

Percentage is a fraction whose denominator is always 100. x percentage is represented by x%.

Calculation of Percentage

If we have to find y% of x, then

$$y\% \text{ of } x = \left[x * \frac{y}{100} \right]$$

1. To express x% as a fraction :

We know

$$x\% = \frac{x}{100}$$

Thus 10% = $\frac{10}{100}$ (means 10 parts out of 100 parts)

= $\frac{1}{10}$ (means 1 part out of 10 parts)

2. To express x/y as a percentage :

We know that $\frac{x}{y} = (\frac{x}{y} \times 100)$

Thus $\frac{1}{4} = (\frac{1}{4} \times 100)\% = 25\%$

and $0.8 = (\frac{8}{10} \times 100)\% = 80\%$

3. To increase a number by a given percentage(x%):

Multiply the number by the following factor

$$= \left[\frac{100 + x}{100} \right]$$

4. To decrease a number by a given percentage(x%):

Multiply the number by the following factor

$$= \left[\frac{100 - x}{100} \right]$$

5. To find the % increase of a number:

$$\text{Percent increament} = \left[\frac{\text{Final Value} - \text{Initial Value}}{\text{Initial Value}} * 100 \right]$$

6. To find the % decrease of a number:

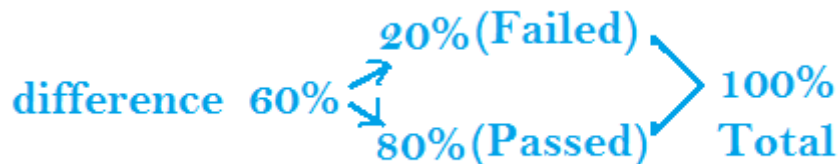
$$\text{Percent decreament} = \left[\frac{\text{Initial Value} - \text{Final Value}}{\text{Initial Value}} * 100 \right]$$

Some Observation

#1

If 20% candidate failed in an exam then observations are

- 80% represent passed in exam
- 100% represent total appeared in exam
- (80%-20%) = 60% represent difference between passed and failed candidate in exam



#2

If a number is increased by 25% then observations are

- 100% represent the old number
- 125% represent the new number.



#3

Remember that Base in the given sentence (Question) is always 100%

Eg. Income of Ram is increased by 20%

In this sentence

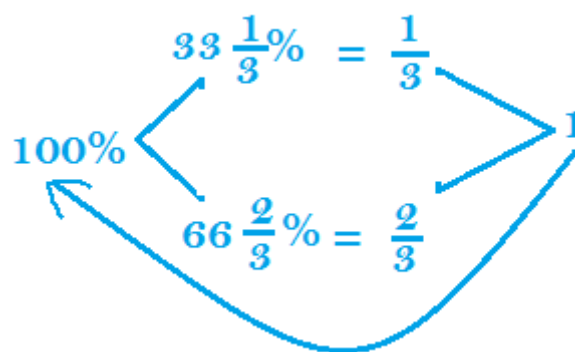
100% - represent the income of Ram

20% - represent increment

120% - represent new income of Ram.

Remember it :

$1 = 100\%$
 $1/2 = 50\%$
 $1/3 = 33 \frac{1}{3}\%$
 $1/4 = 25\%$
 $1/5 = 20\%$
 $1/6 = 16\frac{2}{3}\%$
 $1/7 = 14\frac{2}{7}\%$
 $1/8 = 12\frac{1}{2}\%$
 $1/9 = 11\frac{1}{3}\%$
 $1/10 = 10\%$
 $1/11 = 9\frac{1}{11}\%$
 $1/10 = 8\frac{1}{3}\%$
 $1/13\% = 7\frac{9}{13}\%$



$25\% = 1/4$
 $6.25\% = 1/16$
 $125\% = 5/4$
 $150\% = 3/2$
 $200\% = 2$
 $350\% = 7/2$

#4

If of A is equal to y% of B then -

$$z\% \text{ of } A = \left[\frac{yz}{x} \right] \% \text{ of } B$$

Example: - If 10% of A is equal to 12% of B, then 15% of A is equal to what percent of B?

$$15\% \text{ of } A = \left[\frac{12 * 15}{10} \right] \% \text{ of } B$$

$$15\% \text{ of } A = 18\% \text{ of } B$$

#5

If A is more than B,

then B is $\left[\frac{x}{100+x} * 100\right]\%$ less than A.

Or

If A is $x\%$ less than B, then B is $\left[\frac{x}{100-x} * 100\right]\%$ more than A.

