High School Mathematics Test 2015

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.

YOU WILL NEED A RULER & PROTRACTOR

1. The heights (in cm) of the 16 rugby league players are listed below.

   176, 180, 185, 178, 182, 175, 160, 185, 179, 184, 188, 172, 190, 168, 175, 180.

   What is the range in the heights of the players?

   ……

2. Ivan records the number of people who he serves on his checkout each hour for an eight hour shift.

   The numbers were: 45, 62, 17, 28, 56, 18, 30, 56.

   What is the mode of the numbers?

   ……

   ……

3. Twelve people are asked to cook the same recipe.

The time that they take (in minutes) are listed below.

15, 16, 16, 17, 18, 18, 19, 19, 20, 21, 21, 22.

What is the median of the data?

……....

……

4. Dean and Mitch record the distance (in metres) that they can kick a football. They each have six turns.

Dean	45	56	48	58	64	3
Mitch	44	41	50	59	63	29

Who had the higher median distance and by how much was it greater?

……....

……

5. Millie ran a 400 metre course on four occasions.

Her times (in seconds) were 50.0, 51.2, 50.8 and 49.6.

What was her mean (average) time?

……....

……

6. Two company's profits (in millions of dollars) were compared over a period of eight years.

Browns Bleepers	3.1	5.2	4.8	8.3	5.2	7.6	9.2	8.5
Kings Klaxons	5.6	4.1	4.9	5.9	7.3	8.4	5.9	6.2

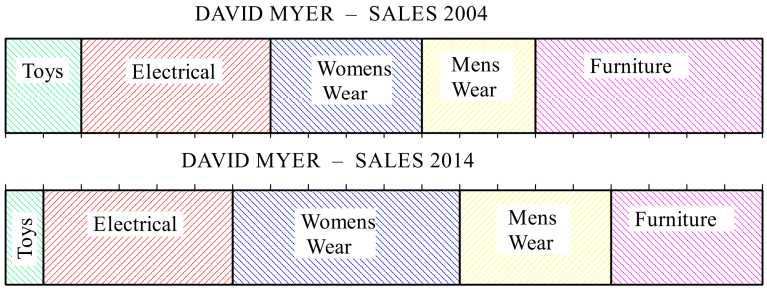
Which had the higher mode and what was it?

……....

……

Questions 7 – 9 refer to the graphs below.

The graphs compared how the sales in a department store changed.



A ruler would be useful.

7. Which departments were the biggest in 2004 and in 2014?

……....

……

8. Which department had the same percentage of sales in 2014 as it did in 2004?

……....

……

9. The total sales in the store increased from $240 million in 2004 to $320 million in 2014. What was the change in the sales of Furniture in this time?

……....

……

Questions 10 and 11 refer to the stem and leaf plot.

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

10. What is the mode of the distribution?

……

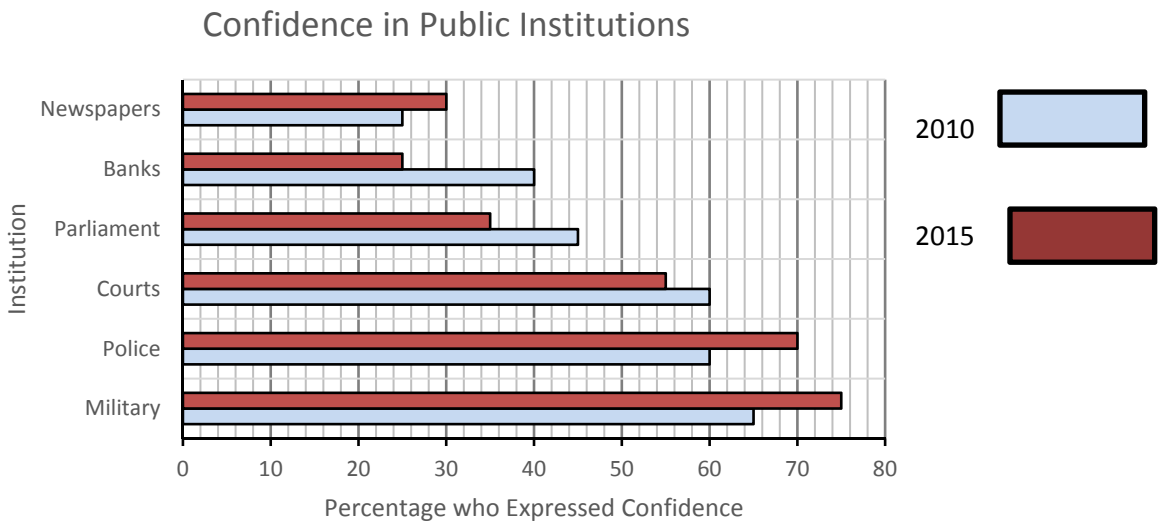
11. Describe the shape of the distribution.

