

High School Mathematics Test 2014

Year
10

Bivariate Data

Non Calculator

Skills and Knowledge Assessed:

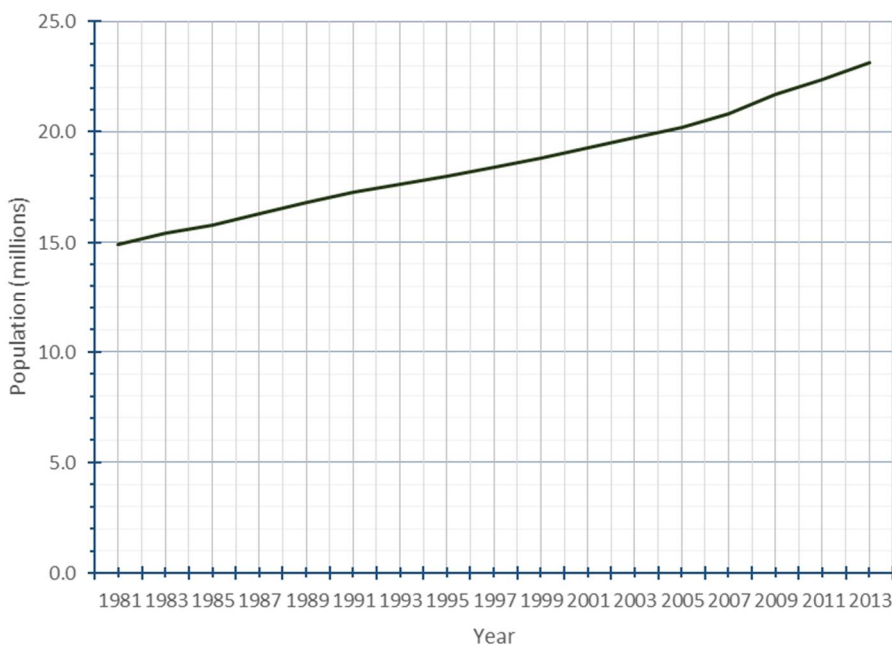
- Use scatter plots to investigate and comment on relationships between two numerical variables (ACMSP251)
- Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252)
- 10A Use information technologies to investigate bivariate numerical data sets. Where appropriate use a straight line to describe the relationship allowing for variation (ACMSP279)

Name _____

Section 1 Short Answer Section

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

Australian Population Change Since 1981



Questions 1 – 3 refer to the line graph above.

1. What was the population in 2005?

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2. In which year did the Australian population reach 18 million?

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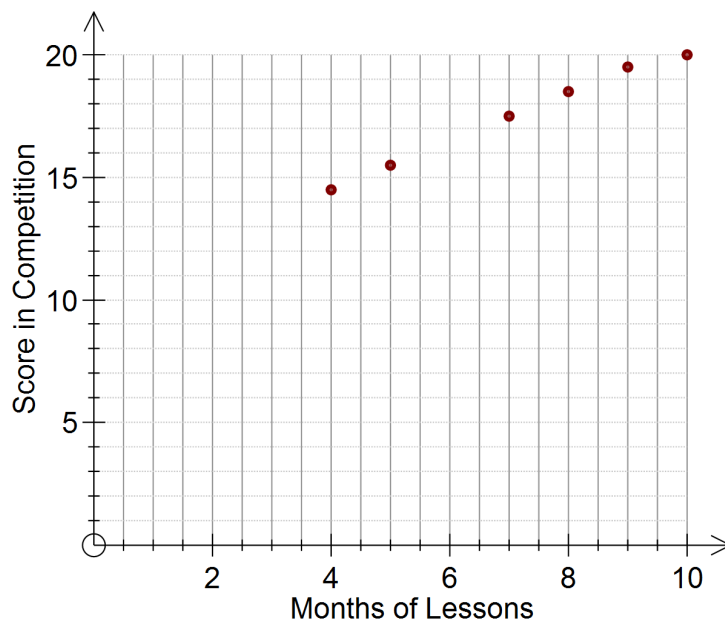
3. Write a brief description of how the Australian population has changed since 1981?

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.....

Hannah has a dancing school and has recorded the scores of her students in a competition against the number of months they were having lessons. She has already plotted six student's results. The rest are shown in the table.

Months of Lessons	Score in Competition
4	15
6	16
7	18
5	16
3	14
2	14
9	20
1	12
2	13



Questions 4 – 6 refer to the information above.

4. Plot the data from the table on the graph above.
5. How many students had six months or more of lessons?

.....

6. How many students scored 16 in the competition?

.....

7. NASA has recorded the area (in square km) of sea ice in the Arctic each year for the last 34 years.
What type of graph would be best to represent this data? Explain why.

