CHAPTER

06

COMPARING QUANTITIES

In this chapter, we study about the percentage and its important rules, profit, loss and discount with their important rules. Apart from this we will also study Simple and Compound Interest.

Sometimes, we have to measure and compare our daily life quantities such as height, distance, price of commodity, rate of interest etc. The best measure of these compare quantities in the percentage.

Percentage

The meaning of term per cent is per hundred or hundred part.

e.g. Meaning of 38% is $\frac{38}{100}$ i.e. 38 parts out of 100 parts.

e.g. $\frac{30}{100} = 30\%$

Important Rules

(i) For expressing 'x' % as a fraction, then $x\% = \frac{x}{100}$.

(ii) For expressing a fraction $\frac{x}{y}$ as a per cent. Then, $\frac{x}{y} = \left(\frac{x}{y} \times 100\right)\%$

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

(iv) If A's 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 What per cent of $\frac{2}{7}$ is $\frac{1}{35}$?

(a) 10% (b) 11% (c) 12% (d) 13%

Sol. (*a*) Required per cent $= \left[\frac{\frac{1}{35}}{\frac{2}{7}} \times 100\right]\%$

$= \left(\frac{1}{35} \times \frac{7}{2} \times 100\right)\%$

$= 10\%$

Example 2 The salary of a worker is first increased by 10% and thereafter it was reduced by 10%. What was the change in his salary ?

(a) 4% (b) 2% (c) 3% (d) 1%

Sol. (*d*) Let the salary of the worker be ₹ 100. After increase, it becomes ₹100 + 10% of 100 = ₹ 110

After decrease, it becomes ₹110 − 10% of ₹110 = ₹99

The percentage reduction = 100 − 99 = 1%

Example 3 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) 38% (c) 39% (d) 40%

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

New length = 160 m, new breadth = x,

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

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

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

$= 37\frac{1}{2}\%$

Profit and Loss

- The price at which an article or item is bought is called its **cost price** and it is denoted by CP.
- And if the price at which an article is sold is called its **selling price** and it is denoted by SP.
- If the selling price of an article is greater than cost price, then it is **profit** (SP > CP) otherwise it is **loss** (CP > SP).
- The list price of an item is known as its **marked price**. It is the price that appers on the item's tag.
- If the shopkeeper given a some rebate on an article is called **discount.**

Note : Discount is always given on a marked price.

Important Formulae

(i) Profit = SP − CP

(ii) Loss = CP − SP

(iii) Profit per cent $= \frac{\text{Profit}}{\text{CP}} \times 100$

$= \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100$

(iv) Loss per cent $= \frac{\text{Loss}}{\text{CP}} \times 100$

$= \frac{\text{CP} - \text{SP}}{\text{CP}} \times 100$

(v) If there is a profit of r%, then

$\text{SP} = \frac{100 + r}{100} \times \text{CP}$

(vi) If there is a loss of r%, then

$\text{SP} = \frac{100 - r}{100} \times \text{CP}$

(vii) Discount = Marked price − Sale price

(viii) Rate of discount = Discount%

$= \frac{\text{Discount}}{\text{MP}} \times 100$

(ix) $\text{SP} = \text{MP}\frac{(100 - \text{Discount}\%)}{100}$

or $\text{MP} = \frac{100 \times \text{SP}}{100 - \text{Discount}\%}$

Example 4 A boy buys a pen for ₹ 25 and sells it for ₹ 20. Find his loss per cent.

(a) 10% (b) 20% (c) 22% (d) 23%

Sol. (b) Loss per cent $= \frac{\text{Loss}}{\text{CP}} \times 100$

$= \frac{5}{25} \times 100$

$= 20\%$

Example 5 A shopkeeper sells a pen set at 30% profit to another shopkeeper who sells it at a loss of 30%. If price of pen set ₹ 150, what is net profit or loss on total transaction?

(a) profit 9% (b) loss 9%

(c) profit 10% (d) loss 10%

Sol. (b) Cost price of pen is ₹ 150.

Initially shopkeeper sells a pen in 30% profit.

