School Name
Mathematics Test 2017

Single Variable Data Analysis

Year 9

Skills and Knowledge Assessed:
- Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly from secondary sources (ACMSP228)
- Construct back to back stem and leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (ACMSP282)
- Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283)
- Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253)
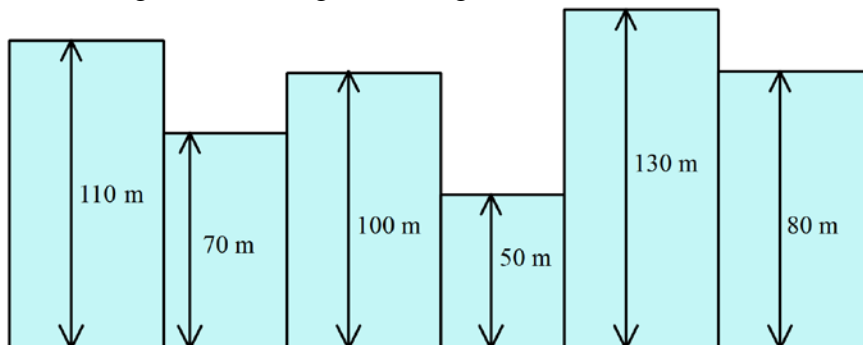
Name_____

Section 1   Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1.	What is the range of the set of scores below? 8, 17, 8, 12, 5, 19, 22, 21, 3, 13, 11, 5, 16, 7, 7. ……………………………………………………………………………………….... …………………………………………………………………………………………
2.	What is the mean height of these eight buildings?

110 m   70 m   100 m   50 m   130 m   80 m

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3.	What is the median of these crowd numbers at a footy field over two months?

3. What is the median of these crowd numbers at a footy field over two months?

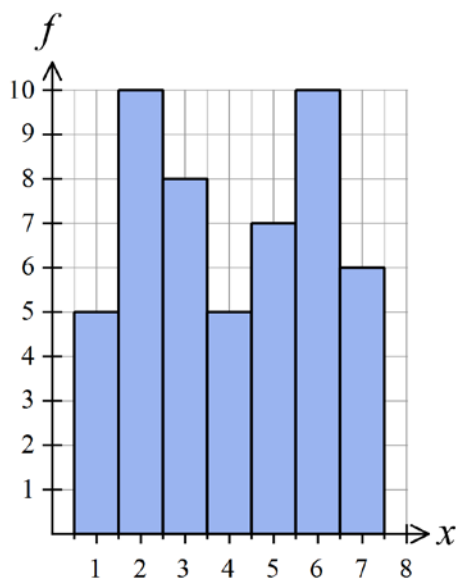| 16 000 | 8 000 | 25 000 | 22 000 |
| 11 000 | 16 000 | 30 000 | 24 000 |

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4. Find the mode(s) for this set of scores.

16, 18, 15, 22, 30, 16, 14, 28, 17, 19, 14, 18, 11, 16, 20

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5. Describe the shape of the distribution represented by the frequency histogram below.

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6. By how much do the medians of the two sets of scores differ?

Set A : 5, 7, 8, 12, 15, 19, 22
Set B : 1, 2, 7, 11, 15, 16, 17, 21

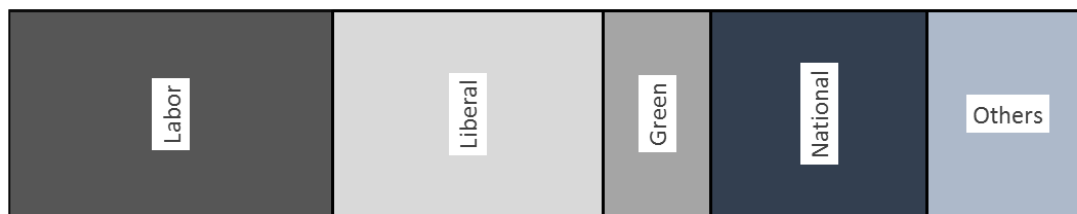…………………………………………………………………………………………....

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Questions 7 – 9 refer to the graphs below.

The divided bar charts below compare the results of a pre-election poll with the actual election result in an electorate.

