Percentage

Per cent means per 100, where 'cent' stands for 100. By a certain percent, we mean that many hundredth, thus x% means x divided by hundred.

i.e. $x\% = \frac{x}{100}$.

Percentage of a number

To find the percentage of a number, convert the percentage into fraction (by dividing by 100) and multiply the resulting fraction with the number.

e.g: 60% of 500 = $\frac{60}{100} \times 500 = 300$.

Conversion of a fraction or a decimal into percentage

A fraction or a decimal can be converted into a percentage by simply multiplying it by 100.

So, the fraction $\frac{1}{5}$ expressed as a percentage is $\frac{1}{5} \times 100 = 20\%$.

And the decimal 0.05 expressed as a percentage is 0.05 × 100 = 5%.

Converting a percentage into a fraction

A percentage when divided by 100 is converted into a fraction. So, 20% as a fraction is $\frac{20}{100} = \frac{1}{5}$.

The '%' sign is dropped when we divide the percentage by 100.

Fraction of a fraction and Relative Percentage

To find the fraction of a fraction we multiply both the fractions.

e.g. $\frac{1}{4}$ of $\frac{1}{5}$ is nothing but $\frac{1}{4} \times \frac{1}{5} = \frac{1}{20}$,

and $\frac{1}{3}$ of $\frac{3}{5}$ is $\frac{1}{5}$, etc.

Similarly, 25% of 20% is 25% × $\frac{20}{100}$ = 5%,

or $\frac{25}{100}$ × 20% = 5%.

Successive percentage changes

If a number is changed (increased/decreased) by a% and in the second step, this changed number is again changed (increased/decreased) by b%, then net percentage change = $\left(a + b + \frac{a \times b}{100}\right)\%$.

If 'a' and 'b' show decrease, then put a –ve sign before 'a' and 'b', otherwise put +ve sign.

1. If the price of an item is increased by 20% and then a discount of 10% is given on the increased price, what will be the effective percentage change in the price of the item?

Solution :

Using percentage change

$= a + b + \frac{a \times b}{100}\%$

$= 20 - 10 - \frac{20 \times 10}{100}$ = 8% (increase)

Notes:

The rule cannot be generalized. This can only be used for 2 values at a time.

You may encounter these types of questions in the examination

Solved Examples

Types of questions	Examples	Approach to the question
1. Convert percentage into fraction.	Express 12% in a fraction.	$x\% = \frac{x}{100} = \frac{12}{100} = \frac{3}{25}$
2. Convert fraction (or decimal) into percentage.	Express $\frac{5}{11}$ as percentage.	Multiply the fraction by 100. $= \frac{5}{11} \times 100 = 45.45\%$
3. If A is x% of B and B = P, then find A in term of P.	A's income is 40% of B's. If B's income is ₹10, 000, what is A's income?	$A = \frac{x}{100} \times P$ $= \frac{40}{100} \times 10{,}000 = ₹4{,}000$
4. If A is r% more than B, by how much percent is B less than A?	X's income is 25% more than Y's. By how much percent is Y's income less than X's?	Difference = $\frac{r}{100+r} \times 100$ $= \frac{25}{125} \times 100 = 20\%$
5. If A is r% less than B, by how much percent is B more than A?	X's income is 40% less than Y's. By how much per cent is Y's income more than X's?	Difference = $\frac{r}{100-r} \times 100$ $= \frac{40}{60} \times 100 = 66.67\%$
6. If the price of a commodity increases by r%, find the decrease in the consumption so as not to increase the expenditure. **General Forumula:** % decrease/increase in consumption $= \frac{r}{100 \pm r} \times 100$ where r is % increase/decrease in the price of the commodity.	(a) If the price of potatoes is increased by 20%, by how much percent should the consumption be decreased so as to have no change in the expenditure? (b) If the price of potatoes is increased by 20% and the consumption is decreased by 10%, what will be the change in expenditure?	Expenditure = Price × Consumption (a) Decrease = $\frac{r}{100+r} \times 100$ $= \frac{20}{120} \times 100 = \frac{50}{3} = 16.67\%$ (b) Net change = $a + b + \frac{ab}{100}$ $= 20 - 10 - \frac{20 \times 10}{100} = 8\%$
7. The population of a town is N. It increases by x% during the first year and y% during the second year. Find the	The population of a town is 18000. It increases by 10% during first year and by 20% during the second year. What will be the population after 2 years?	$N_F = N \times \frac{100+x}{100} \times \frac{100+y}{100}$ $= 18000 \times \frac{110}{100} \times \frac{120}{100} = 23760$ **Alternative method** Successive increments of 10% and 20% = 32%. Then, population will increase by 32% of 18000 = 5760. Population after 2 years will be 18000 + 5760 = 23760.