$\therefore$ SP of a pen $= 150 + 30\%$ of 150

$= 150 + \frac{30}{100} \times 150$

$= 150 + 45 = ₹ 195$

Now, shopkeeper sells a pen to another shopkeeper at an loss of 30%. Then,

SP of a pen $= 195 - \frac{30}{100} \times 195$

$= 195 - 58.5 = ₹ 136.5$

Now, loss % in transaction $= \frac{150 - 136.5}{150} \times 100$

$= \frac{13.5}{150} \times 100 = \frac{1350}{150} = 9\%$

Example 6 The marked price of a ceiling fan is ₹ 1250 and the shopkeeper allows a discount of 6% on it. Find the selling price of the fan.

(a) ₹ 1190 (b) ₹ 1175

(c) ₹ 1200 (d) ₹ 1180

Sol. (b) Marked price = ₹ 1250 and discount = 6%

Discount = 6% of MP

$= (6\% \text{ of } ₹ 1250)$

$= ₹ \left(1250 \times \frac{6}{100}\right) = ₹ 75$

Selling price = (MP) – (discount)

$= ₹ (1250 - 75) = ₹ 1175$

Hence, the selling price of the fan is ₹ 1175.

Example 7 Two successive profits of 50% and 50% is equivalent to

(a) 100% (b) 75% (c) 50% (d) 125%

Sol. (d) Let the cost price of an item be x. Then

After profit of 50%, SP of an item

$= x + 50\%$ of x

$= x + \frac{50}{100} \times x = x + \frac{x}{2} = \frac{3x}{2}$

Again profit of 50%, SP of an item

$= \frac{3x}{2} + 50\%$ of $\frac{3x}{2}$

$= \frac{3x}{2} + \frac{50}{100} \times \frac{3x}{2}$

$= \frac{3x}{2} + \frac{3x}{4} = \frac{9x}{4}$

Now, total profit % in whole transaction

$= \frac{\frac{9x}{4} - x}{x} \times 100\%$

$= \frac{5x}{4 \times x} \times 100 = 125\%$

Simple Interest

If the interest is paid to the lender regularly every year or half year on the same principal, then it is called simple interest.

Or The interest is said to be simple, if it is calculated on the original principal throughout the loan period.

i.e. $\text{SI} = \frac{PRT}{100}$

where, P is the principal amount

R is the rate of interest

T is the time period

Compound Interest

If the borrower and the lender agree to fix up a certain interval of time (say, a year or half year or a quarter of a year, etc), so that the amount at the end of an interval becomes the principal for the next interval, then the total interest over all the intervals calculated in this way is called the compound interest.

$$CI = P\left[\left(1+\frac{R}{100}\right)^{T}-1\right]$$

where, P is the principal amount
T is the time period
R is the rate of interest

Note The simple interest and compound interest for one year will be same, if the rate of interest is annually.

Important Rules

- **Rule 1.** When interest is compounded annually

  Then, Amount $= P\left(1+\frac{R}{100}\right)^{n}$

  where, n is number of time for which interest is calculated,

- **Rule 2.** When interest is compounded half-yearly then, interest would be calculated after every six months,

  So, $n = T \times 2$ and rate $= \frac{R}{2}$

  $\therefore$ Amount $= P\left(1+\frac{R/2}{100}\right)^{n}$

- **Rule 3.** When interest is compounded quarterly. Then, interest would be calculated after every three months, So

  $n = T \times 4$

  and Rate of interest $= \frac{R}{4}$

  $\therefore$ Amount $= P\left(1+\frac{R/4}{100}\right)^{n}$.

- **Rule 4.** When rate of interest are different for different years say R_1, R_2, R_3% for first, second and third year respectively, then

  Amount $= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$.

Note If the difference between the simple interest and compound interest on the same sum ₹ P at r % per annum for 2 yr is ₹ d, then

$$d = P\left(\frac{r}{100}\right)^{2}$$

When interest is compounded yearly, then on the same sum and at the same rate, then

Compound interest for the first year
= Simple interest for the first year

If A and B are the amounts of a certain sum for two consecutive year, then

Simple interest for 1 yr $= B - A$.

Example 8 The sum required to earn a monthly interest of ₹ 400 at 10% per annum at simple interest.

