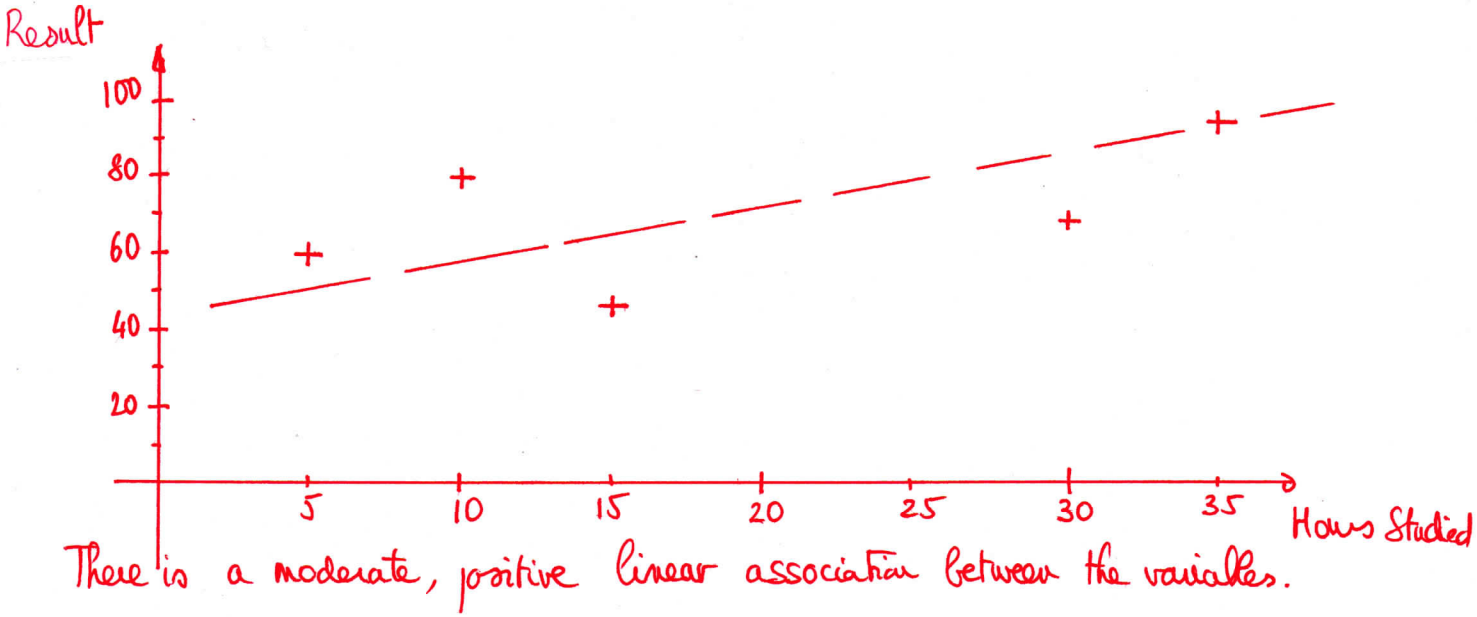
# SCATTERPLOTS AND ASSOCIATION

1 Five friends compete with each other to do the best on their upcoming Mathematics Advanced Examination. In the final month before the exam they record how much time is spent studying, and their final results are given in the table below.

| Name | Alex | Bel | Cam | Darmi | Echo |
|---|---|---|---|---|---|
| Hours of study | 30 | 15 | 5 | 10 | 35 Max |
| Mathematics Advanced result (%) | 70 | 45 | 60 | 80 | 95 Max |

Draw a scatterplot of hours of study versus maths results and describe any pattern you see.




There is a moderate, positive linear association between the variables.

