



Name of the Bundle	ADVANCED BUNDLE V2	Subject	APTITUDE
Topic	PERCENTAGE	Last updated on	9 March 2024

## PERCENTAGE

Percentage is a number or ratio expressed as a fraction of 100.

x percent means x hundredths, written as x%.

To express x% as a fraction:  $x\% = \frac{x}{100}$

To express  $\frac{a}{b}$  as percent:  $\left[\frac{a}{b} \times 100\right] \%$

**Example:**  $20\% = \frac{20}{100} = \frac{1}{5} = 0.2$

### Formulae

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

$$\left[\frac{R}{100+R} \times 100\right] \%$$

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

$$\left[\frac{R}{100-R} \times 100\right] \%$$

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



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

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

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

## FRACTIONS AND ITS PERCENTAGE VALUES:

Fractions	Percentage
1/2	50%
1/3	33.33% or 100/3
1/4	25%
1/5	20%
1/6	16.66%
1/7	14.28%
1/8	12.5%
1/9	11.11%
1/10	10%
1/11	9.09%
1/12	8.33%
1/13	7.69%
1/14	7.14%
1/15	6.66%
2/3	$66\frac{2}{3} \%$ or $\frac{200}{3} \%$
3/4	75%
5/4	125%





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2) A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between the wickets?

- a) 45 %
- b) 55 %
- c)  $45 \frac{5}{11}$  %
- d)  $54 \frac{6}{11}$  %

**Ans: C)  $45 \frac{5}{11}$**

**Solution**

$$110 \quad \begin{array}{c} \curvearrowright \\ 100\% \end{array} \quad 110 - (3 \times 4 + 8 \times 6) = 50 \quad \begin{array}{c} \curvearrowleft \\ 45 \frac{5}{11} \end{array}$$

3) A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:

- a) 588 apples
- b) 600 apples
- c) 672 apples
- d) 700 apples

**Ans: d) 700 apples**

**Solution**

$$60\% \quad \begin{array}{c} \curvearrowleft \\ 420 \end{array} \quad 100\% \quad \begin{array}{c} \curvearrowleft \\ 700 \end{array}$$



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4) If  $A = x\%$  of  $y$  and  $B = y\%$  of  $x$ , then which of the following is true?

- a) A is smaller than B.
- b) A is greater than B
- c) Relationship between A and B cannot be determined.
- d) If  $x$  is smaller than  $y$ , then A is greater than B.
- e) None of these

Ans: e) None of these

### Solution

$$x\% \text{ of } y = y\% \text{ of } x$$

$$y\% \text{ of } x = y\% \text{ of } x$$

$$A = B$$

5) If  $20\%$  of  $a = b$ , then  $b\%$  of 20 is the same as:

- a)  $4\%$  of  $a$
- b)  $5\%$  of  $a$
- c)  $20\%$  of  $a$
- d) None of these

Ans: a)  $4\%$  of  $a$

### Solution





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6) In an election between two candidates, one got 55% of the total valid votes, 20% of the votes were invalid. If the total number of votes was 7500, the number of valid votes that the other candidate got, was:

a) 2700

b) 2900

c) 3000

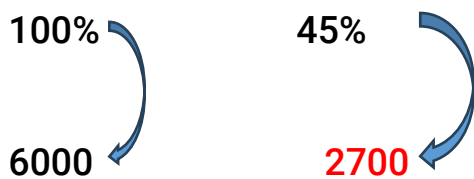
d) 3100

Ans: a) 2700

**Solution**

Number of valid votes = 80% of 7500 = 6000.

∴ Valid votes polled by other candidate = 45% of 6000



7) The population of a town increased from 1,75,000 to 2,62,500 in a decade. The average percent increase of population per year is:

a) 4.37%

b) 5%

c) 6%

d) 8.75%

Ans: b) 5%

**Solution**





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8) Rajeev buys good worth Rs. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax @ 10%. Find the amount he will have to pay for the goods.