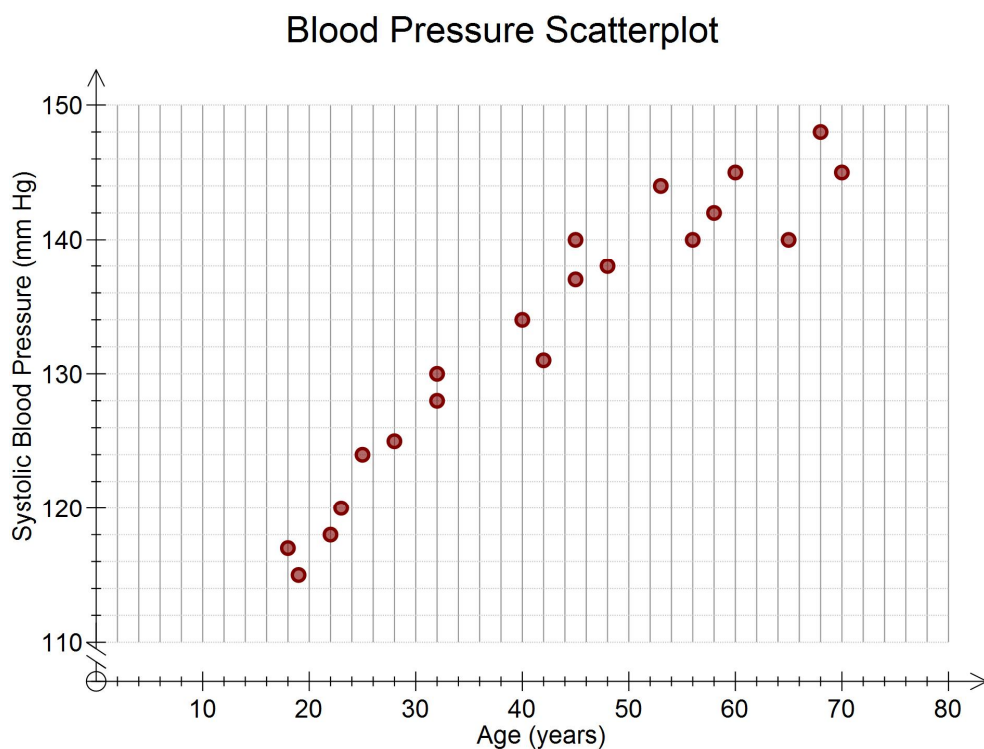
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The scatterplot shows the results of a survey of the blood pressure of men of various ages.



Question 8 – 11 refer to the scatterplot above.

8. What was the highest blood pressure recorded in the survey?

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9. How many of those surveyed had a blood pressure of 140?

.....

10. What percentage of those surveyed were aged less than 30?

.....

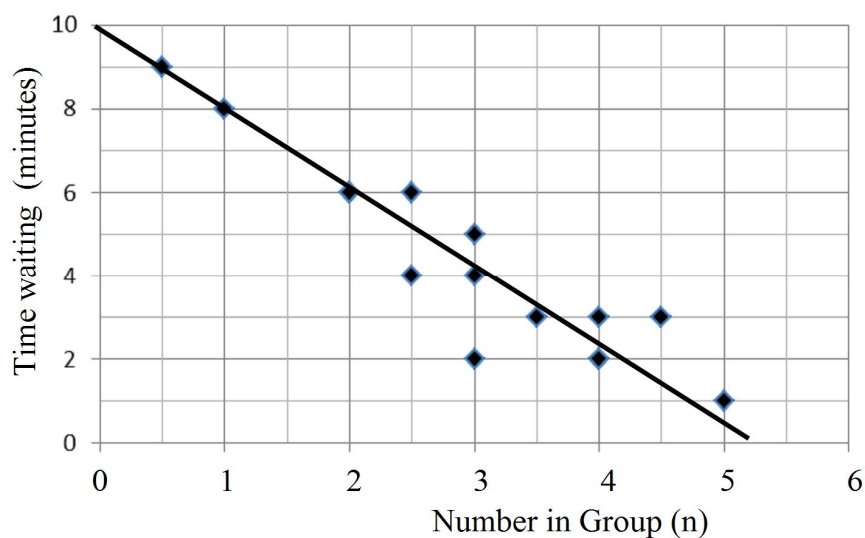
11. What appears to happen to the blood pressures as age increases?

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The scatterplot shows the times that groups were waiting to get into a venue, compared to the number in the group.

A line of best fit has been drawn on the scatterplot.



Question 12 – 13 refer to the scatterplot above.

