8 Comparing Quantities

Learn and Remember

1. To compare two quantities can be expressed in the form of ratio.
2. Two ratios can be compared by converting them to like fractions.
3. Two fractions are equal if their ratios are equivalent.
4. If two ratios are equivalent then the four quantities are said to be in proportion.
5. A way of comparing quantities is percentage.
6. Percentage is numerator of fractions with denominator 100.
7. Per cent means per hundred.
8. S.P. means selling price and C.P. means cost price,
   (i) If S.P. > C.P. then there is profit,
   Profit = S.P. − C.P.
   $$\text{Profit \%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$$
   (ii) If S.P. < C.P. then there is loss,
   Loss = C.P. − S.P.
   $$\text{Loss \%} = \frac{\text{Loss}}{\text{C.P.}} \times 100$$
9. If P is principal, R is rate of interest per annum and T is the time in years Then simple interest (S.I.) is given by,
   $$\text{S.I.} = \frac{P \times R \times T}{100}$$
10. A = P + S.I. where A is amount.

TEXTBOOK QUESTIONS SOLVED

Exercise 8.1 (Page No. 157)

Q1. Find the ratio of:
   (a) ₹ 5 to 50 paise
   (b) 15 kg to 210 g
   (c) 9 m to 27 cm
   (d) 30 days to 36 hours

Sol. (a) ₹ 5 to 50 paise
First we convert both quantities in same unit.
So, ₹ 5 = 5 × 100 = 500 paise   (∵ 1 ₹ = 100 paise)

Now, ratio = 500 : 50 = $\dfrac{500}{50} = \dfrac{10}{1}$

Thus, the required ratio = 10 : 1.

(b) 15 kg to 210 g
Convert both weights in same unit.
So, 15 kg = 15 × 1000 = 15000 g   (∵ 1 kg = 1000 g)

Now, ratio = 15000 : 210 = $\dfrac{15000}{210} = \dfrac{500}{7}$

Thus, the required ratio = 500 : 7.

(c) 9 m to 27 cm
Convert both lengths in same unit.
So, 9 m = 9 × 100 = 900 cm   (∵ 1 m = 100 cm)

Now, ratio = 900 : 27 = $\dfrac{900}{27} = \dfrac{100}{3}$

Thus, the required ratio = 100 : 3.

(d) 30 days to 36 hours
Convert both times in same unit.
So, 30 days = 30 × 24 = 720 hours (∵ 1 day = 24 hours)

Now, ratio = 720 : 36 = $\dfrac{720}{36} = \dfrac{20}{1}$

Thus, the required ratio = 20 : 1.

Q2. **In a computer lab, there are 3 computers for every 6 students. How many computers will be needed for 24 students?**

Sol. 6 students need = 3 computers

1 student needs = $\dfrac{3}{6}$ computer

Therefore, 24 students need = $\dfrac{3}{6} \times 24$ computers

$= 3 \times 4 = 12$ computers

Thus, 12 computers will be needed for 24 students.

Q3. **Population of Rajasthan = 570 lakhs and population of U.P. = 1660 lakhs. Area of Rajasthan = 3 lakh km^2 and area of U.P. = 2 lakh km^2?**

    (i) **How many people are there per km² in both these states?**

    (ii) **Which state is less populated?**

Sol. (i) People are present per km² = $\dfrac{\text{Population}}{\text{Area}}$

      In Rajasthan = $\dfrac{570 \text{ lakhs}}{3 \text{ lakh km}^2}$ = 190 people per km²

      In U.P. = $\dfrac{1660 \text{ lakhs}}{2 \text{ lakh km}^2}$ = 830 people per km²

  (ii) Rajasthan is less populated.

Exercise 8.2 (Page No. 164-165)

Q1. Convert the given fractional numbers to per cents.

    (a) $\dfrac{1}{8}$ (b) $\dfrac{5}{4}$ (c) $\dfrac{3}{40}$ (d) $\dfrac{2}{7}$

Sol. (a) $\dfrac{1}{8} = \dfrac{1}{8} \times 100\% = \dfrac{25}{2}\% = 12.5\%.$

    (b) $\dfrac{5}{4} = \dfrac{5}{4} \times 100\% = 5 \times 25\% = 125\%.$

    (c) $\dfrac{3}{40} = \dfrac{3}{40} \times 100\% = \dfrac{3}{2} \times 5\% = \dfrac{15}{2}\% = 7.5\%.$

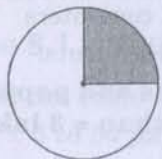   (d) $\dfrac{2}{7} = \dfrac{2}{7} \times 100\% = \dfrac{200}{7}\% = 28\dfrac{4}{7}\%.$

Q2. Convert the given decimal fractions to per cents.