……....

……

Questions 12 and 13 refer to the graph below.

The graph compares the results of surveys of public confidence in institutions in 2010 and 2015. The graph was published in a newspaper.



12. Which two institutions which had the biggest fall in confidence between 2010 and 2015?

……....

……

13. The magazine made the following comment based on the graph.

The survey shows that Newspapers, with an increase of 20% on their previous results, are ahead of even the Police and Military in gaining in public confidence between 2010 and 2015.

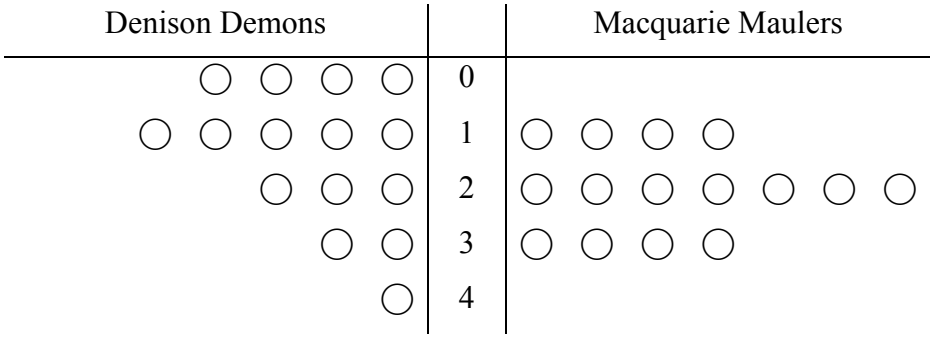
Comment on the accuracy of the statement and whether it is misleading.

……....

……

Questions 14 – 16 refer to the following.

The back to back dot plot shows the number of goals scored by two teams in each game of a season.



14. Compare the centre of the two distributions, by referring to the medians.

……....

……

15. Compare the spread of the two distributions, by referring to the ranges.

……....

……

16. Compare the shape of the two distributions, by using terms such as skewed and symmetric.

……....

……

High School Mathematics Test 2015

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.

YOU WILL NEED A RULER & PROTRACTOR

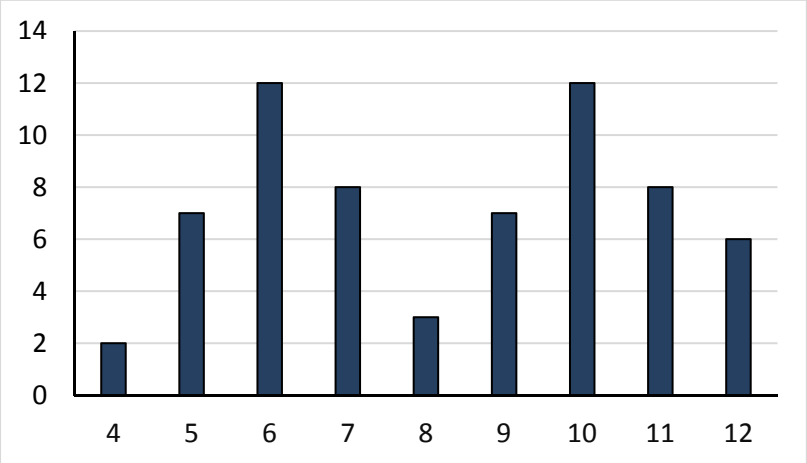
1. The ages of 15 people at a barbeque are listed below.

20, 15, 16, 33, 45, 12, 61, 6, 7, 9, 26, 44, 35, 28, 29

Calculate the median of the ages.

A. 6 B. 20 C. 26 D. 28

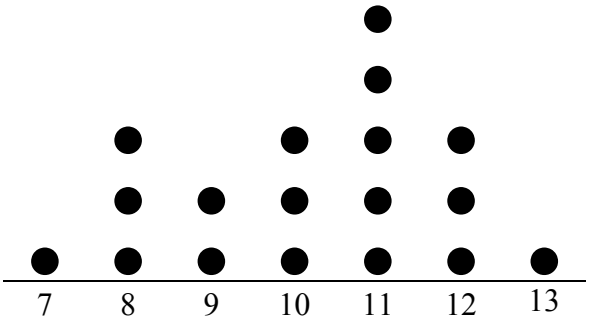
2. Which term below could be used to describe the shape of the distribution shown below.



