High School
Mathematics Test 2014

| Year 9 | *Single Variable Data Analysis* | Non Calculator |

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.

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1. In the Hunter Muffler Shop, the earnings last year of its nine employees were:

$ 56 000 $ 47 000 $ 64 000 $ 56 000 $ 47 000

$ 63 000 $ 53 000 $47 000 $58 000

What is the mode of their earnings?

....

....

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2. Robbie and Harry play a Lord of the Rings video game. Their scores on 6 games are given below.

| Robbie | 45 260 | 16 285 | 18 995 | 24 580 | 27 645 | 33 260 |
| Harry | 44 750 | 41 560 | 15 195 | 38 595 | 32 645 | 29 750 |

Compare the ranges of their scores? Whose was greater and by how much?

....

....

3.	Rodrigo has two cars. He compares their fuel efficiency (in Litres/100km) over eight fuel refills .

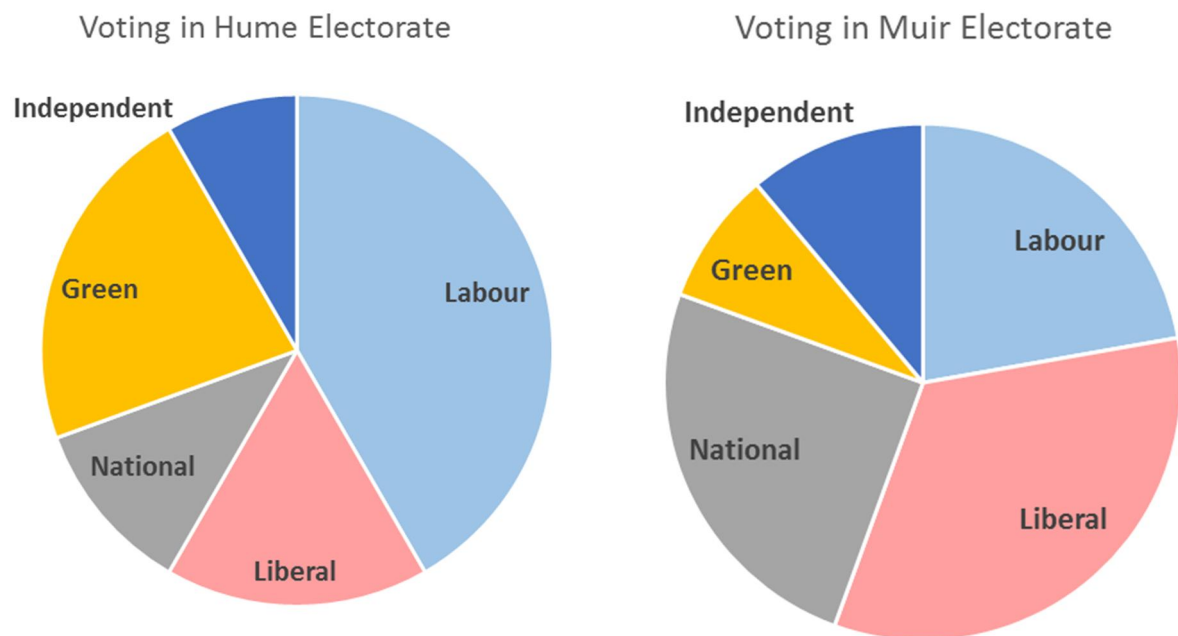Sedan   8.4   8.2   8.6   9.2   8.8   7.9   8.4   8.6
SUV   12.9   11.9   12.7   13.2   14.5   12.6   13.2   12.7

How much higher is the median value for the SUV, compared to the sedan?

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Comparison of Primary Votes in Two Electorates.

Voting in Hume Electorate

Independent
Green
National
Liberal
Labour

Voting in Muir Electorate

Independent
Green
National
Liberal
Labour

Question 4 – 5 refer to the graphs above.

4.	In which electorate did the Nationals receive a quarter of the primary votes?

………………………………………………………………………………………………………

………………………………………………………………………………………………………

5.	Name two parties which together have more than 50% of the primary votes in Hume electorate.

………………………………………………………………………………………………………

………………………………………………………………………………………………………

A survey of a street found the following results for the number of people living in each house.