Pre-Election Polling 2016

| Labor | Liberal | Green | National | Others |

Results of Election 2016

| Labor | Liberal | Green | National | Others |

7. Which party achieved the biggest increase in their proportion of the vote from the pre-election polling to the election?
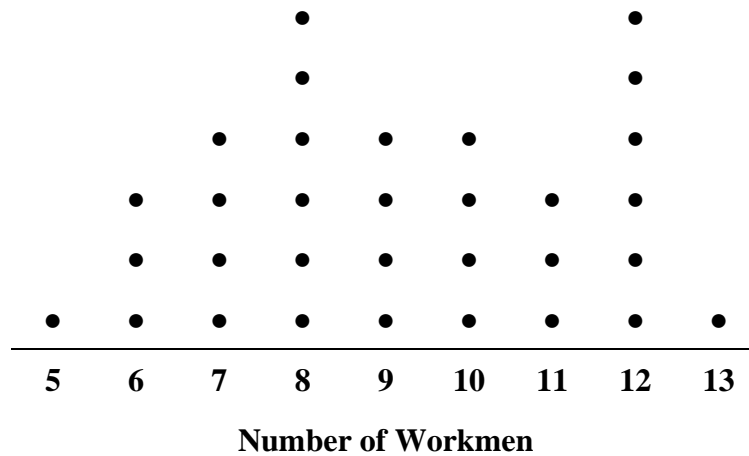
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8. Which party had the same proportion of the vote on both the pre-election polling and in the election?

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9. By what percentage did the National party vote change between the pre-poll and the election?

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Questions 10 – 12 refer to the dot plot below.

Number of Workmen

The dot plot represents the number of workers who were employed on a building site each day during the construction of a block of units.

| 10. | On what percentage of the days were there more than ten workers on the site? |

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| 11. | What was the modal number of workers on site? |

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| 12. | What was the median number of workers on site? |

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Questions 13 – 15 refer to the graph below.

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

The back-to-back stem and leaf plot compares the number of enquiry calls that were received each day by two telecommunications companies over a three-week period.

13. Compare the modal number of calls for the two companies

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14. Compare the median number of calls for the two companies

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15. Given that the mean for Telecom = 46.95, compare the mean number of calls for the two companies.

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Questions 16 – 18 refer to the graph below.

Temperature Projections Western NSW
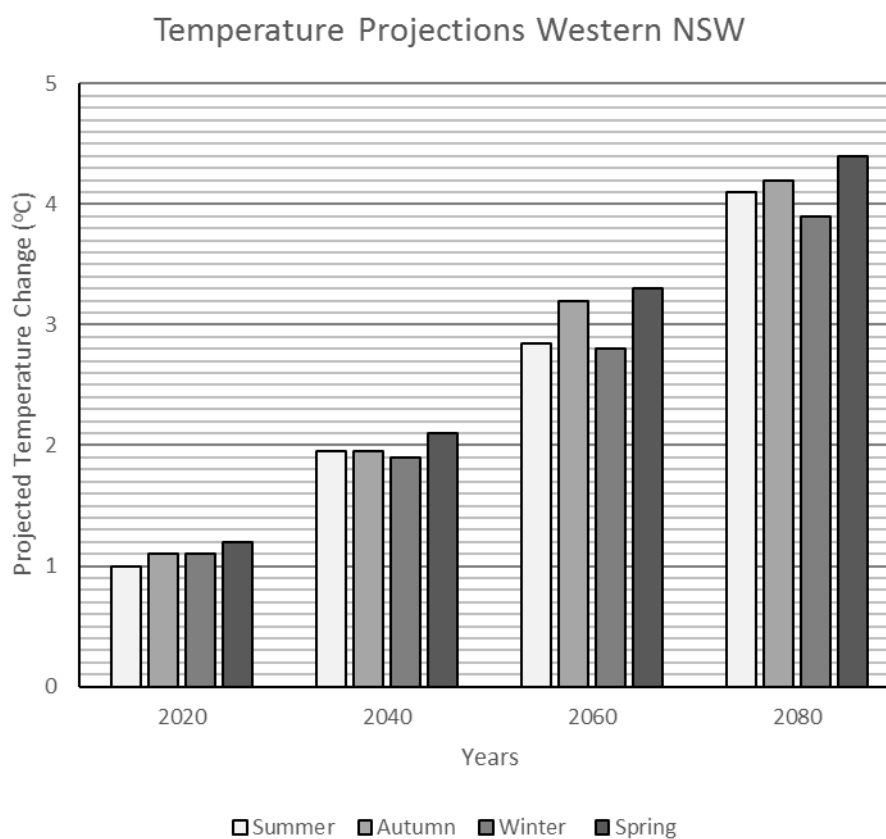
The clustered column graph shows projected temperature changes compared to the long term average, for the four seasons.

