PERCENTAGE

The term per cent means for every hundred. It can best be defined as :

" A fraction, whose denominator is 100, is called a *percentage*, and the numerator of the fraction is called *the rate per cent.*"

Suppose, a man says that he gains forty per cent (40 %) profit after selling a watch. It means his profit is ₹ 40 for every hundred rupees.

So, by definition of the percentage, the meaning of 40 per cent of the percentage, the meaning of 40 per cent is 40/100.

To Convert Fraction into Percentage

Process : 1. Fraction is multiplied by 100.

2. Result (Fraction × 100) takes sign of per cent (%) after it.

Therefore, Rule :

Value in % = (Fraction × 100) %

Example :

	Value in fraction	Rule (Fraction × 100) %	Value in per cent
1.	4/25	(4/25 × 100) %	16 %
2.	2/3	(2/3 × 100) %	66.66 %
3.	3/40	(3/40 × 100) %	7.5 %

To Convert Percentage into Fraction

Process :

1. Given value or term is divided by 100.
2. Sign of per cent (%) is eliminated or removed.

Rule :

$$\text{Fraction} = \frac{\text{Digit of Per cent}}{100}$$

Example :

Value in percentage	Rule $\left(\frac{\text{Digit of \%}}{100}\right)$	Fraction
1. 9 %	9/100	9/100
2. 0.3 %	0.3/100	3/1000
3. 36 %	36/100	9/25

To Convert Percentage into Decimal

Process :

1. Given value (in percentage) is divided by 100 and we take result in decimal.
2. Sign of per cent (%) is eliminated.

Example :

Value in per cent	Using Process	Value in decimal
0.03 %	0.03/100	= 0.0003

Rule : Short-cut Method to Convert Percentage into Decimal.

Decimal is placed at two digits from right to left side in given value eliminating sign of per cent (%).

Example : 25 %

According to rule, decimal will take place after two digits (5 and 2) from right to left. Thus decimal value of 25 % will be 0.25.

Other Example : 34 % = 0.34
126 % = 1.26
9 % = 0.09
(Here, second digit is '0')

To Convert Decimal into percentage

Process : 1. Given value is multiplied by 100.

2. Sign of per cent (%) is added after the product.

Rule :

Value in per cent =(Value in decimal) × 100 %

Example :

	Value in decimal	Rule	Value in per cent
1.	0.218	(0.218 × 100) %	21.8 %

Memorable Point :

If Y % of X = Z, then XY/100 = Z

In above mathematical relation, there are three terms, X, Y and Z. If values of any two terms are known then we can obtain the value of rest term.

1. $X = \frac{Z}{Y} \times 100$ 2. $Y = \frac{Z}{X} \times 100$

3. $Z = \frac{X}{Y} \times 100$

Example : 35 % of 160 + 60 % of 80 = ? % of 312

Solution : 35 % of 160 + 60 % of 80 = ? of 312

$\Rightarrow$ 160 × 35/100 + 80 × 60/100 = ?/100 × 312

$\Rightarrow \frac{(56 + 48) \times 100}{312} = ?$

$\Rightarrow ? = \frac{100}{3} = 33\frac{1}{3}$

Facts To Remember

Remember the following results. Their direct use help in solving objective type problems on percentage.

Sl. No.	Value in %	Value in Fraction	Sl. No.	Value in %	Value in Fraction
1.	100%	1	11.	10 %	1/10
2.	50 %	1/2	12.	90 %	9/10
3.	25 %	1/4	13.	130 %	13/10
4.	20 %	1/5	14.	$6\frac{1}{4}$ %	1/16
5.	30 %	3/10	15.	$12\frac{1}{2}$ %	1/8
6.	40 %	2/5	16.	$37\frac{1}{2}$ %	3/8
7.	80 %	4/5	17.	$62\frac{1}{2}$ %	5/8
8.	120 %	6/5	18.	$66\frac{2}{3}$ %	2/3
9.	70 %	7/10	19.	$87\frac{1}{2}$ %	7/8
10.	1 %	1/100			

