

High School Mathematics Test 2015

Year 10

Further Single Variable Analysis

Non Calculator

Skills and Knowledge Assessed:

- Determine quartiles and interquartile range (ACMSP248)
- Construct and interpret box plots and use them to compare data sets (ACMSP249)
- Compare shapes of box plots to corresponding histograms and dot plots (ACMSP250)
- Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253)
- 10A Calculate and interpret the mean and standard deviation of data and use these to compare data sets (ACMSP278)

Name _____

Section 1 Short Answer Section

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

1. The masses of a litter of 11 pups are (to the nearest 10 grams) :
200, 150, 160, 210, 170, 240, 180, 230, 190, 200 and 220.
What is the range of this data?

.....

2. What is the median of the set of scores below?
12, 18, 15, 20, 14, 19, 22, 7, 16, 14, 25, 8, 5, 19.

.....

.....

3. What percentage of the scores in the set above, lies below the median?

.....

Questions 4 – 6 refer to the following.

The scores of 13 teams in a trivia quiz are shown below.

24, 25, 25, 25, 26, 26, 27, 28, 28, 28, 29, 29, 30

4. What is the median of the scores?

.....

5. What is the upper quartile of the scores?

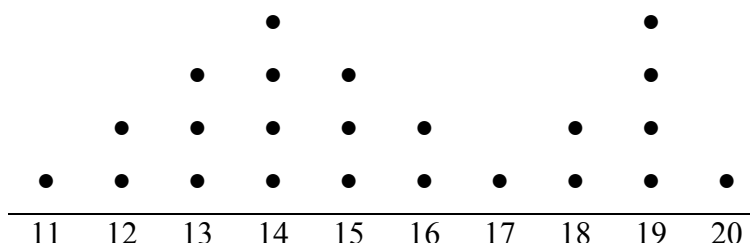
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6. What is the interquartile range of the scores?

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Questions 7 – 10 refer to the dot plot below.

7. What is the range of the scores?

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8. What is the median of the scores?

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9. What is the mode of the scores?

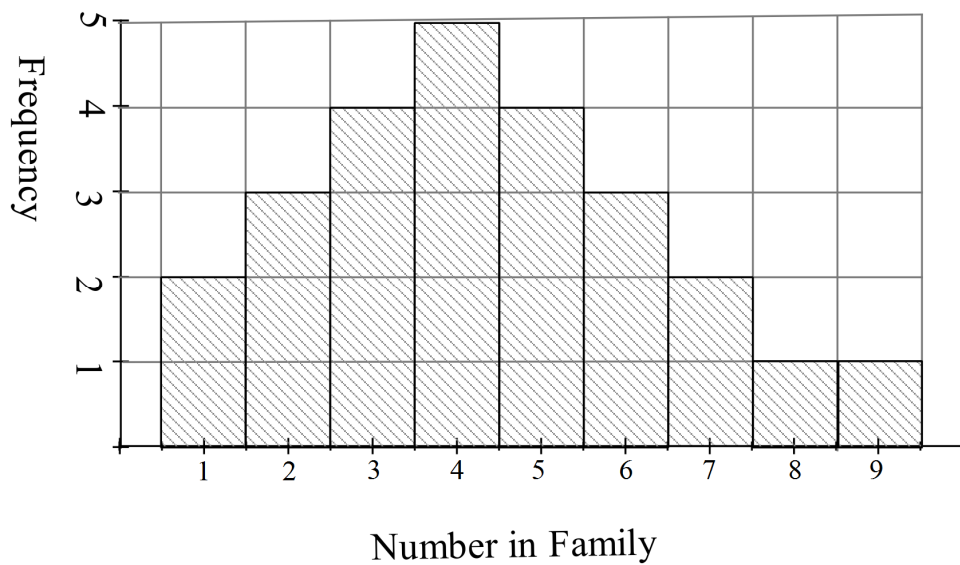
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10. What is the interquartile range of the scores?

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Questions 11 – 13 refer to the histogram below.



The histogram shows the results of a survey of family sizes.

11. What is the median of the scores?

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12. What is the upper quartile of the data?

.....

.....

13. What is the interquartile range?

.....