(a) ₹ 47000 (b) ₹ 48000 (c) ₹ 49000 (d) ₹ 50000

Sol. (b) Total interest amount needed in a year

$= ₹\,400 \times 12 = ₹\,4800$

$\therefore$ $P = \frac{100 \times SI}{R \times T}$

$= \frac{4800 \times 100}{10 \times 1} = ₹\,48000$

Example 9 Find CI on a sum ₹ 8000 for 2 yr at 5% per annum compounded annually.

(a) ₹ 821 (b) ₹ 820
(c) ₹ 822 (d) None of these

Sol. (b) Given, principal (P) = ₹ 8000,
time (n) = 2 yr, rate (R) = 5%

$\therefore$ Amount (A) $= P\left(1+\frac{R}{100}\right)^{n}$

$= 8000\left(1+\frac{5}{100}\right)^{2}$

$= 8000\left(\frac{105}{100}\right)^{2}$

$= 8000 \times \frac{21}{20} \times \frac{21}{20}$

$= ₹\,8820$

$\therefore$ Compound Interest (CI)
= Amount (A) − Principal (P)
= ₹ (8820 − 8000)
= ₹ 820

Example 10 Find the compound interest on ₹ 5000 for 4 yr if the rate of interest is 10% per annum for the first two years and 15% for the next two years.

(a) ₹ 3001 (b) ₹ 3003
(c) ₹ 3008 (d) ₹ 3009

Sol. (*a*) Let $R_1 = 10\%$, $T_1 = 2$ yr

and $R_2 = 15\%$, $T_2 = 2$ yr

and $P = ₹ 5000$

$$\therefore \text{Amount} = 5000\left(1+\frac{10}{100}\right)^2\left(1+\frac{15}{100}\right)^2$$

$$= 5000 \times \left(\frac{110}{100}\right)^2\left(\frac{115}{100}\right)^2$$

$$= 5000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{23}{20} \times \frac{23}{20}$$

$$= ₹ 8001 \text{ (approx)}$$

$$\therefore \text{Compound interest} = 8001 - 5000$$

$$= ₹ 3001$$

PRACTICE EXERCISE

1. If 90% of x is 315 km, then the value of x is
(a) 325 km (b) 350 km (c) 350 m (d) 325m

2. A toy is purchased at ₹ 1500 including 5% SGST and 5% CGST. Find the actual price of the toy without GST.
(a) ₹ 14500 (b) ₹ 1350 (c) ₹ 1500 (d) ₹ 1400

3. If 11% of a number exceeds 7% of the same by 18, the number is
(a) 300 (b) 450 (c) 350 (d) 370

4. If A's income is 30% less than B's, then how much per cent is B's income more than A's?
(a) $42\frac{6}{7}\%$ (b) $32\frac{1}{10}\%$ (c) 30% (d) 40%

5. A man spent 20% of his monthly earning on house rent. Out of the balance, he spent 75% on the other house expenses. If he had a balance of ₹ 250 at the end of the month, the monthly earning of the man is
(a) ₹ 1250 (b) ₹ 1200
(c) ₹ 1150 (d) None of these

6. If the numerator of a fraction is increased by 20% and its denominator is diminished by 10%, the value of the fraction is $\frac{16}{21}$. The original fraction is
(a) $\frac{3}{5}$ (b) $\frac{4}{5}$
(c) $\frac{4}{7}$ (d) None of these

7. In an examination, it is required to get 36% of maximum marks to pass. A student got 113 marks and was declared failed by 85 marks. The maximum marks are
(a) 500 (b) 1008 (c) 640 (d) 550

8. The price of cooking oil has increased by 25%. The percentage of reduction that a family should affect in the use of cooking oil so as not to increase the expenditure on this account is
(a) 20% (b) 15% (c) 22% (d) 25%

9. A boy who asked to find $3\frac{1}{2}\%$ of a sum of money misread the question and found $5\frac{1}{2}\%$ of it. His answer was ₹220, what would have been the correct answer ?
(a) ₹ 140 (b) ₹ 150 (c) ₹ 157 (d) ₹ 160

10. A's salary increased by 12% over last year and has become ₹ 6720. If it increased by 20% over last year's salary, then the next salary will be
(a) ₹ 8000 (b) ₹ 8064
(c) ₹ 7500 (d) ₹ 7200