2 Assuming an association exists, choose the independent variable in each of the following pairs.

(a) Choose the independent variable.
[A] years of employment B value of superannuation

(b) Choose the independent variable.
[A] rainfall B size of plants

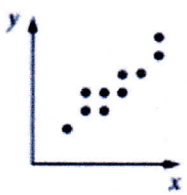
(c) Choose the independent variable.
[A] temperature B number of ice-creams sold

(d) Choose the independent variable.
A waist measurement [B] cans of soft drink consumed

3 Describe the associations, if any, in the following scatterplots.

(a) 

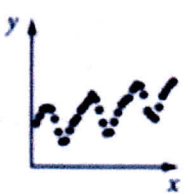
No association

(b) 

Strong, positive, linear

(c) 

Moderate, negative, linear

(d) 

Strong, positive, non-linear

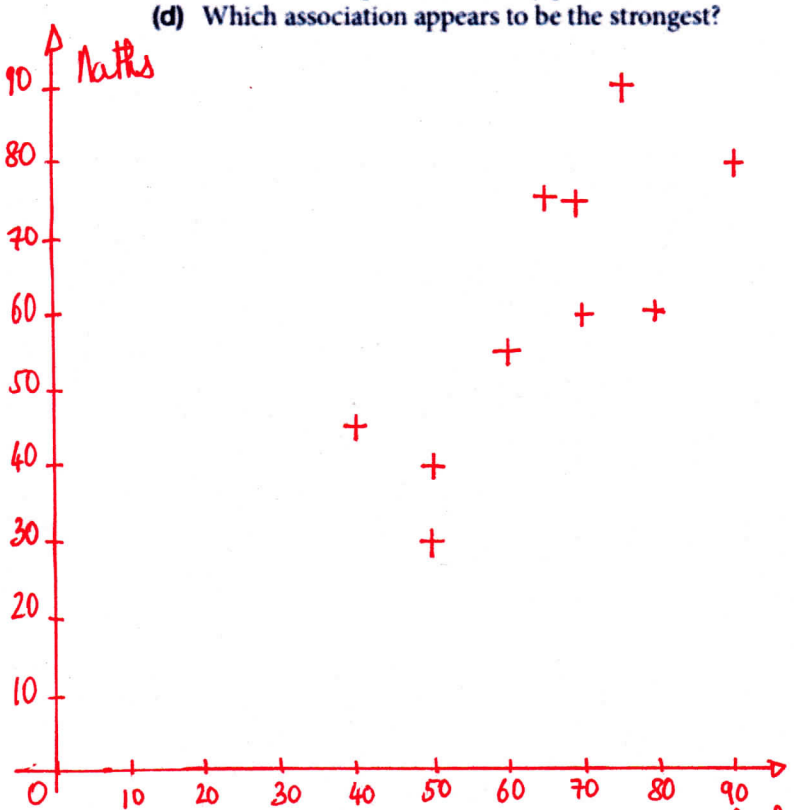
# SCATTERPLOTS AND ASSOCIATION

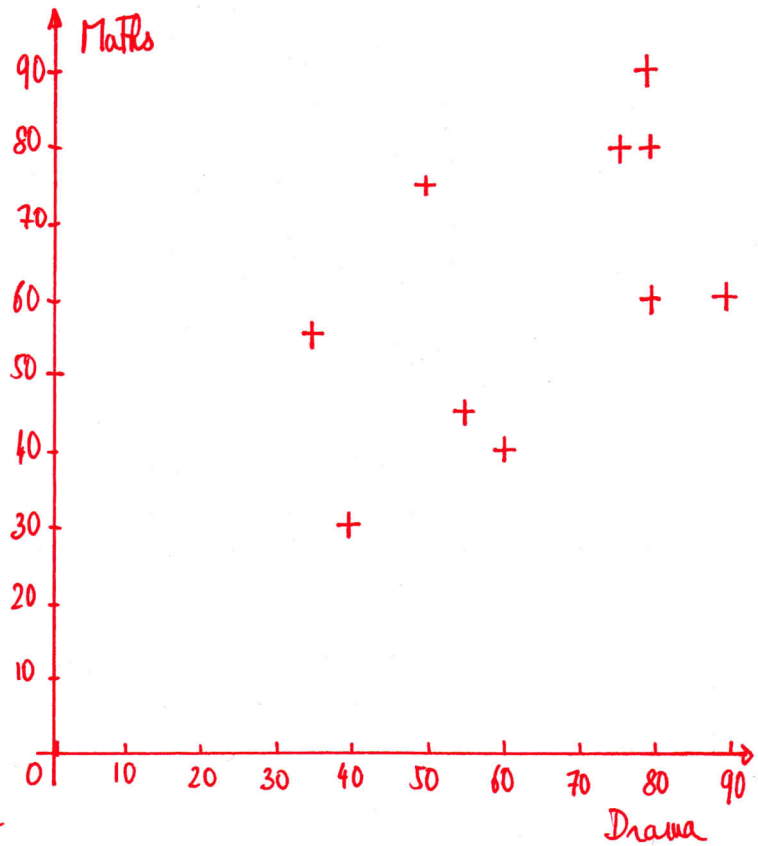
4 The following data set shows the final percentage results for 10 students in the three subjects they have in common.

