High School Mathematics Test 2014

Year 10

Further Measures of Spread

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.

The scores of 11 contestants in a dance contest are shown below.

5, 5, 5, 6, 6, 7, 8, 8, 8, 9, 9

Questions 1 – 3 refer to the dance scores.

1. What is the median of the scores?

……

……

2. What is the upper quartile of the scores?

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3. What is the interquartile range of the scores?

……

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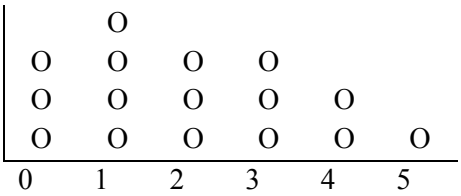
The Vipers football team scored the following number of goals in their games last season.



Questions 4 – 5 refer to the dance scores.

4. What is the lower quartile of the scores?

……

……

5. What is the interquartile range of the scores?

……

……

Stefan makes batches of muffins as part of his job as a baker. The number of batches he had ordered each day over a fortnight are shown below.

4, 5, 4, 3, 5, 7, 3, 4, 2, 3, 5, 3, 8, 5.

Questions 6 and 7 refer to the muffin batches.

6. What is the upper quartile of the scores?

……

……

7. What is the interquartile range of the scores?

……

……

Sam records the number of hours he spends on the internet each day for 10 days.

2, 2, 3, 4, 5, 1, 3, 2, 5, 4.

Questions 4 – 6 refer to the data above.

8. Find the interquartile range of his times.

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9. Write a 5 number summary for the data.

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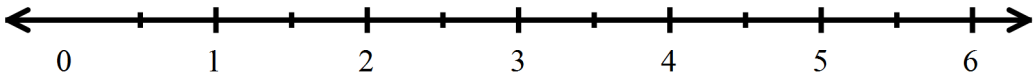
10. Draw a box and whisker plot of the data.



Eighteen friends record how many DVD's they have watched in their lives.

Their results were:

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

Questions 11 and 13 refer to the stem and leaf plot above.

11. What is the interquartile range of the number?

.....

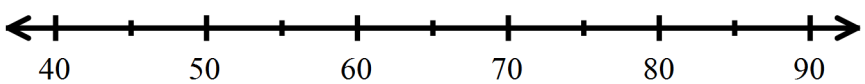
.....

12. Write a 5 number summary for the data.

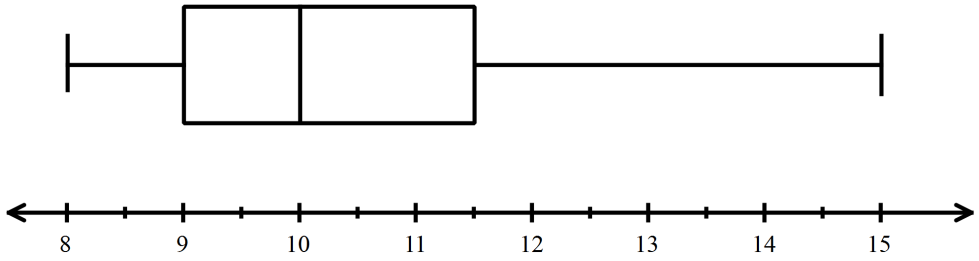
.....

.....

13. Draw a box and whisker plot of the data.



14.



What percentage of the scores on the box plot above lie between 9 and 15?

.....

.....

15. What is the population standard deviation of the scores below (correct to 2 decimal places)?

5, 8, 7, 9, 6, 9, 4, 6, 4, 1, 9, 8, 3, 2, 7.

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High School Mathematics Test 2014

Year 10

Further Measures of Spread

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 range of the scores below?

   15, 16, 19, 25, 22, 26, 25, 37, 40, 52

   A. 15 B. 24 C. 37 D. 52

2. Joe and Martin record the number of hours they spend each day working on their part time jobs.

   Joe 1, 3, 2, 2, 3, 4, 5, 1, 3, 2, 8, 2, 4,
   Martin 0, 5, 6, 2, 1, 3, 5, 5, 2, 7, 8, 0, 1, 10

   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. Martin's range was greater by 1.

