

Year 12 Mathematics Applications
Test 1 2020

Section 1 Calculator Free
Data

STUDENT'S NAME _____

DATE: Thursday 27th February

TIME: 20 minutes

MARKS: 20

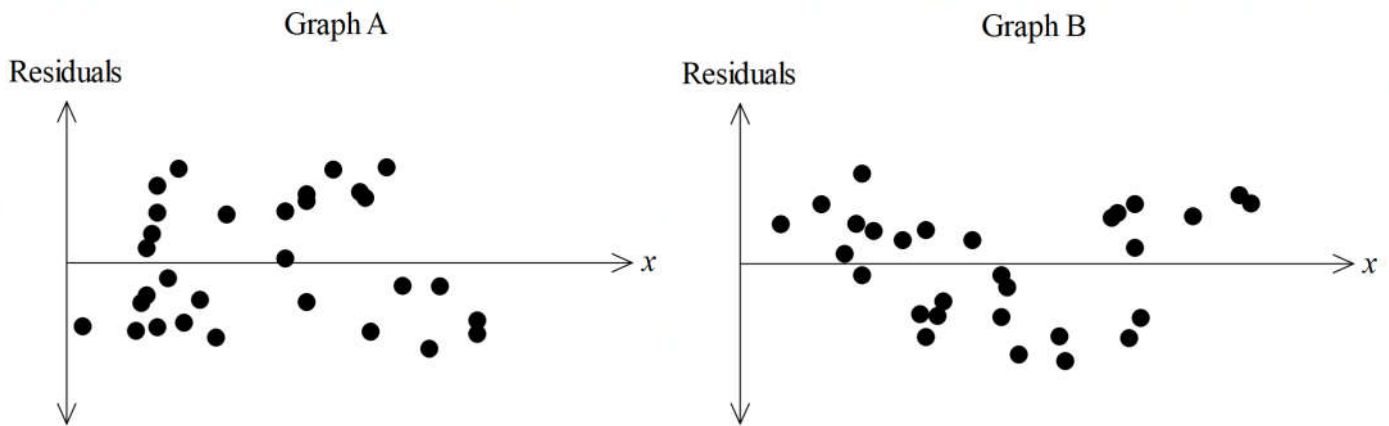
INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

1. (4 marks)

Consider the following two residual plots show.



Comment on the appropriateness of fitting a linear regression model to the each of the two data sets represented in Graph A and Graph B

2. (16 marks)

The table below shows a company's revenue, r , in millions of dollars, in a week, w . A linear regression model is used to predict future revenue amounts. The equation of the least squares of regression line is given below.

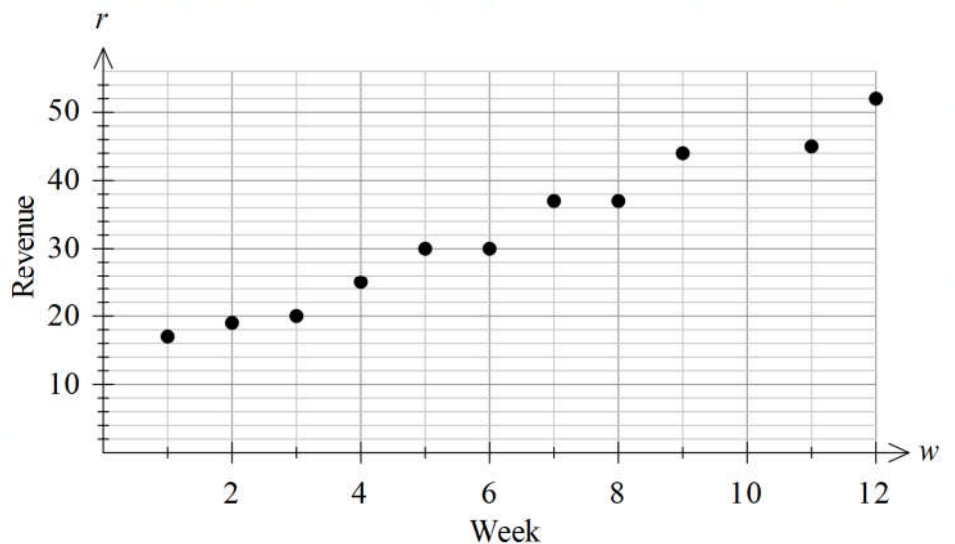
$$\hat{r} = 3w + 14$$

(a) State the response variable. [1]

(b) Use the least squares regression equation to complete the missing values in the table below. [3]

