Simple Graphical Techniques

Graphs are the pictorial representation of facts and figures, or data. The eye can detect patterns and trends from graphs far more easily than from a lot of numbers.

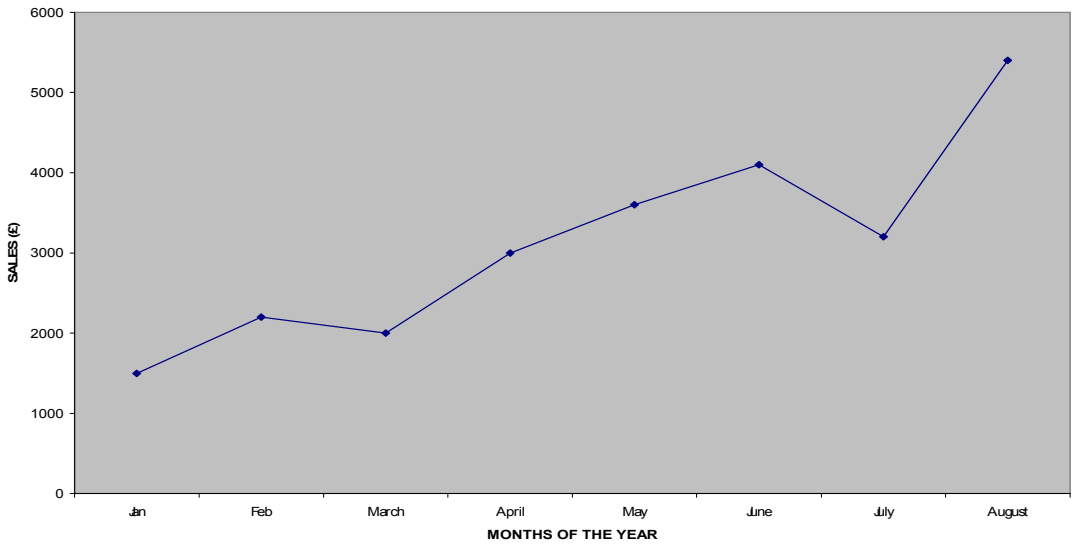
Linear Graphs

There are two types of straight line graph, those that show a trend and those that show a mathematical relationship between two sets of data. Both types must have the axes labelled with scales and units given. Scales chosen must be easily read and interpolated. Never choose a scale that involves a factor of three, try for factors 2, 5, 10 or their multiples. Scales may be different for each axis.

(a) Trend Graphs

Trend graphs are used to give an indication of how the figures are changing. For example: Monthly Sales Figures:

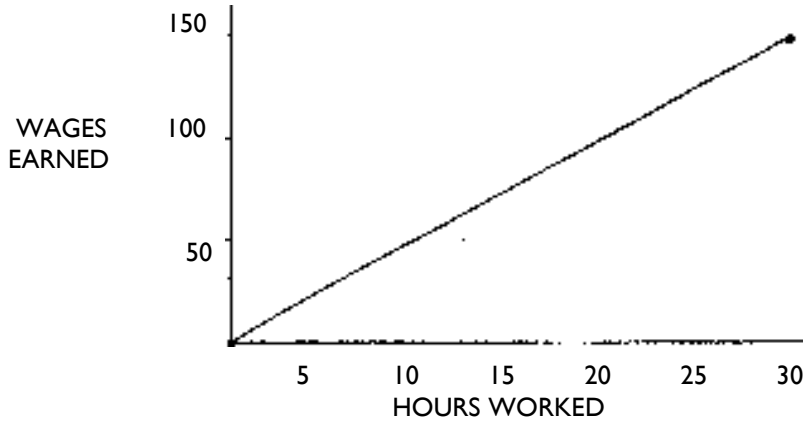
Jan	Feb	March	April	May	June	July	August
£1500	£2200	£2000	£3000	£3600	£4100	£3200	£5400



With a trend graph, only the plotted points are valid and interpolation cannot be made. The scales on the axes need not start from zero. Notice that the first data value is plotted on the upright axis.