   D. Martin's range was greater by 3.

3. What is value of the lower quartile of the scores below?

   24, 26, 29, 35, 32, 36, 35, 37, 40, 52

   A. 26 B. 28 C. 29 D. 30

4. What is the interquartile range of the scores below?

   15, 18, 19, 19, 20, 22, 27, 28, 30, 32, 35, 40

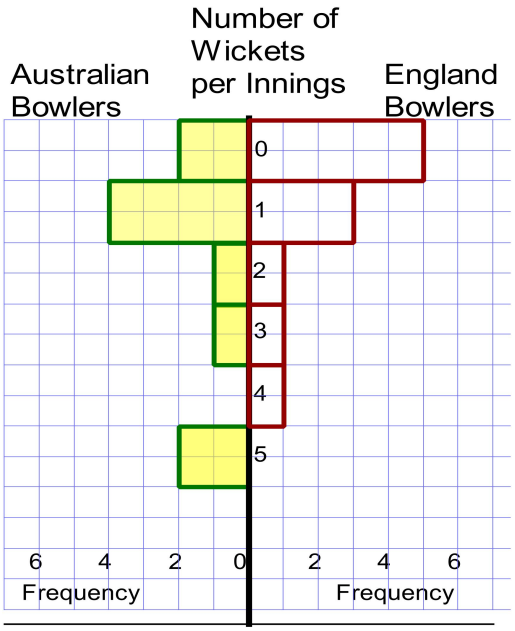
   A. 12 B. 19 C. 31 D. 25

5. Frank makes a deposit each week in a savings account. He only deposits what he can afford each week. In the last 9 weeks he has deposited the following amounts.

   $20, $35, $12, $10, $120, $56, $140, $18, $48.

   What is the interquartile range of the deposits?

   A. $20 B. $73 C. $120 D. $140



Questions 6 and 7 refer to the back to back histogram above.

6. What was the interquartile range for the Australian Bowlers?

A. 1 B. 2 C. 2.5 D. 3

7. Which is **not** correct?

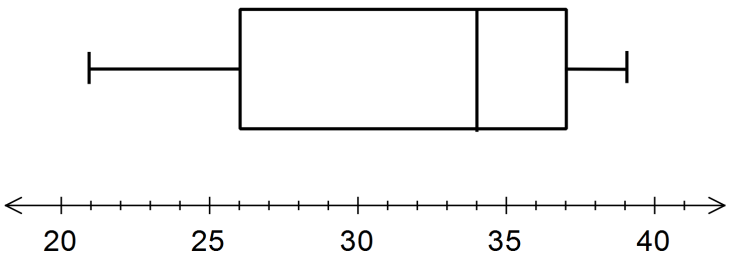
A. The Australian range was 5.

B. The England interquartile range was the same as that of the Australians.

C. The England interquartile range was 2.5.

D. The England range was 1 less than the Australian range.

The box plot summarises the percentage of the vote in the polls that the Browns Party had each week over a year.



Questions 8 – 9 refer to the box plot above.

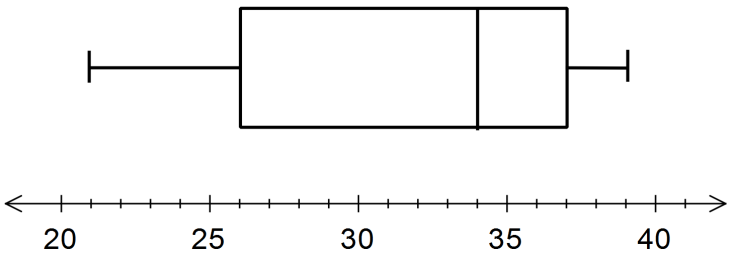
8. What was the range of the votes?

A. 11 B. 15 C. 17 D. 18

9. What was the interquartile range of the votes?

A. 11 B. 18 C. 26 D. 37

10. Which best describes the data represented in the box plot below.



A. The data is bimodal.

B. The data is negatively skewed.

C. The data is positively skewed.

D. The data is symmetric.

Mathilda sends 25 text messages and records the number of characters she uses in each. They were:

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

Questions 11 and 12 refer to the stem and leaf plot above.

11. The percentage of scores that were greater than 24 is closest to:

A. 25% B. 50% C. 75% D. 100%

12. What was the interquartile range of the scores?

A. 29 B. 49 C. 53 D. 62

13. Steve is a basketball coach.
At each training session he records the number of goals that two of his players can land from 50 shots. The mean and standard deviation for their numbers goals are shown below.

Carl has a mean of 42.5 with a standard deviation of 3.8.

Rodrigo has a mean of 45.2 with a standard deviation of 2.2.

Which statement is correct?