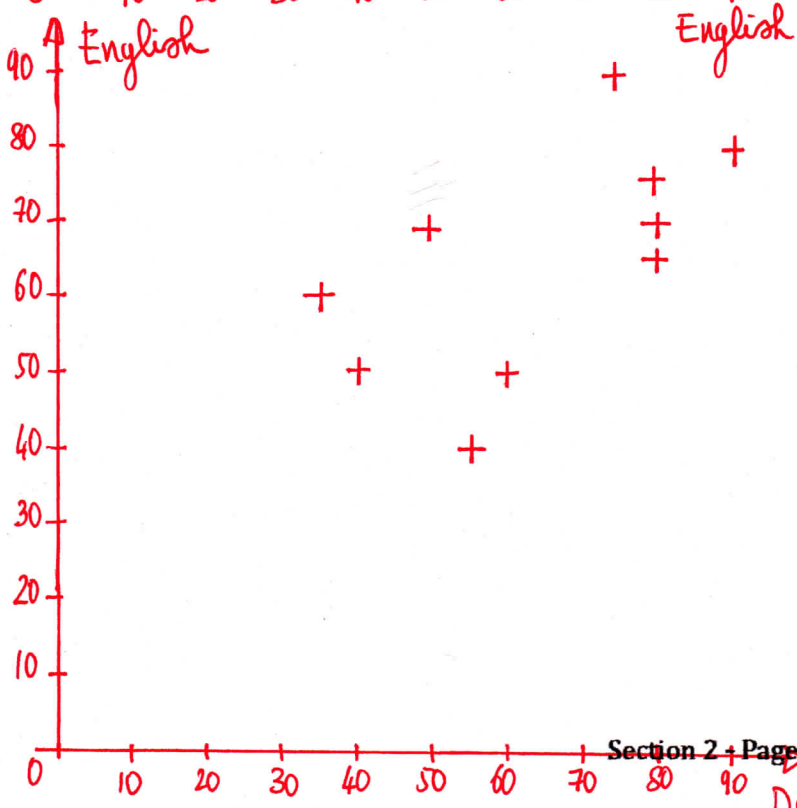
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Maths | 40 | 60 | 75 | 60 | 80 | 30 | 45 | 75 | 90 | 55 |
| English | 50 | 70 | 70 | 80 | 90 | 50 | 40 | 65 | 75 | 60 |
| Drama | 60 | 80 | 50 | 90 | 75 | 40 | 55 | 80 | 80 | 35 |

In each case put the first named variable on the horizontal axis.

**(a)** Draw a scatterplot to show any potential association between their Maths and English scores.
**(b)** Draw a scatterplot to show any potential association between their Maths and Drama scores.
**(c)** Draw a scatterplot to show any potential association between their Drama and English scores.
**(d)** Which association appears to be the strongest?




d) The Maths versus English scores show the closest clustering around a positive line of best fit.

