CHAPTER 7

Percentage

Decimal Fraction

When a fraction (*i.e.*, of form x/y) has a denominator 10, 100, 1000 etc., then we call the fraction as a decimal fraction.

e.g., $\frac{4}{5}, \frac{3}{2}$, etc., are fractions while $\frac{1}{10}, \frac{1}{100}, \frac{1}{1000}$ etc., are decimal fractions.

Percentage

If a decimal fraction has 100 as its denominator, it is called a percentage.

Thus, 29/100 means 29 percentage. Here, symbol % means per cent or per hundred.

Important Rules and Formulae

Rule 1 For expressing 'a' % as a fraction, then $a\% = \frac{a}{100}$, *i.e.*, divide 'a' by 100 and reduce it to the lowest form.

e.g., $25\% = \frac{25}{100} = \frac{1}{4}$

Rule 2 For expressing a fraction $\frac{a}{b}$ as a per cent. Then,

$$\frac{a}{b} = \left(\frac{a}{b} \times 100\right)\%$$

e.g., $\frac{2}{3} = \frac{2}{3} \times 100 = \frac{200}{3}\%$

Points to be Remember

- We can change decimal into percentage and percentage into decimal also.

  e.g., Express as a decimal

  (i) $6\% = \frac{6}{100} = 0.06$

  e.g., Express as a percentage

  (ii) $2.5 = 2.50 = \frac{250}{100} = 250\%$

Rule 3 Percentage increase or decrease in a value :

Increase or decrease percentage :

$$\frac{\text{Increase or decrease in the value}}{\text{Initial value}} \times 100$$

Rule 4 If 'A' income is x% more than that of 'B', then B's income is less than that of 'A' by $\left[\frac{x}{(100+x)} \times 100\right]$%.

Rule 5 If 'A' income is x% less than that of 'B', then B's income is more than that of A by $\left[\frac{x}{(100-x)} \times 100\right]$%.

Example 1. If Ram's monthly income is 60% more than that of Shyam, then how much per cent is Shyam monthly income less than that of Ram?

(a) $35\frac{1}{2}\%$ (b) 36%

(c) 37% (d) $37\frac{1}{2}\%$

Sol. (*d*) Shyam's income is less than that of Ram by

$$\left(\frac{r}{(100+r)} \times 100\right)\% = \left(\frac{60}{100+60} \times 100\right)\% = 37\frac{1}{2}\%$$

Example 2. Raj get 10% less marks than Rohit in an examination. What percentage of marks does Rohit gets more than Raj?

(a) $11\frac{1}{6}\%$ (b) $11\frac{1}{9}\%$

(c) $12\frac{1}{9}\%$ (d) None of these

Sol. (*b*) Rohit more percentage than Raj

$$= \frac{10}{100-10} \times 100 = \frac{10 \times 100}{90} = 11\frac{1}{9}\%$$

Rule 6 Let the present population which increases r% per year, then

(i) population after n year $= P\left[1+\frac{r}{100}\right]^n$

(ii) population n year ago $= \frac{P}{[1+r/100]^n}$

If in any case the population decreases, then take $r = -r$.

Example 3. The population of Meerut is 8000. It increases by 10% during first year and 20% during the second year. The population after two years is

(a) 9560 (b) 10560 (c) 10590 (d) 11560

Sol. (*b*) Total population after 2 yr

$$= 8000\left(1+\frac{10}{100}\right)\left(1+\frac{20}{100}\right) = 8000\left(\frac{110}{100}\right)\left(\frac{120}{100}\right) = 10560$$

Example 4. The population of a town increases by 5% annually. If it is 15435 now, then its population 2 yr ago

(a) 9000 (b) 11000 (c) 12000 (d) 14000

Sol. (*d*) Here, $15435 = P\left(1+\frac{5}{100}\right)^2$

$$\Rightarrow \quad 15435 \times \left(\frac{100}{105}\right)^2 = P \Rightarrow P = 14000$$

Rule 7 If the price of an item increased by r%, then the reduction in consumption so that the expenditure is not increased is

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

Rule 8 If the price of commodity decreases by r%, then the increase in consumption so that the expenditure remains the same is

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

Example 5. If the price of the cooking gas rises by 15%, by what per cent should a family reduce its consumption so as not to exceed the budget on cooking gas?