Example: - If income of Ravi is 20% more than that of Ram, then the income of Ram is how much percent less than that of Ravi?

$$\text{Required Percentage} = \left[\frac{20}{100+20} * 100\right] = \frac{50}{3}\% = 16\frac{2}{3}\%$$

#6

If the passing marks in an examination is P%. If a candidate scores S marks and fails by F marks then–

$$\text{Maximum marks} = \frac{100 * (R + S)}{P}$$

Example: - Pankaj Sharma has to score 40% marks to get through. If he gets 40 marks and fails by 40, then find the total marks set for the examination?

$$\text{Maximum marks} = \frac{100 * (40 + 40)}{40} = \frac{100 * 80}{40} = 200$$

#7

If a candidate scores marks and fails by a marks while an another candidate scores y% marks and gets b marks more than minimum passing marks, then –

$$\text{Maximum marks} = \frac{\text{sum of scores}}{\text{difference in \% marks}} * 100$$

Example: - Raj scores 30% and fails by 60 marks, while Rohan who scores 55% marks, gets 40 marks more than the minimum required marks to pass the examination. Find the maximum marks for the examination?

$$\text{Maximum marks} = \frac{(60 + 40)}{(55 - 30)} * 100 = \frac{100 * 100}{25} = 400$$

#8

If due to decrement in the price of an item, a person can buy Kg more in y rupees, then actual price of that item -

$$= \frac{(Rate) * y}{(100 - Rate) * x} \text{ per Kg}$$

Example: - Ram can buy 5 Kg more sugar in rupees 100 as the price of sugar has decreased by 10%. Find the actual price of the sugar?

$$= \frac{10 * 100}{(100 - 10) * 5}$$

$$= \frac{10 * 100}{90 * 5} = \frac{20}{9} = 2\frac{2}{9} \text{ per Kg}$$

#9

If in an election, a candidate got of total votes cast and still lose by y votes, the total number of votes cast –

$$\frac{100 * y}{100 - 2x}$$

Example: - In an election contested by two candidates, one candidate got 40% of total votes and still lost by 500 votes, find the total number of votes casted?

$$\text{Total votes} = \frac{100 * 500}{100 - (2 * 40)}$$

$$= \frac{100 * 500}{20} = 2500$$

#10

If the population of a town is P and it increases or decreases at the rate of R% per annum then –

I. Population after 'n' years :

$$= P * \left[1 \pm \frac{R}{100} \right]^n$$

II. Population 'n' years ago :

$$= \frac{P}{\left[1 \pm \frac{R}{100} \right]^n}$$

Example: - The population of a town is 352800. If it increases at the rate of 5% per annum, then what will be its population after 2 years and 2 years ago?

$$\begin{aligned}\text{Population after 2 years} &= 352800 * \left[1 + \frac{5}{100}\right]^2 \\ &= 352800 * \left[\frac{105}{100}\right]^2 = 388962 \\ \text{Population 2 years ago} &= \frac{352800}{\left[1 + \frac{5}{100}\right]^2} \\ &= \frac{352800}{\left[\frac{105}{100}\right]^2} = 320000\end{aligned}$$

#11

If the value of a number is first increased by and again decreased by the net effect is always decreased by $\frac{x^2}{100}\%$

Example: -The salary of a worker is first increased by 5% and then it is decreased by 5%. What is the change in his salary?

$$\text{Percent Decrement} = \frac{(5)^2}{100} = 0.25\%$$

Examples

#1

Q. If the difference between 62% of a number and $\frac{3}{5}$ th of that number is 36. what is the number ?

Sol:

Let the number be x.

$$\text{Then } x \times 62\% - x \times \frac{3}{5} = 36$$

$$x \times 62\% - x \times 60\% = 36 \quad (60\% = \frac{3}{5})$$

$$x \times 2\% = 36$$

$$x \times \frac{2}{100} = 36$$

$$x = \frac{36 \times 100}{2} = 1800$$

#2

Q. 40% of Ram's income Rs. 1200 Then Find

1. **75% of Ram's income ?**
2. **1/4 part of Ram's income ?**
3. **1/3 part of Ram's income ?**

Sol :

(1)

40% = 1200 Rs.

75% = $1200/40 \times 75 = 2250$ Rs.

Trick : $1200 / 40 \times 75 = \text{Rs. } 2250/-$

(2)

40% of income = Rs. 1200

Then 1/4 part (i.e. 25%) of Ram's

income = $1200/40 \times 25$

= Rs. 750/- Ans

(3)

40% of Ram's income

= Rs. 1200

i.e. 2/5 part of Ram's income

= Rs. 1200

Then total income of Ram

= Rs. $1200 \times 5/2$

1/3 part of Ram's income

= Rs. $1200 \times 5/2 \times 1/3$

= Rs. 1000 Ans.

Trick :

$1200 / \frac{2}{5} \times 1/3$

= $1200/2 \times 5/3 = 1000$

1. Percent implies “for every hundred”.

% is read as percentage and x % is read as x per cent.

2. To calculate p % of y

$(p/100) \times y = (p \times y)/100$

p % of y = y % of p

3. To find what percentage of x is y: $y/x \times 100$

4. To calculate percentage change in value

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

5. Percentage point change = Difference of two percentage figures

6. Increase N by S % = $N(1 + S/100)$

7. Decrease N by S % = $N(1 - S/100)$

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

9. If A is x% more /less than B, then B is $100x/(100 + x)$ % less/more than A.

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

11. Successive Percentage Change

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

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

12. Percentage – Ratio Equivalence:

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

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

N is Numerator

D is the Denominator

13. Product Stability Ratio:

$$A \times B = P$$

If A is increased by a certain percentage, then B is required to be decreased by a certain percentage to keep the product P stable.

Expressing the percentage figures in ratios:

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

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

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

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

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