12. What is the gradient of the line of best fit?

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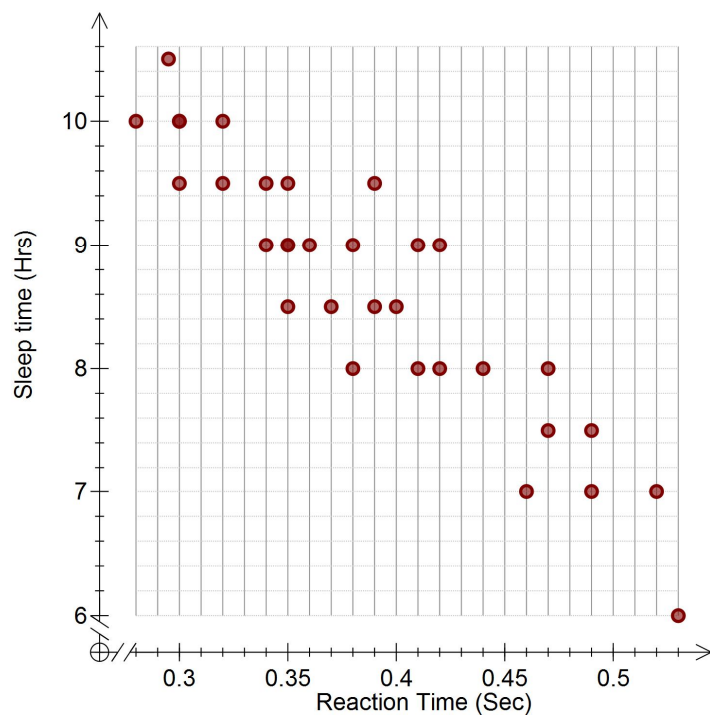
.....

13. What is the equation of the line of best fit?

.....

.....

Veronica compared the reaction times of students and the number of hours of sleep they had the night before.



Questions 14 and 15 refer to the scatter plot above.

14. What fraction of the students slept for less than 8 hours?

.....

.....

15. Describe the apparent relationship between sleep times and reaction times.

.....

.....

16. Draw a line of best fit on the scatter plot.

17. What is the gradient of the line of best fit?

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18. What is the equation of the line of best fit?

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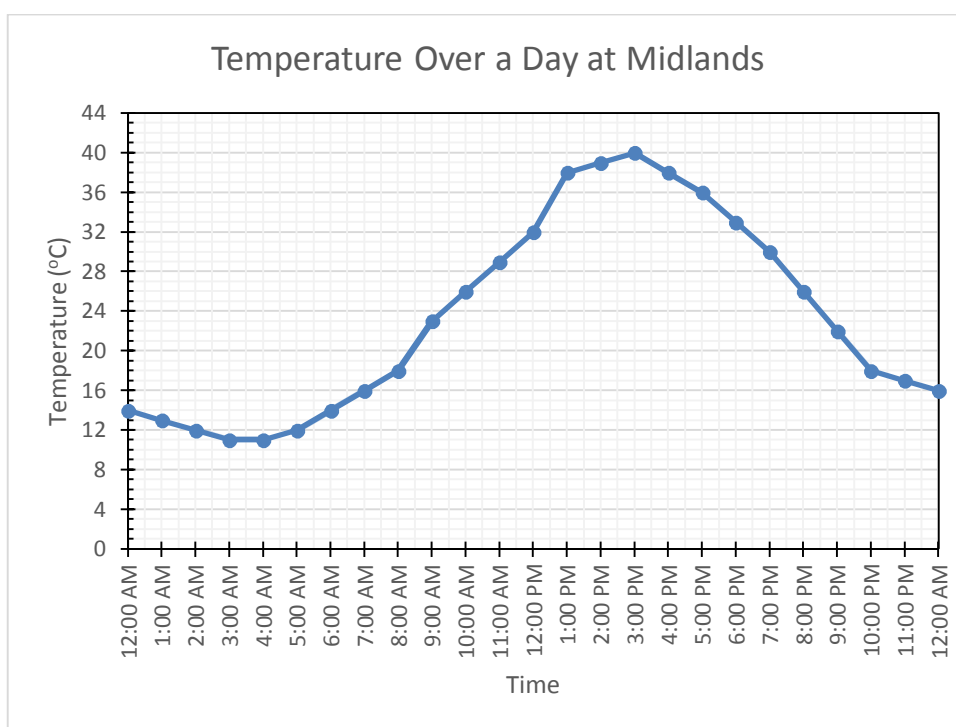
Bivariate Data