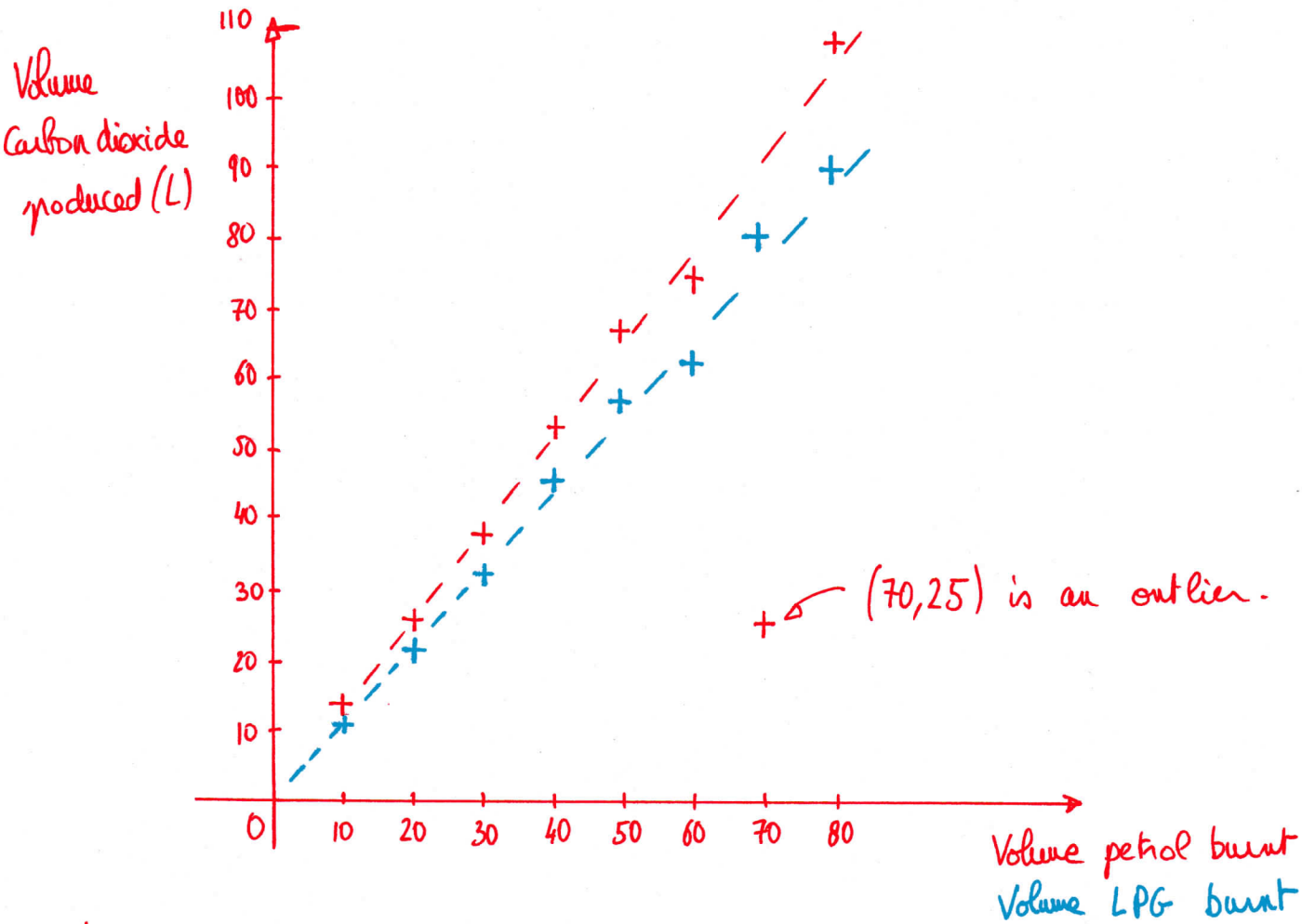
# SCATTERPLOTS AND ASSOCIATION

5 The following experimental data has been collected by scientists doing research on climate change. They measured the volume of carbon dioxide $CO_2$ produced by vehicles using either petrol or LPG (liquid petroleum gas).

