بسم الله الرحمن الرحيم

الرياضيات المالية

المحاضرة الأولى

محاور المحاضرة

1- النسبة المئويةpercentage

2- تحويل العملاتCurrency Conversions

3- The relationship between mathematics and its use in business and economics

4- معادلة الخط المستقيم The equation of a line

percentage

A percentage is a number or ratio expressed as a fraction of 100. It is often denoted using the percent sign, "%"

- We can speak of r % of a number x, means $\frac{r}{100} * x$
- When we say a number increases by x%, then the increase in the number

$$= \text{number} * \frac{X}{100}$$

- The increased number

= number + the increase = $\frac{number}{1} + \left(\frac{number}{1} * \frac{X}{100}\right) = number\left(1 + \frac{X}{100}\right)$

** EXAMPLE:- Calculate 23% of 1534

Sol : 23% of 1534 = $\frac{23}{100} * \frac{1534}{1} = 352.82$

**H.W:- 1- Calculate 11% of 1832

2- Calculate 70% of 23.34

** EXAMPLE:- A salary of 55240 is to be increased by 12%. Calculate (1) the increase (2) the new salary.

Sol : 1- 12% of 55240 = $\frac{12}{100} * \frac{55240}{1} = 6628.8$ = the increase

So the increase in salary is 6628.8

2- The new salary is 55240+6628.8 = 61868.8

**H.W:- A Skateboard is reduced 25% in price in a sale. The old price was $120. Find the new price.

Currency Conversions

You may have browsed the internet in order to purchase books, music, etc. Frequently prices will be quoted in some currency other than your own. With some simple maths and knowledge of the current rate of exchange, you should have no difficulty converting the price to your own currency.

** The following worked examples use the Euro exchange rates in Table. This table 1.1 equates each of the currencies listed to 1 Euro on a given day in August 2001.

Currency	Rate	Currency	Rate
British pound	0.6187	Canadian dollar	1.3460
US dollar	0.8770	Australian dollar	1.6988
Japanese yen	108.5400	Polish zloty	3.7143
Danish krone	7.4424	Hungarian forint	247.5000
Swedish krona	9.1550	Hong Kong dollar	6.8399
Swiss franc	1.5060	Singapore dollar	1.5607
Norwegian krone	7.9566		

Table 1.1 Euro exchange rates

Ex:- A book is priced at US$20. Calculate the price of the book in (i) Euro, (ii) British pounds and (iii) Australian dollars.

Sol :-:

Step 1: State the appropriate rates from Table 1.1.

Step 2 Set up the equation: 1 unit of given currency = y units of required currency.

Step 3 Solve the equation: x units of given currency = x * (y units of required currency).

The price is given in US dollars, the required price (currency) is in euros, hence

((i)) Step 1 : \$0.8770 US = 1 Euro from Table 1.1

Step 2 : \$ 1 US = $\frac{1}{0.8770}$ Euro dividing both sides by 0.8770 to get rate for \$ 1

Step 3 : \$20 US = $20\left(\frac{1}{0.8770}\right)$Euro multiplying both sides by 20

= 22.8050 Euro

((ii)) Step 1 : From Table 1.1 write down the exchange rates for 1 Euro with both British pounds and US dollars:

\$0.8770=1 Euro

£0.6187= 1 Euro

\$0.8770 = £0.6187 since they are each equivalent to 1 Euro

The given price is in US dollars, the required price (currency) is British pounds

Step 2 : \$0.8770 = £0.6187

\$1 US = £1* $\frac{0.6187}{0.8770}$ Euros

dividing both sides of the previous equation by 0.8770 to get rate for \$1

Step 3 : \$20 US = £20* $\frac{0.6187}{0.8770}$ multiplying both sides by 20

= £14.1095

((ii)) Step 1 : From Table 1.1 write down the exchange rates for 1 Euro with Australian dollars and US dollars :

\$0.8770 US = 1 Euro

$1.6988 Aus= 1 Euro

$0.8770 US = $1.6988 Aus since they are each equivalent to 1 Euro

The *given* price is US dollars, the *required* price (currency) is Australian dollars

Step 2 : $1 US = $1*$\frac{1.6988}{0.8770}$ Aus

dividing both sides of the previous equation by 0.8770 to get rate for $1

Step 3 : $20 US = $20*$\frac{1.6988}{0.8770}$ Aus

=38.7412 Aus

Ex:- How many British pounds are equivalent to (i) $500 Australian and (ii) $10000 Singapore?