Calculator Allowed

Name _____

Section 2 Multiple Choice Section

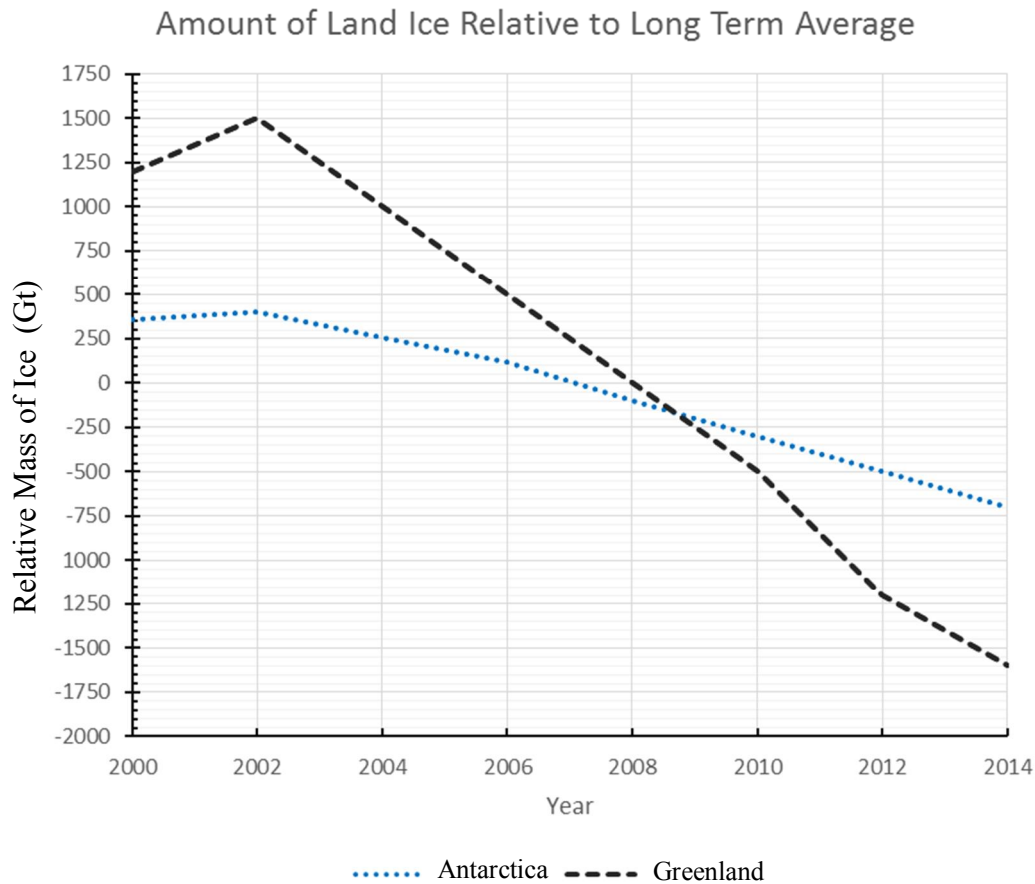
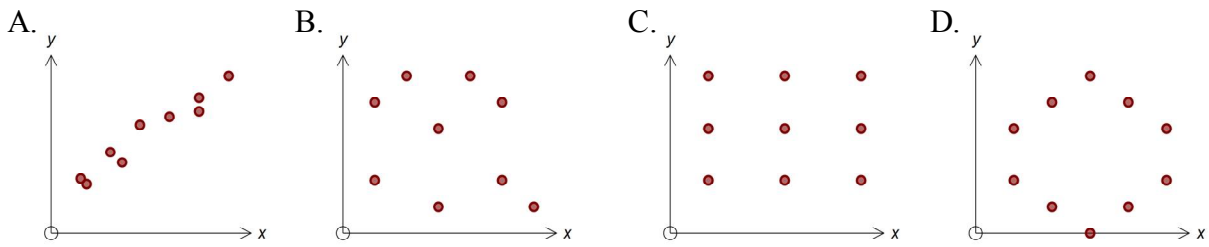
Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.



Questions 1 – 4 refer to the temperature graph above.

- What was the temperature at 6 am?
A. 12°C B. 14°C C. 16°C D. 33°C
- At what time in the morning was the temperature 23°C?
A. 9 am B. 9:30 am C. 10 am D. 10:30 am
- For how many hours was the temperature above 38°C?
A. 2 hours. B. 3 hours. C. 4 hours. D. 5 hours.
- What was the difference between the highest and lowest temperatures (the temperature range)?
A. 11°C B. 16°C C. 27°C D. 29°C

5. Which scatter graph indicates there is a linear relationship between x and y ?



Questions 6 – 7 refer to the line graph above.

6. Which is correct?

- A. Antarctica reached the zero point about six months before Greenland.
- B. Antarctica reached the zero point about a year before Greenland.
- C. Greenland reached the zero point about six months before Antarctica.
- D. Greenland reached the zero point about a year before Antarctica.

7. When was the greatest loss of mass in a two year period?

- A. In Antarctica between 2004 – 2006.
- B. In Greenland between 2004 – 2006.
- C. In Greenland between 2010 – 2012.
- D. In Greenland between 2012 – 2014

The scatterplot shows the results of a survey of 25 students in mixed year group.



Questions 8 and 9 refer to the scatter plot above.