16.	In which season is the temperature increase projected to be the least between 2020 and 2080 (give reasons your answer)?
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17.	By how many degrees is the temperature projected to increase in Spring between 2040 and 2060?
	………………………………………………………………………………………………….... …………………………………………………………………………………………………
18.	Which seasons are projected to have the same temperature increase between 2020 and 2080 (give reasons your answer)?
	………………………………………………………………………………………………….... …………………………………………………………………………………………………

Single Variable Data Analysis

Calculator Allowed

Year 9

Name_____

Section 2   Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1.	What is the mean of the scores below?

2.8, 3.2, 4.1, 4.8, 5.2, 5.2, 7.3, 8.2

A.   5.0   B.   5.1   C.   5.2   D.   5.4

Questions 2 – 4 refer to the graph below.

Recipe Complexity

Number of Ingredients Needed
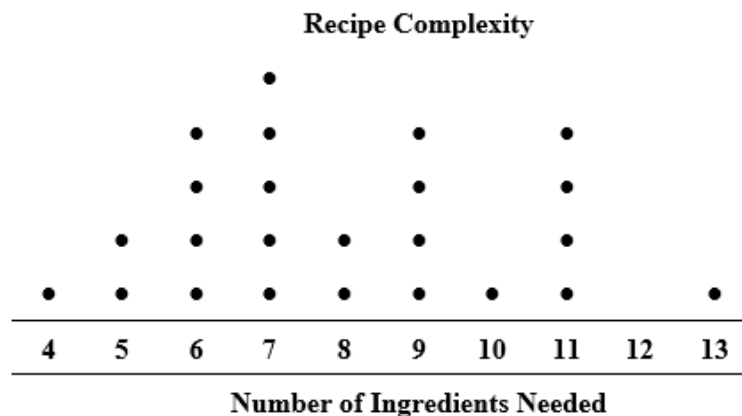
The dot plot summarises the number of ingredients needed for the 24 recipes on the menu at the Slow Fox Restaurant.