- a) Rs. 6876.10
- b) Rs. 6999.20
- c) Rs. 6654
- d) Rs. 7000

**Ans: a) Rs. 6876.10**

### Solution

Rebate = 6% of Rs. 6650 = Rs  $(\frac{6}{100} \times 6650) = 399$

Sales tax = 10% of Rs.  $(6650 - 399) = \text{Rs. } (\frac{6}{100} \times 6650) = 625.6$

Final amount = Rs.  $(6251 + 625.10) = \text{Rs. } 6876.10$

9) If 2% of X is 40, then the value of 2% of (X + 50)

- a) 50
- b) 401
- c) 410
- d) 41

**Ans: d) 41**

### Solution



**Ans 40+1=41**



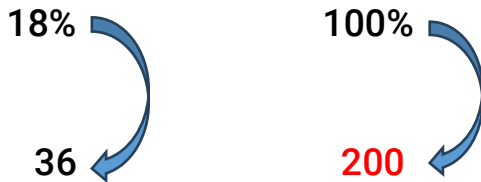
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10) If 18% of the total number of oranges in a basket is 36, then find the total number of oranges in the basket

- a) 100      b) 150      c) 200      d) 300

Ans: c) 200

Solution

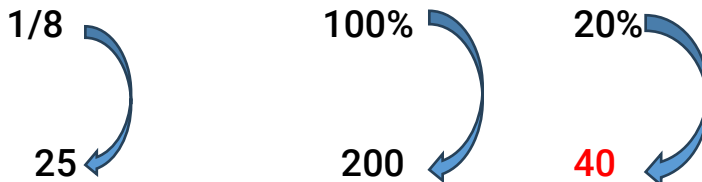


11) If one-fourth of half of a number is 25, then 20% of that number is?

- a) 40      b) 80      c) 20      d) 60

Ans: a)40

Solution



12) A man's income at first increased by 20% and later on increased again by 30%. Find the total percent increase.

- a) 58      b) 54      c) 60      d) 56

Ans: d) 56

Solution

$$20+30+(20 \times 30)$$

$$=56$$





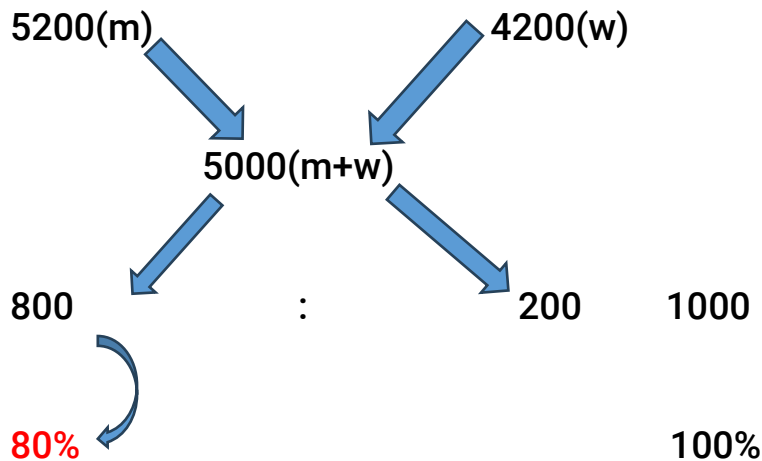
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13) In a firm, the average salary of male worker is Rs. 5,200 and for women Rs. 4200 and the average salary of all workers is Rs. 5000. What is the percentage of male workers in the firm?

- a) 40%                  b) 80%                  c) 20%                  d) 60%

**Ans: b)80%**

**Solution**



14) 5% of A + 4% of B = 2/3 (6% of A + 8% of B), then find A: B

- a) 1:1                  b) 4:3                  c) 1:2                  d) 5:4

**Ans: b) 4:3**

**Solution**

$$15A - 12A = 16B - 12B$$

$$3A = 4B$$

$$A : B$$

$$4 : 3$$



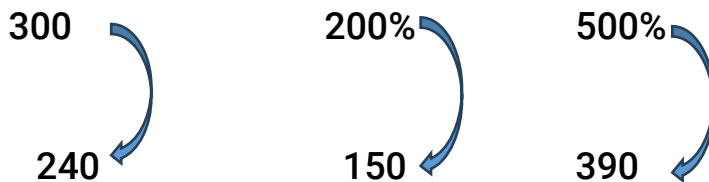
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15) The ratio of the number of boys to the girls in a school is 3:2. If 20% of the boys and 25% of the girls are scholarship holders, find the percentage of those who are Not scholarship holders?

- a) 78%                      b) 87%                      c) 68%                      d) 86%

Ans: a) 78%

Solution

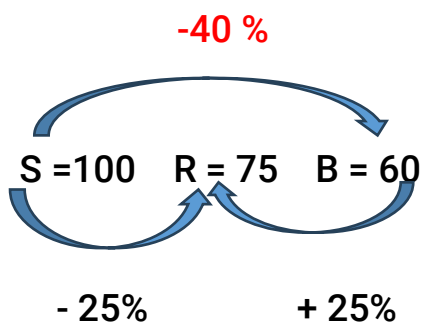


16) Ram sell his goods 25% cheaper than Shyam and 25% dearer than Bram. How much % is Bram's goods cheaper than Shyam?

