PERCENTAGE

In mathematics, a **percentage** is a number or ratio expressed as a fraction of 100. It is often denoted using the percent sign, "%", or the abbreviations "pct.", "pct"; sometimes the abbreviation "pc" is also used. A percentage is a dimensionless number (pure number).

Important Points---

❖❖ To calculate p % of y

(p/100) x y = (p x y)/100

So, p % of y = y % of p

❖❖ To find what percentage of x is y: y/x × 100

❖❖ To calculate percentage change in value

Percentage change = {change/(initial value)} x 100

❖❖ Percentage point change = Difference of two percentage figures

❖❖ Increase N by S % = N(1+ S/100)

❖❖ Decrease N by S % = N (1– S/100)

❖❖ If the value of an item goes up/down by x%, the percentage reduction/increment to be made to bring it back to the original point is 100x/ (100 + x) %.

❖❖ If A is x% more /less than B, then B is 100x/(100 + x) % less/more than a)

❖❖ If the price of an item goes up/down by x %, then the quantity consumed should be reducedby 100x/ (100 + x)% so that the total expenditure remains the same.

❖❖ Successive Percentage Change

If there are successive percentage increases of a % and b%, the effective percentage increase is:

{(a + b + (ab/100)}%

❖❖ **Percentage – Ratio Equivalence:**

1/3 X 100 = 33.33%	1/10 X 100 = 10%
1/4 X 100 = 25%	1/11 X 100 = 9.09%
1/5 X 100 = 20%	1/12 X 100 = 8.33%
1/6 X 100 = 16.66%	1/13 X 100 = 7.69%
1/7 X 100 = 14.28%	1/14X 100 = 7.14%
1/8 X 100 = 12.5%	1/15X 100 = 6.66%
1/9 X 100 = 11.11%	1/16 X 100 = 6.25%

N is Numerator, D is the Denominator

D/N	1	2	3	4	5	6	7	8	9	10
1	100	200	300	400	500	600	700	800	900	1000
2	50	100	150	200	250	300	350	400	450	500
3	33.33	66.66	100							
4	25	50	75	100						
5	20	40	60	80	100					
6	16.66	33.33	50	66.66	83.33	100				
7	14.28	28.56	42.85	57.14	71.42	85.71	100			
8	12.5	25	37.5	50	62.5	75	87.5	100		
9	11.11	22.22	33.33	44.44	55.55	66.66	77.7	88.8	100	
10	10	20	30	40	50	60	70	80	90	100
11	9.09	18.18	27.27	36.36	45.45	54.54	63.6	72.7	81.8	90.9
12	8.33	16.66	25	33.33	41.66	50	58.3	66.6	75	83.3
13	7.69	15.38	23.07	30.76	38.45	46.14	53.83	61.52	69.21	76.9
14	7.14	14.28	21.42	28.57	35.71	42.85	49.98	57.12	64.26	71.4
15	6.66	13.33	20	26.66	33.33	40	46.6	53.3	60	66.6
16	6.25	12.5	18.75	25	31.25	37.5	43.7	50	56.2	62.5

❖❖ **Product Stability Ratio**: A × B = P

If A is increased by a certain percentage, then B is required to be decreased by a certain percentage to keep the product P as shown in table. Expressing the percentage figures in

Change in A (INCREASE)	Change in B (DECREASE)	Change in P
$\frac{1}{1}$	$\frac{1}{2}$	0
$\frac{1}{2}$	$\frac{1}{3}$	0
$\frac{1}{3}$	$\frac{1}{4}$	0
$\frac{1}{4}$	$\frac{1}{5}$	0

If the price of a commodity increases by P%, then the reduction in consumption so as not to increase the expenditure is:

$$\left(\frac{P}{100+P}\times 100\right)\%.$$

If the price of a commodity decreases by P%, then the increase in consumption so as not to decrease the expenditure is:

$$\left(\frac{P}{100-P}\times 100\right)\%.$$

❖❖ **Results on Population:**

Let the population of a town be P now and suppose it increases at the rate of R% per annum, then:

1. Population after *n* years = $P\left(1+\frac{R}{100}\right)^n$

2. Population *n* years ago = $\frac{P}{\left(1+\frac{R}{100}\right)^n}$

❖❖ **Results on Depreciation:**

Let the present value of a machine be P. Suppose it depreciates at the rate of R% per annum. Then:

1. Value of the machine after *n* years = $P\left(1-\frac{R}{100}\right)^n$

2. Value of the machine *n* years ago = $\frac{P}{\left(1-\frac{R}{100}\right)^n}$

3. If A is R% more than B, then B is less than A by $\left[\frac{R}{(100+R)}\times 100\right]\%$.

4. If A is R% less than B, then B is more than A by $\left[\frac{R}{100-R}\times 100\right]\%$.