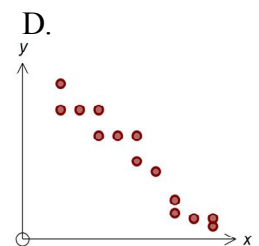
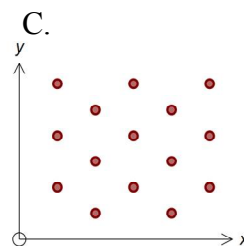
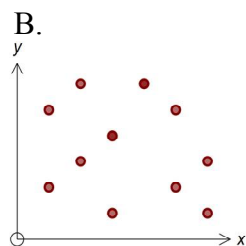
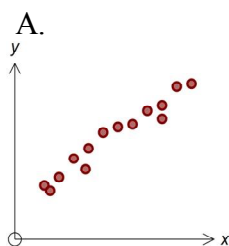
8. How many of the group had an arm span above 160 cm?

- A. 8
- B. 9
- C. 10
- D. 15

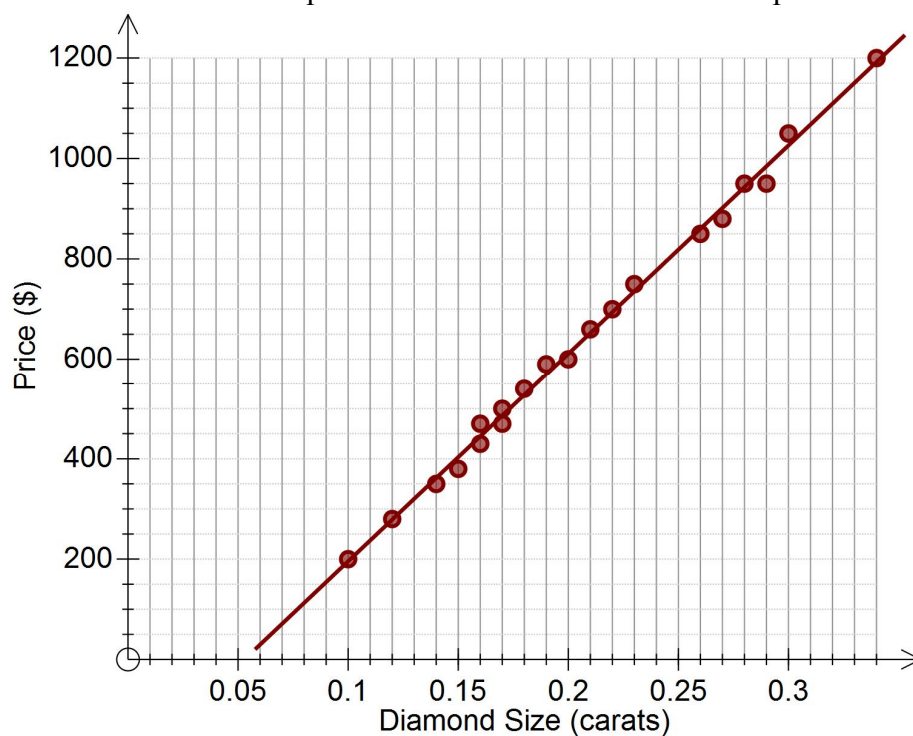
9. What type of relationship is evident between height and arm span?

- A. A strong negative linear relationship
- B. A weak negative linear relationship
- C. A strong positive linear relationship
- D. A weak positive linear relationship

10. Which scatter graph indicates there is a strong negative relationship between x and y ?



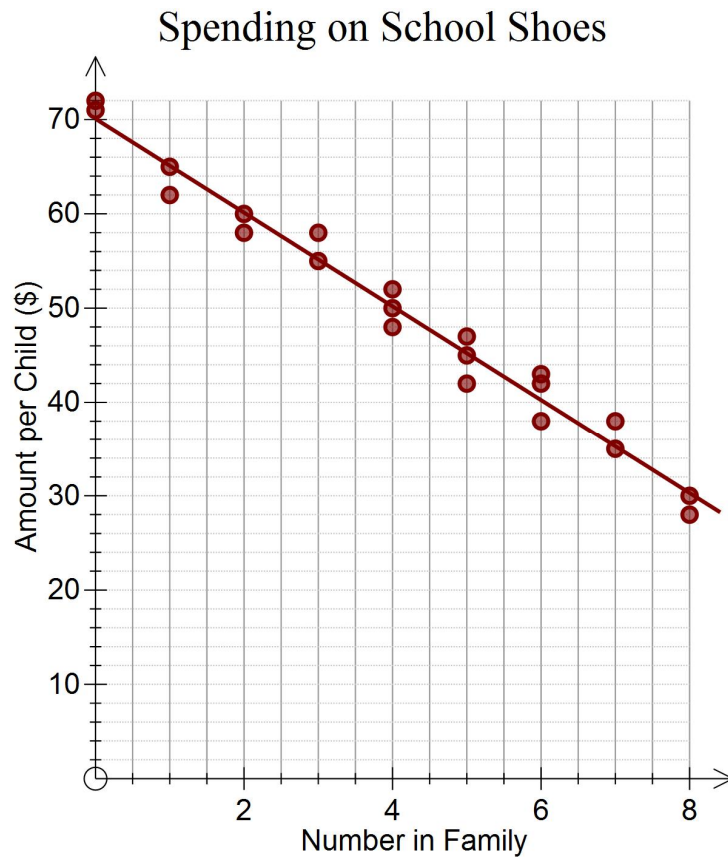
The scatterplot shows the relationship between size of a diamond and its price.