(a) $12\frac{1}{23}\%$ (b) $13\frac{1}{23}\%$

(c) $14\frac{1}{23}\%$ (d) None of these

Sol. (*b*) Let price of cooking gas = ₹ 100

Raised price = ₹ 115

On ₹ 115 he should reduce ₹ 15 on ₹ 100, he should reduce

$$= \frac{15}{115}\times 100 = 13\frac{1}{23}\%$$

Example 6. The length of a rectangle is increased by 60%. By what per cent would the breadth be decreased to maintain the same area?

(a) $37\frac{1}{2}\%$ (b) 37%

(c) $36\frac{1}{2}\%$ (d) $38\frac{1}{3}\%$

Sol. (*a*) Let the length be 100 m and breadth be 100 m then

New length = 160 m, New breadth = x,

then $160 \times x = 100 \times 100$

$$\Rightarrow \quad x = \frac{100\times 100}{160} \Rightarrow x = \frac{125}{2}$$

Decrease in breadth $= \left(100 - \frac{125}{2}\right)\% = 37\frac{1}{2}\%$

Example 7. The length and breadth of a square are increased by 40% and 20%, respectively. Find the difference of area of the rectangle so formed to the original square.

(a) 56% (b) 57.5% (c) 65% (d) 68%

Sol. (*d*) Let length = 100 m and breadth = 100 m

Area of square $= (100)^2 = 10000\,m^2$

New length = 140 m

New breadth = 120 m

New area $= (140\times 120)\,m^2 = 16800\,m^2$

Increase in area $= 16800 - 10000 = 6800\,m^2$

Increase percentage $= \left(\frac{6800}{10000}\times 100\right)\% = 68\%$

Exercise

1. The fraction equivalent to 2/5% is
(a) 1/250 (b) 1/125 (c) 1/500 (d) 1/300

2. 0.25 in terms of rate per cent is
(a) 50% (b) 0.25% (c) 25% (d) 2.5%

3. What per cent is 4% of 5%?
(a) 80% (b) 0.8% (c) 0.08% (d) 1%

4. What is the number whose 20% is 30% of 40%?
(CDS 2011 I)
(a) 90 (b) 80 (c) 60 (d) 50

5. If salary of X is 20% more than salary of Y, then by how much percentage is salary of Y less than X?
(CDS 2010 II)
(a) 25 (b) 20 (c) $\frac{50}{3}$ (d) $\frac{65}{4}$

6. If the cost of a book worth ₹ 50 is increased by ₹ 25, the rate of increase is
(a) 25% (b) 20% (c) 50% (d) 10%

7. A number exceeds 20% of itself by 40. The number is
(a) 40 (b) 50 (c) 30 (d) 60

8. If 90% of A = 30% of B and B = x% of A, the value of x is
(a) 700 (b) 600 (c) 300 (d) 1100

9. When 40% of a number is added to 42, the result is the number itself. The number is
(a) 70 (b) 90 (c) 82 (d) 72

10. If the length of a rectangle is increased by 10% and the area is unchanged, then by how much per cent does the breadth decrease? **(CDS 2007 I)**
(a) 100/11% (b) 100/9% (c) 9% (d) 10%

11. Two candidates fought an electron one get 65% of the votes and won by 300 votes. The total number of votes polled is
(a) 700 (b) 950 (c) 1000 (d) 900

12. What number when increased by 20% becomes 300?
(a) 250 (b) 200 (c) 180 (d) 280

13. If x% of y is 13x, then the value of y is
(a) 880 (b) 1300 (c) 1200 (d) 700

14. The income of '*A*' is 20% higher than that of '*B*'. The income of '*B*' is 25% less than of '*C*'. What per cent less is *A*'s income from *C*'s income? **(CDS 2011 I)**
(a) 7% (b) 8% (c) 10% (d) 12.5%