Number Living in House

```
                              O
            O     O     O
            O     O     O
      O     O     O     O
O     O     O     O     O     O
_____
0     1     2     3     4     5
```
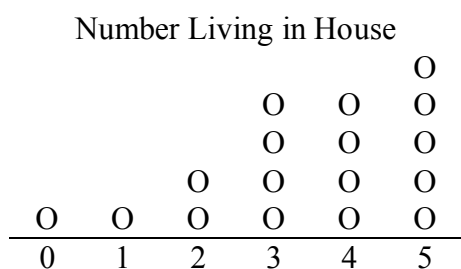
Questions 6 - 8 refer to the dot plot above.

6. What was the modal number of people living in a house?

   ....

   ....

7. What was the median number of people living in a house?

   ....

   ....

8. Use statistical terminology to describe the shape of the distribution.

   ....

   ....

9. What is the median of the scores in this stem and leaf plot?

Stem	Leaf
2	2 3 5 5 7 9
3	0 3 4 5 7 8 8 9
4	0 1 1 1 2 4 6 8
5	1 3

   ....

   ....

10. Two cells in the frequency distribution table have been accidentally deleted, indicated by A and B.

What are the missing numbers?

S	F	f
1	4	4
1	6	7
1	8	1
1	A	B
1	5	8
1	3	5

$$\Sigma f = 36 \qquad \Sigma fx = 519$$

....

....

Rating Comparison for New and Repeat Programs
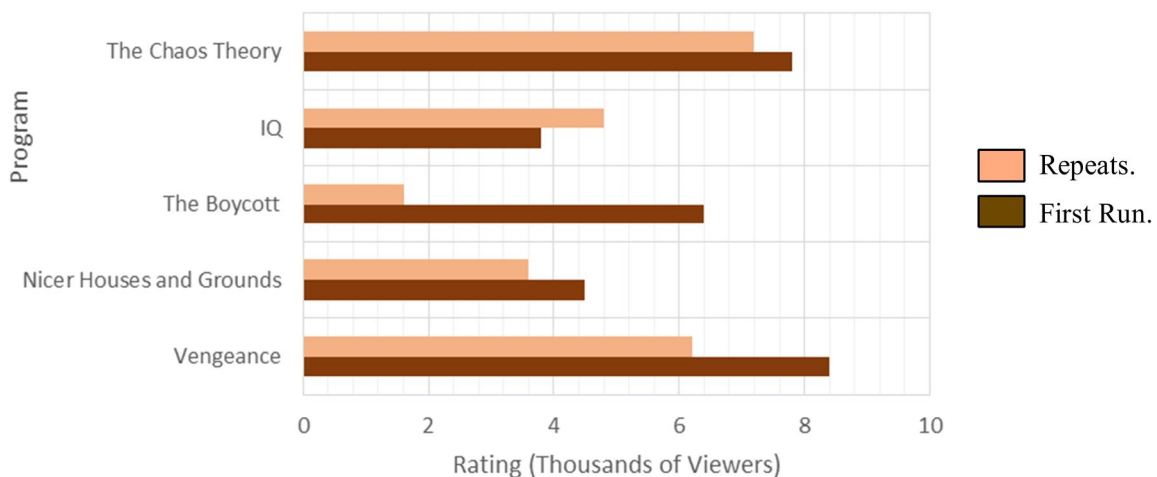
Questions 11 and 12 refer to the graph above.

11. Which program had the highest total rating when first run and repeats are both included and by how many did it beat it's next rival?

....

....

12. Which program had a loss of 20% of its first run number of viewers when repeated?

....

....

13.	What was different about the repeats for the IQ program in comparison to the others surveyed? ………………………………………………………………………………………………………. ……………………………………………………………………………………………………….

14. The results on the same test for two classes are shown in the tables.

Explain why comparing the mode for each class would not give an accurate comparison of the two class's performances on the test.