Questions 11 – 13 refer to the scatter plot.

11. What percentage of the diamonds were worth less than \$400?
A. 4% B. 5% C. 20% D. 25%
12. What is the ratio of diamonds smaller than 0.25 carats to those larger than 0.25 carats?
A. 3 : 7 B. 7 : 3 C. 7 : 10 D. 10 : 7
13. A line of best fit has been drawn on the scatterplot. What is the best approximation for the gradient of this line?
A. 4 B. 40 C. 400 D. 4 000

The scatterplot shows the relationship between the size of family and the amount spent on each child's school shoes.



Questions 14 – 16 refer to the scatter plot.

14. What type of relationship is evident between the number and the amount?
- A. A strong negative linear relationship.
 - B. A weak negative linear relationship.
 - C. A strong positive linear relationship.
 - D. A weak positive linear relationship.
15. A line of best fit has been drawn on the scatterplot. What is the best approximation for the gradient of this line?
- A. -5.
 - B. -4.
 - C. 4.
 - D. 5.
16. What is the equation of this line?
- A. $y = -4x + 70$
 - B. $y = -5x + 70$
 - C. $y = -70x + 4$
 - D. $y = -70x + 5$

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Bivariate Data

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.

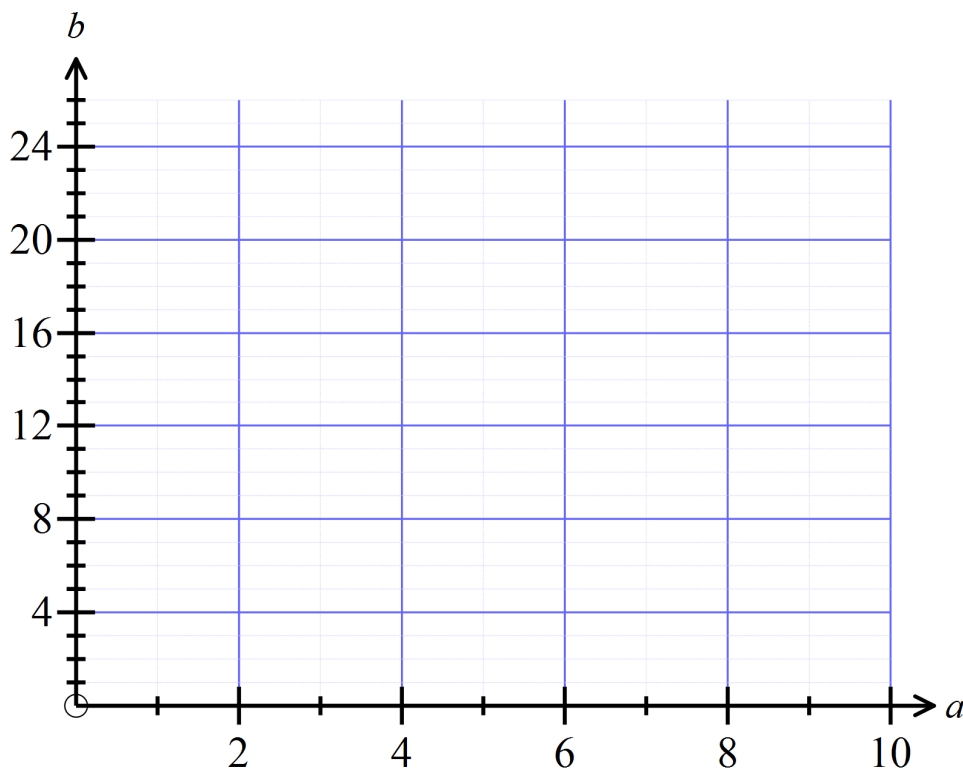
Marks

1. Jessica collects data on the age (a years) and the breadth (b cm) of trees in her local park. She records the results in the table below.

Age	5	3	7	6	9	8	3	4	5	2	7	1
Breadth	13	9	18	17	22	21	10	13	14	8	17	6

- (a) Plot the points on a scatter plot below.