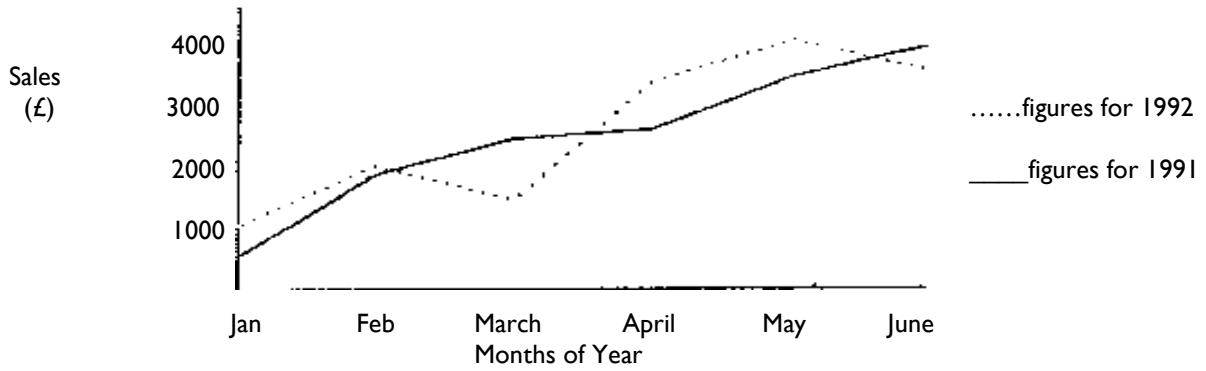
(b) Mathematical Relationship Graph

A mathematical relationship occurs when the values of two sets of data depend on each other. For example: Wages earned for Hours Worked. These are related because the more hours worked, the more the wages will be so the two figures are related.



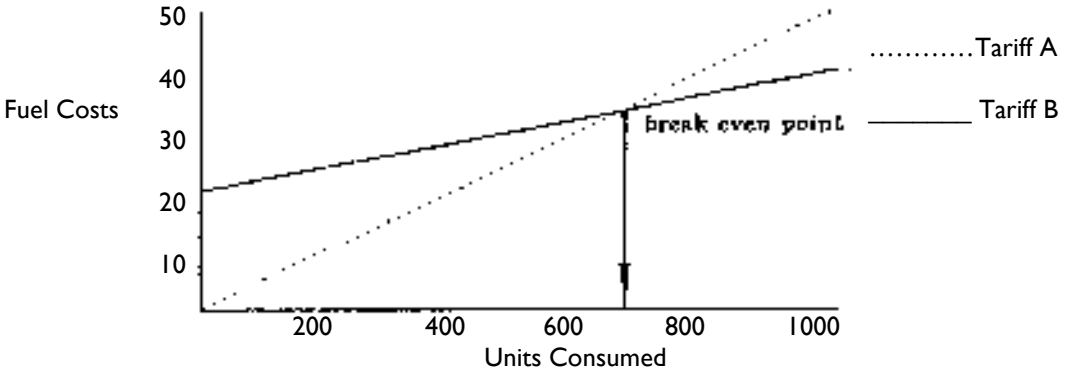
With a mathematical graph, all points are valid and interpolation may be made between the plotted points. In theory, only two points are needed for a mathematical graph but three should be used as a check on the arithmetic. The axes on a mathematical graph should both start from zero.

More than one set of information may be plotted on the same graph, provided a code and key are e.g. different colours, or different line styles



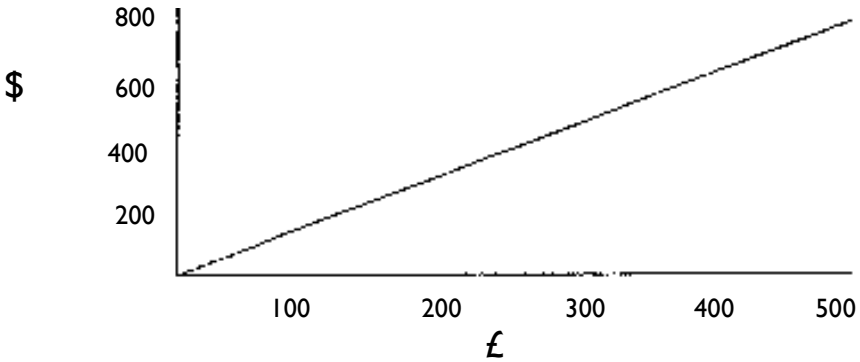
If two or more sets of mathematical information are plotted using the same scales and axes, critical points such as break even points can be found.