Ms Hypatia

Score	Frequency
20	0
21	1
22	8
23	7
24	7
25	6

Mr Kepler

Score	Frequency
20	3
21	6
22	7
23	8
24	3
25	2

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

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

15. Don and Phil record the number of takes each needs to record a loop in their home studio.

```
Don                            | Phil
        O    O    O    | 1 | O
   O    O    O    O    | 2 | O
        O    O    O    | 3 | O    O
             O    O    | 4 | O    O    O    O
                  O    | 5 | O    O    O
```

Whose data was negatively skewed? Explain your answer.

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

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

High School
Mathematics Test 2014

Year 9	*Single Variable Data Analysis*	Calculator Allowed 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. Kim tells Felix the range of her 5 exam results and her highest score.

   What can Felix calculate from this?

   A. Kim's lowest exam result.

   B. The median of Kim's exam results.

   C. The mode of Kim's exam results.

   D. The sum of Kim's exam results.
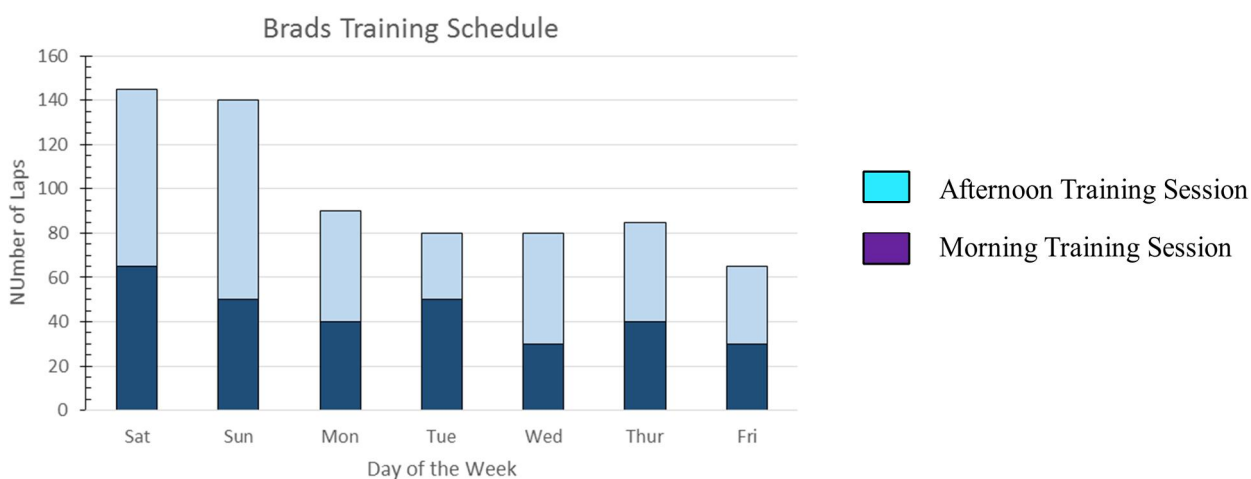
Questions 2 and 3 refer to the stacked column graph above.

2. How many laps did Brad do altogether on Wednesday?

   A. 30   B. 50   C. 80   D. 130

3. On which day did Brad do more laps in the morning than in the afternoon?

   A. Monday   B. Tuesday   C. Wednesday   D. Thursday
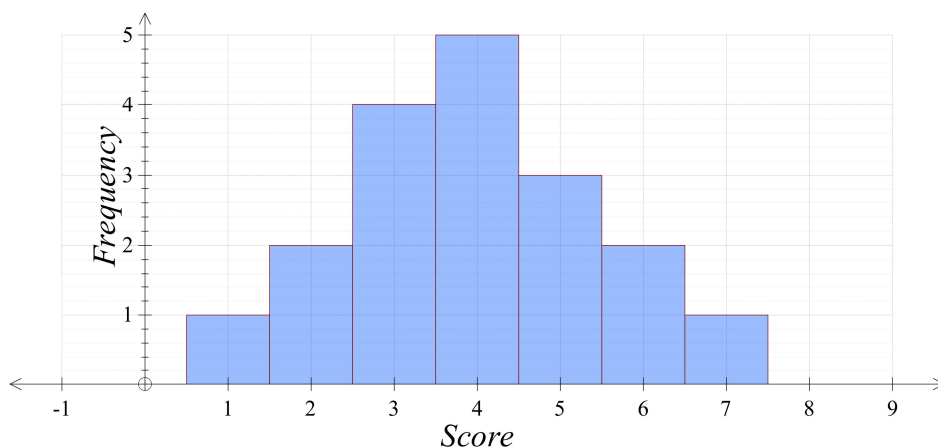
Questions 4 and 5 refer to the Histogram above.