- a) 60%                      b) 40%                      c) 50%                      d) 30%

Ans: b) 40%

Solution





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17) A student multiplied a number by  $\frac{3}{5}$  instead of  $\frac{5}{3}$ . What is the percentage error in the calculation?

- a) 50%      b) 10%      c) 25%      d) 64%

Ans: d) 64%

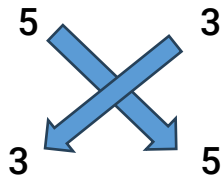
**Solution**

$$\left(\frac{5}{3} - \frac{3}{5}\right) / \left(\frac{5}{3}\right) \times 100$$

$$= \frac{16}{15} \times \frac{3}{5} \times 100$$

$$= 16 \times 4 = 64$$

**Alter method**





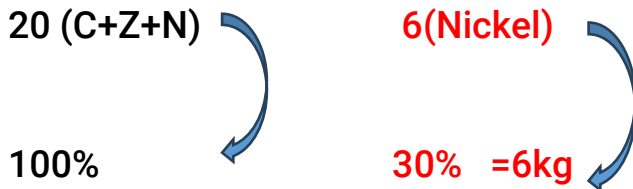
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18) An alloy consists of 30% copper and 40% zinc and the remaining is nickel. Find the amount of nickel in 20 kilograms of the alloy.

- a) 3 kg      b) 4 kg      c) 5 kg      d) 6 kg

Ans: d) 6 kg

**Solution**



19) Price of an article is increased by 10% and then reduced by 10% . What will be the net percentage change?

- a) -1%.      b) -10%.      c) +1%.      d) -10%.

Ans: a) -1%.

**Solution**

Old      1st Change      2nd Change

100 → + 10% → 110 → - 10% → 99

Therefore, Overall % change will be  $99 - 100 = - 1\%$ .

**ALTERNATIVE METHOD:**

Percentage change will be a decrease of  $(x^2/100)$  %, where x is given percentage value.

% Change =  $-(100/100) = - 1\%$ .



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## CONCEPT OF PRODUCT CONSTANCY

1) When one factor of a product is increased by R % then the other will be decreased by

$$\left[ \frac{R}{100+R} \times 100 \right] \%$$

It means when one factor of a product is increased by N/D then the other factor will be decreased by N/(D + N).

2) When one factor of a product is decreased by R % then the other will be increased by

$$\left[ \frac{R}{100 - R} \times 100 \right] \%$$

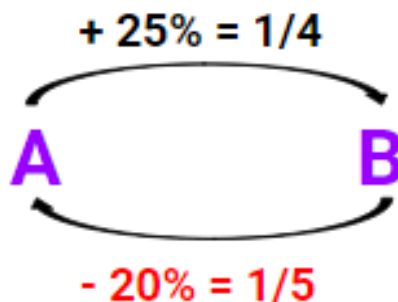
It means when one factor of a product is decreased by N/D then the other factor will be increased by N/(D - N).

20) If A's income is 25% more than that of B's income, then by what percentage B's income is less than that of A's income?

- a) 30%.      b) 20%.      c) 25%.      d) 35%.

**Ans: b) 20%.**

**Solution**





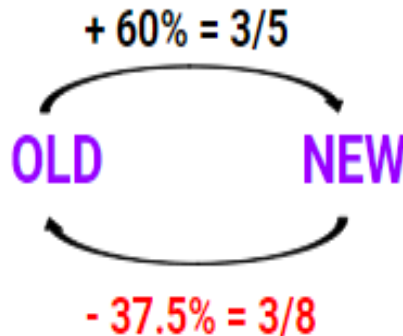
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21) The number has increased by 60%. To get back to the original number, it is to be reduced to initial value by what % ?

- a) 37%.                      b) 50%.                      c) 37.5%.                      d) 35%.

**Ans: c) 37.5%.**

**Solution**



22) The price of sugar rises by 10%. How much percentage should the consumption of sugar be reduced so that the expenditure doesn't change?

- a) 11%.                      b) 10%.                      c) 0.09%.                      d) 9.09%.