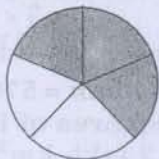   (a) 0.65   (b) 2.1   (c) 0.02   (d) 12.35.

Sol. (a) $0.65 = \dfrac{65}{100} \times 100\% = 65\%$ (b) $2.1 = \dfrac{21}{10} \times 100\% = 210\%$

    (c) $0.02 = \dfrac{002}{100} \times 100\% = 2\%$ (d) $12.35 = \dfrac{1235}{100} \times 100\%$
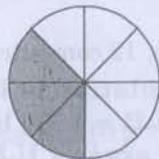
                                  = 1235%.

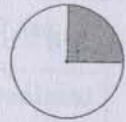**Q3. Estimate what part of the figures is coloured and hence find the per cent which is coloured.**
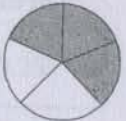

     (i)   (ii)   (iii)

Sol. (i) Coloured part = $\dfrac{1}{4}$

      Per cent of coloured part = $\dfrac{1}{4} \times 100\% = 25\%.$

  (ii) Coloured part = $\dfrac{3}{5}$

      Per cent of coloured part = $\dfrac{3}{5} \times 100\% = 60\%.$

 (iii) Coloured part = $\dfrac{3}{8}$

      Per cent of coloured part = $\dfrac{3}{8} \times 100\% = \dfrac{3}{2} \times 25\%$

                              = $(1.5 \times 25)\% = 37.5\%.$

Q4. Find:

    (a) **15% of 250**   (b) **1% of 1 hour**

    (c) **20% of ₹ 2500**   (d) **75% of 1 kg.**

Sol. (a) 15% of $250 = \dfrac{15}{100} \times 250 = 15 \times 2.5 = 37.5.$

    (b) 1% of 1 hour

      We know that 1 hour = 60 min. = 60 × 60 sec.

      Now, 1% of (60 × 60) sec.

                     = $\dfrac{1}{100} \times (60 \times 60)$ sec.

                     = 6 × 6 sec.

                     = 36 sec.

    (c) 20% of ₹ $2500 = \dfrac{20}{100} \times 2500 = ₹ (20 \times 25) = ₹ 500.$

    (d) 75% of 1 kg

      We know, 1 kg = 1000 g

      Now, 75% of 1000 g = $\dfrac{75}{100} \times 1000$ g = 750 g or 0.750 kg.

Q5. Find the whole quantity if

    (a) **5% of it is 600.**   (b) **12% of it is ₹ 1080.**

    (c) **40% of it is 500 km.**   (d) **70% of it is 14 minutes.**

    (e) **8% of it is 40 litres.**

Sol. Let the whole quantity be x in given problems:

(a) 5% of it is 600

$\Rightarrow$ 5% of $x = 600$

$\Rightarrow$ $\dfrac{5}{100} \times x = 600$

$\Rightarrow$ $x = \dfrac{600 \times 100}{5} = 12{,}000$

Thus, $x = 12{,}000$, which is required quantity.

(b) 12% of it is ₹ 1080

$\Rightarrow$ 12% of $x = 1080$

$\Rightarrow$ $\dfrac{12}{100} \times x = 1080$

$\Rightarrow$ $x = \dfrac{1080 \times 100}{12} = 9{,}000$

Thus, $x = ₹\ 9{,}000$, which is required quantity.

(c) 40% of it is 500 km

$\Rightarrow$ 40% of $x = 500$

$\Rightarrow$ $\dfrac{40}{100} \times x = 500$

$\Rightarrow$ $x = \dfrac{500 \times 100}{40} = 1{,}250$

Thus, $x = 1{,}250$ km, which is required quantity.

(d) 70% of it is 14 minutes

$\Rightarrow$ 70% of $x = 14$

$\Rightarrow$ $\dfrac{70}{100} \times x = 14$

$\Rightarrow$ $x = \dfrac{14 \times 100}{70} = 20$

Thus, $x = 20$ minutes, which is required quantity.

(e) 8% of it is 40 litres

$\Rightarrow$ 8% of $x = 40$

$\Rightarrow$ $\dfrac{8}{100} \times x = 40$

$\Rightarrow$ $x = \dfrac{40 \times 100}{8} = 500$

Thus, $x = 500$ litres, which is required quantity.

Q6. **Convert given per cents to decimal fractions and also to fractions in simplest forms:**

    (a) 25%   (b) 150%   (c) 20%   (d) 5%.

Sol.

S.No.	Per cents	Fractions	Simplest form	Decimal form
(a)	25%	$\dfrac{25}{100}$	$\dfrac{1}{4}$	0.25
(b)	150%	$\dfrac{150}{100}$	$\dfrac{3}{2}$	1.5
(c)	20%	$\dfrac{20}{100}$	$\dfrac{1}{5}$	0.2
(d)	5%	$\dfrac{5}{100}$	$\dfrac{1}{20}$	0.05

Q7. **In a city, 30% are females, 40% are males and remaining are children. What per cent are children?**

Sol. Given, percentage of females = 30%

             percentage of males = 40%

Total percentage of females and males = 30% + 40% = 70%

Percentage of children

      = Total percentage – Percentage of females and males

      = (100 – 70)% = 30%

Thus, the 30% are children.