4. What is the median, correct to one decimal place, of the scores displayed in the frequency histogram.

     A.   3.0   B.   3.5   C.   3.9   D.   4.0

5. What is the mean, correct to one decimal place, of the scores displayed in the frequency histogram.

     A.   3.0   B.   3.5   C.   3.9   D.   4.0

6. What is the mean of the scores in this stem and leaf plot?

Stem	Leaf
2	2 3 7
3	1 3 7 9 9
4	0 1 2 4 6 8
5	1 3

     A.   38.5   B.   39.0   C.   39.5   D.   40

The First and Second Division teams in the Kenthurst Soccer Club compared the number of goals scored per game in 2013.

```
      First Division                              Second Division
      O
      O   O                           O                           O
      O   O                           O                           O
      O   O   O                       O                           O   O
  O   O   O   O   O   O               O   O   O   O   O   O   O
  _____                 _____
  0   1   2   3   4   5               0   1   2   3   4   5   6
```

Questions 7 - 9 refer to the dot plots above.

7. Which team had the highest mean and what was it?

    A. The First Division team had the higher mean which was 2.

    B. The First Division team had the higher mean which was 3.

    C. The Second Division team had the higher mean which was 2.

    D. The Second Division team had the higher mean which was 3.

8. Which is a correct statement about the medians for the two teams?

    A. The First Division team's median was higher by 1.5.

    B. The First Division team's median was higher by 2.0.

    C. The Second Division team's median was higher by 1.5.

    D. The two team's medians were the same.

9. Which is a correct description of the shape of the two distributions?

    A. The Firsts distribution is negatively skewed and the Seconds is bi-modal.

    B. The Firsts distribution is positively skewed and the Seconds is bi-modal.

    C. The Seconds distribution is negatively skewed and the Firsts is bi-modal.

    D. The Seconds distribution is positively skewed and the Firsts is bi-modal.

10. Tim compares the number of listeners (in thousands) on two radio stations at 8:00 am over a week.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
MISS FM	16	18	11	**12**	**14**	20	16
2NITE	15	14	13	15	14	15	18

Which station had the greater mean, and by how much was it greater?

    A.   2NITE has a mean which is higher by 0.4

    B.   2NITE has a mean which is higher by 1.0

    C.   MISS FM has a mean which is higher by 0.4

    D.   MISS FM has a mean which is higher by 1.0

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11. Fifteen scores are recorded in the stem and leaf plot.

Another score of 55 is added.

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

Which measures will both change?

    A.   The mean and the median.   B.   The mean and the mode.

    C.   The median and the mode.   D.   The mode and the range.

Runs scored by Batsmen 4th Test Dec 2013

Australia							Stem	England						
9	6	6	2	0	0		0	0	0	0	0	1	1	2
		9	8	0	0		1	0	1	1	2	4	5	9
					5		2	1	4	7	7			
							3	8						
							4	9						
							5	1						
				5	1		6							
							7	1						
					3		8							
							9							
							10							
					6		11							

Questions 12 and 13 refer to the back to back stem and leaf plot above.

12.	Which is not an accurate statement about the runs scored?
	A. The Australian batsmen had a mean of 28.7 runs (1 d.p.).
	B. The English batsmen had a mean of 18.4 runs (1 d.p.).
	C. The Australian batsmen scored a total of 430 runs.
	D. The English batsmen scored a total of 430 runs

13.	Which is correct?
	A. Both sets of scores were positively skewed.
	B. Both sets of scores were symmetric.
	C. Only the Australian scores were positively skewed.
	D. Only the English scores were positively skewed.