11. The ratio of the number of boys and girls in a school is 3 : 2. If 20% of the boys and 30% of the girls are scholarship holders, the percentage of the students who are not scholarship holder is
(a) 50% (b) 72% (c) 75% (d) 76%

12. If 50% of $(x - y) = 30\%$ of $(x + y)$, then what per cent of x is y ?
(a) 25% (b) $33\frac{1}{3}\%$ (c) 40% (d) 400%

13. If 15% of 40 is greater than 25% of a number by 2, then the number is
(a) 12 (b) 16 (c) 24 (d) 32

14. If 35% of a number is 12 less than 50% of that number, then the number is
(a) 80 (b) 60 (c) 50 (d) 40

15. 60% of that the students in a school are boys. If the number of girls in the school is 300, then the number of boys is
(a) 300 (b) 450 (c) 500 (d) 750

16. Profit after selling an article for ₹ 425 is the same as loss after selling it for ₹ 355. The cost of the article is
(a) ₹ 390 (b) ₹ 405
(c) ₹ 380 (d) None of these

17. The difference between a discount of 40% on ₹ 500 and two successive discounts of 36% and 4% on the same amount is
(a) ₹ 0 (b) ₹ 2 (c) ₹ 5 (d) ₹ 7.20

18. The marked price of an article is 10% higher than the cost price. A discount of 10% is given on the marked price. In this kind of sale, the seller
(a) bears no loss, no gain
(b) gains 1%
(c) loses 1%
(d) None of the above

19. On selling an article for ₹ 240, a trader loses 4%. In order to gain 10%, he must sell that article for
(a) ₹ 264 (b) ₹ 275
(c) ₹ 250 (d) ₹ 280

20. A sweet seller declares that he sells sweets at the cost price. However, he uses a weight of 450 g instead of 500 g. His percentage profit is
(a) $11\frac{1}{9}\%$ (b) 12%
(c) 13% (d) None of these

21. A radio is sold at a gain of 16%. If it had been sold for ₹ 20 more, 20% would have been gained. The cost price of the radio is
(a) ₹ 420 (b) ₹ 410 (c) ₹ 485 (d) ₹ 500

22. A dealer sold a radio at a loss of 2.5%. Had he sold it for ₹ 100 more, he would have gained $7\frac{1}{2}\%$. In order to gain $12\frac{1}{2}\%$, he should sell it for
(a) ₹ 850 (b) ₹ 925 (c) ₹ 1000 (d) ₹ 1125

23. By selling sugar at ₹ 11.16 per kg, a man loses 7%. To gain 7%, it must be sold (per kg) at
(a) ₹ 11.24 (b) ₹ 12.84 (c) ₹ 14.64 (d) ₹ 13.24

24. If a commission of 10% is given to the marked price of a book, the publisher gains 20%. If the commission is increased to 15%, the gain is
(a) $16\frac{2}{3}\%$ (b) $13\frac{1}{3}\%$
(c) $15\frac{1}{6}\%$ (d) 15%

25. Oranges are bought at 7 for ₹ 3. At what rate per hundred must they be sold to gain 33% ?
(a) ₹ 56 (b) ₹ 60
(c) ₹ 58 (d) ₹ 57

26. A reduction of 20% in the price of oranges enables a man to buy 5 oranges more for ₹ 10. The price of an orange before reduction was
(a) 20 paise (b) 40 paise
(c) 50 paise (d) 60 paise

27. Kiran buys an article with 25% discount on the marked price. She makes a profit of 10% by selling it at ₹ 660. What was the marked price ?
(a) ₹ 900 (b) ₹ 600
(c) ₹ 700 (d) ₹ 800

28. If a shirt cost ₹ 64 after a 20% discount, what was its original price ?
(a) ₹ 76.80 (b) ₹ 80
(c) ₹ 88 (d) ₹ 86.80

29. The cost price of 19 chairs is equal to the selling price of 16 chairs. Then the gain is
(a) $3\frac{9}{17}\%$ (b) $15\frac{15}{19}\%$
(c) $18\frac{3}{4}\%$ (d) None of these

30. The ratio between the sales price and the cost price of an article is 7 : 5. What is the ratio between the profit and the cost price of that article ?
(a) 2 : 5 (b) 7 : 2
(c) 2 : 7 (d) Data inadequate