A. Bimodal B. Negatively Skewed

C. Positively Skewed D. Symmetrical

Questions 3 – 5 refer to the dot plot below.



The dot plot represents the number of cases solved by each detective in the Swann police district.

3. How many detectives are there in the Swann police district?

A. 5 B. 7 C. 13 D. 18

4. What was the modal number of cases solved?

A. 7 B. 11 C. 13 D. 18

5. What was the range of the data?

A. 5 B. 6 C. 7 D. 13

Questions 6 – 8 refer to the graph below.

Number of Successful Attempts (x)	Frequency (f)	fx
15	7	105
16	10	160
17	9	153
18	8	144
19	6	114
	$\Sigma f = 40$	$\Sigma fx = 676$

The frequency distribution table shows the number of successful attempts at goal by each of 40 players when shooting from a penalty spot.

6. What was the total number of successful attempts by all the players?

A. 40 B. 160 C. 676 D. 800

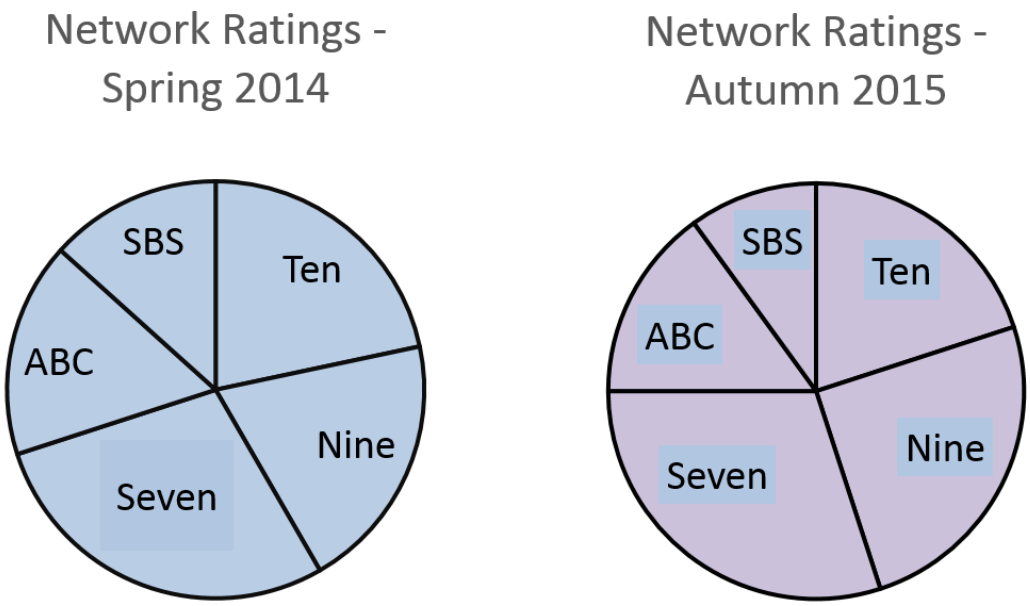
7. What was the mean number of successful attempts (correct to 1 d.p.)?

A. 16.0 B. 16.9 C. 17.0 D. 17.5

8. What was the range of the number of successful attempts?

A. 4 B. 9 C. 19 D. 46

Questions 9 – 11 refer to the sector graphs below.



The graph shows the proportion of the free to air market that was held by five networks in two ratings periods.

