FURTHER MATHEMATICS

UNIT 3

Name_____

38 marks

ASSIGNMENT

UNIT 3 – 0 4

Question 1
A student's mark on a test is 75. The mean mark for their class is 68 and the standard deviation is 4. Their standardised score is:

A –2.5 **B** –1.75 **C** 0 **D** 1.75 **E** 2.5

The following information relates to Questions 2 & 3

The heights of a group of 256 junior athletes are approximately normally distributed with a mean of 157 cm and a standard deviation of 3 cm.

Question 2
The percentage of the junior athletes with heights between 148 and 166 cm is:

A 0.03% **B** 50% **C** 68% **D** 95% **E** 99.7%

Question 3

The number of junior athletes with heights greater than 154 cm is around:

A 82 **B** 128 **C** 175 **D** 215 **E** 250

Question 4
People's weight and blood glucose level are linearly related with an r value of 0.72. From this information, we may conclude that:

A a person's weight is 0.72 of their blood glucose level

B high blood glucose levels in people are associated with low weights

C low blood glucose levels in people are associated with high weights

D high blood glucose levels in people are associated with high weights

E a person's weight is 72% of their blood glucose level

Question 5

The English and Art marks for eight students are given in the table below.

English	59	47	65	37	78	69	56	81
Art	67	69	89	76	59	82	84	69

The value of the correlation coefficient is closest to:

A –0.233

B –0.157

C –0.054

D 0.157

E 0.233

Question 6

There is a strong positive association between a country's Human Development Index and its carbon dioxide emissions.
From this information, it can be concluded that

A increasing a country's carbon dioxide emissions will increase the Human Development Index of the country.

B decreasing a country's carbon dioxide emissions will increase the Human Development Index of the country.

C the association must be a chance occurrence and can be safely ignored.

D countries that have higher Human Development Indices tend to have higher levels of carbon dioxide emissions.

E countries that have higher Human Development Indices tend to have lower levels of carbon dioxide emissions.

Question 7

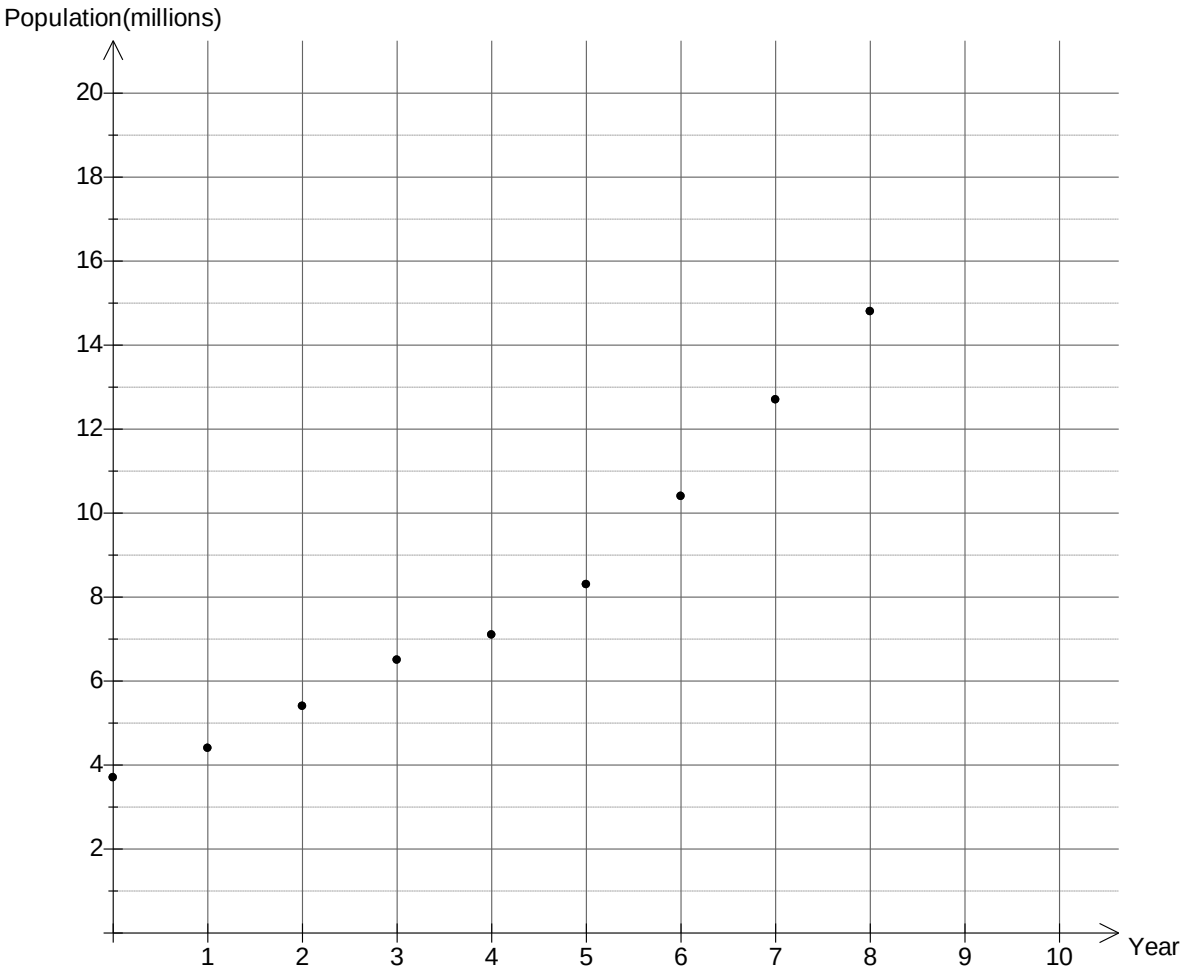
The data below shows Australia's population for each decade in the 20th century.