2.	What is the modal number of ingredients?

A. 7   B.   7.5   C.   8   D.   8.5

3.	What is the median number of ingredients?

A. 7   B.   7.5   C.   8   D.   8.5

4.	What is the mean number of ingredients?

A. 7   B.   7.5   C.   8   D.   8.5

5.	Which term best describes the shape of the distribution shown below.

A.   Bimodal

B.   Negatively skewed

C.   Positively skewed

D.   Symmetric
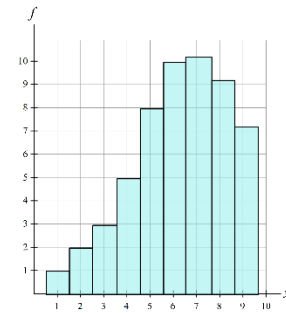
Questions 6 – 8 refer to the graph below.
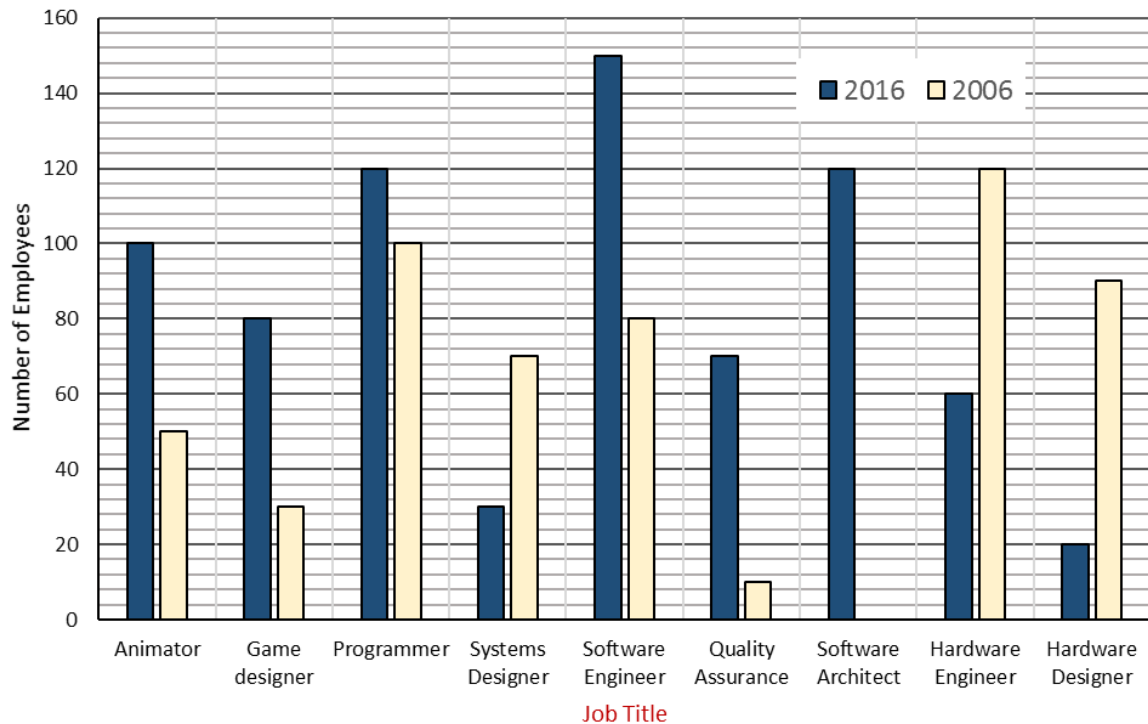
The Actron Computer Company completed the graph above to illustrate the changes in the jobs in the industry over a ten-year period.

6.	How many Jobs had less employees in 2016 than they did in 2006?

A. 2   B.   3   C.   4   D.   6

7. Which job had the biggest increase in numbers between 2006 and 2016?

    A.   Animator

    B.   Game designer

    C.   Software Architect

    D.   Software Engineer

8. By what percentage did the number of jobs for Game Designers increase between 2006 and 2016?

    A. $37\frac{1}{2}\%$ B. $66\frac{2}{3}\%$ C. $166\frac{2}{3}\%$ D. $266\frac{2}{3}\%$

Questions 9 and 10 refer to the following table.

Score (x)	Frequency (f)	fx	Cumulative Frequency
3	6	18	6
4	8	32	14
5	5	25	19
6	6	36	25
7	3	21	28
	$\Sigma f =$	$\Sigma f =$	

9. What is the mean of the data summarised in the table? (Answer rounded to 1 decimal place)

    A.   4.0   B. 4.5   C. 4.7   D.   5.0

10. What is the median of the data summarised in the table?

    A.   4.0   B. 4.5   C. 4.7   D.   5.0

Questions 11 – 12 refer to the graph below.

```
3 | 9
4 | 1  3  4
5 | 0  3  3  3  7
6 | 1  4  4  6  8
7 | 0  2  3  5  6  9
8 | 0  2  9
9 | 2  5
```

The stem and leaf plot shows the percentage charge retained by 25 different mobile phones after being left on standby for 24 hours.

11. What percentage of phones retained more than 50% of their charge?

    A.   20%   B.   50%   C.   75%   D.   80%

12.	What was the mean percentage of charge retained?

A.   53   B.   56   C.   66   D.   67

Questions 13 – 15 refer to the graphs below.