EXERCISE

1. (?) × 15 = 37.5 % of 220
(*a*) 11 (*b*) 81.5
(*c*) 5.5 (*d*) 815
(*e*) None of these

2. 67 % of 89 ÷ 89 % of 67 = ?
(*a*) 5163 (*b*) 5963
(*c*) 0 (*d*) 1
(*e*) None of these

3. 80 % of 1200 + 40 % of 20 = ?
(*a*) 960 (*b*) 1760
(*c*) 968 (*d*) 96,800
(*e*) None of these

4. 0.75 + ? = 1350 % of 50
(*a*) 746.25 (*b*) 674.25
(*c*) 576.25 (*d*) 467.25
(*e*) None of these

5. 10 % of ? = 0.101
(*a*) 10.1 (*b*) 0.101
(*c*) 101 (*d*) 1.01
(*e*) None of these

EXPLANATORY ANSWERS

1. (*c*) : In the given expression

$? = 220 \times \frac{37.5}{100} \times \frac{1}{15} = 5.5$

2. (*d*) : The given expression can be written as

? = 89 × 67/100 ÷ 67 × 89/100
= 89 × 67/100 × 100/67 × 89 = 1

3. (*c*) : In the given expression

? = 1200 × 80/100 + 20 × 40/100
= 960 + 8 = 968.

4. (*b*) : In the given expression

? = 1350 % of 50 – 0.75
= 1350/100 × 50 – 0.75
= 675 – 0.75
= 674.25.

5. (*d*) : Given expression can be written as

? × 10/100 = 0.101

$\Rightarrow ? = \frac{0.101 \times 100}{10} = 1.01.$

Some Special Rules For Quantitative Questions

Rule I :

First time X % is increased and second time X % is decreased, then loss % = $[X^2/100]$%

Example : The price of a book is increased by 30% and after some days decreased by 30%. Decreased or increase per cent is :

(*a*) 0.0009% increase (*b*) 0.09% decrease
(*c*) 90% decrease (*d*) 9% increase
(*e*) None of these

Solution : (*e*) Loss % = $[(30)^2/100] = 9\%$.

Rule II :

In price increase of x% reduced per cent to have no extra expenditure = $[x/(100 + x) \times 100]$ %

Example : If the price of milk is increased by 1%, how much per cent must a man reduce his consumption of milk to have no extra expenditure?

(*a*) 100/101 % (*b*) 101/100 %
(*c*) 1/101 % (*d*) 1 %
(*e*) None of these

Solution. (*a*) : Reduced per cent
$= [1/100 + 1 \times 100]\% = 100/101\%$.

Rule III :

(1) If P's salary is r % more than Q's, then Q's salary less than P's

$$= \left[\frac{r}{(100 + r)} \times 100\right] \%$$

(2) If P's salary is r % less than Q's, then Q's salary more than P's

$$= \left[\frac{r}{(100 - r)} \times 100\right] \%$$

Example : P's salary is 50 % below Q's. How much per cent is Q's salary above P's ?

(*a*) 0 % (*b*) $16\frac{2}{3}$ %
(*c*) 50 % (*d*) 100 %
(*e*) None of these

Solution. (*d*) : Q's salary above P's

$$= \left[\frac{50}{(100 - 50)} \times 100\right] \% = 100\ \%$$

Rule IV :

In price decrease of x %, increase per cent in consumption to maintain same expenditure

$$= \left[\frac{x}{(100 - x)} \times 100\right] \%$$

Example : The price of sugar is reduced by 40 %. Find by how much per cent must its consumption be increased so that the expenditure remains the same as before?