Year	1900	1910	1920	1930	1940	1950	1960	1970	1980	**1990**	**2000**
Population (millions)	3.7	4.4	5.4	6.5	7.1	8.3	10.4	12.7	14.8	**17.2**	**19.3**

a Explain why Year would be the explanatory variable?

1 mark

To investigate the association between the two variables Year has been coded as
$t = 0 \, is 1900, \;\; t = 1, is \; 1910 \;\; etc$
The first 9 pairs of data are displayed in the form of a scatterplot as shown below.



b Complete the scatterplot by plotting the last two highlighted entries from the table above.

1 mark

c Use the scatterplot to comment on the association between population and year in terms of direction, outliers, form and strength

2 marks

d Use a calculator to determine:

i the value of Pearson's correlation coefficient(correct to 3 decimal places)

ii the value of the coefficient of determination(nearest whole percentage)

iii the equation of the least squares regression line (coefficients correct to 2 significant figures)

1 + 1 + 2 = 4 marks

e Interpret the coefficient of determination in terms of the variables involved.

1 mark

f Interpret the slope of the regression equation in terms of the variables involved.

1 mark

g Use the regression equation to predict, , the average population(millions) for the following years:

i 1920 ($t = 2$)_____ extrapolation/interpolation

ii 2020 _____ extrapolation/interpolation

1+1=2 marks

h For which of the predictions above are we interpolating, and for which are we extrapolating? Circle the correct choice above.