Science Marks – Half-yearly

Science Marks – Yearly
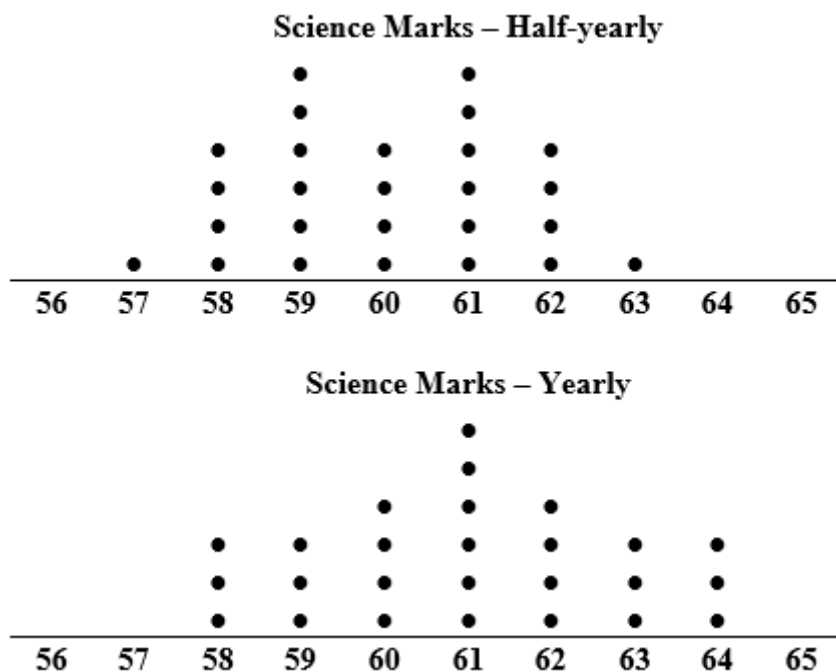
The parallel dot plots compare the Half-yearly and Yearly Science Exam marks for the same class.

13. Which description of the two distributions is not correct?

A.   The distribution of half yearly marks was bimodal.

B.   The distribution of half yearly marks was symmetrical.

C.   The distribution of yearly marks was bimodal.

D.   The distribution of yearly marks was symmetrical.

14. Which is true?

A.   The mean is the same for both sets of results.

B.   The median is the same for both sets of results.

C.   The mode is the same for both sets of results.

D.   The range is the same for both sets of results.

15. By how much did the median mark change from the Half-yearly to the Yearly exam?

A. Increased by 1 mark   B.   Increased by 2 marks

C. Increased by 3 marks   D.   Stayed the same

Questions 16 – 18 refer to the graph below.

Results of Participants in a Four Week Training Program
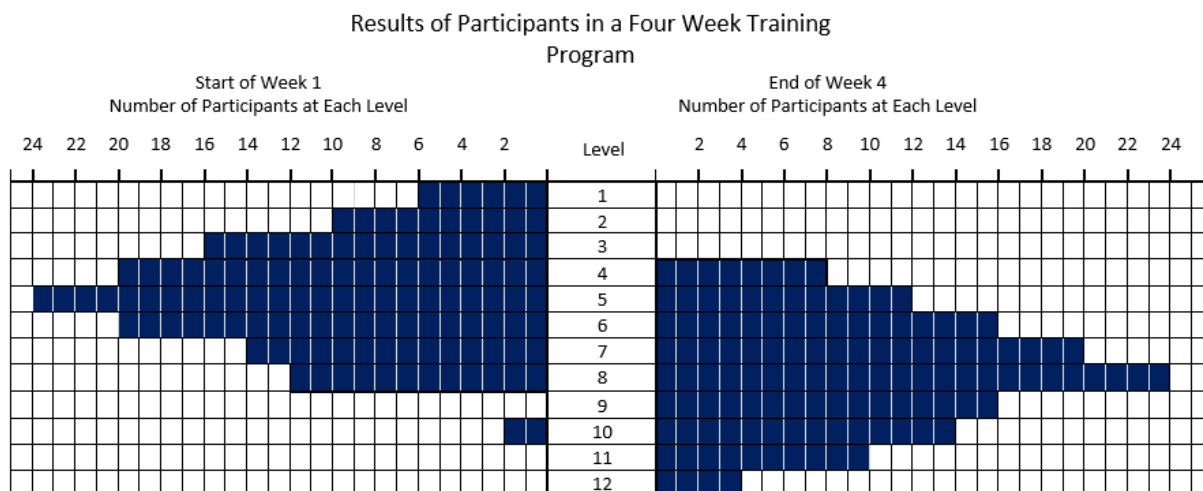
124 people participated in a four-week training program.