A. Carl has a higher average but is less consistent.

B. Carl has a higher average and is more consistent.

C. Rodrigo has a higher average but is less consistent.

D. Rodrigo has a higher average and is more consistent.

14. Rick recorded the diameter of the 12 trees in her back garden (in metres to 1 decimal place).
They were: 0.8, 1.5, 0.6, 0.9, 1.1, 0.8, 0.3, 1.1, 0.7, 0.5, 0.8, 0.3.

What were the mean and population standard deviation of the diameters?
(Correct to two decimal places.)

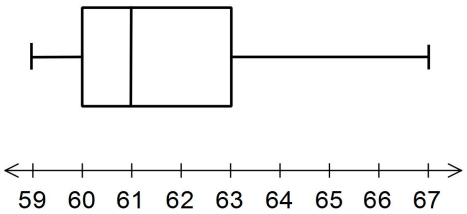
A. Mean = 0.78 and standard deviation = 0.33

B. Mean = 0.78 and standard deviation = 0.45

C. Mean = 0.80 and standard deviation = 0.33

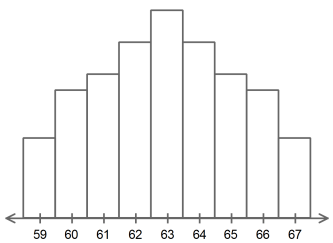
D. Mean = 0.80 and standard deviation = 0.45

15. The box plot below is drawn to illustrate a distribution.

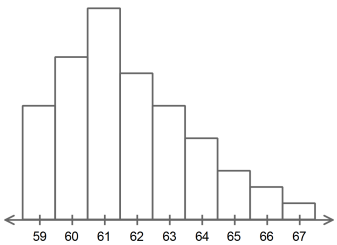


Which histogram could represent the same distribution?

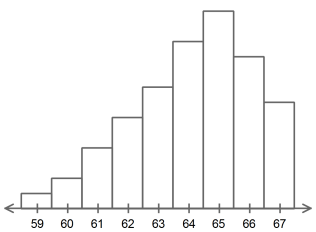
A.



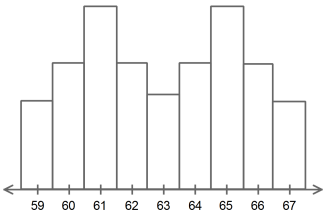
B.



C.



D.



High School Mathematics Test 2014

Year 10

Further Measures of Spread

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. A hotel records the number of booking it takes per hour over two days. The results are summarised in the frequency distribution table below.

Number of Bookings (x)	Frequency (f)	fx	Cumulative frequency
0	4		
1	2		
2	1		
3	0		
4	5		
5	6		
6	8		
7	10		
8	8		
9	4		
	$\Sigma f =$	$\Sigma fx =$	

(a) Complete the table above. **3**

(b) Write a five number summary for the data. **3**

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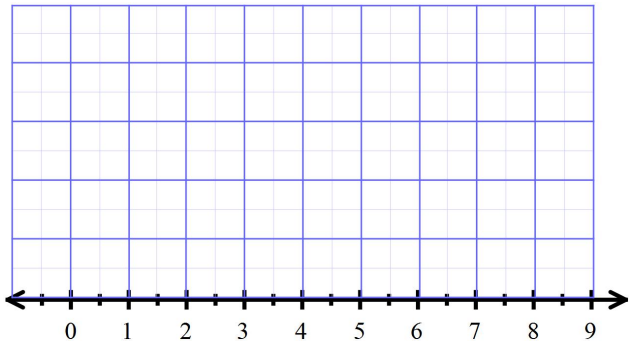
Marks

(c) Draw a box plot for the data. **2**



(d) Find the mean and standard deviation from the data. **2**

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High School
Mathematics Test 2014