(*a*) 45 % (*b*) $66\frac{2}{3}\%$
(*c*) $16\frac{2}{3}\%$ (*d*) $33\frac{1}{3}\%$
(*e*) None of these

Solution. (*b*) : Increase per cent

$$= \left[\frac{40}{100 - 40} \times 100\right] \% = \frac{200}{3} \% = 66\frac{2}{3} \%$$

Rule V :

First time x % is increased and second time y % is increased, then increase in per cent

$$= \left[(x + y) + \frac{xy}{100}\right] \%$$

Example : The price of a TV is increased by 30 % before budget and 20 % after budget. Then total increase in price will be

(*a*) 50 % (*b*) 56 %
(*c*) 55 % (*d*) 59 %
(*e*) None of these

Solution. (*b*) : Increase per cent

$$= \left[(30 + 20) + \frac{30 \times 20}{100}\right] \%$$

$$= 50 + 6 = 56\ \%$$

Rule VI :

First time x % decreased and second time y% decreased, then decrease per cent

$$= \left[(x + y) - \frac{xy}{100}\right] \%$$

Example : The price of a commodity is reduced two times as 40% and 10% respectively. What is percentage decrease in the price?

(*a*) 48 (*b*) 46
(*c*) 45 (*d*) 51
(*e*) None of these

Solution. (*b*) : Percentage decrease

$$= \left[(40 + 10) - \frac{40 \times 10}{100}\right] \% = 46\%$$

EXERCISE

1. $\dfrac{20\% \text{ of } 740}{?} = 1036$

(*a*) 7 (*b*) 2/7
(*c*) 1/7 (*d*) 3/7
(*e*) None of these

2. 12 % of 200 = ?

(*a*) 24 (*b*) 25
(*c*) 27 (*d*) 28
(*e*) 23

3. The tax on a commodity is diminished by 10% and its consumption increased by 10%. The effect on the revenue derived from it is :

(*a*) 0.1% decrease (*b*) 1% decrease
(*c*) 1% increase (*d*) 0.1% increase
(*e*) None of these

4. A reduction of 20% in the price of coffee enables a purchaser to obtain 4 kg more for ₹ 80. The reduced price per kg of coffee is

(*a*) ₹ 5 (*b*) ₹ 6
(*c*) ₹ 4 (*d*) ₹ 5.50
(*e*) None of these

5. A student has to secure 40% marks to get through. If he gets 40 marks and fails by 40 marks, find the maximum marks set for the examination.

(*a*) 200 (*b*) 150
(*c*) 300 (*d*) 100
(*e*) None of these

6. Due to increase of 40% in the price of a radio, selling is reduced 60%, then how much percentage increase or decrease will be in income?

(*a*) 74% increase (*b*) 44% increase
(*c*) 44% decrease (*d*) 62% increase
(*e*) None of these

7. If the length of a rectangle is decreased by 40 % and the breadth is increased by 30 %, then what is increase or decrease per cent in the area of rectangle?

(*a*) 22% increase (*b*) 22% decrease
(*c*) 28% increase (*d*) 27% decrease
(*e*) None of these

EXPLANATORY ANSWERS

1. (*c*) : $= \dfrac{740 \times 20}{? \times 100} = 1036$

$\Rightarrow \quad ? \times 1036 = 74 \times 2$

$? = \dfrac{74 \times 2}{1036} = \dfrac{1}{7}.$

2. (*a*) : $\dfrac{12}{100} \times 200 = 24$

3. (*b*) : **Trick :** Effect = $(10^2/100)\ \% = 1\ \%$ decrease.

4. (*c*) : **Trick :** Reduced price per kg

$= \dfrac{80 \times 20}{100 \times 4} = ₹ 4$

5. (*a*) : Maximum marks = $\dfrac{100\,(40 + 40)}{40} = 200$

6. (*c*) : **Trick :** $= \left[(40 - 60) - \dfrac{40 \times 60}{100}\right]\%$

$= -20 - 24$

$= -44 = 44\ \%$ decrease,

7. (*b*) : **Trick :** Percentage increase or decrease

$= \left[(30 - 40) - \dfrac{30 \times 40}{100}\right]\%$

$= -22 = 22\%$ decrease

Note: Negative sign shows decrease and positive sign shows increase.