15. A man spends ₹ 3500 and saves $12\frac{1}{2}$% of his income. His monthly income (in ₹) is
(a) 4000 (b) 3800 (c) 4200 (d) 4500

16. The population of a village increases by 20% in one year and decrease by 20% by the next year. If at the beginning of the third year, the population is 5184, what was the population in the first year? **(CDS 2007 II)**
(a) 5400 (b) 5500 (c) 5600 (d) 5800

17. 38 L of milk was poured into a tub and the tub was found to be 5% empty. To completely fill the tub, what amount of additional milk must be poured? **(CDS 2011 I)**
(a) 1 L (b) 2 L (c) 3 L (d) 4 L

18. In an examination 52% of the candidates failed in English, 42% in Mathematics and 17% in both. The number of those who passed in both the subjects is
(a) 23% (b) 40% (c) 53% (d) 33%

19. The population of a village is 5000 and it increases at the rate of 2% every year. After 2 yr, the population will be
(a) 5120 (b) 5100 (c) 5204 (d) 5202

20. If after 24% of wastage the net output of a coal-mine is 68400 quintals. Then, the total output of the coal-mine in quintals is
(a) 70000 (b) 90000 (c) 80000 (d) 89000

21. A person spends 30% of monthly salary on rent, 25% on food, 20% on children's education and 12% on electricity and the balance of ₹ 1040 on the remaining items. What is the monthly salary of the person? **(CDS 2010 II)**
(a) ₹ 8000 (b) ₹ 9000 (c) ₹ 9600 (d) ₹ 10600

22. A rise of 25% in the price of grapes compels a person to buy 1.5 kg of grapes less for ₹ 240. Then, the original price of grapes per kg is
(a) ₹ 40 (b) ₹ 32 (c) ₹ 30 (d) ₹ 28

23. The price of an item is increased by 20% and then decreased by 20% the final price as compared to original price is
(a) 4% less (b) 4% more (c) 20% less (d) 20% more

24. If the radius of the base and the height of a right circular cone are increased by 20%, then what is the approximate percentage increases in volume? **(CDS 2009 II)**
(a) 60 (b) 68 (c) 73 (d) 75

25. If *A*'s salary is 50% more than *B*'s, then by what per cent *B*'s salary is less than *A*'s salary?
(a) $33\frac{1}{3}$% (b) $23\frac{1}{13}$% (c) 33% (d) 30%

26. Sohan saves 14% of his salary while George saves 22%. If both gets the same salary and George saves ₹ 1540. Then, the salary of each of them is
(a) ₹ 9500 (b) ₹ 17000 (c) ₹ 7000 (d) ₹ 7500

27. *A*'s salary is half that of *B*. If *A* got a 50% rise in his salary and *B* got a 25% rise in his salary, then the percentage increase in combinded salaries of both is
(a) 13% (b) $33\frac{1}{3}$% (c) 33% (d) 45%

28. There are some coins and rings of either gold or silver in a box. 60% of the objects are coins, 40% of the rings are of gold and 30% of the coins are of silver. What is the percentage of gold articles? **(CDS 2009 I)**
(a) 16 (b) 27 (c) 58 (d) 70

29. A man donated 4% of his salary to a charity and deposited 10% of the rest in the bank. If now he has ₹ 10800, then his income was
(a) ₹ 13500 (b) ₹ 14500 (c) ₹ 40000 (d) ₹ 12500

30. Rohit saves 30% of his salary. When his expenses increased by 30%, he is able to save ₹ 1215 per month. His monthly salary is
(a) ₹ 13500 (b) ₹ 14500 (c) ₹ 30000 (d) ₹ 12500

31. A customer asks for the production of x number of goods. The company produces y number of goods daily out of which z% are unfit for sale. The order will be completed in day
(a) $\frac{10x}{100(yz)}$ (b) $\frac{100x}{y(100-z)}$ (c) $\frac{100x}{y(z-1)}$ (d) $\frac{100x}{y(100+z)}$

32. Water contains $14\frac{2}{7}$% of hydrogen and the rest is oxygen. In 350 g of water, oxygen will be
(a) 300 g (b) 250 g **(CDS 2011 II)**
(c) 200 g (d) None of these