9. Which network dropped from second place in the market to third place, between the Spring and Autumn ratings?

A. ABC B. Nine C. SBS D. Ten

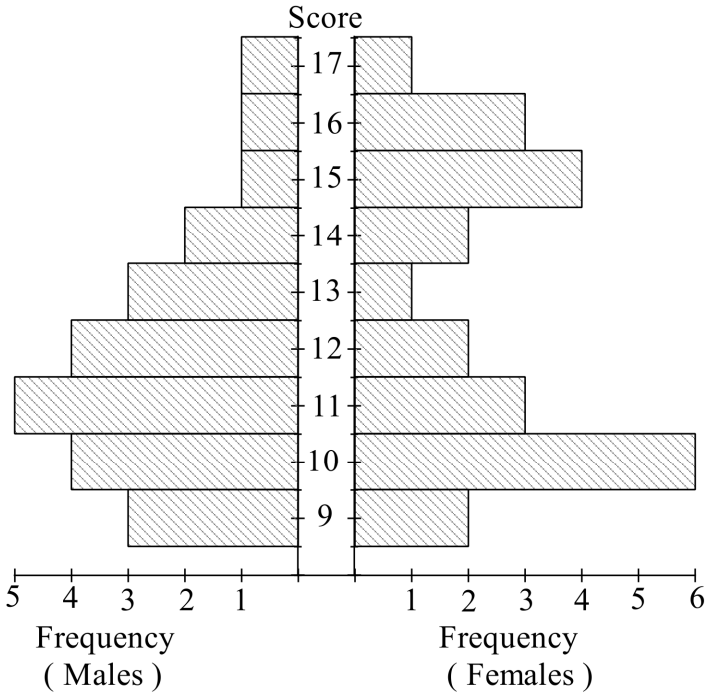
10. Which network had exactly a quarter of the market in one of the Ratings?

A. Nine in Autumn. B. Nine in Spring
C. Ten in Autumn. D. Ten in Spring

11. What percentage of the ratings did Seven have in the Autumn period?

A. 20% B. 25% C. 30% D. 36%

Questions 12 – 13 refer to the graph below.



The back to back frequency histogram compares the scores of male and female subjects on a perception test.

12. Which term describes the distribution for the males?

A. Bimodal
B. Negatively Skewed
C. Positively Skewed
D. Symmetrical

13. The mean for the males was 11.9.

Which is true?

A. The mean for females is 0.9 lower than that for males.
B. The mean for females is 0.6 lower than that for males..
C. The mean for males is 0.9 lower than that for females.
D. The mean for males is 0.6 lower than that for females.

Questions 14 – 16 refer to the back to back stem and leaf plot below.

Reds							Demons						
						0	8						
						1	1	3					
			5	2	0	2	0	2	3	3			
		5	4	4	2	3	1	2	4	6	7	8	
7	6	5	3	2	1	4	0	1	2	5			
		7	5	3	1	5	0	2					
			8	3	0	6	2						

The stem and leaf plot compares the number of minutes that the players in two football squads spent warming up before their games.

14. Which is true in relation to the median time for warming up?

A. The Reds median was 11 minutes higher than that of the Demons.
B. The Reds median was 9 minutes higher than that of the Demons.
C. The Reds median was 1 minute higher than that of the Demons.
D. The Reds and the Demons had the same median.

15. Which statement is true in all respects?

A. The Reds mode was higher but they had a smaller range than the Demons.
B. The Reds mode was lower but they had a greater range than the Demons.
C. The Reds mode was higher than the Demons and they both had the same range.
D. The Reds and the Demons had the same mode but the Demons range was higher.

16. How could you describe the shape of the two distributions?

A. The Reds distribution is negatively skewed but the Demons is symmetrical.
B. The Reds distribution is positively skewed but the Demons is symmetrical.
C. The Reds distribution is symmetrical but the Demons is negatively skewed.
D. The Reds and Demons distributions are both symmetrical.

High School Mathematics Test 2015

Year 9

Single Variable Data Analysis

Calculator Allowed

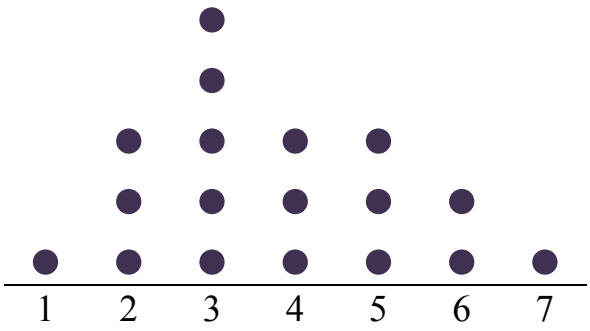
Name_____

Section 3 Longer Answer Section

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

Marks

1. The dot plot shows the number of hours spend by the students in a class, in preparing their English essay (to the nearest hour).



Time spent on Essay (hours)

(a) What was the modal time spent on the essay? **1**

……..

(b) What was the range of the times spent on the essay? **1**

……..

(c) What was the median time?

……..

(d) What was the mean time spent on the essay? **1**

……..