Further Measures of Spread

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 ⬭

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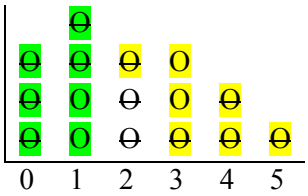
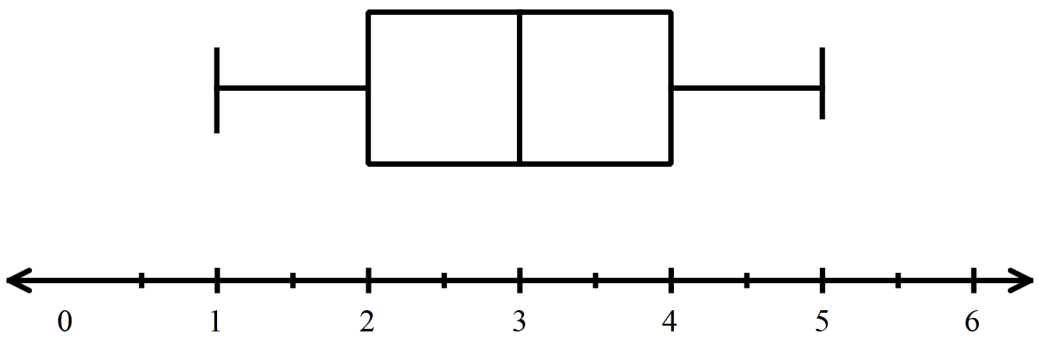
Further Measures of Spread

ANSWERS

Section 1 (1 mark each)	
	Working and Answers
1.	~~5, 5, 5, 6, 6~~, 7, ~~8, 8, 8, 9, 9~~ Median = 7
2.	~~8, 8,~~ 8, ~~9, 9~~ Upper quartile = 8
3.	~~5, 5~~, 5, ~~6, 6~~ Lower quartile = 5 Interquartile range = 8 – 5 = 3
4.	 Median = 2 middle two scores (8th and 9th) are both 2. Lower quartile (4th and 5th scores) = 1
5.	Upper quartile = (12th and 13th scores) = 3 Interquartile range = 3 – 1 = 2
6.	Arrange in order: ~~2, 3, 3~~, 3, ~~3, 4, 4~~, ~~4, 5, 5~~, 5, ~~5, 7, 8~~, Upper quartile = 5.
7.	Lower quartile = 3 Interquartile range = 5 – 3 = 2
8.	In order 1, 2, 2, 2, 3, 3, 4, 4, 5, 5. Median = 3, LQ = 2, UQ = 4, Interquartile range = 4 – 2 = 2
9.	The five number summary is 1, 2, 3, 4, 5.
10.	

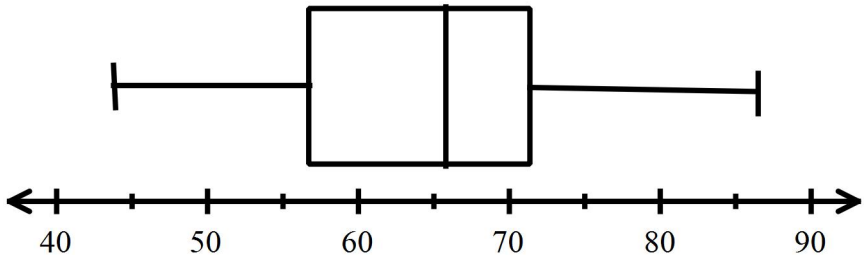
11.

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

Median = 66 LQ = 57 UQ = 72
Interquartile range = 72 – 57 = 15

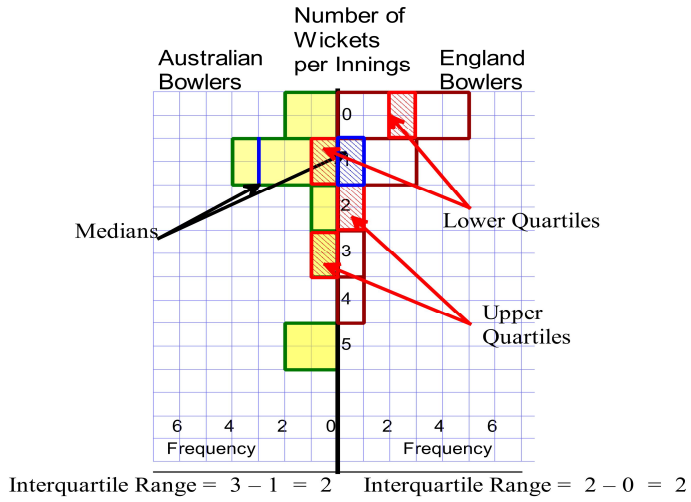
12. 43, 57, 66, 72, 86

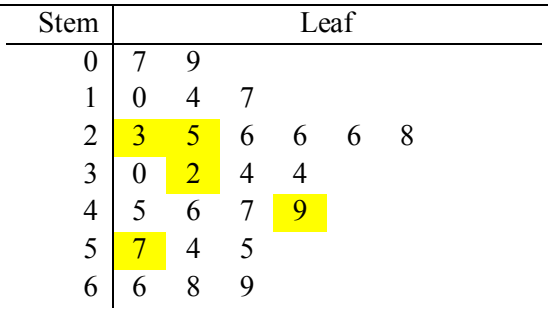
13.