1. Express 40% in decimal terms.

Solution :

$40\% = \frac{40}{100} = 0.4$

2. Express 30 as a percentage of 45.

Solution :

$\left(\frac{30}{45}\right) \times 100 = 66.67\%$

3. Find 40% of 3340.

Solution :

$\left(\frac{40}{100}\right) \times 3340 = 1336$

4. Express 50 g as a percentage of 4 kg.

Solution :

$\frac{50\text{ g}}{4\text{ kg}} \times 100 = \left(\frac{50\text{ g}}{4000\text{ g}}\right) \times 100 = 1.25\%$

5. A's income is 70% of B's. B's income is 50% of C's. If C's income is ₹1,00,000 then A's income is

Solution :

B's income = $\left(\frac{50}{100}\right)$ × ₹1,00,000 = ₹50,000

A's income = $\left(\frac{70}{100}\right)$ × ₹50,000 = ₹35,000

Alternative Method :

B's income = $\frac{50}{100}$ of C's income

A's income = $\frac{70}{100}$ of B's income

= $\frac{70}{100} \times \frac{50}{100}$ of C's income

A's income = $\frac{35}{100} \times 1{,}00{,}000 = ₹35{,}000$.

6. X's income is 50% more than Y's. By how much percentage is Y's income less than X's?

Solution :

Using formula, r = 50

$\Rightarrow \left[\frac{50}{(100+50)}\right] \times 100 = 33.33\%$

7. In a market survey, 20% individuals opted for product B. The remaining individuals were uncertain. If the difference between those who opted for product B and those who were uncertain was 720. How many individuals were covered in the survey?

Solution :

Clearly, 80% were uncertain. Let assume 'x' individuals were surveyed.

80% of x – 20% of x = 720

$\Rightarrow 60\%\text{ of } x = 720 \Rightarrow \frac{60}{100}x = 720$

$\Rightarrow x = \frac{720 \times 100}{60} = 1200$

8. Of the total amount received by Kiran, 20% was spent on purchases and 5% of the remaining on transportation. If he was left with ₹1,520, what was the initial amount?

Solution :

Let 100 be the sum, 20% is spent on purchases. Hence, we are left with 80; 5% of 80 is 4. Hence, the remaining is 76. We are given that the remaining is 1520. Hence, 76 corresponds to 1520 and therefore 100 corresponds to $\frac{100 \times 1520}{76}$ = ₹2000.

9. The length of a rectangle is increased by 10%. What will be the percentage decrease in its breadth, so as to have a constant area?

Solution :

Let length and breadth of the rectangle are l and b respectively. Area = lb.

Increased length and corresponding breadth $= l'$ and b', area $= l'b'$

$l' = \frac{110}{100}l = \frac{11}{10}l$

$\frac{11}{10}lb' = lb \Rightarrow b' = \frac{10}{11}b$

Decrease in breath = b – b' = $b - \frac{10}{11}b = \frac{1}{11}b$

Percentage decrease in breadth

$\frac{b}{11b} \times 100 = \frac{100}{11} = 9\frac{1}{11}\%$.

Shortcut

Applying percentage change = $a + b + \frac{ab}{100}$.

Let decrease in breadth be x%.

Then $0 = 10 - x - \frac{10 \times x}{100} \Rightarrow \frac{11x}{10} = 10$

or $x = \frac{100}{11} = 9\frac{1}{11}\%$

10. A school has only three classes which contain 40, 50 and 60 students. The passing percentage of these classes are 10, 20 and 10 respectively. What is the percentage of the students who passed in the school?

Solution :

Total number of students = 40 + 50 + 60 = 150

Number of students passed

$$= \left(\frac{10}{100} \times 40 + \frac{20}{100} \times 50 + \frac{10}{100} \times 60\right)$$

= (4 + 10 + 6) = 20

Percentage of students passed

$$= \frac{20}{(40 + 50 + 60)} \times 100 = 13\frac{1}{3}\%.$$

11. Tax on water is increased by 20% but its consumption is decreased by 20%. Then, what is the percentage increase or decrease in the expenditure?