.....

Questions 14 – 15 refer to the five number summary below.

Jason completes an analysis of a set of data and produces the following five number summary.

5, 7, 12, 14, 19

14. What is the range of the data?

.....

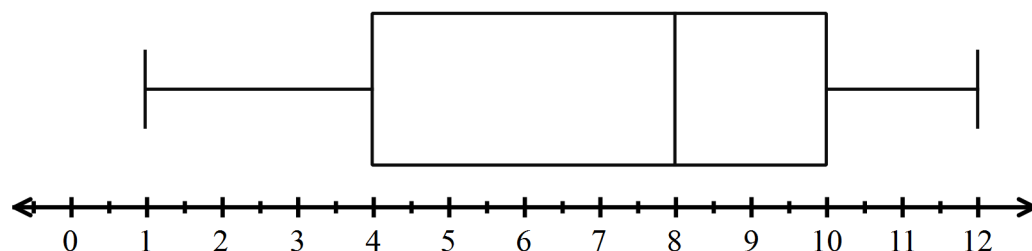
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15. What is the interquartile range of the data?

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.....

Questions 16 and 17 refer to the box plot below.



16. What is the lower extreme of the scores in the box plot?

.....

.....

17. What is the interquartile range of the scores in the box plot?

.....

.....

Question 18 – 20 refer to the following.

Linda analyses a set of data and comes up with the results below.

Lower extreme = 4,

Upper Extreme = 25,

1st Quartile = 12,

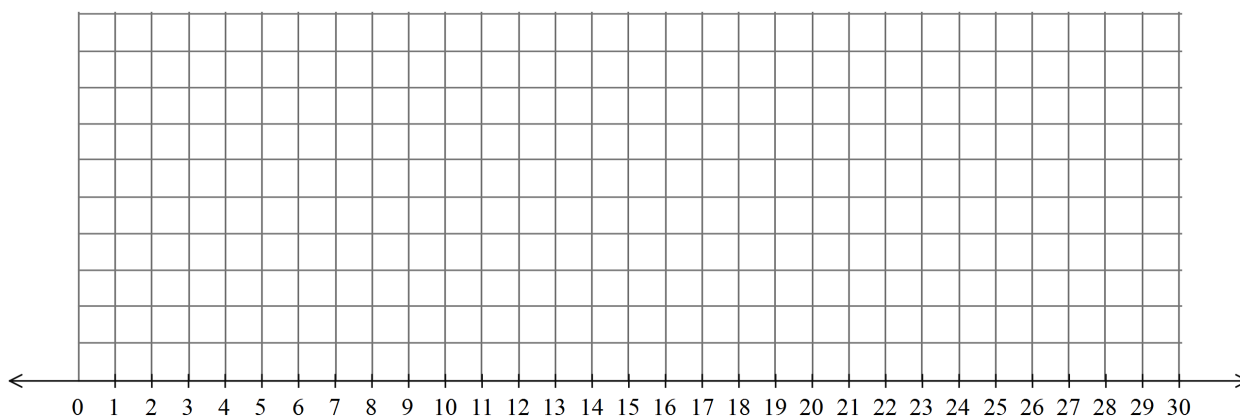
3rd Quartile = 20

Median = 18.

18. Write this information as a five number summary.

.....
.....

19. Draw a box plot for the set of data.



20. What percentage of the scores lie between 12 and 25?

.....
.....

High School Mathematics Test 2015

Year
10

Further Single Variable 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. What is the median of the set of scores below?
12.5, 6.4, 8.9, 7.4, 6.6, 5.8, 10.4, 12.3, 8.2, 7.4
A. 7.4 B. 7.5 C. 7.8 D. 8.2

2. The scores by the players in a cricket team are shown.
Find the range of the scores.

A. 45
B. 61
C. 70
D. 73

Harrisville Hornets

JOHN	45
SALLY	38
ANDREW	63
DANNI	75
LIAM	2
KERRIE	37
LISA	45
LUKE	28
BILLY	18
JUDE	7
KAYLAH	5

Questions 3 – 4 refer to the following:

Tony and Joe record the number of their colleagues who supported them over a twelve month period.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Tony	31	33	32	32	33	24	15	11	9	7	6	2
Joe	28	29	36	32	31	27	25	16	12	8	4	6

3. Who had the greater range and by how much?
A. Joe's range was greater by 1. B. Joe's range was greater by 2.
C. Tony's range was greater by 1. D. Tony's range was greater by 3.
4. What was the lower quartile of Joes data?