33. A man spends 75% of his income. If his income is increased by 20% and he increased his expenditure by 10%. His savings percentage is increased by
(a) 25% (b) 50% (c) 75% (d) 10%

34. The price of wheat has increased by 60%. In order to restore to the original price, the new price must be reduced by
(a) 37.5% (b) 33% (c) 34% (d) 40%

35. 3 L of water is added to 5 L of a 20% solution of alcohol in the water. The strength of the alcohol is now
(a) 12.5% (b) 27.5% (c) 28.5% (d) 20%

36. If the height of a cone is increased by 50%, then what is the percentage increase in the volume of the cone? **(CDS 2010 II)**
(a) $\frac{100}{3}$ (b) 40 (c) 50 (d) $\frac{200}{3}$

37. If the numerator of a fraction increased by 20% and its denominator be diminished by 10%. The value of the fraction is $\frac{16}{27}$, then the fraction is

(a) 4/9 (b) 3/2 (c) 3/8 (d) 9/4

38. What is the 5% of 25% of ₹ 1200?

(a) ₹ 30 (b) ₹ 15 (c) ₹ 305 (d) ₹ 600

39. 1 L of water is evaporated from 6 L of a solution having 4% of sugar. The percentage of sugar in the remaining solution is

(a) 4% (b) 5% (c) $4\frac{4}{5}\%$ (d) $\frac{4}{5}\%$

40. Two numbers are less than a number by 30% and 40%, respectively. How much per cent is the second number less than the first?

(a) 35% (b) 36% (c) 14% (d) $14\frac{2}{7}\%$

41. The length and the breadth of a square are increased by 30% and 20%, respectively. The area of rectangle so formed exceeds the area of the square by

(a) 56% (b) 54% (c) 42% (d) 46%

42. A sample of 5 L of glycerine is formed to be adulterated to the extent of 20%. Find how glycerine should be added to bring down percentage of impurity to 5%

(a) 10 L (b) 25 L (c) 15 L (d) 20 L

43. 10% of the inhabitants of a certain city left that city. Later on 10% of the remaining inhabitants of that city again left the city. What is the remaining percentage of population of that city? **(CDS 2009 II)**

(a) 80% (b) 80.4% (c) 80.6% (d) 81%

44. The daily wages of a worker increase by 20% but the number of hours worked by him also dropped by 20%. If originally he was getting ₹ 200 per week, his wages per week now is

(a) ₹ 160 (b) ₹ 192 (c) ₹ 210 (d) ₹ 198

45. 140 L of a liquid contains 90% of acid and the rest water. How much water must be added to make the water 12.5% of the resulting mixture?

(a) 4 L (b) 10 L (c) 12 L (d) 3 L

46. To an examination, a candidate needs 40% marks. All questions carry equal marks. A candidate just passed by getting 10 answers correct by attempting 15 of the total questions. How many questions are there in the examination? **(CDS 2011 I)**

(a) 25 (b) 30 (c) 40 (d) 45

47. The number of workers in the employment guarantee scheme increased by 15 which resulted into an increase of 20%. What was the initial number of workers? **(CDS 2009 II)**

(a) 60 (b) 75
(c) 80 (d) 90

48. If 50% of $(x - y) = 40\%$ of $(x + y)$, then what per cent of x is y? **(CDS 2010 I)**

(a) $10\frac{1}{9}\%$ (b) $11\frac{1}{9}\%$ (c) $13\frac{1}{9}\%$ (d) $21\frac{1}{9}\%$

49. An employee is required to contribute 10% of his pay to General Provident Fund. If he gets ₹ 13500 as net pay in a month, then what is the monthly General Provident Fund contribution (assuming no other deductions)? **(CDS 2011 II)**