Solution :

Let the original consumption = 100 units and tax = ₹100 per unit.

Then, original expenditure = ₹(100 × 100) = ₹10,000.

New expenditure = 80 ×120 = ₹9600.

$$\text{Decrease in expenditure} = \left(\frac{400}{100 \times 100} \times 100\right) = 4\%.$$

Shortcut

$$\text{Change in expenditure} = 20 - 20 - \frac{20 \times 20}{100} = -4\%$$

Thus, expenditure decreases by 4%.

12. The number of seats in an auditorium is increased by 25%. The price of a ticket is also increased by 12%. What is the effect on the revenue collected?

Solution :

Let the initial number of seats be 100 and price per ticket be ₹1.

Then, revenue = Number of seats × Price per ticket

$$\text{Increased number of seats} = \frac{125}{100} \times 100 = 125$$

$$\text{Increased price of a ticket} = \frac{112}{100} \times 1 = ₹1.12$$

Increased revenue = 125 × 1.12 = ₹140

Percentage increase in revenue

= 140 – 100 = 40%

Shortcut

Using successive percentage increase formula $= x + y + \frac{x \times y}{100}$, where 'x' and 'y' are the percentage increase.

∴ Percentage increase in revenue

$= 25 + 12 + \frac{25 \times 12}{100}$ = 25 + 12 + 3 = 40%.

13. A's 5% income is equal to 15% income of B, and 10% of income of B is equal to 20% income of C. If income of C is ₹2,000, then what is the total income of A, B and C?

Solution :

$$\frac{5}{100}A = \frac{15}{100}B \text{ and } \frac{10}{100}B = \frac{20}{100}C$$

∴ A = 3B and B = 2C = 2 × 2000 = ₹4,000

∴ A = 3 × 4000 = ₹12,000

∴ A + B + C = (12,000 + 4,000 + 2,000) = ₹18,000

14. Arvind spends 75% of his income. His income is increased by 20% while his expenditure increased by 10%. By what per cent did Arvind's savings increase?

Solution :

Let the income be 100. Expenditure = 75 and savings = 25. New income = 120,

$$\text{New expenditure} = \left(\frac{110}{100} \times 75\right) = \frac{165}{2}.$$

$$\text{New savings} = \left(120 - \frac{165}{2}\right) = \frac{75}{2}$$

$$\text{Increase in savings} = \left(\frac{75}{2} - 25\right) = \frac{25}{2};$$

$$\text{Increase per cent} = \left(\frac{25}{2} \times \frac{1}{25} \times 100\right) = 50\%$$

15. Two numbers are respectively 19% and 70% more than a third number. The first number as a percentage of the second number is:

Solution :

Let the third number be 100.

Then, the first number is 100 + 19 = 119 and the second number is 170.

$$\therefore \quad \text{The first is } \frac{119}{170} \times 100 = 70\% \text{ of the second.}$$

Shortcut

$$\text{First number is } \frac{100 + 19}{100 + 70} \times 100 = 70\% \text{ of the second.}$$

16. Salaries of A, B and C are in the ratio 1 : 2 : 3. Salaries of B and C together is ₹6,000. By what percentage is the salary of C more than that of A?

Solution :

Let A = x; B = 2x and C = 3x.

Then $2x + 3x = 6000 \Rightarrow x = 1200$

$\therefore$ A = 1200 and C = 3600

Required percentage = $\left(\frac{2400}{1200} \times 100\right)$ = 200%

Shortcut

Salary of A = x and C = 3x

Hence, salary of C is 2x more than that of A

Required percentage $= \frac{2x}{x} \times 100 = 200\%$

17. If the side of a square is increased by 25%, then by what percentage is its area increased?

Solution :

Let the side be 10 cm. Then, the area will be 100 cm^2.

New side = 125% of 10 = 12.5 cm;

area = $(12.5)^2$ = 156.25 cm^2

$\therefore$ Percentage increase = 56.25%

Shortcut

If 'x' is the percentage increase in the side of a square, then increase in area is given by

$x + x + \frac{x \times x}{100} = 2x + \frac{x^2}{100}$;

$= 25 + 25 + \frac{25 \times 25}{100} = 56.25\%$.