A. 10 B. 20 C. 26 D. 30

Questions 5 – 7 refer to the stem and leaf plot below.

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

The stem and leaf plot gives the number of times the members of a football team had been penalised in a season.

5. What is the median number of penalties?

- A. 25 B. 26 C. 27 D. 28

6. What was the range?

- A. 35 B. 36 C. 37 D. 41

7. What was the interquartile range?

- A. 11 B. 13 C. 16 D. 22

8. Find the interquartile range of the set of scores below.

14, 16, 29, 35, 22, 36, 26, 17, 20, 32

- A. 15 B. 18 C. 22 D. 24

Questions 9 – 11 refer to the column graph below.



9. What is the lower quartile of the scores?

- A. 1 B. 2 C. 3 D. 4

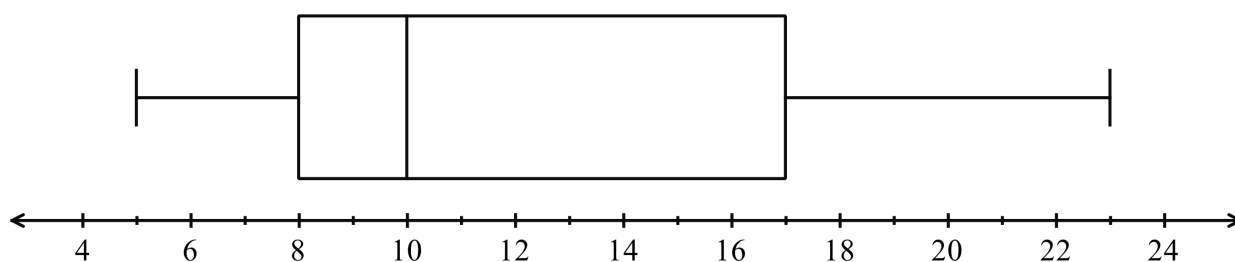
10. What is the interquartile range of the scores?

- A. 1 B. 2 C. 3 D. 4

11. Which is a true comparison of the range and the interquartile range?

- A. The interquartile range is twice the range.
B. The range is twice the interquartile range.
C. The range is three times the interquartile range.
D. The range is four times the interquartile range.

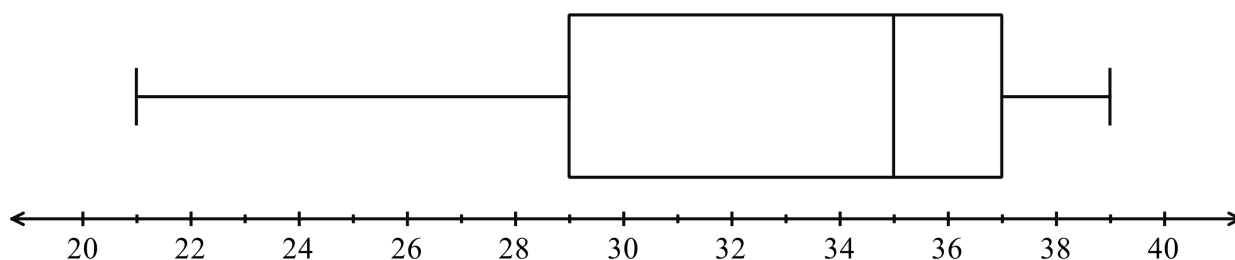
Questions 12 – 14 refer to the box plot below.



The box plot summarises the scores on a quiz.

12. What was the lowest score ?
A. 4 B. 5 C. 6 D. 7
13. What was the upper quartile?
A. 8 B. 10 C. 16 D. 17
14. What was the interquartile range?
A. 6 B. 7 C. 9 D. 18

Questions 15 – 17 refer to the box plot below.