Sol:

((i)) Step 1 From Table 1.1 write down the exchange rates for 1 Euro with Australian dollars and British pounds:

£0.6187= 1 Euro

$1.6988 Aus = 1 Euro

$1.6988 Aus = £0.6187 since they are each equivalent to 1 Euro

Here we are *given* $500 Aus and we *require* its equivalent in British pounds

Step 2 : $1 Aus = £1*$\frac{0.6187}{1.6988}$

dividing both sides of the previous equation by 1.6988 to get rate for $1AUS

Step 3 : $500 Aus = £500*$\frac{0.6187}{1.6988}$ multiplying both sides by 500

H.W **((ii))**

The relationship between mathematics and its use in business and economics

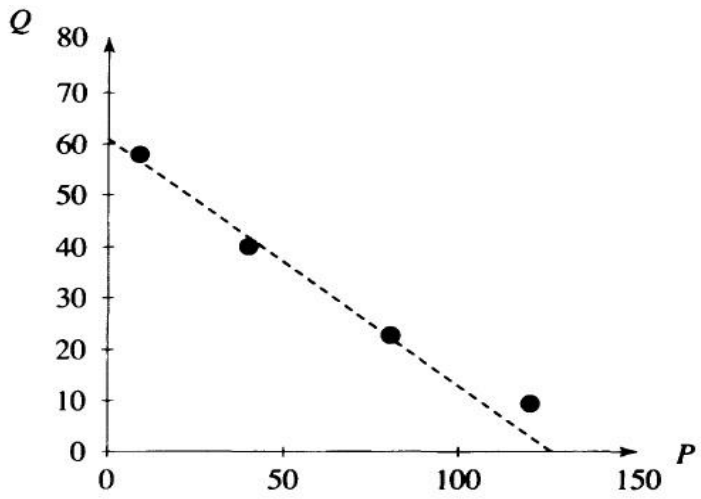
This chapter begins to establish a formal relationship between mathematics and its use in business and economics. Economics studies the relationship between different parts of an economic system; for example, the relationship between the price of a good and quantity demanded.

Remark :- when price increase the quantity demand decrease

But is not precise as it does not tell us by how much quantity demanded decreases when price increases.

Remark :- the relationship between price (P), and quantity demand (Q) can be observed as following :

Price	Quantity demanded
$P = 10$	$Q = 58$
$P = 40$	$Q = 40$
$P = 80$	$Q = 23$
$P = 120$	$Q = 10$



Remark :- from the previous example we can say that the relation between the quantity demand (Q) and price (P) is linear, to describe this relation we need some information about the slope and equation of a straight line.

** A straight line may be defined by two properties:

1- Slope, usually represented by the symbol m

2- Vertical intercept, the point at which the line crosses the y-axis, usually represented by the symbol c.

**Measuring the slope of a line:-

Note: The change in height and change in distance are generally referred to as Δy and Δx respectively where the symbol Δ means change.