18. A cricket team won 40% of the total number of matches it played during a year. If it lost 50% of the matches played and 20 matches were drawn, what was the total number of matches played by the team during the year?

Solution :

40% of x + 50% of x + 20 = x,

where x = Total number of matches

$\Rightarrow \frac{40}{100}x + \frac{50}{100}x + 20 = x$ or $x = 200$.

Exercise

1. What is $18\frac{3}{4}$% of 2000?
   (a) 300 (b) 400
   (c) 390 (d) 375
2. What percentage of 48 is 26?
   (a) 54.16% (b) 184.6%
   (c) 56.33% (d) 57.16%
3. What is $33\frac{1}{3}$% of 972?
   (a) 332 (b) 411
   (c) 348 (d) 324
4. What percentage of 60 is 37?
   (a) 60% (b) 61.66%
   (c) 65.66% (d) 70%
5. The population of a town increases from 6,500 to 7,475. What is the percentage increase?
   (a) 10% (b) 12%
   (c) 15% (d) 20%
6. The population of a town increases by 20% annually. What is the population after 2 years, if present population is 2,500?
   (a) 3,250 (b) 3,500
   (c) 3,600 (d) 4,000
7. What is 90% of 90% of 100?
   (a) 80 (b) 100
   (c) 90 (d) 81
8. If 37% of a number is 990.86, then what will be (approximately) 19% of that number?
   (a) 600 (b) 400
   (c) 510 (d) 700
9. 50 min is what percentage of an hour?
   (a) 83.33% (b) 50%
   (c) 90% (d) 87.66%
10. I bought 20 kg mango, out of which 16 kg was fine and rest were rotten. What is my percentage loss, if I bought them for ₹30 per kilogram?
    (a) 33% (b) 40%
    (c) 15% (d) 20%
11. If A's income is 25% more than B's, then what is B's income as a percentage of A's income?
    (a) 75% (b) 80%
    (c) 90% (d) 125%
12. In an examination the passing percentage is 40. A obtained 72 out of 200. By what percentage of the total marks did he fail?
    (a) 8% (b) 5%
    (c) 4% (d) 16%
13. What is y as a percentage of x, if x is 120% of y?
    (a) 80% (b) 83.33%
    (c) 75% (d) 86.66%
14. If A is increased by 10%, by what per cent does A^2 increase?
    (a) 20% (b) 21%
    (c) 100% (d) 10%
15. A is what per cent of $\left(\frac{9}{15}\right)$ A?
    (a) 60% (b) 100%
    (c) 133.33% (d) 166.66%
16. If the length and breadth of a rectangle are decreased by 10%, then by what per cent does the area decrease?
    (a) 19% (b) 25%
    (c) 10% (d) 20%
17. The price of rice increased from ₹15 by 15% and then reduced by 30 paise. What was the net increase?
    (a) 10% (b) 12%
    (c) 13% (d) 28%
18. What is 30% of 55% of 100?
    (a) 25 (b) 85
    (c) 16.5 (d) 11.5
19. If 20% of a number exceeds 16% of the same number by 16, what is the number?
    (a) 400 (b) 40
    (c) 4000 (d) 160
20. Which is the largest?
    (a) $66\frac{1}{6}$% (b) $\frac{3}{5}$
    (c) 0.65 (d) $\frac{16}{25}$

21. In a town, there are 2,500 men and 2,500 women. If the number of men increased by 20% and women decreased by 20%, women as a percentage of men now is
    (a) 60% (b) 66.67%
    (c) 80% (d) 83.33%
22. In order to increase sales, price of a product was decreased by 20%. The net sales increased by 28%. What was the percentage increase in number of units sold?
    (a) 48% (b) 50%
    (c) 60% (d) 83%
23. In a class of 300 students, the number of boys is twice that of girls. If 50% of boys and 48% of girls appear in examinations, how many students did not appear?
    (a) 6 (b) 160
    (c) 152 (d) 144
24. Al Pacino invested 40% of his money in shares, 20% of rest in property and lost 25% of the remaining in a casino. What per cent does he have now?
    (a) 15% (b) 40%
    (c) 42% (d) 36%

Directions for questions 25 to 27: Answer the questions based on the following information.