(a) ₹ 1215 (b) ₹ 1350 (c) ₹ 1500 (d) ₹ 1650

Answers

1. (a)	2. (c)	3. (a)	4. (c)	5. (c)	6. (c)	7. (b)	8. (c)	9. (a)	10. (a)
11. (c)	12. (a)	13. (b)	14. (c)	15. (a)	16. (a)	17. (b)	18. (a)	19. (d)	20. (b)
21. (a)	22. (b)	23. (a)	24. (c)	25. (a)	26. (c)	27. (b)	28. (c)	29. (d)	30. (a)
31. (b)	32. (a)	33. (b)	34. (a)	35. (a)	36. (c)	37. (a)	38. (b)	39. (c)	40. (d)
41. (a)	42. (c)	43. (d)	44. (b)	45. (a)	46. (a)	47. (b)	48. (b)	49. (c)	

Hints and Solutions

1. $\frac{2}{5}\% = \frac{2}{5} \times \frac{1}{100} = \frac{1}{250}$

2. $0.25 \times 100 = 25\%$

3. Required percentage $= \left[\frac{4\%}{5\%} \times 100\right]\% = \left[\frac{4/100}{5/100} \times 100\right]\% = 80\%$

4. Let the number be x.

By given condition, 20% of x = 30% of 40

$\therefore \quad \frac{x \times 20}{100} = \frac{40 \times 30}{100}$

$\Rightarrow \quad x = \frac{40 \times 30}{20} = 60$

5. Let the salary of $Y = ₹\ a$

$\therefore$ Salary of $X = ₹\ \frac{120a}{100} = ₹\ \frac{6a}{5}$

Difference of their salaries $= ₹\left(\frac{6a}{5} - a\right) = ₹\ \frac{a}{5}$

$\therefore$ Required percentage $= \frac{\frac{a}{5}}{\frac{6a}{5}} \times 100\% = \frac{50}{3}$

6. Increase on ₹ 100 $= \left(\frac{25}{50} \times 100\right) = 50\%$

7. Let the number be x.

$$x - 20\% \text{ of } x = 40 \Rightarrow x - \frac{20}{100} \times x = 40 \Rightarrow \frac{4x}{5} = 40$$

$$\therefore \quad x = \frac{40 \times 5}{4} = 50$$

8. $\frac{90}{100}A = \frac{30}{100}B = \frac{30}{100} \times \frac{x}{100}A$

$$\therefore \quad x = \left(100 \times \frac{100}{30} \times \frac{90}{100}\right) = 300$$

9. Let the number be x, then

$$42 + 40\% \text{ of } x = x \Rightarrow x = 42 + \frac{40}{100}x$$

$$\Rightarrow \quad \frac{3}{5}x = 42 \Rightarrow x = \frac{42 \times 5}{3} = 70$$

10. Let the length of the rectangle $= l$

and breadth of the rectangle $= b$

$\therefore$ Area of rectangle $= lb$

New length of the rectangle $= \frac{l \times 110}{100} = \frac{11l}{10}$

and let new breadth of the rectangle $= B$

$\therefore$ Area of new rectangle $= \frac{11l}{10}B$

By given condition, $lb = \frac{11l}{10}B \Rightarrow B = \frac{10}{11}b$

$\therefore$ Decrease in breadth of the rectangle $= b - \frac{10}{11}b = \frac{b}{11}$

$$\text{Percentage decrease} = \frac{b/11}{b} \times 100\% = \frac{100}{11}\%$$

11. Let total number of votes polled be x, then

$$65\% \text{ of } x - 35\% \text{ of } x = 300$$

$$\frac{65}{100}x - \frac{35}{100}x = 300 \Rightarrow \frac{30}{100}x = 300$$

$$x = \frac{300 \times 100}{30} \Rightarrow x = 1000 \text{ votes}$$

12. $x + \frac{20x}{100} = 300 \Rightarrow x = \frac{300 \times 100}{120} = 250$

13. By condition $x\%$ of $y = 13x \Rightarrow \frac{x}{100}y = 13x$

$$\Rightarrow \quad y = 13 \times 100 = 1300$$

14. Let C's income $= ₹\ x$

$$\therefore \quad B\text{'s income} = \frac{x \times 75}{100} = ₹\ \frac{3x}{4}$$

and A's income $= \frac{3x}{4} \times \frac{120}{100} = ₹\ \frac{9x}{10}$

$$\therefore \text{ Required percentage} = \frac{x - \frac{9x}{10}}{x} \times 100 = 10\%$$

Here, A's income is 10% less than C's income.