Where:- $(x_1,y_1),(x_2,y_2)$ are points

The line through the points $(x_1,y_1),(x_2,y_2)$ has a slope (m) define as

$$slope(m) = \frac{\Delta y}{\Delta x}$$

Remark :-

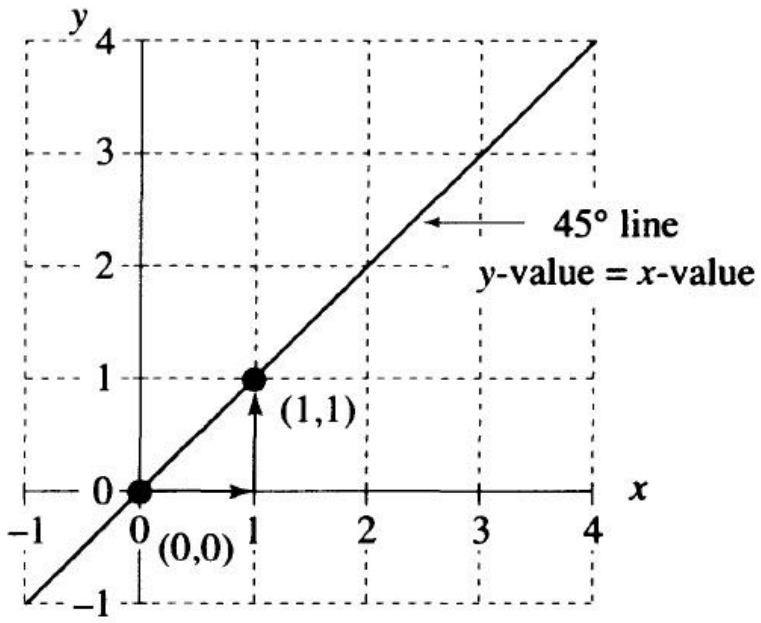
- Lines with the same slope, but different intercepts are different lines: they are parallel
- Lines with the same intercept, but different slopes are different lines
- Two lines are identical only if their slopes and intercepts are identical

Ex:- Plot the lines given the following information on slope and intercept:

(a) Slope = 1, intercept = 0 *(m* = 1, *c* = 0)

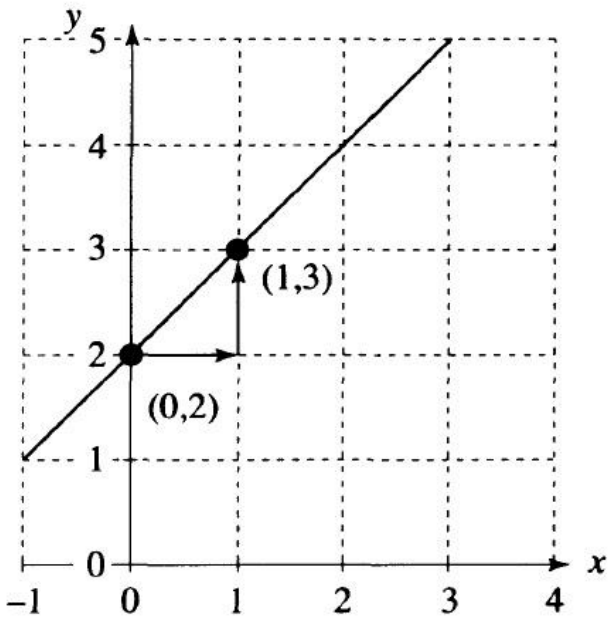
(b) Slope = 1, intercept = 2 (m= l , c = 2)

Sol:-



a) $y = 0$ on the y-axis. This gives the point (0,0) which is the origin. Since slope is 1 and, slope = $\frac{\Delta y}{\Delta x}$, start at the origin (intercept) and move forward a horizontal distance of 1 unit and move up a vertical height of 1 unit. Join the points (0,0) and (1,1).

b) y = 2. At y = 2, set up a slope of 1, that is, move out a horizontal distance of 1 unit and move up a vertical height of 1 unit. This gives the point (1, 3). Join the points (0, 2) and (1,3)



H.W :- 1- Slope = 2, *y*-intercept = 0.

2- Slope = 1, *y*-intercept = —2.