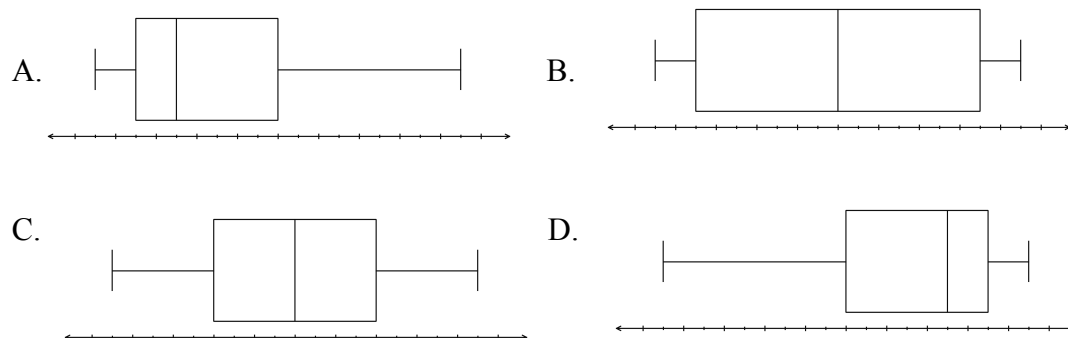
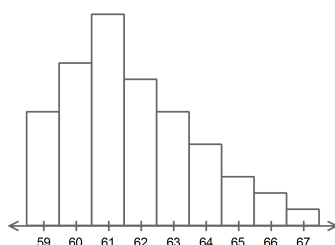
The box plot summarises the ages of people on the staff of a company.

15. What percentage of the staff were older than 29 years of age?
A. 25% B. 50% C. 65% D. 75%
16. Between what ages are the oldest 25% of the staff?
A. 29 and 37 B. 29 and 39 C. 35 and 39 D. 37 and 39

17. Which description of the shape of the distribution can be made based on the box plot?

- A. It is a bimodal distribution.
- B. It is a negatively skewed distribution.
- C. It is a positively skewed distribution.
- D. It is a symmetrical distribution.

18. Which box plot could represent the histogram below?



19. Kerry recorded the masses of the 15 joeys that she is caring for (in kg to 1 decimal place). They were: 12.8, 14.5, 7.6, 8.9, 9.1, 15.8, 12.3, 8.1, 5.7, 7.5, 6.8, 7.3, 6.8, 9.8, 8.4. What were the mean and population standard deviation of the masses? (Correct to one decimal place.)

- A. Mean = 8.4 and standard deviation = 2.9
- B. Mean = 8.4 and standard deviation = 5.0
- C. Mean = 9.4 and standard deviation = 2.9
- D. Mean = 9.4 and standard deviation = 5.0

20.

The mean and standard deviation of the scores attained by two rugby teams in their last season are :

Bulls : Mean = 22.5 Standard deviation = 9.9.

Giants : Mean = 25.5 Standard deviation = 4.6.

Which statement is correct?

- A. The Bulls had far greater variation in their scores.
- B. The Bulls had higher scores on average.
- C. The Giants had far more variation in their scores.
- D. The Giants were less consistent in the scores they made.

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Further Single Variable 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 stem and leaf plot gives the number of wins by the sprint runners in a club.

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

- (a) What is the median of the data? 1

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- (b) What is the range of the data? 1

.....

- (c) What is the mode of the data? 1

.....

- (d) What is the lower quartile of the data? 1

.....

- (e) What is the interquartile range of the data? 1

.....

.....

Marks

2. The frequency table below summarises the points scored by football teams in a weekend.

Points scored x	Frequency f	fx	Cumulative frequency
0	7		
1	12		
2	11		
3	5		
4	2		
5	3		

$$\Sigma f = \quad \Sigma fx =$$

- (a) Complete the table. 2

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

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.....

- (c) Find the interquartile range of the data. 2

.....

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3. Two market research firms conduct surveys on the popularity of a movie. Both surveys ask for a rating of the movie on a scale of 0 – 10. Survey A was requested by the producers of the movie and had a sample size of 12 people. Survey B was requested a movie review magazine and had a sample size of 120 people.