14.   Which histogram could not be described as being bimodal?
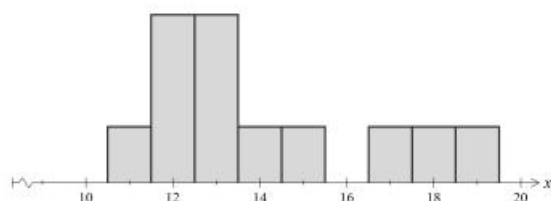
A.   B.
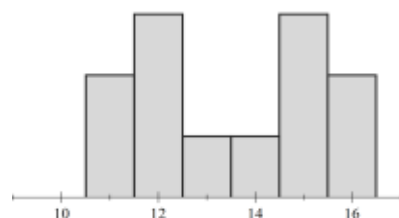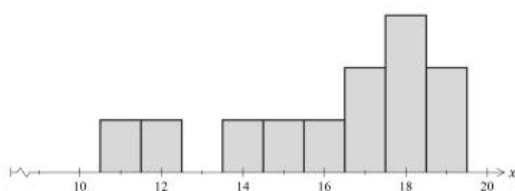
C.   D.
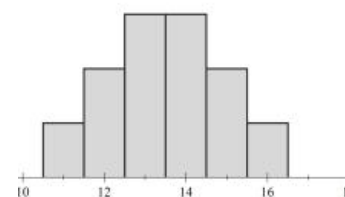
15.   The number of occupants in vehicles on two
roads were recorded for half an hour.
Which is **not** true?

   A.   The data for the Kings Hwy was symmetric.

   B.   The data for the Kings Hwy was bimodal.

   C.   The data for Lavington road was symmetric.

   D.   The data for Lavington road was bimodal.
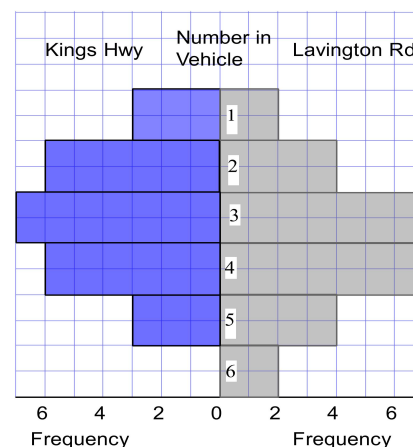
High School
Mathematics Test 2014

Year 9	*Single Variable Data Analysis*	Calculator Allowed
		Name_____

Section 3   Longer Answer Section

Answers should be supported by relevant mathematical reasoning and/or calculations.
Write all working and answers in the spaces provided on this test paper.

Marks

1.   The marks of a group of 15 students on their History and Science Assessments are shown below.

History					Science				
12	28	30	11	13	33	19	25	12	8
9	9	25	12	8	34	23	7	16	12
22	23	27	26	32	7	8	8	21	22

(a)   Construct a back to back stem and leaf plot using the stems given below.   **3**