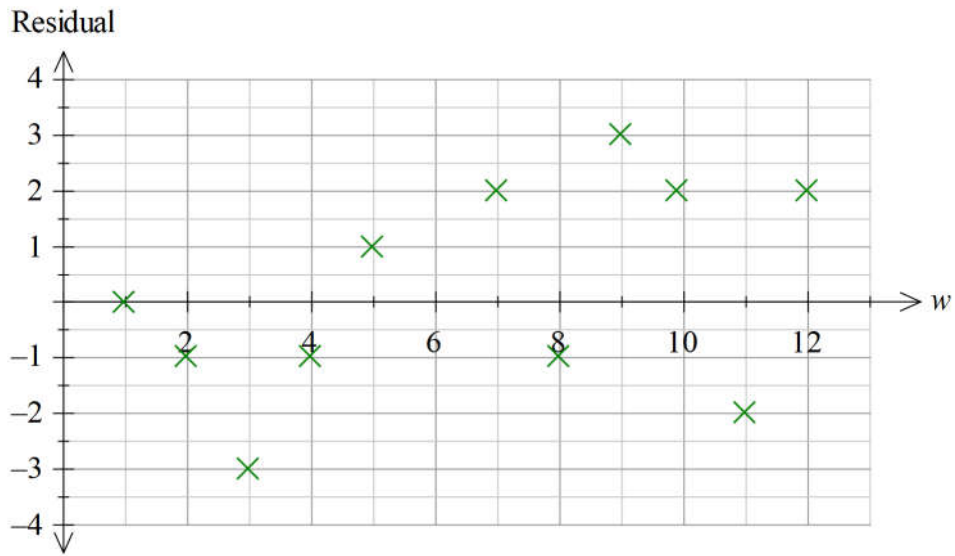
Week w	Revenue r	\hat{r}	Residual
1	17	17	0
2	19	20	-1
3	20	23	-3
4	25	26	-1
5	30	29	1
6	30		
7	37	35	2
8	37	38	-1
9	44	41	3
10		44	2
11	45	47	-2
12	52	50	2

(c) Plot the missing value you added to the revenue column in the table in part (b) on the scatterplot below and comment on the relationship between r and w . [3]



(d) Graph the least squares regression line on the scatterplot. [2]

(e) Plot the residual value you added to the table in part (b) on the residual plot below. [1]



(f) (i) Predict the company's revenue for week 10. [2]

(ii) Comment on the reliability of your prediction in part. [3]

(g) The company directors suggested that as the weeks increase, it will cause the revenue to also increase. Provide a non-causal explanation for the association between these two variables. [1]

Year 12 Mathematics Applications
Test 1 2020

Section 2 Calculator Assumed
Data

STUDENT'S NAME _____

DATE: Thursday 27th February

TIME: 30 minutes

MARKS: 30

INSTRUCTIONS:

Standard Items: Pens, pencils, drawing templates, eraser

Special Items: Three calculators, notes on one side of a single A4 page (these notes to be handed in with this assessment)

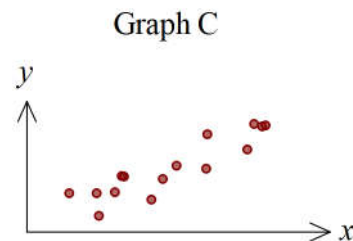
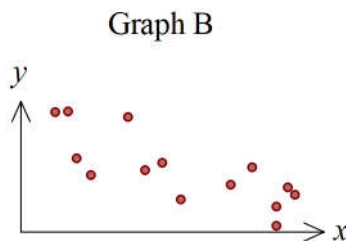
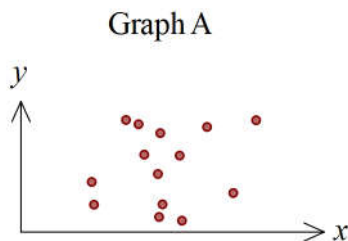
Questions or parts of questions worth more than 2 marks require working to be shown to receive full marks.

3. (2 marks)

Mrs Pontré wants to investigate if there is a relationship between students' tests results and the amount of natural light in the classroom.
 Clearly indicate which is the explanatory variable and which is the response variable.

4. (3 marks)

Match each of the scatter graphs with the most appropriate r value from the list below.



$r = -0.99$

$r = 0.20$

$r = 0.80$

$r = 0.91$

$r = 0.45$

$r = -0.80$

5. (8 marks)

A survey of 200 people was conducted to determine if there is an association between age and type of car license obtained. The results are shown in the table below.

		Age Bracket					Total
		20-29	30-39	40-49	50-59	60-69	
License type	Manual	12	10	15	8		85
	Automatic	36		32	10	15	115
	Total	48	32		18		200

(a) Complete the missing entries in the table. [2]

(b) State the explanatory variable. [1]