For example: The quarterly bill for gas supplied to a small business can be charged on Tariff A or Tariff B. Tariff A has no standing charge but each unit consumed costs 5p. Tariff B has a standing charge of £20 but each unit consumed costs 2p. Which tariff should the business choose?



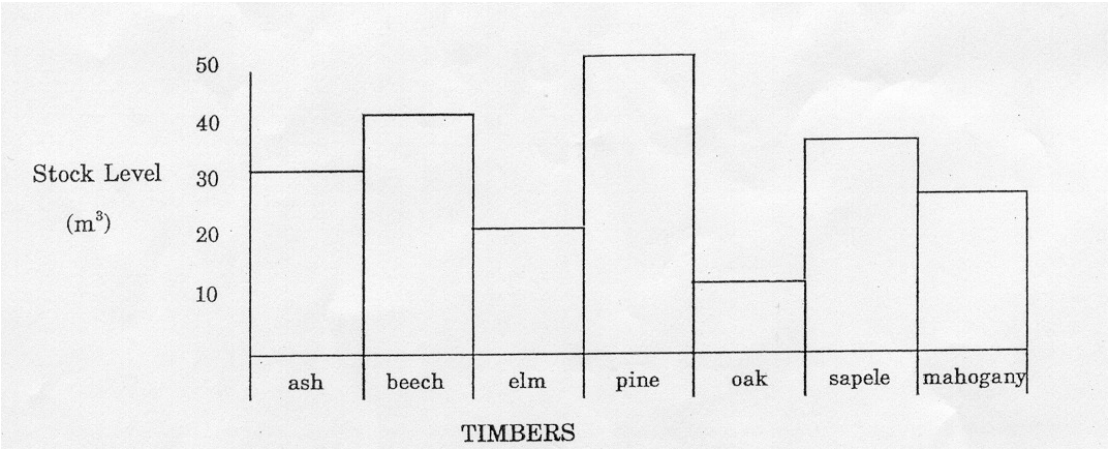
Break even point indicates the limit of units consumed for bill to be cheaper on tariff A than on tariff B. In this example breakeven point is approximately 675 units. If the business generally consumes less than this it will pay them to be charged on tariff A. If it uses more they should opt for tariff B. If they consume exactly 675 units, the bill will be the same which ever tariff they are on.

Mathematical graphs are also used to give conversion figure for example conversion of £ sterling into $ (dollars).



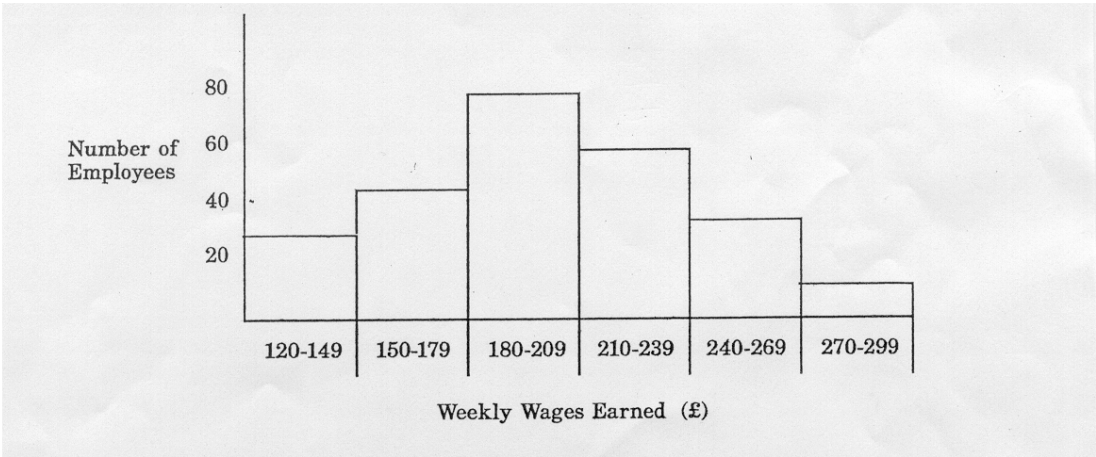
Bar Graphs

Bar graphs are generally used to show comparisons, for example stock levels of timber in a timber yard.