2



- (b) What fraction of the trees were 12 cm or more in breadth.

1

.....

.....

Marks

(c) Draw a line of best fit on the graph.

1

(d) Determine the equation of the line of best fit.

2

.....

.....

(e) Use the equation to find the breadth of a tree that was 15 years old.

1

.....

.....

High School Mathematics Test 2014

Bivariate Data

Multiple Choice Answer Sheet

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"/> |
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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"/> |
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| 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"/> |

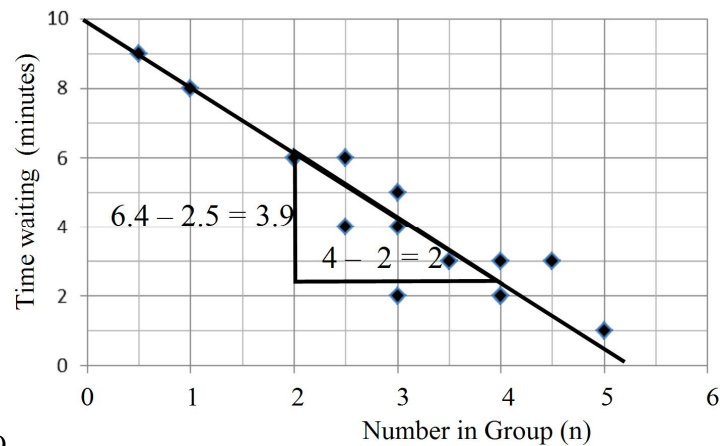
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Bivariate Data

ANSWERS

Section 1 (1 mark each)	
Working and Answers	
1.	Around 20.2 million (possibly allow between 20.1 and 20.4)
2.	1995
3.	The population has increased steadily at a rate which varied slightly over the years.
4.	<p>Score in Competition</p> <p>Months of Lessons</p>
5.	Seven students had six months or more of lessons.
6.	Two students scored 16.
7.	A line graph as it illustrates the way that the area of ice has changed over time.
8.	148
9.	3
10.	6 out of 20 were under thirty. $\text{Percentage under 30} = \frac{6}{20} \times 100 = 30\%$
11.	As age increases so does blood pressure.

12.



$$\text{Gradient} = -\frac{3.9}{2} = -1.95$$

Accept any value around -1.8 to -2.2 provided working shown.

13.

$$\text{Equation } y = mx + b$$

$$y = -1.95x + 10$$

14.

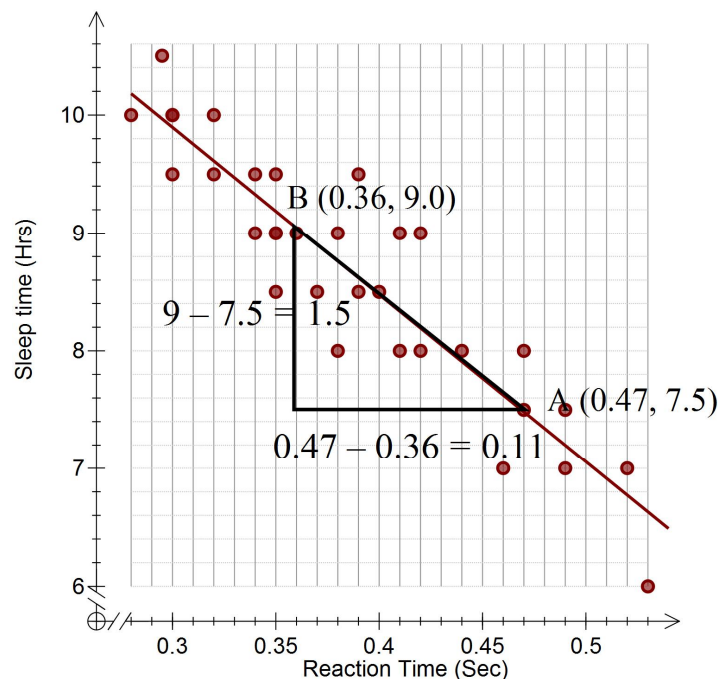
6 students out of 30 slept less than 8 hours.

$$\text{Fraction under 8 hours sleep: } = \frac{6}{30} = \frac{1}{5}$$

15.

As the hours of sleep increased the reaction time decreased,. The relationship is a negative linear relationship.

16.

