Percentage

Points to remember:

1) The term percent comes from the Latin phrase 'per centum' which means per hundred or for every hundred. It is a fraction whose denominator is 100 and numerator is percent, e.g. 40% or **40/100** . In mathematics, percent is denoted by the symbol '%'.

2) How to convert a fraction into a percent: To convert a fraction into percent multiply it by 100, e.g. $\frac{3}{5} * 100 = 60\%$

3) How to convert a percent into a fraction: Divide the number by 100 and drop the percent symbol, e.g. 60% $= \frac{60}{100} = \frac{3}{5}$

4) The percentage of a given number 'n' is given by;

x % of a given number 'n' = $\frac{x}{100} * n$

E.g. 70% of 200 = $\frac{70}{100}$ * 200 = 140

Some quicker methods:

1) If two values are respectively x% and y% more than a third value, the first value is $(\frac{100 + x}{100 + y} * 100)$ % of the second value.

And, the second value is $(\frac{100 + y}{100 + x} * 100)$ % of the first value.

2) If two values are respectively x% and y% less than a third value, the first value is $(\frac{100 - x}{100 - y} * 100)$ % of the second value.

And, the second value is $(\frac{100 - y}{100 - x} * 100)$ % of the first value.

3) If the price of a commodity increases by x %, the reduction in consumption so as not to increase the expenditure is given by;

$$= (\frac{x}{100 + x} * 100)\ \%$$

If the price of a commodity decreases by x %, the increase in consumption so as not to decrease the expenditure is given by;

$$= (\frac{x}{100 - x} * 100)\ \%$$

4) If A is x% of C and B is y% of C, A would be $\frac{x}{y}$ * 100 % of B.

5) Percentage fraction table: Some important fractions to remember

1 = 100%	1/8 = 12(1/2)%	1/25 = 4%	5/11 = 45(5/11)%
1/2 = 50%	1/9 = 11(1/9)%	2/5 = 40%	3/8 = 37(1/2)%
1/3 = 33.5%	1/10 = 10%	3/5 = 60%	5/8 = 62(1/2)%
1/4 = 25%	1/11 = 9(1/11) %	4/5 = 80%	7/8 = 87(1/2)%
1/5 = 20%	1/12 = 8(1/3)%	4/7 = 57(1/7)%	
1/6 = 16(2/3)%	1/15 = 6(2/3)%	1/11 = 9(1/11) %	
1/7 = 14(2/7)%	1/20 = 5%	2/11 = 18(2/11)%	

5) x % of a quantity is taken by A, y % of the remaining is taken by B and z % of the remaining is taken by C. If P is left in the fund, there

was $\frac{P*100*100*100}{(100-x)(100-y)(100-z)}$ in the beginning.

6) x % of a quantity is added, y% of the increased quantity is added, again z % of the increased quantity is added and it becomes A, the initial amount is given by;

$$= \frac{A*100*100*100}{(100+x)(100+y)(100+z)}$$

7) The population of a town is P. If it increases by x % in the first year, y % in the second year and z% in the third year, the final population after three years is given by;

$$= \frac{P*(100+x)*(100+y)*(100+z)}{100*100*100}$$

And, if the population decreases by y % in the second year, the population after three years is given by;

$$= \frac{P*(100+x)*(100-y)*(100+z)}{100*100*100}$$

Similarly, if the present population of a city changes (increases or decreases) at r % per annum, the population after n years is given by;

$$= P\left(1+\frac{r}{100}\right)^n$$

And, the population n years ago is given by;

$$= \frac{P}{\left(1+\frac{r}{100}\right)^n}$$

Note: Use '+' sigh if the population is increasing at r % per annum and use '-' sign if it is decreasing at r % per annum.

8) If a number is r % more than the second number, the second number will be $(\frac{r}{100+r} * 100)$ % less than the first number,

e.g. If

A's income is r % more than B's income, B's income is $(\frac{r}{100+r} * 100)$ % less than A's income.

9) If a number is r % less than the second number, the second number will be $(\frac{r}{100-r} * 100)$ % more than the first number.

10) If a value is increased by x % and later decreased by x %, net change in the value is always a decrease which is equal to x% of x or . $\frac{x^2}{100}$

11) If a value is first increased by x %, decreased by y%, there will be $(x - y - \frac{x}{100})$ % increase or decrease in the value, i.e. '+' sign will show an increase and '- 'sign will show a decrease in the value.

12) If a value is increased by x % and y % successively, the final increase in the value is given by;

$$= (x + y + \frac{xy}{100})\ \%$$

13) If the price of a product is reduced by x % and its consumption is increased by y % or the price is increased by x % and consumption is decreased by y%, the effect on revenue is given by;

= percent increase - percent decrease = $\frac{\text{percent increase} * \text{percent decrease}}{100}$

'+' sign will show an increase and '-' sign will show a decrease in the value.

14) The pass marks in an examination are x %. If a student secures y marks and fails by z marks, the maximum marks are given by;

$$= \frac{100\,(y+z)}{x}$$

15) A candidate scores x % marks in an examination and fails by 'a' marks. If another candidate who scores y % marks which is 'b' marks more than the required pass marks, the maximum marks for this examination are given by;

$$= \frac{100\,(a+b)}{y-x}$$

16) The sides of a triangle are measured. If one side is taken x % in excess and the other side is taken y% in deficit, the error percent in area calculated from these measurements is given by;

$$= x - y - \frac{xy}{100}$$

'+' sign will show the excess and '-' sign will show the deficit in the area.

17) If the sides of a triangle, rectangle, square or any other two-dimensional shape are increased by x %, the area is increased by:

$$\frac{x\,(x+200)}{100}\ \%\ \text{or}\ (2x + \frac{x^2}{100})\ \%$$

18) In an examination, x% students failed in one subject and y% students failed in another subject. If z% students failed in both the subjects, the percentage of students who passed in both the subjects is given by;

= 100 - (x + y - z)