In an election, there were only 2 candidates. The losing candidate received $66\frac{2}{3}\%$ of the votes the winner got. The votes polled in favour of the loser were 60 less than that of the winner.

25. How many votes did the loser get?
    (a) 200 (b) 150
    (c) 120 (d) 100
26. How many votes were cast?
    (a) 200 (b) 300
    (c) 400 (d) 500
27. What percentage of the total votes did the winner get?
    (a) 60% (b) 50%
    (c) 80% (d) 66.66%
28. If the numerator of a fraction is increased by 25% and the denominator is decreased by 20%, the new value is $\frac{5}{4}$. What was the original fraction?
    (a) $\frac{3}{5}$ (b) $\frac{4}{5}$
    (c) $\frac{7}{8}$ (d) $\frac{3}{7}$
29. If 28% of a number is less than 43% of the same number by 75. What is 30% of that number?
    (a) 120 (b) 150
    (c) 180 (d) 200
30. In an examination, it is required to get 45% marks to pass. A student got 138 marks and failed by 15%. What were the maximum marks?
    (a) 400 (b) 450
    (c) 460 (d) 600
31. A 'laddoo' is made of 70% flour, 20% sugar and rest is 'ghee'. What is the quantity of 'ghee' in 2 kg laddoos?
    (a) 200 g (b) 2 kg
    (c) 100 g (d) 400 g
32. Calculation shows that an angle is $37\frac{1}{2}^{\circ}$. The size obtained by drawing and measurement is 36º. The error percentage is
    (a) $1\frac{1}{2}\%$ (b) 3%
    (c) 4% (d) $4\frac{1}{6}\%$
33. Avinash spends 30% of his income on petrol for scooter, $\frac{1}{4}$ of the remaining on house rent and the balance on food. If he spends ₹300 on petrol, then what is the expenditure on house rent?
    (a) ₹525 (b) ₹1,000
    (c) ₹675 (d) ₹175
34. If x% of 'a' is the same as y% of 'b', then z% of 'b' is
    (a) $\frac{yz}{x}$ % of 'a' (b) $\frac{xy}{z}$ % of 'a'
    (c) $\frac{xz}{y}$ % of 'a' (d) None of these
35. In an examination, A got 10% marks less than B; B got 25% marks more than marks obtained by C; and C got 20% marks less than D. If A got 360 marks out of 500, the percentage of marks obtained by D was
    (a) 70% (b) 75%
    (c) 80% (d) 85%

36. p is six times as large as q. The percentage by which q is less than p is
    (a) 83.33% (b) 16.66%
    (c) 90% (d) 60%
37. In an election, involving two candidates, 68 votes were declared invalid. The winning candidate scores 52% of the valid votes and wins by 98 votes. The total number of votes polled is
    (a) 2,518 (b) 2,450
    (c) 2,382 (d) None of these
38. The price of sugar is increased by 20%. As a result, a family decreases its consumption by 25%. The expenditure of the family on sugar will be decreased by
    (a) 10% (b) 5%
    (c) 14% (d) 15%
39. The current birth rate per thousand is 32, whereas corresponding death rate is 11 per thousand. The net growth rate in terms of population is
    (a) 0.021%
    (b) 0.0021%
    (c) 21%
    (d) 2.1%
40. The length of a rectangle is increased by 60%. By what per cent the width must be decreased to maintain the same area?
    (a) 37.5%
    (b) 60%
    (c) 75%
    (d) None of these

Answer Key

1. (d)	**2.** (a)	**3.** (d)	**4.** (b)	**5.** (c)	**6.** (c)	**7.** (d)	**8.** (c)	**9.** (a)	**10.** (d)
11. (b)	**12.** (c)	**13.** (b)	**14.** (b)	**15.** (d)	**16.** (a)	**17.** (c)	**18.** (c)	**19.** (a)	**20.** (a)
21. (b)	**22.** (c)	**23.** (c)	**24.** (d)	**25.** (c)	**26.** (b)	**27.** (a)	**28.** (b)	**29.** (b)	**30.** (c)
31. (a)	**32.** (c)	**33.** (d)	**34.** (c)	**35.** (c)	**36.** (a)	**37.** (a)	**38.** (a)	**39.** (d)	**40.** (a)