The back to back histogram compares the level of the program at which each participant was performing at the start and end of the program.

16. What percentage of participants were at Level 10 or better before and after the program?

   A. 1.6 % increasing to 22.6 %

   B. 1.6 % increasing to 28.0 %

   C. 2.0 % increasing to 22.6 %

   D. 2.0 % increasing to 28.0 %

17. The mean Level was 4.9 on Week 1.

By how much did the mean increase by Week 4?

   A. 2.9   B. 3.0   C. 3.1   D. 3.2

18. By how much did the median increase over the 4 weeks?

   A. 2.0   B. 2.1   C. 2.9   D. 3.0

Single Variable Data Analysis

Calculator Allowed

Name_____

Year 9

Section 3   Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1.   (a)   Complete the frequency distribution table, including the column totals indicated.   **2**

Score (x)	Frequency (f)	fx
1	2	
2	4	
3	7	
4	5	
5	4	
6	3	
$\Sigma f =$		$\Sigma f =$

(b)   Draw a frequency histogram from the data above.   **2**
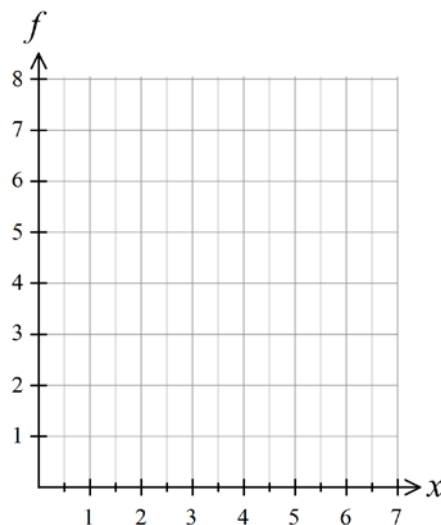
Marks

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

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2.   The back-to-back stem and leaf plot compares the fuel consumption of twenty-four models of car on the city and highway cycles.

					Highway		stem	City					
			8	7	4	2	1	4					
Key		9	8	7	6	4	2	5	4	5			
5 | 4			7	6	4	4	2	6	0	3	3	5	
= 5.4				9	9	3	2	7	2	2	4	6	7 8
						5	3	8	0	1	2	5	7 8
							4	9	2	4	7	9	
							7	10	5	8			

(a)   Compare the shapes of the data distributions for both the Highway and City cycles.   **2**

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(b)   By how much is the median for the Highway cycle lower than that for the City cycle.   **2**

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(c)   Find the mean for the City cycle and use this to estimate the mean for the Highway cycle.   **2**

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School Name

Mathematics Test 2017

Multiple Choice Answer Sheet

Single Variable Data Analysis

Name _____

Completely fill the response oval representing the most correct answer.

1.   A ◯   B ◯   C ◯   D ◯
2.   A ◯   B ◯   C ◯   D ◯
3.   A ◯   B ◯   C ◯   D ◯
4.   A ◯   B ◯   C ◯   D ◯
5.   A ◯   B ◯   C ◯   D ◯
6.   A ◯   B ◯   C ◯   D ◯
7.   A ◯   B ◯   C ◯   D ◯
8.   A ◯   B ◯   C ◯   D ◯
9.   A ◯   B ◯   C ◯   D ◯
10. A ◯   B ◯   C ◯   D ◯
11. A ◯   B ◯   C ◯   D ◯
12. A ◯   B ◯   C ◯   D ◯
13. A ◯   B ◯   C ◯   D ◯
14. A ◯   B ◯   C ◯   D ◯
15. A ◯   B ◯   C ◯   D ◯
16. A ◯   B ◯   C ◯   D ◯
17. A ◯   B ◯   C ◯   D ◯
18. A ◯   B ◯   C ◯   D ◯

