samples would be expected to give similar statistical results, which A, B and D all do. Sample C is most likely biased. **3rd Answer**

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Longer Answer Section

ANSWERS

<table>
<tr><th>Question</th><th>Working and Answer</th><th>Marks</th></tr>
<tr><td>1.</td><td>(a) Median of 25 scores is the 13th score which is 49</td><td>1 mark for correct answer</td></tr>
<tr><td></td><td>(b) The outlier is 60 and it has the effect of increasing the range, from 11 if it is not included to 16 when it is included.</td><td>1 mark for correct outlier
1 mark for any valid description of change to range</td></tr>
<tr><td></td><td>(c) $\text{Mean} = \frac{44+135+92+141+144+196+150+51+52+53+54+55+60}{25}$
$= \frac{1227}{25}$
$= 49.08$</td><td>1 marks for correct answer</td></tr>
<tr><td>2.</td><td>(a)
<table>
<tr><th>Hours (x)</th><th>Tally</th><th>Frequency (x)</th><th>fx</th><th>Cumulative Frequency</th></tr>
<tr><td>1</td><td>III</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>2</td><td>II</td><td>2</td><td>4</td><td>5</td></tr>
<tr><td>3</td><td>IIII</td><td>4</td><td>12</td><td>9</td></tr>
<tr><td>4</td><td>IIII I</td><td>6</td><td>24</td><td>15</td></tr>
<tr><td>5</td><td>IIII II</td><td>7</td><td>35</td><td>22</td></tr>
<tr><td>6</td><td>II</td><td>2</td><td>12</td><td>24</td></tr>
<tr><td></td><td></td><td>$\Sigma f = 24$</td><td>$\Sigma fx = 90$</td><td></td></tr>
</table>
</td><td>1 mark for each of the 3 columns
1 mark for correct total for fx</td></tr>
</table>

Question	Working and Answer	Marks
	(b) $\text{Mean} = \frac{\Sigma fx}{\Sigma f}$ $= \frac{90}{24}$ $= 3.75$	1 mark for correct answer
	(c) Median is between 12th and 13th scores, which are both 4's so median = 4	1 mark for correct answer
3.	(a) Mean of Rachael's sample = $295 \div 8$ $= 36.875$ Mean of Mulan's sample = $354 \div 10$ $= 35.4$	1 mark for each correct answer
	(b) Rachael : median of 8 scores is between 4th and 5th (so between 31 and 39) Rachael's median = $\frac{31+39}{2} = \frac{70}{2} = 35$ Mulan : median of 10 scores is between 5th and 6th (so between 31 and 35) Mulan's median = $\frac{31+35}{2} = \frac{66}{2} = 33$	1 mark for each correct answer
	(c) Mention could be made of the mean and median of each sample being different from that of the population. Mention could also be made of sampling methods used here, not strictly random. Discussion could include mention of larger samples normally giving more accurate results, which was not the case here.	2 marks for any valid discussion that makes two points about the issues related to sampling.