15. Let total income by ₹ x.

$$\Rightarrow \quad 87\frac{1}{2}\% \text{ of } x = 3500 \Rightarrow \frac{175}{2 \times 100}x = 3500$$

$$\Rightarrow \quad x = \frac{3500 \times 2 \times 100}{175} = 4000$$

16.

Present populations	After 1 yr	Next year
x	$x + 20\%$ of x	$\left(x + \frac{x}{5}\right) - 20\%$ of $\left(x + \frac{x}{5}\right)$
	or	or
x	$\left(x + \frac{x}{5}\right)$	$\frac{4}{5}\left(x + \frac{x}{5}\right)$

By given condition, $\frac{4}{5}\left(x + \frac{x}{5}\right) = 5184$

$$\Rightarrow \quad \frac{4}{5} \times \frac{6x}{5} = 5184 \Rightarrow x = \frac{5184 \times 25}{24} = 5400$$

17. Amount of milk in tub $= 38$ L

95% of total milk $= 38$ L

$$\text{Percentage of total milk} = \frac{38}{95} \text{ L}$$

$$5\% \text{ of total milk} = \frac{38 \times 100}{95} \times \frac{5}{100} = 2 \text{ L}$$

18. Failed in Maths $= 42$

Failed in English $= 52$

Failed in English only $= 52 - 17 = 35$

Failed in Maths only $= 42 - 17 = 25$

Failed in Maths or English or both $= 35 + 25 + 17 = 77$

Passed percentage in both $= (100 - 77)\% = 23\%$

19. Population after 2 yr $= 5000 \times \left(1 + \frac{2}{100}\right)^2$

$$= 5000 \times \frac{51}{50} \times \frac{51}{50} = 5202$$

20. Useful output $= 100 - 24 = 76\%$

Let total output be x quintal.

$$\Rightarrow \quad \frac{76}{100}x = 68400$$

$$\Rightarrow \quad x = \frac{68400 \times 100}{76} = 90000 \text{ quintal}$$

21. Let the monthly salary of the person $= ₹\ x$

By given condition, $\frac{(100 - 30 - 25 - 20 - 12) \times x}{100} = 1040$

$$\Rightarrow \quad x = \frac{1040 \times 100}{13} = 8000$$

Hence, monthly salary of the person $= ₹\ 8000$

22. Let original price be ₹ x.

$$\text{Rise in price} = ₹\ \frac{25}{100}x$$

$$\therefore \text{ Increased price} = x + \frac{25}{100}x = ₹\ \frac{125}{100}x \quad \ldots(i)$$

Increased price of 1.5 kg of grapes $= \frac{25}{100} \times 240 = ₹\ 60$

$$\therefore \text{ Increased price of 1 kg} = \frac{60}{15} = ₹\ 40 \quad \ldots(ii)$$

So, from Eqs. (i) and (ii)

$$\frac{125}{100}x = ₹\ 40$$

$$x = \frac{40 \times 100}{125} = ₹\ 32$$

23. Let original price = 100

First new price with rise of 20% = 120

Final price = 80% of 120 $= \frac{80}{100} \times 120 = 96$

∴ Percentage less in final price = 100 − 96 = 4%

So, final price is 4% less than original.

24. Since, volume of cone $V_1 = \frac{4}{3}\pi r^2 h$

After increasing by 20% of radius and height, then volume of cone,

$$V_2 = \frac{4}{3}\pi\left(1+\frac{1}{5}\right)^2 r\left(1+\frac{1}{5}\right)h = \frac{4}{3}\pi \times \frac{216}{125} r^2 h$$

$$\therefore \text{Required percentage} = \frac{V_2 - V_1}{V_1} \times 100$$

$$= \frac{\frac{4}{3}\pi r^2 h\left(\frac{216}{125} - 1\right)}{\frac{4}{3}\pi r^2 h} \times 100$$

$$= \frac{91}{125} \times 100 = 72.8\% = 73\% \text{ (approx)}$$

25. Let B's salary = ₹ 100

A's salary $= 100 + \frac{50}{100} \times 100 =$ ₹ 150

So, B's salary is ₹ 50 less than A's salary.