31. By selling a table for ₹ 350 instead of ₹ 400, loss percent increased by 5%. The cost price of the table is
(a) ₹ 1050 (b) ₹ 417.50 (c) ₹ 435 (d) ₹ 1000

32. A house worth ₹150000 is sold by X at 5% profit to Y. Y sells the house back to X at a 2% loss. Then, in the entire transaction
(a) X gains ₹ 4350 (b) X loses ₹ 4350
(c) X gains ₹ 3150 (d) X loses ₹ 3150

33. Find interest and amount to be paid on ₹ 15000 at 5% per annum after 2 yr.
(a) ₹ 1500, ₹ 16600 (b) ₹ 1500, ₹ 16500
(c) ₹ 1600, ₹ 16500 (d) None of the above

34. A sum of money at simple interest amount to be ₹ 1260 in 2 yr and ₹ 1350 in 5 yr, then the rate per cent per annum is
(a) 30% (b) 10% (c) 2.5% (d) 5%

35. The difference of 13% per annum and 12% of a sum in one year is ₹ 110. Then, the sum is
(a) ₹ 12000 (b) ₹ 13000 (c) ₹ 11000 (d) ₹ 16000

36. The amount of a certain sum at compound interest for 2 yr at 5% is ₹ 4410. The sum is
(a) ₹ 4000 (b) ₹ 4200 (c) ₹ 3900 (d) ₹ 3800

37. Two equal amounts of money are deposited in two banks, each at 15% per annum, for $3\frac{1}{2}$ yr and 5 yr. If the difference between their interest is ₹ 144, each sum is
(a) ₹ 460 (b) ₹ 500 (c) ₹ 640 (d) ₹ 720

38. If the simple interest on ₹ 1500 increases by ₹ 30, when the time increases by 8 yr. The rate per cent per annum is
(a) 0.5% (b) 0.25% (c) 0.75% (d) 1.25%

39. What annual payment will discharge a debt of ₹ 19350 due 4 yr hence at the rate of 5% simple interest ?
(a) ₹ 4500 (b) ₹ 5400
(c) ₹ 4000 (d) None of these

40. The simple interest on a sum of money for 3 yr at $6\frac{2}{3}\%$ per annum is ₹ 6750. The compound interest on the same sum at the same rate of interest for the same period will be
(a) ₹ 7200 (b) ₹ 7210
(c) ₹ 7120 (d) ₹ 7012

41. The difference of the compound interest and the simple interest on ₹ 60000 at 6% annually for 2 yr will be
(a) ₹ 215 (b) ₹ 216 (c) ₹ 220 (d) ₹ 250

42. The compound interest on ₹ 350 for 1 year at 4% per annum, the interest being payable half yearly, will be
(a) ₹ 364.14 (b) ₹ 365.15
(c) ₹ 14.14 (d) ₹ 15.15

43. The compound interest on ₹ 2000 for $1\frac{1}{4}$ yr is 10% per annum, the interest being payable quarterly will be
(a) ₹ 2262.81 (b) ₹ 262.81
(c) ₹ 261.81 (d) None of these

44. A sum of money doubles itself at compound interest in 15 yr. In how many years will it become eight times ?
(a) 20 yr (b) 40 yr
(c) 35 yr (d) 45 yr

45. A certain sum amounts to ₹ 7350 in 2 yr and to ₹ 8575 in 3 yr. The the rate per cent and sum are
(a) $16\frac{2}{3}\%$, ₹ 5400 (b) $16\frac{2}{3}\%$, ₹ 2400
(c) $12\frac{1}{2}\%$, ₹ 5400 (d) None of these