(a) Survey A had the following results: 2

5, 8, 7, 9, 10, 9, 8, 7, 9, 10, 9, 9

Calculate the mean and standard deviation of the results.

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.....

(b) Survey B had a mean of 6.5 with a standard deviation of 3.4. 2

Compare the results of the two surveys, making reference to the centre and spread of the two distributions.

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(c) Outline two reasons why the results of one of the surveys may be less reliable than the other. 2

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High School Mathematics Test 2015

Multiple Choice Answer Sheet Further Single Variable Analysis

Name _____

Completely fill the response oval representing the most correct answer.

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|-----|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|
| 1. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 2. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 3. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 4. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 5. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 6. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 7. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 9. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 10. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 11. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 12. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 13. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 14. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 15. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 16. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 17. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 18. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 19. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 20. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |

High School Mathematics Test 2015

Year 10

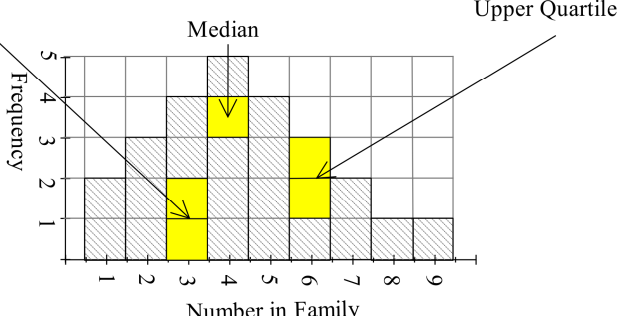
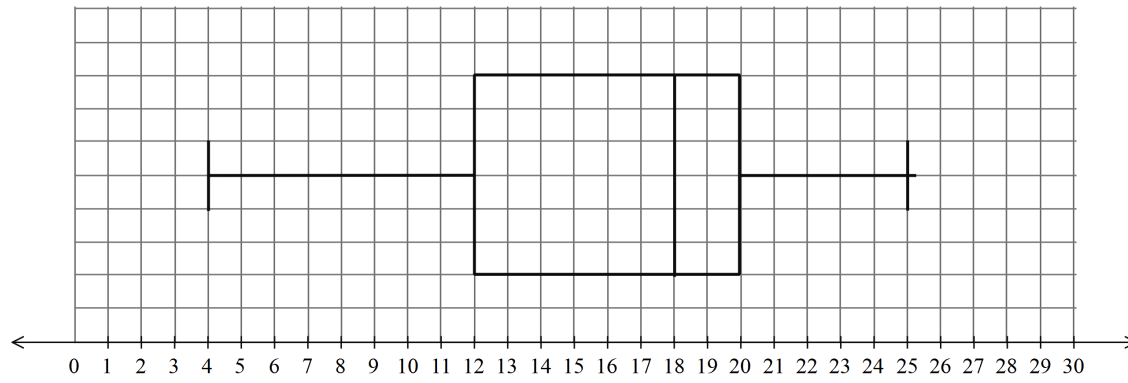
Further Single Variable Analysis

Non Calculator

Section 1 Short Answer Section

ANSWERS

No.	WORKING	ANSWER
1.	200, 150, 160, 210, 170, 240, 180, 230, 190, 200 and 220. Range = highest – lowest = $240 - 150 = 90$	90
2.	Put 14 scores in order 5, 7, 8, 12, 14, 14, 15, 16, 18, 19, 19, 20, 22, 25 Median is between 7 th and 8 th which are 15 and 16, so median is 15.5.	15.5
3.	The median is the middle score, so 7 lie above and 7 below, so 50% lie below.	50%
4.	24, 25, 25, 25, 26, 26, 27, 28, 28, 28, 29, 29, 30 Median = 27	27
5.	Upper quartile is the middle of the 6 top scores, so between 28 and 29. Upper quartile = 28.5	28.5
6.	Lower quartile is the middle of the 6 bottom scores, so between 25 and 25. Upper quartile = 25 Interquartile range = $28.5 - 25 = 3.5$	3.5
7.	Range = highest – lowest = $20 - 11 = 9$	9
8.	There are 23 scores so median is the 12 th score. Counting the 12 th score is 15.	15
9.	Mode is most common, so this is 14 and 19.	14 and 19.
10.	Lower Quartile is 6 th score which is 13. Upper Quartile is 18 th score which is 18. Interquartile range = $18 - 13 = 5$	5