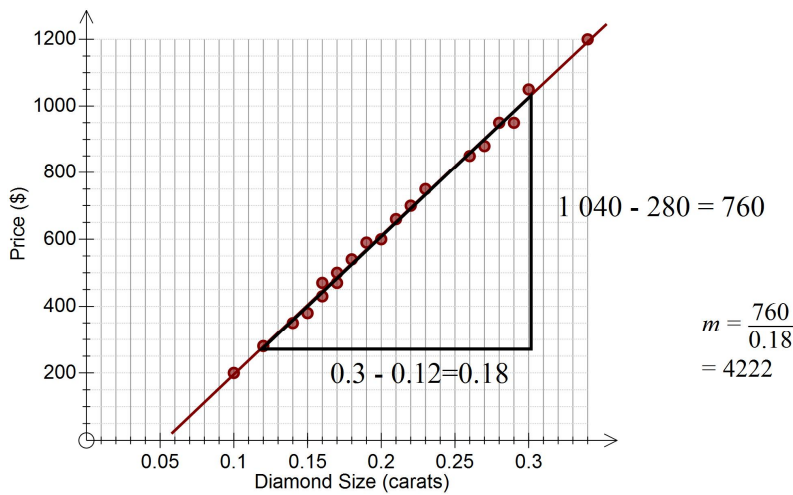
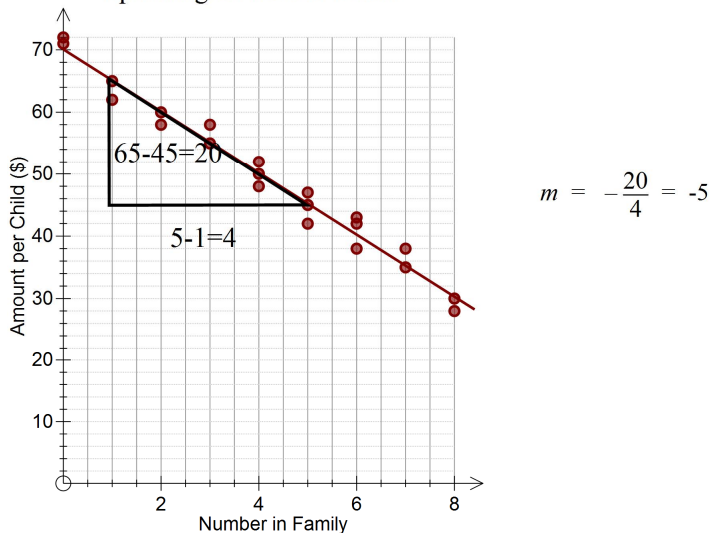


17.

Using two points on the line A (0.47, 7.5) and B (0.36, 9.0) in this case.

$$\text{Gradient} = -\frac{1.5}{0.11} = -13.6$$

18.	Using any point on the line (A in our case) $y = mx + b$ Sub point A and the gradient. $7.5 = -13.6 \times 0.47 + b$ $7.5 = -6.392 + b$ $b = 6.392 + 7.5$ $b = 13.892$ $y = -13.6x + 13.9$ (to 1 dp)
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Section 2 (1 mark each)		
	Working	Answers
1.	14°C from graph.	B
2.	9 am from graph	A
3.	From 1 pm to 4 pm, a total of 3 hours.	B
4.	Range = $40 - 11 = 29^{\circ}\text{C}$	D
5.	A has the points approaching a straight line.	A
6.	Antarctica reached zero in 2007 and Greenland in 2008, Antarctica was a year ahead.	B
7.	There was a fall of 700 Gt from 2010 to 2012 in Greenland.	C
8.	There are 8 above the horizontal line for 160.	A
9.	A moderately strong positive linear relationship	C
10.	D has points which could be approximated by a line with a negative gradient.	D
11.	4 out of 20 = 20%	C
12.	14 less than 0.25 to 6 more, so Ratio = $14 : 6 = 7 : 3$.	B
13.		D
14.	A strong negative linear relationship	A
15.	<p>Spending on School Shoes</p> 	A
16.	Gradient = -5 and y intercept = 70, so equation is $y = -5x + 70$.	B

Section 3		
	Working and Answers	Marks
1.	<p>a)</p>	
	<p>b) There are 8 out of 12 that are 12 cm or more. Fraction = $\frac{8}{12} = \frac{2}{3}$</p>	1
	c) see graph	1
	<p>d) Gradient = $m = \frac{8}{4} = 2$ y intercept = 4 $y = 2x + 4$ Using the variables a and b. $b = 2a + 4$</p>	2 (1 for gradient) (1 for equation)
	<p>e) $b = 2a + 4$ $b = 2(15) + 4$ $b = 34$ cm</p>	1

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Multiple Choice Answer Sheet

Name _____ **Marking Sheet**

Completely fill the response oval representing the most correct answer.

- | | | | | | | | | |
|-----|---|----------------------------------|---|----------------------------------|---|----------------------------------|---|----------------------------------|
| 1. | A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 5. | A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
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| 14. | A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 15. | A | <input checked="" type="radio"/> | B | <input type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |
| 16. | A | <input type="radio"/> | B | <input checked="" type="radio"/> | C | <input type="radio"/> | D | <input type="radio"/> |