Answers

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

Hints and Solutions

1. We have, 90% of $x = 315$

$\Rightarrow \quad \frac{90}{100} \times x = 315$

$\Rightarrow \quad x = \frac{315 \times 100}{90}$

$= \frac{315 \times 10}{9} = 350$

$\Rightarrow \quad x = 350\,\text{km}$

2. Now, SGST = 5% of 1500

$\therefore \quad = \frac{5}{100} \times 1500 = ₹\ 75$

Similarly, CGST = 5% of 1500 = ₹ 75

$\therefore$ Actual price of toy = 1500 − SGST − CGST

$= 1500 - 75 - 75 = 1500 - 150$

$= ₹\ 1350$

3. Let x be the given number.

Then, according to the question,

11% of x − 7% of x = 18

$\Rightarrow \quad$ 4% of $x = 18$

$\Rightarrow \quad x = \frac{18 \times 100}{4}$

$\Rightarrow \quad x = 450$

4. $\therefore$ Required percentage

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

$= 42\frac{6}{7}\%$

5. Let total income be ₹ x.

Then, 25% of (80% of x) = 250

$\Rightarrow \quad \frac{25}{100} \times \frac{80}{100} \times x = 250$

$\Rightarrow \quad x = 250 \times 5 = ₹\ 1250$

6. Let the fraction be $\frac{x}{y}$.

New fraction $= \frac{120\%\text{ of } x}{90\%\text{ of } y} \Rightarrow \frac{4x}{3y} = \frac{16}{21}$

$\therefore \quad \frac{x}{y} = \frac{16}{21} \times \frac{3}{4} = \frac{4}{7}$

7. Let maximum marks be x.

Then, 36% of $x = 113 + 85 = 198$

$\therefore \quad x = \frac{198 \times 100}{36} = 550$

8. Reduction in consumption $= \left[\frac{25}{100 + 25} \times 100\right]\%$

$= 20\%$

9. Since, $5\frac{1}{2}\% \equiv 220 \Rightarrow 3\frac{1}{2}\% \equiv \frac{220 \times (7/2)}{11/2} = ₹\ 140$

10. Last year's salary $= \frac{6720 \times 100}{100 + 12} = ₹\ 6000$

$\therefore$ The next year's salary $= \frac{6000 \times 120}{100} = ₹\ 7200$

11. Let the number of boys and girls be $3x$ and $2x$.

Number of those who are not scholarship holder

$= (80\%\text{ of } 3x + 70\%\text{ of } 2x)$

$= \frac{12x}{5} + \frac{7x}{5} = \frac{19x}{5}$

$\therefore$ Required percentage $= \left(\frac{19x}{5} \times \frac{1}{5x} \times 100\right)\%$

$= 76\%$

12. Since, $\frac{50}{100}(x - y) = \frac{30}{100}(x + y)$

$\Rightarrow \quad 5(x - y) = 3(x + y) \quad 2x = 8y$

$\Rightarrow \quad \frac{y}{x} \times 100 = \frac{20}{80} \times 100 = 25\%$

13. According to the given condition,

$$\frac{15}{100}\times 40-\frac{25}{100}x=2\Rightarrow x=16$$

14. Since, $(50-35)\%$ of $x=12$

$$\Rightarrow \quad x=\frac{12\times 100}{15}=80$$

15. Here, 40% are girls in a school.

$$\therefore \quad 40\%=300$$

$$\Rightarrow \quad 60\%=\frac{300\times 60}{40}=450$$

16. Let cost price of an article be ₹ x.

According to the given condition,

$$425-x=x-355$$

$$\Rightarrow \quad 2x=780\Rightarrow x=₹\ 390$$

17. SP at 40% discount = 60% of ₹ 500 = ₹ 300

SP after two successive discounts of 36% and 4%

$$=96\%\text{ of }(64\%\text{ of }500)$$

$$=\frac{96}{100}\times\frac{64}{100}\times 500=₹\ 307.20$$

$\therefore$ Required difference = ₹ 7.20

18. Let CP of article be Rs 100, then marked price be Rs 110.

$$\therefore \quad \text{SP}=90\%\text{ of Rs }110$$

$$=\frac{90}{100}\times 110=\text{Rs }99$$

$\therefore$ Loss per cent $=100-99=1\%$

19. $\text{CP}=\frac{100}{96}\times 240=₹\ 250$

Now, CP = ₹ 250, Gain = 10%

$$\therefore \quad \text{SP}=\frac{110}{100}\times 250=₹\ 275$$

20. Let CP of each gram be ₹ 1.

Then, CP of 450 g = ₹ 450, SP of 450 g = ₹ 500

$$\therefore \quad \text{Profit per cent}=\left(\frac{50}{450}\times 100\right)\%=11\frac{1}{9}\%$$