Marks

2. The stem and leaf plots compare the number of books owned by the students in two classes.

Class 9M						Class 9P					
		7	6	5	1	1	2				
8	7	5	2	0		2	0				
		5	4	4	2	3	1	2			
				8	5	4	0	1	3	5	
				3	2	5	0	2	4	5	6	7
					0	6	2	3	5	7	8	

(a) How many students were there in each class? **1**

……

……

(b) What was the median number of books for each class? **2**

……

……

(c) Compare the two distributions, by describing the shape of each distribution and contrasting the medians. **2**

……

……

Marks

3. The grouped frequency distribution table shows the heights of the members of a club (to the nearest cm).

Heights	Class Centre (x)	Frequency (f)	fx	Cumulative frequency
130- 139	134.5	1		
140 - 149	144.5	6		
150 – 159	154.5	11		
160 – 169	164.5	17		
170 - 179	174.5	12		
180 - 189	184.5	3		
		Σf =	Σfx =	

(a) Complete the table, including the values of Σf and Σfx. **2**

(b) Calculate an estimate for the mean, using the table. **1**

……

……

(c) Use the cumulative frequency to determine the median class. **1**

……

……

High School
Mathematics Test 2015

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 ⬭

High School Mathematics Test 2015

Year 9

Single Variable Data Analysis

Non Calculator

Section 1 Short Answer Section

ANSWERS

No.	WORKING	ANSWER
1.	176, 180, 185, 178, 182, 175, **160,** 185, 179, 184, 188, 172, **190**, 168, 175, 180. Range = 190 – 160 = 30	30
2.	45, 62, 17, 28, **56**, 18, 30, **56**. Mode = 56	56
3.	15, 16, 16, 17, 18, 18, 19, 19, 20, 21, 21, 22. Median is 6th and 7th scores which are 18 and 19. $\text{Median} = \frac{18+19}{2} = 18.5$	18.5
4.	Dean 3 45 48 56 58 64 $\text{Median} = \frac{48+56}{2} = 52$ Mitch 29 41 44 50 59 63 $\text{Median} = \frac{44+50}{2} = 47$	Deans median (52) is greater by 5 than Mitch's.
5.	$\text{Mean} = \frac{50.0 + 51.2 + 50.8 + 49.6}{4}$ $= \frac{201.6}{4}$ = 50.4 seconds	50.4
6.	Browns Bleepers 3.1 5.2 4.8 8.3 5.2 7.6 9.2 8.5 Mode = 5.2 Kings Klaxons 5.6 4.1 4.9 5.9 7.3 8.4 5.9 6.2 Mode = 5.9	Kings Klaxons had the higher mode which was $5.9 million.
7.	In 2004 Furniture was the largest department and Women's Wear in 2014.	Furniture and Women's Wear
8.	In 2004 Electrical had 5 out of 20 = 25% and in 2014 it had the same.	Electrical (with 25%)

9.	In 2004 Furniture had $\frac{6}{20}$ of 240 = \$72 million In 2014 Furniture had $\frac{4}{20}$ of 320 = \$64 million	It decreased by \$8 million
10.	Mode is both 69 and 72 as both occur 3 times.	69 and 72
11.	The distribution is (negatively) skewed and is bi- modal.	Use of any one of the terms *Skewed* *Negatively skewed* *Bimodal* is sufficient to earn a mark.
12.	Banks and Parliament had the biggest falls.	Banks and Parliament
13.	The military and police had actual increases of 10%, compared to the 5% of the newspapers. Since the newspapers had 25% in 2010, a 5% increase corresponds to 20% of the previous result. This 20% is larger than the percentage increase for police and military, because their increases were coming from a higher starting point. The statement uses a correct percentage but out of context it gives a misleading impression that the Newspapers confidence is on a par to the other two,	Give marks for mention of any relevant information with a consistent conclusion.
14.	From 15 games, the median is the 8^{th}. For the Demons the median is 1. For the Maulers the median is 2.	The Demons have a median of 1 and the Maulers 2, so the Demons distribution has a lower centre.
15.	From 15 games, the range = $15^{th} - 1^{st}$ score. For the Demons the range is 4 – 0 = 4. For the Maulers the range is 3 – 1 = 2.	The Demons have a range of 4 and the Maulers 2, so the Demons distribution has a wider spread.
16.	The Demons distribution has most scores toward the lower end so it is skewed. The Maulers distribution is centres around the median and is symmetrical.	The Demons distribution is skewed and the Maulers is symmetrical.