11.	<p>Lower Quartile</p>  <p>Median</p> <p>Upper Quartile</p> <p>Frequency</p> <p>Number in Family</p> <p>There are 25 families in the data, so median is the 13th score which is a 4.</p>	4
12.	Upper quartile is middle of the top 12 scores, so 19 th and 20 th scores which are both 6's, so upper quartile is 6.	6
13.	Lower quartile is middle of the bottom 12 scores, so 6 th and 7 th scores which are both 3's, so lower quartile is 3. Interquartile range = $6 - 3 = 3$	3
14.	Range is upper extreme – lower extreme = $19 - 5 = 14$	14
15.	Interquartile range = $Q_3 - Q_1 = 14 - 7 = 7$	7
16.	Lower extreme = end of lower whisker = 1	1
17.	Quartiles at the ends of the box, so 4 and 10. Interquartile range = $Q_3 - Q_1 = 10 - 4 = 6$	6
18.	Five number summary is the five key values in ascending order.	4, 12, 18, 20, 25
19.		
20.	12 is the lower quartile and 25 is the upper extreme, so 75% lie between these.	75%

High School Mathematics Test 2015

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Further Single Variable Analysis

Calculator Allowed

Section 2 Multiple Choice Section

ANSWERS

No.	WORKING	ANSWER												
1.	<p>In Order 5.8, 6.4, 6.6, 7.4, 7.4, 8.2, 8.9, 10.4, 12.3, 12.5</p> <p>Median = $\frac{7.4 + 8.2}{2} = 7.8$</p>	C												
2.	<p>Max score Danni 75, Min score Liam 2 Range = $75 - 2 = 73$</p>	D												
3.	<p>Tony : Max score 33, Min score 2 Range = $33 - 2 = 31$ Joe : Max score 36, Min score 4 Range = $36 - 4 = 32$ Joe's range was greater by 1</p>	A												
4.	<p>Arrange Joes data in order</p> <table border="1"><tr><td>4</td><td>6</td><td>8</td><td>12</td><td>16</td><td>25</td><td>27</td><td>28</td><td>29</td><td>31</td><td>32</td><td>36</td></tr></table> <p>Median = 26 (average of 6th and 7th scores) Lower Q = 10 (average of 3rd and 4th scores)</p>	4	6	8	12	16	25	27	28	29	31	32	36	A
4	6	8	12	16	25	27	28	29	31	32	36			
5.	<p>From 15 scores, median is the 8th which is 27</p>	C												
6.	<p>Range = $41 - 5 = 36$</p>	B												
7.	<p>Lower quartile = 16 (4th score) Upper Quartile = 32 (12th score) Interquartile range = $32 - 16 = 16$</p>	C												
8.	<p>In Order Median = 24 14, 16, 17, 20, 22, 26, 29, 32, 35, 36</p> <p>Q₁ = 17 Q₃ = 32 Interquartile range = $32 - 17 = 15$</p>	A												

9.	There are 50 scores, so median is between 25 th and 26 th which are both 3's so median is 3. Lower quartile is middle of bottom 25, so 13 th score which is a 2.	B
10.	Upper quartile is middle of top 25, so 38 th score which is a 4. Interquartile range = $4 - 2 = 2$	B
11.	Range = $8 - 0 = 8$ and interquartile range is 2, so it is 4 times.	D
12.	Lowest score is end of first whisker which is 5	B
13.	Upper quartile is top end of rectangle which is 17	D
14.	Interquartile range = $17 - 8 = 9$	C
15.	29 is the lower quartile, so 75% are more than this.	D
16.	The oldest 25% are between the upper quartile and the upper extreme, so this is between 37 and 39.	D
17.	It has a long tail toward the bottom and the median and upper scores are grouped together, so it is negatively skewed.	B
18.	The histogram is positively skewed, so the box plot A has this shape.	A
19.	From Calculator Mean = 9.4 and standard deviation = 2.9	C
20.	The bulls had the lower mean, and higher SD, so had a lower average score and more variation in scores. So only A is true	A

High School Mathematics Test 2015

Multiple Choice Answer Sheet Further Single Variable Analysis

Name ANSWERS

Completely fill the response oval representing the most correct answer.