21. Let CP of radio be ₹ x. Then,

120% of $x-116\%$ of $x=20$

$$\Rightarrow \quad 4\%\text{ of }x=20$$

$$\Rightarrow \quad x=\frac{20\times 100}{4}=₹\ 500$$

22. Let CP of radio be ₹ x. Then,

$$107\frac{1}{2}\%\text{ of }x-97\frac{1}{2}\%\text{ of }x=100$$

$$\Rightarrow \quad 10\%\text{ of }x=100$$

$$\Rightarrow \quad x=\frac{100\times 100}{10}$$

$$\Rightarrow \quad x=₹\ 1000$$

23. Let CP of sugar per kg be ₹ x.

$$\therefore \quad 93\%\text{ of }x=11.16$$

$$\Rightarrow \quad x=\frac{11.16\times 100}{93}=12$$

So, CP = ₹ 12 per kg

$$\therefore \quad \text{SP}=107\%\text{ of }₹\ 12$$

$$=\frac{107}{100}\times 12=₹\ 12.84$$

24. Let CP be ₹ 100, then SP be ₹ 120.

Now, SP = ₹ 120, commission = 10%

$$\therefore \quad \text{Marked price}=\frac{100}{90}\times 120=₹\ \frac{400}{3}$$

Now, marked price $=\frac{400}{3}$, commission = 15%

$$\therefore\ \text{SP}=85\%\text{ of }\frac{400}{3}=\frac{85}{100}\times\frac{400}{3}=\frac{340}{3}$$

$$\therefore \quad \text{Gain per cent}=\frac{340}{3}-100=13\frac{1}{3}\%$$

25. CP of an orange $=\frac{3}{7}$

$$\therefore \quad \text{CP of 100 orange}=\frac{300}{7}$$

$$\Rightarrow\ \text{SP of 100 oranges}=\frac{300}{7}\times\frac{(100+33)}{100}=₹\ 57$$

$$\left[\because \text{SP}=\text{CP}\left(\frac{100+r}{100}\right)\right]$$

26. Reduced price $=\frac{10\times 20}{5\times 100}=₹\ \frac{2}{5}$ per orange

$$\therefore\ \text{Original price}=\frac{2\times 100}{5\times 80}=\frac{1}{2}=50\text{ paise}$$

27. $\because$ SP = ₹ 660, Profit % = 10%

$$\Rightarrow\ \text{CP}=₹\ 600$$

$$\therefore \quad \text{MP}=\frac{600\times 100}{75}=₹\ 800$$

28. Let the original CP be ₹ x.

$\therefore \quad x \times \frac{80}{100} = 64 \quad \Rightarrow \quad x = ₹\ 80$

29. $\therefore$ Gain % $= \frac{19-16}{16} \times 100$

$= \frac{3 \times 100}{16} = \frac{75}{4} = 18\frac{3}{4}\%$

30. Let SP = $7x$ and CP = $5x$

$\therefore$ Profit = $7x - 5x = 2x$

$\therefore \frac{\text{Profit}}{\text{CP}} = \frac{2x}{5x} = \frac{2}{5}$

31. Given, 5% = ₹ 50

$\Rightarrow \quad 100\% = \frac{50}{5} \times 100 = ₹\ 1000$

32. Final cost of the house

$= 150000 \times \frac{100+5}{100} \times \frac{(100-2)}{100}$

$= ₹\ 154350$

$\therefore$ X gains ₹ 4350.

33. $\because$ Interest $= \frac{P \times R \times T}{100}$

$= \frac{15000 \times 5 \times 2}{100} = ₹\ 1500$

$\therefore$ Amount = Principal + Interest

$= ₹\ (15000 + 1500) = ₹\ 16500$

34. Interest in three years = 1350 − 1260 = ₹ 90

$\therefore$ Interest in one year = ₹ $\frac{90}{3}$ = ₹ 30

and interest for two years = ₹ 60

and Principal = ₹ (1260 − 60)