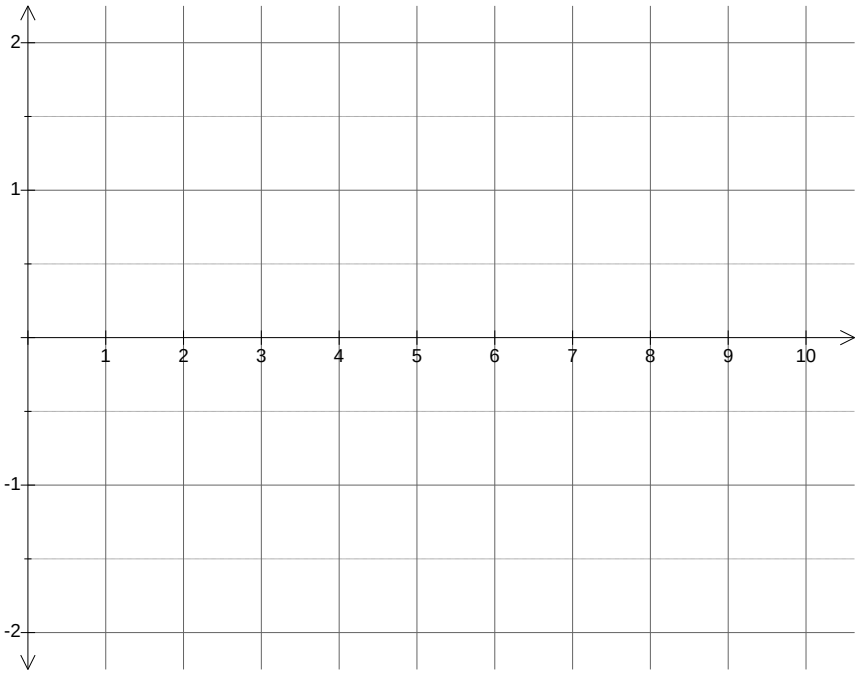
2 marks

i Explain why the prediction for 2020 may be unreliable.

1 mark

To determine if a linear model is appropriate a residual plot is constructed.

j Construct a residual plot for the least squares model and label the axes appropriately.



2 marks

k Explain why this residual plot supports the suggestion that this model is **not** linear.

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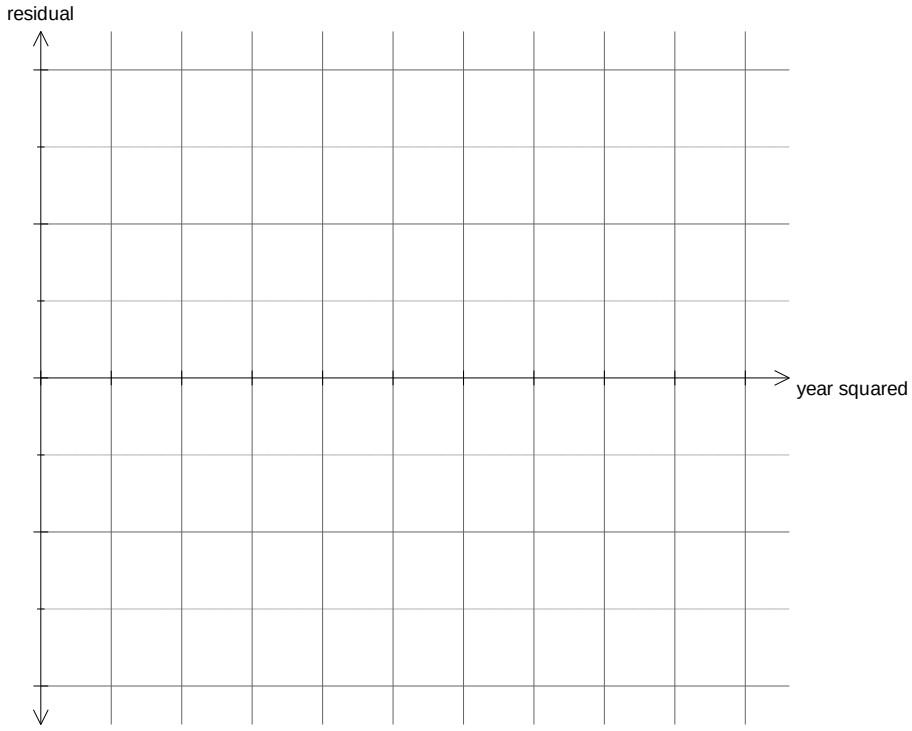
1 mark

To transform this data a number of transformations are possible. To determine whether these will be successful, you are required to complete an x^2 transformation and a $\log_{10}(y)$ transformation.
Give all results to three significant figures
.
Suitable grids have been supplied below:

l $year^2$ **transformation**

$Population = \_\_\_\_\_ + \_\_\_\_\_ \times year^2$

$r^2 =$



5 marks

m $\log_{10}(population)$ **transformation**

$\log(population) = \_\_\_\_\_ + \_\_\_\_\_ \times year$

$r^2 =$

5 marks

n Using the results obtained above choose the best model to predict population from year:

Original Linear Model	x^2 transformation	log(y) transformation

1 mark

o Explain your choice made in **part n** using appropriate results from **parts l and m.**

2 marks

p Using the preferred model, predict the population, correct to 2 decimal places, of Australia in 1950.

1 mark