The bars must all be the same width then the height of the bar can be used to show the value of the data to be plotted. The horizontal base of each bar can be used to represent one item from a set as in the example above. Each bar represents one type of timber from the set of seven different timbers. The base can also be used to represent a spread of values for a single variable, as in the example below:

Wages earned by employees in a small firm



The horizontal base of each bar represents a small range of wage values from the lowest £120 to the highest £299.

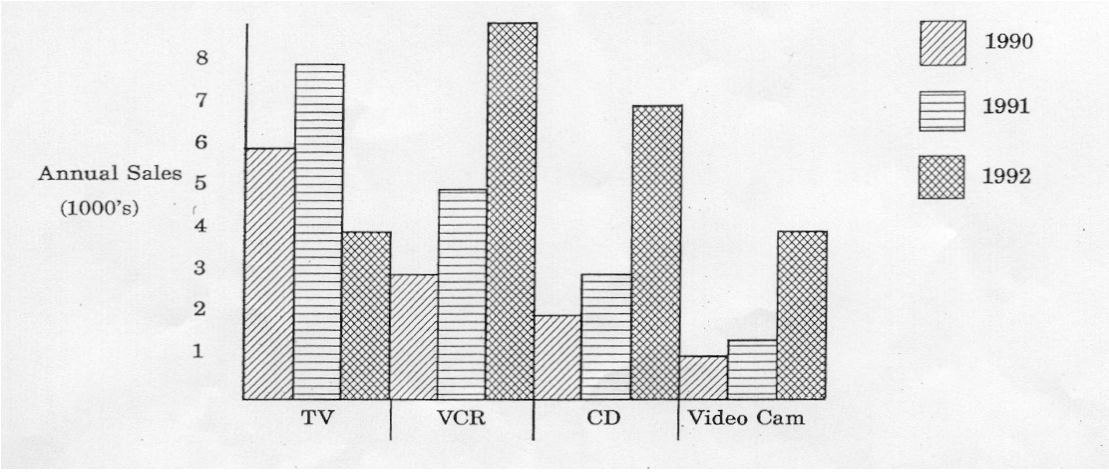
If the horizontal axis (base line) shows numerical values, it must be clear that the bar represents a spread of values and that no one point can be used to represent a specific value.

If more than one set of data are to be shown on the same graph, a code and key must be given. The bias of the graph can be changed to suite the comparison needed for example:

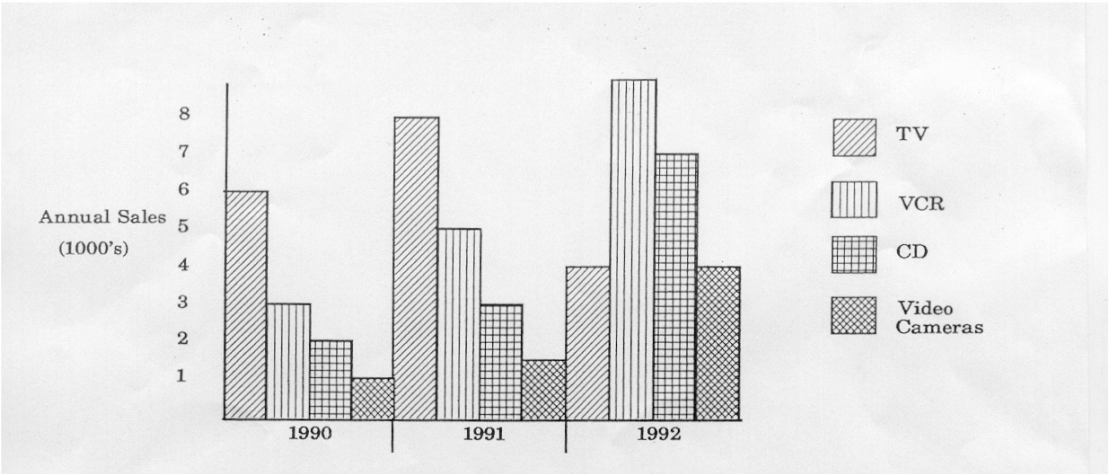
Sales of electronic consumer products for the last three years are shown in the following table

		TV	VCR	CD	Video Cam
	1990	6	3	2	1
Sales (in 1000's)	1991	8	5	3	1.5
	1992	4	9	7	4

The data has been used to plot the following bar graph



This graph shows the data with yearly bias. The yearly totals for each appliance are next to each other so it can be seen how each type of appliance is doing.