Explanations

1. d $18\frac{3}{4}\%$ of 2000 = $\frac{75}{4} \times \frac{2000}{100} = 375$

   Alternative: 18% of 2000 + $\frac{3}{4}\%$ of 2000 = 375

2. a $\frac{26}{48} \times 100 = \frac{13}{24}$ × 100 = 54.16%

3. d $33\frac{1}{3}\%$ of 972 = $\frac{1}{3} \times 972$ = 324

4. b $\frac{37}{60}$ × 100 = 61.66%

5. c Percentage increase = $\frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$

   = $\frac{7475 - 6500}{6500} = \frac{975}{6500}$ × 100 = 15%

6. c 20% increase for 2 years = 20 + 20 + $\frac{20 \times 20}{100}$

   {using successive % change a + b + $\frac{ab}{100}$} = 44%

   Now, population after 2 years = 2500 × 1.44 = 3600.

7. d 90% of 90% of 100 = 90% of 90 = 81.

8. c Let 37% of x = 990.86.

   Then, $\frac{37}{100} \times x$ = 990.86

   $\Rightarrow x = \frac{990.86 \times 100}{37} = \frac{99086}{37} = 2678.$

   Now, 19% of 2678 = $\frac{19}{100} \times 2678 = 508.82$

   or 510 approximately.

9. a 1 hr = 60 min, $\therefore \frac{50}{60} \times 100 = 83.33\%$

10. d Loss percentage = $\frac{4}{20} = \frac{1}{5} = 20\%$

11. b A's income = 1.25 B's income.

    B's income = $\frac{1}{1.25}$ A's income = 80% of A's income.

12. c 40% of 200 = 80

    He obtained 72, i.e. he failed by 8 marks.

    Percentage by which he failed = $\frac{8}{200} \times 100 = 4\%$.

13. b If x = 120% of y, then y = $\frac{100}{120}$ of x = 83.33% of x.

14. b If A is increased by 10%,

    i.e. A_1 = 1.1A

    $\therefore A_1^2 = (1.1)^2 A^2 = 1.21A^2$

    $\therefore A^2$ increases by 21%.

15. d $A = \frac{1500}{9}\%$ of $\frac{9}{15}$A i.e. 166.66%.

16. a Length becomes 0.9L.

    Breadth becomes 0.9B.

    Area = 0.9L × 0.9B = 0.81LB.

    $\therefore$ Area decreases by 19%.

    Short cut:

    Using successive % change

    $-10 - 10 + \frac{10 \times 10}{100} = -19\%(\text{decrease})$

17. c Price of rice after 15% increase

    = 1.15 × 15 = ₹17.25

    After 30 paise reduction, price = ₹16.95

    Net increase = $\frac{16.95 - 15}{15} \times 100$ = 13%.

18. c 30% of 55% of 100 = 30% of 55 = 16.5

19. a Let the number be n.

    Then 20% of n – 16% of n = 16

    0.2n – 0.16n = 16 or 0.04n = 16

    $\Rightarrow n = 400$

20. a (i) $66\frac{1}{6}\%$, (ii) $\frac{3}{5}$ = 60%

    (iii) 0.65 = 65%, (iv) $\frac{16}{25}$ = 64%

    Hence option (a).

21. b After 20% increase, men = 2500 × 1.2 = 3000.

    After 20% decrease, women = 2500 × 0.8 = 2000.

    So, women as a percentage of men = $\frac{2000}{3000}$ = 66.67%.

22. c Net sales = Number of units × Price

    1.28 S = y (Number of units) × SP

    $y = \frac{1.28}{.8} = 1.6$

    $\therefore$ Number of units increase by 60%

23. c In a class of 300 students, boys = 200, girls = 100.

    50% boys = 100, 48% girls = 48.

    Total students who appeared = 148.

    Hence, 300 – 148 = 152 did not appear.

24. d Let he has ₹100. He invests ₹40 in shares. Out of ₹60, he invests ₹12 in property. Out of remaining ₹48, he loses ₹12 at casino. He is left with ₹36, i.e. 36%.

25. c Let the winner gets 'x' votes.

$\therefore$ The loser got $(x - 60)$ or $\frac{2}{3}x$ votes.

$\therefore x = 180$, i.e. the winner got 180 votes and the loser got 120 votes.