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|-----|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input checked="" type="radio"/> | D | <input type="radio"/> |
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| 11. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
| 12. | A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 14. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input checked="" type="radio"/> | D | <input type="radio"/> |
| 15. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input checked="" type="radio"/> |
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| 17. | A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 19. | A | <input type="radio"/> | B | <input type="radio"/> | C | <input checked="" type="radio"/> | D | <input type="radio"/> |
| 20. | A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |

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Further Single Variable Analysis

Calculator Allowed

Section 3

Longer Answer Section

ANSWERS

		Marks
1.	<p>(a) 21 runners so median is the 11th score.</p> <p>See green highlighting : Median is 22</p>	1
	<p>(b) Range = $43 - 5 = 38$</p>	1
	<p>(c) Mode is 28 (occurs 3 times)</p>	1
	<p>(d) Lower quartile is middle of bottom 10 scores, so between the 5th and 6th scores which are both 12's. Lower quartile = 12 See strike-through on stem and leaf plot.</p>	1
	<p>(e) Upper quartile is middle of top 10 scores, so between the 16th and 17th scores which are 30 and 34. Upper quartile = 32 See strike-through on stem and leaf plot. Interquartile range = $32 - 12 = 20$</p>	1

2.	<div>(a)</div> <table><tr><th>Points scored x</th><th>Frequency f</th><th>fx</th><th>Cumulative frequency</th></tr><tr><td>0</td><td>7</td><td>0</td><td>7</td></tr><tr><td>1</td><td>12</td><td>12</td><td>19</td></tr><tr><td>2</td><td>11</td><td>22</td><td>30</td></tr><tr><td>3</td><td>5</td><td>15</td><td>35</td></tr><tr><td>4</td><td>2</td><td>8</td><td>37</td></tr><tr><td>5</td><td>3</td><td>15</td><td>40</td></tr></table> <div>$\Sigma f = 40$$\Sigma fx = 72$</div>	Points scored x	Frequency f	fx	Cumulative frequency	0	7	0	7	1	12	12	19	2	11	22	30	3	5	15	35	4	2	8	37	5	3	15	40	<div>2 marks for complete Table</div> <div>1 mark if incomplete or has minor errors</div>
Points scored x	Frequency f	fx	Cumulative frequency																											
0	7	0	7																											
1	12	12	19																											
2	11	22	30																											
3	5	15	35																											
4	2	8	37																											
5	3	15	40																											
	<div>(b)</div> <div>Mean = $\frac{72}{40} = 1.8$</div>	<div>1</div>																												
	<div>(c)</div> <div>From 40 scores median is between 20th and 21st, which are both 2 Lower quartile is between 10th and 11th, which are both 1 Upper quartile is between 30th and 31st, which are 2 and 3 so UQ = 2.5 Interquartile range = 2.5 – 1 = 1.5</div>	<div>2 marks for correct answer</div> <div>1 mark for partial answer or answer with minor errors</div>																												

3.	<p>(a) Mean = 8.33.. (8.3) and SD (population) = 1.37 (1.4) From calculator. (Syllabus seems to indicate use of Pop SD) Sample SD = 1.44 (up to teacher to decide whether to allocate mark for this)</p>	<p>1 mark for mean 1 mark for SD</p>
	<p>(b) Survey B has a lower mean than Survey A meaning that the central tendency (average) is less, the scores were lower overall. Survey B has a higher SD than Survey A meaning the spread of the scores is greater, the scores were more spread out or less consistent.</p>	<p>1 mark for comment on mean 1 mark for comment on SD</p>
	<p>(d) Survey A was requested by the producers of the movie, so the participants may have been chosen to give a positive view of the movie which would be biased. Survey A also had a very small sample size compared to Survey B, so the results would be less reliable, as each participant has a bigger influence on the result.</p>	<p>1 mark for comment for mention of possible bias 1 mark for mention of sample size</p>