High School Mathematics Test 2015

Year 9

Single Variable Data Analysis

Calculator Allowed

Section 2 Multiple Choice Section

ANSWERS

No.	WORKING	ANSWER
1.	In order 6, 7, 9, 12, 15, 16, 20, 26, 28, 29, 33, 35, 44, 45, 61 Median = 26	C
2.	The distribution is bimodal as it has two modes, 6 and 10, it is neither skewed or symmetrical.	A
3.	Each dot corresponds to a detective, so there are 18 detectives.	D
4.	Mode is the score which occurs most which is 11 (occurs 5 times)	B
5.	Range = highest score – lowest score = 13 – 7 = 6	B
6.	The total number of successful attempts by all the players is the sum of the *fx* column, which is 676.	C
7.	$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{676}{40} = 16.9$	B
8.	Range = highest score – lowest score = 19 – 15 = 4	A
9.	In spring order was Seven, Ten, Nine, ABC, SBS. In spring order was Seven, Nine, Ten, ABC, SBS. So Ten dropped from 2nd to 3rd.	D
10.	A quarter is a 90° angle, and the only one is for Nine in Autumn.	A
11.	Angle for Seven = 108°. $\text{Percentage} = \frac{108}{360} \times 100 = 30\%$	C
12.	The males have the bulk of scores grouped toward the lower scores, so it is positively skewed.	C

13.	$Sum_{FEMALES} = 17 + 16 \times 3 + 15 \times 4 + 14 \times 2 + 13 \times 1 + 12 \times 2 + 11 \times 3 + 10 \times 6 + 9 \times 2$ $= 301$ $Mean_{FEMALES} = \frac{301}{24} = 12.541666.. = 12.5\ (1\ dp)$ Mean given for males is 11.9, so mean for males is 0.6 lower than that for females.	D
14.	The medians for both are between the 10th and 11th scores (from 20 altogether) $Median_{REDS} = \frac{43 + 45}{2} = 44$ $Median_{DEMONS} = \frac{34 + 36}{2} = 35$ Reds are higher by 44 – 35 = 9 minutes.	B
15.	Mode for Reds = 34 (occurs twice) & range = 68 – 20 = 48 Mode for Demons = 23 (occurs twice) & range = 62 – 8 = 54 Reds have higher mode but smaller range.	A
16.	To all intents both distributions appear symmetrical with the median located in the centre.	D

High School
Mathematics Test 2015

Multiple Choice Answer Sheet

Single Variable Data Analysis

Name _____ANSWERS_____

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 ●

High School Mathematics Test 2015

Year 9	*Single Variable Data Analysis*	Calculator Allowed

Section 3 Longer Answer Section

ANSWERS

		Marks
1.	(a) Mode = 3 (occurs 5 times which is the most common)	**1**
	(b) Range = 7 – 1 = 6	**1**
	(c) There are 18 entries to median is between the 9th and 10th. 9th and 10th are 3 and 4 respectively. Median is 3.5.	**1**
	(d) Sum of Scores = $1 + 2 \times 3 + 3 \times 5 + 4 \times 3 + 5 \times 3 + 6 \times 2 + 7 = 68$ Mean = $\frac{68}{18} = 3.7777$ $= 3.8$ (1 dp)	**1**
2.	(a) There are 18 in 9M and 19 in 9P.	**1**

(b) **2**

Class 9M		Class 9P
7 6 5 1	1	2
8 7 5 2 0	2	0
5 4 4 2	3	1 2
8 5	4	0 1 3 5
3 2	5	0 2 4 5 6 7
0	6	2 3 5 7 8

In 9M median is between 9th and 10th
Which are 28 and 32.
Median for 9M is 30

In 9P median is the 10th
Which is 52
Median for 9P is 52

(c) Both distributions are skewed, with 9M being positively skewed and 9P negatively skewed. 9P has a median which is 12 points higher, which is due to the skew of the two classes. **2**

3. (a) **2**

Heights	Class Centre (x)	Frequency (f)	fx	Cumulative frequency
130- 139	134.5	1	134.5	1
140 - 149	144.5	6	867	7
150 – 159	154.5	11	1699.5	18
160 – 169	164.5	17	2796.5	35
170 - 179	174.5	12	2094	47
180 - 189	184.5	3	553.5	50

$\Sigma f = 50$ $\Sigma fx = 8145$

(b) $\text{Mean} = \frac{8145}{50} = 162.9$ **1**

(c) Median from 50 is between the 25th and 26th scores which are both in the 160 – 169 class. **1**