Q8. **Out of 15,000 voters in a constituency, 60% voted. Find the percentage of voters who did not vote. Can you now find how many actually did not vote?**

Sol. Total voter = 15,000

Percentage of voted candidates = 60%

Percentage of not voted candidates = (100 – 60)% = 40%

Actual candidates who did not vote = 40% of 15,000

                    $= \dfrac{40}{100} \times 15{,}000 = 6{,}000$

Thus, 6,000 candidates did not vote.

Q9. **Meeta saves ₹ 400 from her salary. If this is 10% of her salary. What is her salary?**

Sol. Let Meeta's salary be ₹ x.

Now, 10% of salary = ₹ 400

$$10\% \text{ of } x = 400$$

$$\Rightarrow \qquad \frac{10}{100} \times x = 400$$

$$\Rightarrow \qquad x = \frac{400 \times 100}{10} = 4,000$$

Thus, Meeta's salary is ₹ 4,000.

Q.10. **A local cricket team played 20 matches in one season. It won 25% of them. How many matches did they win?**

Sol. Given, number of matches played by cricket team = 20

Percentage of won matches = 25%

Total matches won by them = 25% of 20 = $\dfrac{25}{100} \times 20 = 5$

Thus, they won 5 matches.

Exercise 8.3 (Page No. 171-172)

Q1. **Tell what is the profit or loss in the following transactions. Also find profit per cent or loss per cent in each case.**

(a) **Gardening shears bought for ₹ 250 and sold for ₹ 325.**

(b) **A refrigerator bought for ₹ 12,000 and sold at ₹ 13,500.**

(c) **A cupboard bought for ₹ 2,500 and sold at ₹ 3,000.**

(d) **A skirt bought for ₹ 250 and sold at ₹ 150.**

Sol. (a) Given, cost price of gardening shears = ₹ 250

Selling price of gardening shears = ₹ 325

On comparing the prices, the S.P. is greater so obtains profit,

So, $\qquad\qquad$ Profit = S.P. – C.P.

$$= ₹ (325 - 250)$$

$$\text{Profit} = ₹ 75$$

Now, $\quad$ Profit per cent = $\dfrac{\text{Profit}}{\text{C.P.}} \times 100$

$$= \frac{75}{250} \times 100 = \frac{7500}{250}$$

$$= 30\%$$

Therefore, profit = ₹ 75, profit per cent = 30%.

(b) Given, cost price of refrigerator = ₹ 12,000

Selling price of refrigerator = ₹ 13,500

On comparing the prices, the S.P. is greater so obtained profit.

So, $\qquad\qquad$ Profit = S.P. – C.P.

$$= ₹ (13,500 - 12,000)$$

$$\text{Profit} = ₹ 1,500$$

Now, $\quad$ Profit per cent = $\dfrac{\text{Profit}}{\text{C.P.}} \times 100$

$$= \frac{1500}{12000} \times 100$$

$$= 12.5\%$$

Therefore, profit = ₹ 1,500 and profit per cent = 12.5%.

(c) Given, cost price of cupboard = ₹ 2,500

Selling price of cupboard = ₹ 3000

On comparing the price, S.P. is greater so obtained profit,

So, $\qquad\qquad$ Profit = S.P. – C.P.

$$= ₹ (3,000 - 2,500)$$

$$\text{Profit} = ₹ 500$$

Now, $\quad$ Profit per cent = $\dfrac{\text{Profit}}{\text{C.P.}} \times 100$

$$= \frac{500}{2500} \times 100$$

$$= 20\%$$

Therefore, profit = ₹ 500 and profit per cent = 20%.

(d) Given, cost price of skirt = ₹ 250

Selling price of skirt = ₹ 150

On comparing the prices, S.P. is smaller so obtained loss.

So, $\qquad\qquad$ Loss = C.P. – S.P.

$$= ₹ (250 - 150)$$

$$\text{Loss} = ₹ 100$$

Now, $\quad$ Loss per cent = $\dfrac{\text{Loss}}{\text{C.P.}} \times 100$

$$= \frac{100}{250} \times 100$$

$$= 40\%$$

Therefore, loss = ₹ 100 and loss per cent = 40%.