** **The equation of a line**

The formula, which calculates the y-coordinate for any given x-value on the line, is called The equation of a line, and the equation of a line has the general form

$$y = mx + c$$

where m is the symbol representing slope and c is the symbol representing the intercept on the y-axis.

Ex:- find the equation of the line with slope m = 3 and intercept c = 1.

Sol:- y = 1 + 3x

Ex:- Find the equations of the lines with slope and intercept

(i) $m = 1$, c = 0

(ii) $m = 1$, c = 2

Sol:- (i) y=0+x

Y=x

(ii) y=2+x

x-value	*y*-value
$x = 0$	$y = 1$
$x = 1$	$y = 4$
$x = 2$	$y = 7$
$x = 3$	$y = 10$

**To graph a straight line from its equation (y=mx+c):

1-Re arrange the equation into the form y=mx+c

2-Choose convenient values of x (x=-2,-1,0,1,2)

3-Plot the points and draw the line through these points.

Ex:- graph the line y=1+3x

** graph any line at ax+by+d=0

To graph the line ax+by+d=0, where a,b and d are constant, we write the line in the form

ax+by+d=0

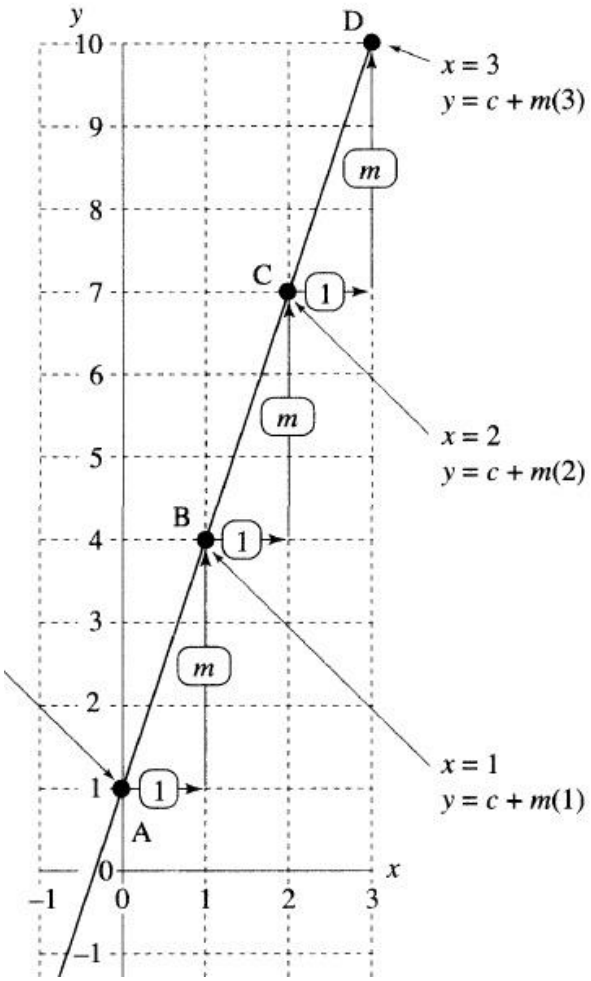
ax+by= - d

by= - ax- d

$y = -\frac{a}{b}x - \frac{d}{b}$

This is a straight line that cuts the vertical axis at $y = -d/b$ with a slope $-a/b$.

**Some mathematical notations



For the line y=mx+c is a function of x, x is called the independent variable, and y is called the dependent variable. Thus we write y=f(x).

EX:-

1- Y= -20x+4 ---------- y=f(x)= -20x+4
2- Y=11x-12 ----------y=g(x)=11x-12

****Inverse function**

Let y=f(x) be a linear function, we can define $x=f^{-1}(y)$, this function is called the inverse function.

EX:- y=11x-12 Y=f(x)=11x-12

Y=11x-12

11X=y+12

$X=\frac{y+12}{11}$

$X=\frac{y}{11}+1.09$

Therefore the inverse function is :$x=f^{-1}(y)=\frac{y}{11}+1.09$