| Volume of petrol burnt (L) | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|
| Volume of carbon dioxide produced (L) | 13.5 | 25.6 | 38 | 53.5 | 67 | 74.2 | 25 | 108 |

| Volume of LPG burnt (L) | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|---|
| Volume of carbon dioxide produced (L) | 11.1 | 22 | 32.5 | 46 | 57.5 | 62.8 | 80.2 | 90 |

**(a)** Draw a scatterplot for each set of data.
**(b)** Which set of data contains an outlier? Give the coordinates of the outlier.
**(c)** Describe the trend for each scatterplot.
**(d)** Which fuel produces the least amount of carbon dioxide per litre of fuel burnt? Explain your answer.

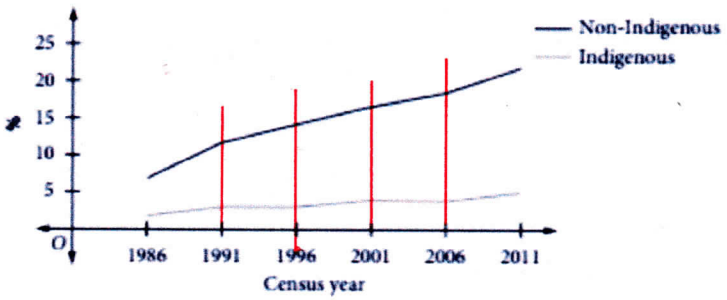



c) Strong, positive, linear for both (ignoring the outlier)

d) LPG: the gradient is roughly 1.1L of $CO_2$ per litre of fuel while for petrol, it's closer to 1.3 L of $CO_2$ per litre of fuel.

# SCATTERPLOTS AND ASSOCIATION

6 The census results published by the Australian Bureau of Statistics (ABS) in 2013 contained the following information about the percentage of 15 to 24 year olds who were engaged in Higher Education. The results comparing Indigenous and non-Indigenous students are shown on the graph below.




**(a)** Complete the table below by estimating the percentage values from the graph.

| Year | 1986 | 1991 | 1996 | 2001 | 2006 | 2011 |
|---|---|---|---|---|---|---|
| Non-Indigenous | 7 | 12 | 14 | 16 | 18 | 22 |
| Indigenous | 2 | 3 | 3 | 4 | 4 | 5 |

Max

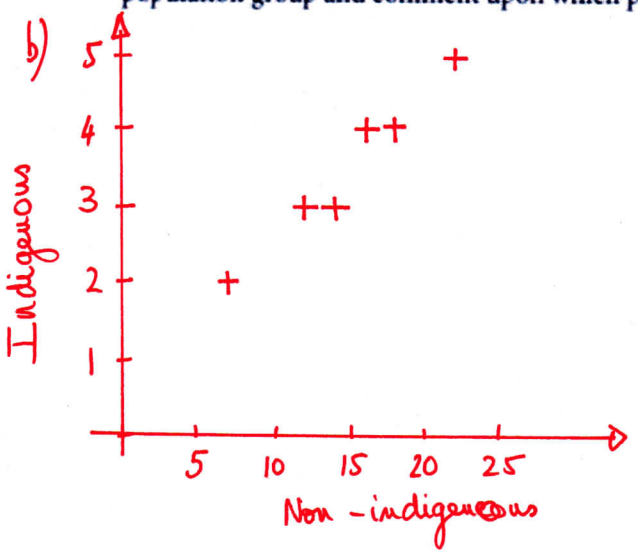
Max

**(b)** Draw a scatterplot of the Indigenous and non-Indigenous data.

**(c)** Describe the trend in the scatterplot.

**(d)** By examining the figures for 1986 and 2011, determine the rate of growth in engagement for each population group and comment upon which population group has increased its engagement the most.

b)




c) Trend is strong, positive, linear

d) The non-indigenous population has increased its engagement the most.