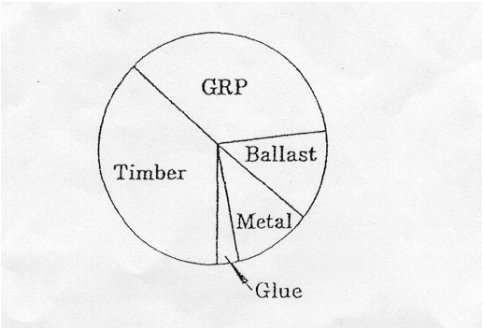
This bar graph has been plotted from the same set of data but with appliance bias. In any year it is now easy to see which particular appliance is the top seller etc.

Pie Charts

These are based on a complete circle and are used to show the breakdown of something into its component parts for example:

Raw materials used in the manufacture of a small dinghy.

Timber	40%
GRP	35%
Foam ballast	16%
Metal	8%
Glue	1%



The components are often quoted as percentages; the circle is then divided up into sectors, the size of which are proportional to the percentages.

To calculate the number of degrees for each sector, the percentage is multiplied by 360 e.g.

Timber 40% = 40 x 360 = 144° GRP 35% = 35 X 360 = 126°

A protractor is used to measure the number of degrees for each sector. Calculations should be rounded off to the nearest whole number of degrees.

If the data is not given as percentages, the total value must be found, for example:

Breakdown of costs for a small firm

Materials	£62000
Labour	£17000
Advertising	£8000
Overheads	£6500
Loan repayments	£4700
Total	£98200

Each individual amount is then divided by the total multiplied by 360 to calculate the number of degrees for each sector.

Materials $\frac{62000}{98200} \times 360 = 227°$ e.g. Labour $\frac{17000}{98200} \times 360 = 62°$

Advertising $\frac{8000}{98200} \times 360 = 29°$ etc

Simple Graphical Techniques Worksheet 1

Simple Linear Graphs

1. The following table records the volume of timber delivered to a timber yard for the first six months of this year. Plot a graph for this information.

Month number	1	2	3	4	5	6
Amount Del (m^3)	250	650	800	0	850	680

2. The exchange rate on a certain day was £1 = $2.4. Draw a graph showing the currency conversion for up to £5000. From the graph determine how many $ would be exchanged for £900, and how much in £ would you receive in exchange for $8500.

Bar graph

3. Draw a bar graph to show the following information:

Output of machine operatives per week

No of units produced	No of operatives
200-209	5
210-219	14
220-229	17
230-239	29
240~249	42
250-259	21
260-269	10
270-279	2

Pie chart

Draw pie charts for each of the following sets of data.

4. Expenses for a small firm breakdown as follows

Labour	22%
Materials	43%
Energy	18%
Advertising	10%
Investment	7%

Simple Graphical Techniques Worksheet 2

Simple Linear Graphs

1. The output for a small factory for the first six months of 1994 and 1995 was as follows. Draw a graph to compare the figures for the two years.

	Jan	Feb	March	April	May	June
1994	412	386	105	370	420	455
1995	509	421	490	520	385	460

2. For small businesses, gas can be charged on tariff A or tariff B.

Tariff A - Standing charge of £14.50	Price per kilowatt hour - 2.4p
Tariff B – No standing charge	Price per kilowatt hour – 3.6p

Draw a graph to show the cost for up to 5000 kilowatt hours for both tariffs. Use the graph to determine the break even point. If a business consumes, on average, 3850 kilowatt hours per quarter, which tariff should they opt for?

Bar graph

3. The following table shows the output, in thousands, of an electrical goods factory for three consecutive years. Draw bar graphs to show the information with (a) year bias and (b) product bias.

	TV	RADIO	VCR
1996	120	160	61
1997	200	90	310
1998	304	70	344

Pie chart

Draw pie charts for each of the following sets of data.

4. A small firm has the following overheads

Labour	£41,300
Materials	£108.650
Advertising	£18,230
Loan repayments	£12,400
Capital investment	£28,000
Variable overheads	£4,600