**Ans: d) 9.09%.**

**Solution:** Price \* Consumption = Expenditure  
Expenditure – same

$$\text{Price} \propto (1 / \text{Expenditure}).$$

Old : New

Price                      10 : 11

Consumption           11 : 10

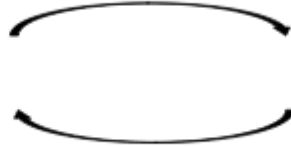
Consumption decreases by 1 in 11. Therefore Consumption decreased by 1/11% .i.e. **9.09%**



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## ALTERNATIVE METHOD

$$\text{Price} + 10\% = 1/10$$



$$\text{Consumption} - 9.09\% = 1/11$$

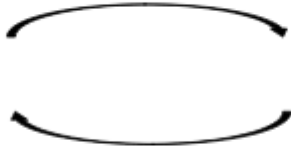
23) If the price of a commodity is increased by 50% by what fraction must its consumption be reduced so as to keep the same expenditure on its consumption?

- a) 33.33%.      b) 30%.      c) 35%.      d) 25%.

Ans: a) 33.33%.

**Solution**

$$\text{Price} + 50\% = 1/2$$



$$\text{Consumption} - 33.33\% = 1/3$$



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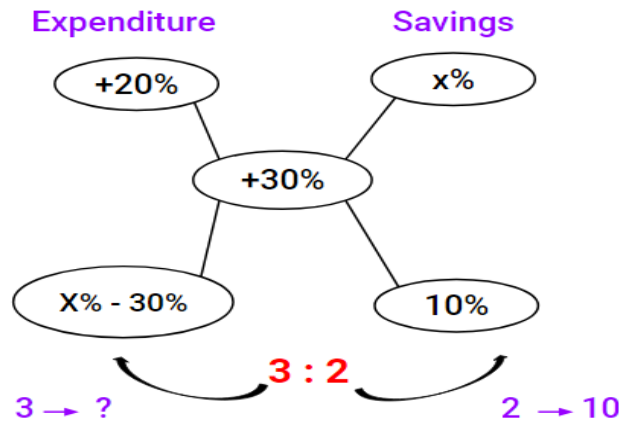
24) The ratio of Income and Expenditure of a person is 5:3. If the income is increased by 30% and the expenditure also increases by 20%. What is the percentage increase/decrease in savings?

- a) 20%.      b) 55%.      c) 35%.      d) 45%.

Ans: d) 45%.

### Solution

Income: Expenditure = 5:3 ; Savings = Income - Expenditure = 5-3 = 2  
Expenditure : Savings = 3:2



$$2 \text{ UNITS} - 10$$

$$3 \text{ UNITS} - 15$$

$$X\% - 30\% = 15\%$$

$$X\% = 45\%$$





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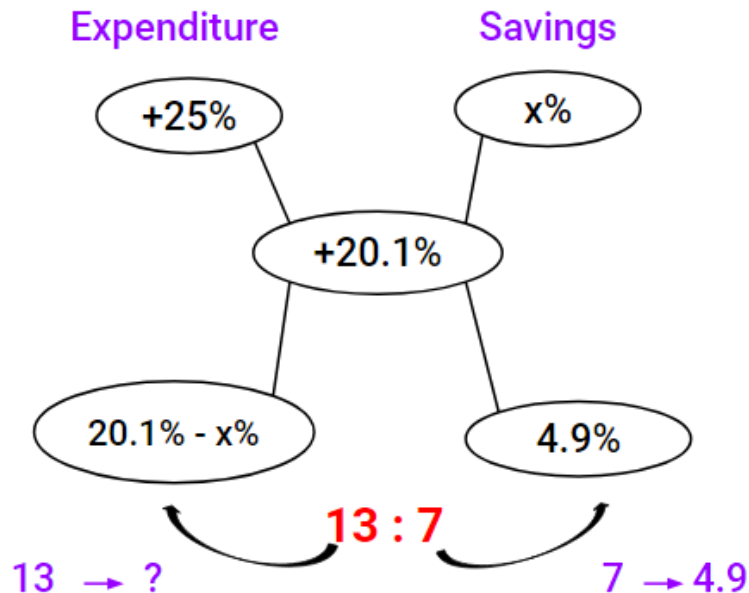
25) A saves 35% of his income. If the income is increased by 20.1% and the expenditure also increases by 25%. What is the percentage increase/decrease in savings?

- a) -9%.      b) +11%.      c) +13%.      d) -14%.

Ans: b) +11%.

**Solution**

$$\text{Expenditure: Savings} = 65\% : 35\% = 13 : 7$$



$$7 \text{ UNITS} - 4.9$$

$$13 \text{ UNITS} - 9.1$$

$$20.1\% - x\% = 9.1\%$$

$$x\% = 11\%$$