ANSWERS

Question	Working and Answer
1.	**8, 17, 8, 12, 5, 19, 22, 21, 3, 13, 11, 5, 16, 7, 7.** **Range = 22 – 3 = 19**
2.	$$\text{mean} = \frac{110 + 70 + 100 + 50 + 130 + 80}{6}$$ $$= \frac{540}{6}$$ $$= 90$$
3.	8 000 11 000 16 000 16 000 22 000 24 000 25 000 30 000 **Median is between 16 000 and 22 000 so** $\dfrac{16\,000 + 22\,000}{2} = \dfrac{38000}{2} = 19\,000$
4.	Arrange in order, to help find the most common score. 11, 14, 14, 15, 16, 16, 16, 17, 18, 18, 19, 20, 22, 28, 30 **Median = 16**
5.	**There are two modes in the data, so it is bi-modal.**
6.	Set A : 5, 7, 8, 12, 15, 19, 22 Median = 12 Set B : 1, 2, 7, 11, 15, 16, 17, 21 Median = $\dfrac{11 + 15}{2} = \dfrac{26}{2} = 13$ Difference between medians = 1
7.	**Labor had the biggest increase. (30% going to 40%)**
8.	**The Green Party had 10% on both.**
9.	**They went from 20% to 10%, a reduction of 10%.** **Or a 50% decrease, if calculated as a percentage decrease on the pre-poll results.**

Question	Working and Answer
10.	Percentage $= \dfrac{10}{32} \times 100$ $= \mathbf{31.25\%}$
11.	**There were two modes 8 and 12**
12.	There are 32 scores so median is average of 16th and 17th $\mathbf{16^{th}}$ **and** $\mathbf{17^{th}}$ **are both 9, so median = 9**
13.	Modal score occurs most. This is 68 for Telecom and 23 for Comtel. So the mode for Telecom is higher by 45. **Any answer which gives both modes and makes a comparative comment**
14.	There are 21 days so median is the 11th day. This is 49 for Telecom and 34 for Comtel. So the median for Telecom was higher by 15. **Any answer which gives both medians and makes a comparative comment**
15.	Mean for Telecom = 46.95 and Mean for Comtel = 33.38 Telecom has a higher mean by 13.57 **Any answer which gives the Comtel mean and makes a comparative comment**
16.	**Winter had the least increase** going from $1.1\,^{o}C$ in 2020 to $3.9\,^{o}C$ in 2080 an increase of $2.8^{o}C$. The other season all had an increase of $3\,^{o}C$ or more.
17.	**I**n 2040 Spring is projected to be $2.1^{o}C$ above the mean. In 2060 Spring is projected to be $3.3^{o}C$ above the mean. **Increase in this period is 1.2º C**
18.	Summer increase = 4.1 – 1.0 = 3.1 Autumn increase = 4.2 – 1.1 = 3.1 Winter increase = 2.8 from above Spring increase = 4.4 – 1.2 = 3.2 **Summer and Autumn had the same increase and it was 3.1º C.**

<table>
<tr><td>School Name
Mathematics Test 2017</td><td></td></tr>
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Year 9	*School Name* *Mathematics Test 2017* *Single Variable Data Analysis*	Calculator Allowed Multiple Choice Section

ANSWERS

Question	Working	Answer
1.	$\text{Mean} = \dfrac{2.8 + 3.2 + 4.1 + 4.8 + 5.2 + 5.2 + 7.3 + 8.2}{8}$ $= 40.8 \div 8$ $= 5.1$	**B**
2.	Mode is most common which is 7 with 5 recipes.	**A**
3.	Since there are 24 recipies, the median is the mean of the 12th and 13th which are 7 and 8 respectively. Median = 7.5	**B**
4.	$\text{Mean} = \dfrac{4 + 10 + 24 + 35 + 16 + 36 + 10 + 44 + 13}{24}$ $= \dfrac{192}{24}$ $= 8$	**C**
5.	Scores are clustered at the top with a tail to the bottom so it is negatively skewed.	**B**
6.	3, Systems designer, and the two Hardware jobs.	**B**
7.	Animator and Game Designer both had an increase of 50. **Software Architect** has increase from 0 to 120, so increase of 120. Software Engineer has increase from 80 to 150, so increase of 70.	**C**
8.	2006 – 30 jobs 2016 – 80 jobs Increase = 50 jobs Percentage increase = $\dfrac{50}{30} \times 100 = 166\frac{2}{3}\%$	**C**