Percentage of B's salary less than A $= \frac{50}{150} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

26. Let salary of each of them be ₹ x.

George saves 22% of x and his saving amount is ₹ 1540.

$$\Rightarrow \quad \frac{22}{100}x = 1540 \quad x = \frac{1540 \times 100}{22} = ₹\ 7000$$

27. Let A's salary = x. Then, B's salary = 2x

New salary of A = 150% of $x = \frac{3}{2}x$

Total salary of B = 125% of $2x = \frac{5}{2}x$

Total combined salary $= \left(\frac{3}{2}x + \frac{5}{2}x\right) = 4x$

∴ Required increment in salary $= \frac{x}{3x} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

28. Silver in object = 60

Gold in object = 40

Gold rings = 16

Coins of silver = 18

∴ Gold coins = 60 − 18 = 42

Total gold articles = 42 + 16 = 58

Hence, 58% of gold articles.

29. Let total income be x.

Income deposited = 10% of $\left[x - \frac{4}{100}x\right]$

$$= \frac{10}{100}\left(x - \frac{4}{100}x\right) = \frac{96}{1000}x$$

Remaining income = ₹ 10800

$$\Rightarrow \quad \frac{4}{100}x + \frac{96x}{1000} + 10800 = x \Rightarrow 10800 = x - \frac{136x}{1000}$$

$$10800 = \frac{864x}{1000} \Rightarrow x = \frac{10800 \times 1000}{864} = ₹\ 12500$$

30. Let the salary of Rohit be ₹ 100, then Saving = ₹ 30

Expenses = ₹ 70

New expenses = (100 + 30)% of ₹ 70 = ₹ 91

New saving = ₹ (100 − 91) = ₹ 9

He saves ₹ 9, his salary = ₹ 100

If he saves ₹ 1215.

Now, his salary $= ₹\left(\frac{100}{9} \times 1215\right) = ₹\ 13500$

31. Daily supply = (100 − z)% of $y = \frac{(100-z)y}{100}$

Required days $= \frac{x \times 100}{(100-z)y}$

32. Percentage of oxygen in water $= 100 - 14\frac{2}{7} = 85\frac{5}{7}\%$

Percentage of water in 350 g of water $= 85\frac{5}{7}\%$ of 350

$$= \frac{600}{7} \times \frac{350}{100} = 300 \text{ g}$$

33. Let his income be ₹ 100.

Then, his expenditure = ₹ 75

and savings = ₹ 25

New income = ₹ (100 + 20) = ₹ 120

New expenditure = ₹ (75 + 7.5) = ₹ 82.50

New saving = ₹ (120 − 82.5) = ₹ 77.50

∴ Percentage increase saving $= \frac{12.5}{25} \times 100 = 50\%$

34. As per question,

The percentage reduction in price

$$= \left[\frac{60}{100+60} \times 100\right]\% = 37.5\%$$

35. Alcohol in 5 L solution $= \frac{20}{100} \times 5 = 1$ L

∴ Water = 4 L

If 3 L of water is added to the mixture, we have 1 L alcohol and (4 + 3) = 7 L of water.

∴ Strength of mixture $= \left(\frac{1}{8} \times 100\right)\% = 12.5\%$

36. Let h and r be the height and radius of the cone.

∴ Volume of cone $= \frac{1}{3}\pi r^2 h$

and New height $= \frac{h \times 150}{100} = \frac{3h}{2}$

∴ Volume of cone $= \frac{1}{3}\pi r^2 \cdot \frac{3h}{2} = \frac{1}{2}\pi r^2 h$

Change in volume of cone $= \frac{1}{2}\pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{1}{6}\pi r^2 h$

$$\therefore \text{Percentage increase} = \frac{\frac{1}{6}\pi r^2 h}{\frac{1}{3}\pi r^2 h} \times 100\% = 50\%$$