= ₹ 1200

Hence, rate of interest $= \frac{100 \times 60}{1200 \times 2} = 2.5\%$

35. Let sum = ₹ x

Then, according to given condition

$\frac{x \times 13 \times 1}{100} - \frac{x \times 12 \times 1}{100} = 110$

$\Rightarrow \quad \frac{x}{100} = 110$

$\Rightarrow \quad x = ₹\ 11000$

36. According to given condition,

$4410 = P\left(1 + \frac{5}{100}\right)^2$

$\Rightarrow \quad P = \frac{4410}{(21/20)^2}$

$= \frac{4410 \times 400}{441} = ₹\ 4000$

37. Let the sum be ₹ x. Then,

$\frac{x \times 5 \times 15}{100} - \frac{x \times 15}{100} \times \frac{7}{2} = 144$

$\Rightarrow \quad \frac{x}{100}\left(75 - \frac{105}{2}\right) = 144$

$\Rightarrow \quad x = \frac{144 \times 100 \times 2}{45} \Rightarrow x = ₹\ 640$

38. t = 8 yr

SI increase by ₹ 30 in 8 yr

$\therefore$ SI increases in 1 yr $= \frac{30}{8} = 3.75$

Let the rate be x% per annum

$3.75 = \frac{1500 \times 1 \times x}{100}$

$x = 0.25\%$

39. Let the annual instalment be ₹ x, then

$4x$ + {interest on x for (3 + 2 + 1) yr} = 19350

$\Rightarrow \quad 4x + \frac{x \times 6 \times 5}{100} = 19350$

$\therefore \quad x = ₹\ 4500$

40. Since, SI $= \frac{PRT}{100}$

$\therefore \quad 6750 = \frac{P \times \frac{20}{3} \times 3}{100}$

$\Rightarrow \quad P = 33750$

Now, $\text{CP} = 33750\left[\left(1 + \frac{20}{300}\right)^3 - 1\right]$

$= 33750\left[\frac{4096}{3375} - 1\right] = ₹\ 7210$

41. Now, simple interest for two years, SI $= \frac{PRT}{100}$

$= \frac{60000 \times 6 \times 2}{100} = ₹\ 7200$

and compound interest for two years CI = $A - P$

$$= P\left(1+\frac{R}{100}\right)^{n} - P = 60000\left(1+\frac{6}{100}\right)^{2} - 60000$$

$$= 60000\left(\frac{53}{50}\right)^{2} - 60000$$

$$= 67416 - 60000 = ₹\,7416$$

$\therefore$ Required difference = CI − SI

$$= 7416 - 7200 = ₹\,216$$

42. $$A = P\left(1+\frac{R/2}{100}\right)^{2n}$$

$$= 350 \times \frac{102}{100} \times \frac{102}{100}$$

$$= ₹\ 364.14$$

$\therefore$ Compound interest = ₹ 364.14 − ₹ 350

$$= ₹\ 14.14$$

43. $$A = 2000\left(1+\frac{10}{400}\right)^{4\times\frac{5}{4}}$$

$$= 2000\left(\frac{41}{40}\right)^{5} = ₹\ 2262.81$$

$\therefore$ Compound interest = 2262.81 − 2000

$$= ₹\,262.81$$

44. $$P\left(1+\frac{R}{100}\right)^{15} = 2P$$

or $$\left(1+\frac{R}{100}\right)^{15} = 2 \qquad ...(i)$$

Now, $$P\left(1+\frac{R}{100}\right)^{n} = 8P$$

$$\Rightarrow \quad \left(1+\frac{R}{100}\right)^{n} = 8 = (2)^3 = \left\{\left(1+\frac{R}{100}\right)^{15}\right\}^{3}$$

[from Eq. (i)]

$$\Rightarrow \quad \left(1+\frac{R}{100}\right)^{n} = \left(1+\frac{R}{100}\right)^{45}$$

$$\Rightarrow \quad n = 45$$

45. SI on ₹ 7350 for 1 yr

$$= ₹\,(8575 - 7350) = ₹\,1225$$

$$\therefore \quad \text{Rate} = \left(\frac{100\times 1225}{7350\times 1}\right)\% = 16\frac{2}{3}\%$$

Let the sum be ₹ x.

Then, $$x\left(1+\frac{50}{3\times 100}\right)^{2} = 7350$$

$$\Rightarrow \quad x \times \frac{7}{6} \times \frac{7}{6} = 7350$$

$$\Rightarrow \quad x = 7350 \times \frac{36}{49} = 5400$$

or Sum = ₹ 5400