9.	$\Sigma f = 28$ $\Sigma f = 132$ $\overline{x} = \dfrac{132}{28} = 4.7$ (1 dec place)	**C**
10.	There are 28 scores so median is average of 14th and 15th 14th is 4 and 15th is 5, so median = 4.5	**B**
11.	5 are 50% or less, so 20 are more than 50%. Percentage = $\dfrac{20}{25} \times 100 = 80\%$	**D**
12.	From calculator mean is 66 rounded to a whole number.	**C**
13.	Both are symmetrical, but only the half yearly is bi-modal.	**C**
14.	The mean and median increase and the mode goes from 2 to 1. The range stays at 6 for both sets.	**D**
15.	The median was 60 and went to 61, so increased by 1 mark.	**A**
16.	Before the program 2 out of 124, were at L10 or more, so $\dfrac{2}{124} \times 100 = 1.6129032 = 1.6\%$ (1 dec place) After the program 28 out of 124, were at L10 or more, so $\dfrac{14}{62} \times 100 = 22.5806451 = 22.6\%$ (1 dec place)	**A**
17.	Mean for week 4 $= \dfrac{32 + 60 + 96 + 140 + 192 + 144 + 140 + 110 + 48}{124}$ $= \dfrac{962}{124}$ $= 7.7580645161290$ $= 7.8$ (1 dec place) Increase $= 7.8 - 4.9 = 2.9$	**A**
18.	Median is mean of 62nd and 63rd scores. For Week 1 these are both 5's so median = 5 For Week 4 these are both 8's so median = 8 So the median increased by 3.0.	**D**

School Name

Mathematics 2017

Multiple Choice Answer Sheet

Single Variable Data Analysis

Name _____

Completely fill the response oval representing the most correct answer.

1. A ○ B ● C ○ D ○
2. A ● B ○ C ○ D ○
3. A ○ B ● C ○ D ○
4. A ○ B ○ C ● D ○
5. A ○ B ● C ○ D ○
6. A ○ B ● C ○ D ○
7. A ○ B ○ C ● D ○
8. A ○ B ○ C ● D ○
9. A ○ B ○ C ● D ○
10. A ○ B ● C ○ D ○
11. A ○ B ○ C ○ D ●
12. A ○ B ○ C ● D ○
13. A ○ B ○ C ● D ○
14. A ○ B ○ C ○ D ●
15. A ● B ○ C ○ D ○
16. A ● B ○ C ○ D ○
17. A ● B ○ C ○ D ○
18. A ○ B ○ C ○ D ●

ANSWERS

Question	Working and Answer	Marks
1.	(a)	**1 mark for *fx* column and 1 mark for totals**

Score (x)	Frequency (f)	fx
1	2	2
2	4	8
3	7	21
4	5	20
5	4	20
6	3	18

$$\Sigma f = 25 \qquad \Sigma f = 89$$

	(b)	**2 marks for a complete and accurate histogram** **1 mark if it is inaccurate or incomplete.**

	(c) $\quad$ Mean $= \dfrac{89}{25}$ $\quad = 3\frac{14}{25} = 3.56$	**1 mark for correct answer**
2.	(a) The Highway cycle is positively skewed and the city cycle is symmetric.	**1 mark for each description**

Question	Working and Answer	Marks
	(b) Median Highway = 6.3 Median City = 7.9 The highway cycle's median is 1.6 lower than the city's.	**1 mark for the two medians and** **1 mark for the difference**
	(c) Mean $(city) = \dfrac{190.7}{24} = 7.94583$ $= 7.95$ (2 dec place) The difference between the means will be similar to the difference between the medians. Estimate around $7.95 - 1.6 = 6.35$. (Any answer around 6.3)	**1 mark for City mean and** **1 mark for reasonable estimate.**