History   Science

					0					
					1					
					2					
					3					

(b)   Find the mean of both distributions.   **2**

……………………………………………………………………………………………

……………………………………………………………………………………………

(c)   Describe the shape of each distribution.   **2**

……………………………………………………………………………………………

……………………………………………………………………………………………

High School
Mathematics Test 2014

Single Variable Data Analysis

Multiple Choice Answer Sheet

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 ○

High School
Mathematics Test 2014

Single Variable Data Analysis

ANSWERS

Section 1 (1 mark each)	
	Working and Answers
1.	Mode = 47 000. (Occurs 3 times)
2.	Robbies range = 45 260 – 16 285 =28 975 Harrys range = 44750 – 15195 = 29 555 Harrys is higher by 580.
3.	Sedan 7.9 8.2 8.4 8.4 8.6 8.6 8.8 9.2 SUV 11.9 12.6 12.7 12.7 12.9 13.2 13.2 14.5 Sedan median is between 8.4 and 8.6 so it is 8.5. SUV median is between 12.7 and 12.9 so it is 12.8. SUV median is higher by 4.3 (12.8 – 8.5)
4.	The Nationals have a 90º sector which is a quarter of the vote in Muir.
5.	Labour with any one of Greens, Nationals or Liberals.
6.	The mode was 5.
7.	Number Living in House The median number was 4.
8.	The distribution was negatively skewed.
9.	Crossing equal numbers from each end leaves two scores of 38. Stem | Leaf 2 | 2 3 5 5 7 9 3 | 0 3 4 5 7 8 8 9 4 | 0 1 1 1 2 4 6 8 5 | 1 3 Median is 38
10.	Σf = 4 + 6 + 8 + A + 5 + 3 = 36 26 + A = 36 so A = 10 fx = 15 × A = B so B = 15 × 10 = 150

11.	The Chaos Theory had 15.0 in total compared to Vengeance with 14.6, so it beat its rival by 0.4 thousand or 400 viewers.
12.	Nicer Houses and Grounds had 4.5 which reduced to 3.6 and $\frac{3.6}{4.5} \times 100 = 80\%$, a loss of 20%.
13.	IQ had an increase in viewers when shown as a repeat.
14.	The mode is higher for Mr Kepler, but Ms Hypatia has 20 students with scores of 23 or better, compared to 13 for Mr Kepler. (The data for the classes are skewed positively and negatively). The mean or even the median would be a better measure to compare.
15.	Phils data is negatively skewed as it has more scores clustered toward the higher values.

Section 2 (1 mark each)		
	Working	Answers
1.	He can calculate her lowest exam result by subtracting the range from the highest result.	A
2.	80 laps	C
3.	On Tuesday the lower dark section is longer than the light upper section.	B
4.	There are 18 scores, so the median is between the 9th and 10th scores which are both 4. Median = 4.0.	D
5.	Mean $= \dfrac{71}{18} = 3.9$	C
6.	Mean $= \dfrac{616}{16} = 38.5$	A
7.	Firsts Mean $= \dfrac{28}{14} = 2$ Seconds Mean $= \dfrac{42}{14} = 3.$ The Seconds mean of 3 was higher.	D
8.	Firsts Median is between 7th and 8th which are both 2's, so median =2. Seconds Median is between 7th and 8th which are 3 and 4, so median =3.5. The Seconds median was higher by 1.5.	C
9.	The Firsts distribution is positively skewed. The Seconds distribution is bi-modal.	B
10.	MISS FM mean $= \dfrac{107}{7} = 15.3$ 2NITE mean $= \dfrac{104}{7} = 14.9$ MISS FM has a mean which is higher by 0.4	C
11.	As median is 53, so adding a 55 would change it to 53.5. As 55 is already mode adding another will not change it. The mean without calculating is lower than 55, so adding a 55 would change it. (existing mean is 50.2 for those who need to be convinced) Highest or lowest scores not effected b y adding a 55, so range doesn't change.	A
12.	The first 3 statements are correct, the English scored 404 runs not 430.	D
13.	Both tail off toward the upper end, so are positively skewed.	A
14.	C has only one mode.	C
15.	The data for Kings Hwy has only one mode.	B

Section 3		
	Working and Answers	Marks
1.	The marks of a group of 15 students on their History and Science Assessments are shown below.	

	History					Science				
12	28	30	11	13	33	19	25	12	8	
9	9	25	12	8	34	23	7	16	12	
22	23	27	26	32	7	8	8	21	22	

(a)   Construct a back to back stem and leaf plot using the stems given below.   3

History   Science

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

(b)   Find the mean of both distributions.   2

Mean History $= \dfrac{287}{15} = 19.1$ (1 dp).

Mean Science $= \dfrac{255}{15} = 17$

(c)   Describe the shape of each distribution.   2

The History distribution is slightly negatively skewed
and the Science slightly positively Skewed.

High School
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Multiple Choice Answer Sheet

Single Variable Data Analysis   Name___ Marking
Sheet

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 ◯