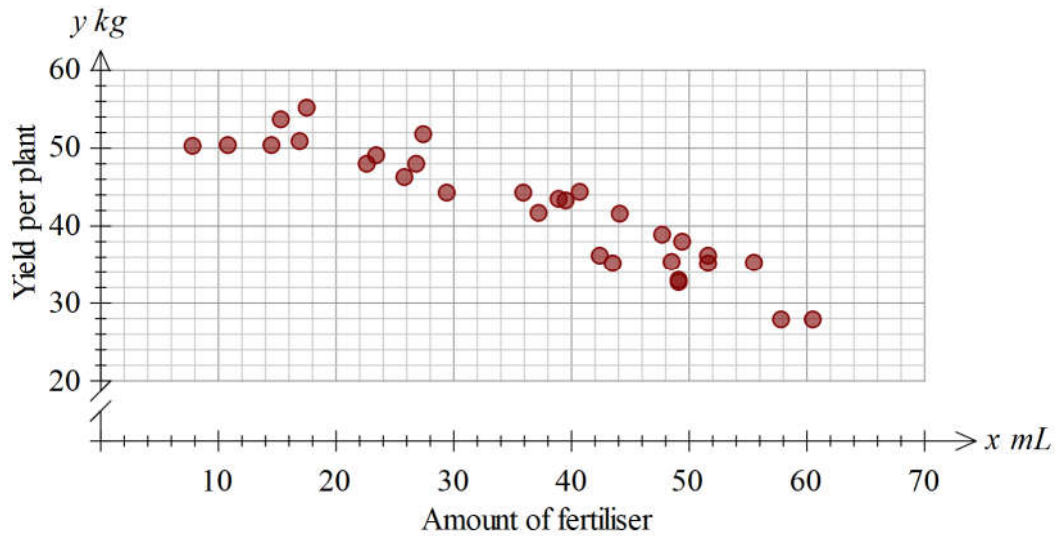
(c) Construct a column or row percentage table that can be used to determine if there is an association between age and type of car license obtained. Round values to the nearest percentage. [3]

		Age Bracket					
		20-29	30-39	40-49	50-59	60-69	
License type	Manual						
	Automatic						

(d) Does there appear to be an association between age and type of car license obtained? Provide evidence to support your answer. [2]

6. (11 marks)

A tomato grower added varying amounts of a liquid fertiliser (x ml) to the irrigation systems of thirty greenhouses and observed the resulting yield of tomatoes per plant (y kg) to test the effectiveness of the fertiliser. The results of the 30 tested systems is shown in the scatterplot below.



(a) State the explanatory variable. [1]

Displayed below is the results of performing linear regression.

Linear Regression

$$y = ax + b$$

$$a = -0.499328$$

$$b = 59.2179$$

$$r = -0.929047$$

(b) State the equation of the least squares regression line correct to 4 decimal places and draw this line on the scatterplot, clearly indicating the two calculated points used. [4]

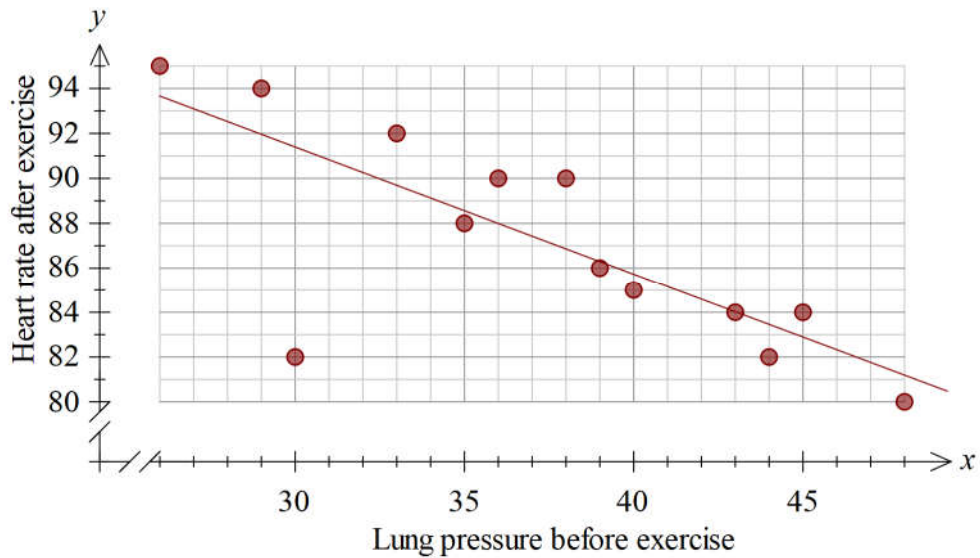
(c) Interpret the slope of the least squares regression line determined in part (b). [2]

(d) Determine the coefficient of determination and explain what it indicates. [2]

(e) What effect can 15 mL of fertiliser be expected to have on the yield of tomatoes per plant? [2]

7. (6 marks)

A group of 15-year-old outdoor education students were given two fitness tests. The first test was a measure of maximum lung pressure before exercise, x , and the second was a measure of heart rate taken one minute after exercise, y . The results of the 13 students that were present on the day are shown in the scatterplot below.



Two students were absent on the day of the fitness tests. Their results are shown in the table below.

	Absent Student 1	Absent Student 2
x	30	45
y	93	83

(a) Add the two missing data points to the scatterplot above. [2]

The least squares line of regression was calculated with all 15 students' data and added to the scatterplot above.

(b) Clearly indicate on the scatterplot above the student with the greatest variation from the rest of the students. [1]

(c) If the results from the student indicated in part (b) were cropped (removed) from the data what effect would it have on:

(i) The correlation coefficient? [1]

(ii) The slope and y intercept of the least squares regression line? [2]