14. 9 is Lower Quartile and 15 is Upper Extreme.
75% lie between these.

15. $\sigma_n = 2.53$

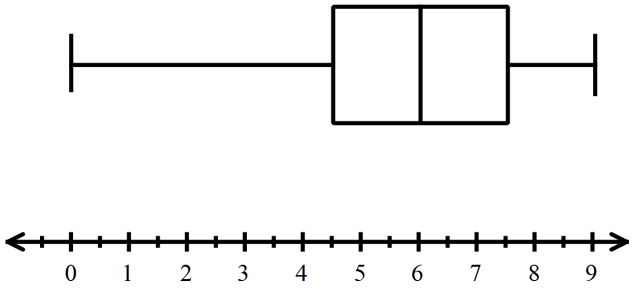
Section 2 (1 mark each)		
	Working	Answers
1.	15, 16, 19, 25, 22, 26, 25, 37, 40, 52 Range = 52 – 15 = 37.	C
2.	Joe 1, 3, 2, 2, 3, 4, 5, 1, 3, 2, 8, 2, 4, Range = 8 – 1 = 7 Martin 0, 5, 6, 2, 1, 3, 5, 5, 2, 7, 9, 0, 1, 10 Range = 10 – 0 = 10 Martins range was greater by 3	D
3.	~~24, 26~~, 29, ~~35, 32~~, 36, 35, 37, 40, 52 Lower quartile = 29	C
4.	~~15, 18~~, 19, 19, ~~20, 22~~, ~~27, 28~~, 30, 32, ~~35, 40~~ Upper q = $\frac{30+32}{2} = 31$ Upper q = $\frac{19+19}{2} = 19$ Interquartile range = 31 – 19 = 12.	A
5.	In order ~~$10,~~ $12, $18, ~~$20,~~ $35, ~~$48,~~ $56, $120, ~~$140.~~ Upper q = $\frac{56+120}{2} = \frac{176}{2} = 88$ Upper q = $\frac{12+18}{2} = \frac{30}{2} = 15$ Interquartile range = 88 – 15 = 73.	B
6.	 Interquartile Range = 3 – 1 = 2 Interquartile Range = 2 – 0 = 2	B
7.	The England Interquartile range was 2 not 2.5.	C
8.	Range = 39 – 21 = 18	D
9.	Interquartile Range = 26 – 37 = 11	A
10.	There is not enough information to indicate if it is bimodal. The closeness of the median, upper quartile and top extreme and a longer tail toward the lower values indicate negative skew.	B

11.	 Median = 49 Lower Q = $\frac{23+25}{2}=24$ Upper Q = $\frac{49+57}{2}=53$ 24 is lower Q so 75% are above this.	C
12.	Interquartile range = 53 – 24 = 29.	A
13.	Rodrigo has higher mean (average) and smaller SD which means he is more consistent.	D
14.	Mean = 0.783333=0.78 (1 dp) and standard deviation = 0.3312 = 0.33 (1 dp)	A
15.	The box plot indicates a positive skew which is that shown in histogram B.	B

Section 3		
	Working and Answers	Marks
1.	a)	3 MARKS Basically 1 for each column and 1 for the totals. Allow for subsequent error in marking.
	b) Median (24th and 25th scores) = 6 Lower Q (12th and 13th scores)= $\frac{4+5}{2}=4.5$ Upper Q (36th and 37th scores)= $\frac{7+8}{2}=7.5$ Five number Summary : 0, 4.5, 6, 7.5, 9.	3 MARKS 1 for median 1 for quartiles 1 for extremes

Number of Bookings (x)	Frequency (f)	fx	Cumulative frequency
0	4	0	4
1	2	2	6
2	1	2	7
3	0	0	7
4	5	20	12
5	6	30	18
6	8	48	26
7	10	70	36
8	8	64	44
9	4	36	48

$\Sigma f = 48$ $\Sigma fx = 272$

	c) 	2 MARKS 1 for general shape correct. 1 for accurate placement of 5 numbers
	d) $\bar{x} = 5.67\ (2\ d\ p)$ $\sigma_n = 2.54\ (2\ d\ p)$ [From Calculator]	2 MARKS 1 each

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Further Measures of Spread

Multiple Choice Answer Sheet

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 ○