37. Let fraction be $\frac{x}{y}$.

New fraction $= \frac{120\%\, x}{90\%\, y} = \frac{4x}{3y}$ (by given condition)

So, $\frac{4x}{3y} = \frac{16}{27} \Rightarrow \frac{x}{y} = \frac{16}{27} \times \frac{3}{4} = \frac{4}{9}$

38. Here, 5% of 25% of ₹ 1200 = 5% of $\frac{25}{100} \times 1200$

$= \frac{5}{100} \times 300 =$ ₹ 15

39. Amount of sugar in 6 L of solution $= \frac{4}{100} \times 6 = 0.24$ L

After evaporation, sugar in 5 L = 0.24 L

∴ Percentage of sugar $= \left(\frac{0.24}{5} \times 100\right) = 4\frac{4}{5}\%$

40. Let the third number be 100.

∴ Ist number = 70

IInd number = 60

∴ IInd number is less than the first by $\left(\frac{10}{70} \times 100\right)\% = 14\frac{2}{7}\%$

41. Let the original side of square = 10

So, original area = 100

New length = 130% of 10 = 13

New breadth = 120% of 10 = 12

New area = 13 × 12 = 156

∴ Increase in area = 56%

42. Glycerine in the given sample = 80% of 5 L $= \frac{80}{100} \times 5 = 4$ L

Let x litres of glycerine be added, then

$\frac{4+x}{(5+x)} \times 100 = 95 \Rightarrow 80 + 20x = 95 + 19x$

So, $x = 15$ L

43. Let initial number of inhabitants = 100

Firstly after 10% left, number of inhabitants = 100 − 10 = 90

Secondly again 10% left, number of inhabitants

= 90 − (10% of 90) = 81

Hence, remaining percentage of population of that city is 81%.

44. Increased wages of the worker = 200 + 20% of 200 = ₹ 240

Also, let he worked for x hours

∴ Reduced working hours $= x - \frac{20}{100}x = 0.80x$

Now, when he worked for x hours, his wages = ₹ 240

∴ When he worked for $0.8x$ hours, his wages will be

$= \frac{240}{x} \times 0.8x =$ ₹ 192

45. Amount of acid $= \frac{90}{100} \times 140 = 126$ L

∴ Amount of water = 140 − 126 = 14 L

Let x litres of water be added,

then amount of water = $(14 + x)$ L

$14 + x = \frac{12.5}{100}(140 + x)$

$\Rightarrow \quad 1400 + 100x = 1750 + 12.5x$

$\Rightarrow \quad 875x = 1750 - 1400 = 350$

$\therefore \quad x = \frac{350}{875} = 4$ L

46. Let the number of questions in examination = x

By given condition, 40% of $x = 10$

$\therefore \quad \frac{x \times 40}{100} = 10$

$\Rightarrow \quad x = \frac{1000}{40} = 25$

48. Let initial number of workers = x

20% of $x = 15 \Rightarrow \frac{20}{100} \times x = 15 \Rightarrow x = 75$

49. Given, 50% of $(x - y)$ = 40% of $(x + y)$

$\Rightarrow \quad \frac{50}{100} \times (x - y) = \frac{40}{100} \times (x + y)$

$\Rightarrow \quad 5x - 5y = 4x + 4y \Rightarrow x = 9y$ ...(i)

Let r% of $x = y$

$\Rightarrow \frac{r}{100} \times x = y \Rightarrow \frac{r}{100} \times 9y = y$ [from Eq. (i)]

$\Rightarrow \quad r = \frac{100}{9} = 11\frac{1}{9}\%$

50. Let net pay of an employee = ₹ 100

After contributing 10%, then pay = ₹ 90

When ₹ 90 is net pay, then basic pay = ₹ 100

∴ ₹ 13500 is net pay, then basic pay

$= \frac{100 \times 13500}{90} =$ ₹ 15000

∴ General Provident Fund = 10% × basic pay

$= \frac{15000 \times 10}{100} =$ ₹ 1500