26. b $180 + 120 = 300$

27. a $\frac{180}{300} = \frac{6}{10} = \frac{3}{5} = 60\%$

28. b Let the original fraction $= \frac{x}{y}$.

$$\therefore \frac{x + 25\% \text{ of } x}{y - 20\% \text{ of } y} = \frac{5}{4},\ \frac{1.25x}{0.8y} = \frac{5}{4} \Rightarrow \frac{x}{y} = \frac{4}{5}$$

29. b Let 100 be the number. Then $43 - 28 = 15$. But difference is 75, i.e. five times 15. Therefore, actual number should be five times 100, i.e. 500.

$\therefore 30\%$ of $500 = \frac{30}{100} \times 500 = 150$

30. c A student failed by 15%, i.e. he has got only 30%.
So, 30% of total marks = 138.

$\therefore$ Total marks $= \frac{138}{30} \times 100 = 460$.

31. a In 1 kg pack, ghee is 10%, i.e. 100 g.
So, in 2 kg, ghee will be 200 g.

32. c Error on $37\frac{1}{2} = \left(37\frac{1}{2} - 36\right) = 1\frac{1}{2}$.

$\therefore$ Error on $\frac{75}{2} = \frac{3}{2}$.

Error on 100 $= \left(\frac{3}{2} \times \frac{2}{75} \times 100\right) = 4\%$.

33. d 30% of petrol = ₹300. Hence, total sum = ₹1,000.

70% = 700; $\frac{1}{4}$th of 700 = ₹175

34. c $x\%$ of $a = y\%$ of $b \Rightarrow \frac{x}{100}a = \frac{y}{100}b$

$$\Rightarrow b = \left(\frac{x}{100} \times \frac{100}{y}\right)a = \left(\frac{x}{y}\right)a$$

$$z\% \text{ of } b = z\% \text{ of } \left(\frac{x}{y}\right)a = \left(\frac{xz}{y \times 100}\right)a$$

$$= \left(\frac{xz}{y}\right)\% \text{ of } a$$

35. c $A = \frac{90}{100}B$, $B = \frac{125}{100}C$ and $C = \frac{80}{100}D$

$B = \frac{10}{9}A$, $C = \frac{4}{5}B$ and $D = \frac{5}{4}C$ then,

$$B = \frac{10}{9} \times 360 = 400,\ C = \frac{4}{5} \times 400 = 320$$

$$\text{and } D = \frac{5}{4} \times 320 = 400$$

Percentage of marks obtained by

$$D = \left(\frac{400}{500} \times 100\right)\% = 80\%$$

36. a $p = 6q$. So q is less than p by 5q.
Note that q has been compared with p, i.e. p is the base for comparison.
Required percentage

$$\left(\frac{5q}{p} \times 100\right)\% = \left(\frac{5q}{6q} \times 100\right)\% = 83\frac{1}{3}\%.$$

37. a Let the valid votes be x.
Then 52% of x – 48% of x = 98 $\Rightarrow$ 4% of x = 98.

$\therefore \frac{4}{100}x = 98 \Rightarrow x = 98 \times 25 = 2450.$

$\therefore$ Total votes polled = (2450 + 68) = 2518.

38. a Let the original consumption = 100 units and the original price = ₹100 per unit.
Original expenditure = ₹(100 × 100) = ₹10,000.
New expenditure = ₹(120 × 75) = ₹9,000.

Decrease in expenditure $= \left(\frac{1000}{10000} \times 100\right)\% = 10\%$.

Short Cut:

Change in expenditure $= 20 - 25 - \frac{20 \times 25}{100} = -10\%$

Thus, expenditure decreases by 10%

39. d Net growth on 1000 = (32 – 11) = 21.

Net growth on 100 $= \left(\frac{21}{1000} \times 100\right) = 2.1\%$.

40. a Let length = l and breadth = b, and the required decrease in breadth be x%.

Then, $\frac{160}{100}l \times \frac{(100 - x)}{100} \times b = lb$

$$\Rightarrow 160(100 - x) = 100 \times 100$$

$$\Rightarrow 100 - x = \frac{10000}{160} = \frac{125}{2}$$

$$\Rightarrow x = \left(100 - \frac{125}{2}\right) = 37\frac{1}{2}\%$$