Q2. **Convert each part of the ratio to percentage:**

    (a) **3 : 1**   (b) **2 : 3 : 5**   (c) **1 : 4**   (d) **1 : 2 : 5**

Sol. (a) 3 : 1

    Total part = 3 + 1 = 4

    Fractional of first part = $\dfrac{3}{4}$ and second part = $\dfrac{1}{4}$

    Therefore, percentage of first part = $\dfrac{3}{4} \times 100 = 75\%$

    Percentage of second part = $\dfrac{1}{4} \times 100 = 25\%$

    Thus, 3 : 1 = 75% : 25%.

    (b) 2 : 3 : 5

    Total part = 2 + 3 + 5 = 10

    Fractional of first part = $\dfrac{2}{10}$, second part = $\dfrac{3}{10}$ and third

    part = $\dfrac{5}{10}$

    Therefore, Percentage of first part = $\dfrac{2}{10} \times 100 = 20\%$

    Percentage of second part = $\dfrac{3}{10} \times 100 = 30\%$

    Percentage of third part = $\dfrac{5}{10} \times 100 = 50\%$

    Thus, 2 : 3 : 5 = 20% : 30% : 50%

    (c) 1 : 4

    Total part = 1 + 4 = 5

    Fractional of first part = $\dfrac{1}{5}$ and second part = $\dfrac{4}{5}$

    Percentage of first part = $\dfrac{1}{5} \times 100 = 20\%$

    Percentage of second part = $\dfrac{4}{5} \times 100 = 80\%$

    Thus, 1 : 4 = 20% : 80%.

    (d) 1 : 2 : 5

    Total part = 1 + 2 + 5 = 8

    Fractional of first part = $\dfrac{1}{8}$, second part = $\dfrac{2}{8}$ and third

    part = $\dfrac{5}{8}$

    Percentage of first part = $\dfrac{1}{8} \times 100 = 12.5\%$

    Percentage of second part = $\dfrac{2}{8} \times 100 = 25\%$

    Percentage of third part = $\dfrac{5}{8} \times 100 = 62.5\%$

    Thus, 1 : 2 : 5 = 12.5% : 25% : 62.5%.

Q3. **The population of a city decreased from 25,000 to 24,500. Find the percentage decrease.**

Sol. The decreased population of a city from 25,000 to 24,500.

    Amount of change = 25,000 – 24,500 = 500

    Therefore, decreased percentage = $\dfrac{\text{Amount of change}}{\text{Original amount}} \times 100$

                             = $\dfrac{500}{25000} \times 100 = 2\%$

    Thus, population decreased percentage is 2%.

Q4. **Arun bought a car for ₹ 3,50,000. The next year, the price went upto ₹ 3,70,000. What was the percentage of price increase?**

Sol. Increase in price of a car from ₹ 3,50,000 to ₹ 3,70,000.

    Amount of change = ₹ (3,70,000 – 3,50,000) = ₹ 20,000

    Therefore, increased percentage = $\dfrac{\text{Amount of change}}{\text{Original amount}} \times 100$

                             = $\dfrac{20000}{350000} \times 100 = 5\dfrac{5}{7}\%$

    Thus, the percentage of price increased is $5\dfrac{5}{7}\%$.

Q5. **I buy a T.V. for ₹ 10,000 and sell it at a profit of 20%. How much money do I get for it?**

Sol. Given, the cost price of T.V. = ₹ 10,000

                  Profit per cent = 20%

                  Profit = Profit % of C.P.

                           = $\dfrac{20}{100} \times 10,000$

                  Profit = ₹ 2,000

Now, the selling price = C.P. + Profit

$$= ₹ (10,000 + 2,000) = ₹ 12,000$$

Thus, he gets ₹ 12,000 for selling his T.V.

Q6. **Juhi sells a washing machine for ₹ 13,500. She loses 20% in the bargain. What was the price at which she bought it?**

Sol. Given, selling price of washing machine = ₹ 13,500

Loss per cent = 20%

Let the cost price of washing machine be ₹ x.

Loss = loss % of C.P.

$\Rightarrow$ Loss = 20% of $x = \dfrac{20}{100} \times x = \dfrac{x}{5}$

Therefore,   S.P. = C.P. – Loss

$\Rightarrow$ $13,500 = x - \dfrac{x}{5}$

$\Rightarrow$ $13,500 = \dfrac{4x}{5}$

$\Rightarrow$ $4x = 13,500 \times 5$

$\Rightarrow$ $x = \dfrac{13,500 \times 5}{4}$

or $x = ₹ 16,875$

Thus, the cost price of the washing machine is ₹ 16,875.

Q7. **(i) Chalk contains calcium, carbon and oxygen in the ratio 10 : 3 : 12. Find the percentage of carbon in chalk.**

(ii) If in a stick of chalk, carbon is 3 g, what is the weight of the chalk stick?

Sol. **(i)** Given ratio = 10 : 3 : 12

Total part = 10 + 3 + 12 = 25

Now, part of carbon = $\dfrac{3}{25}$

Percentage of carbon part in chalk = $\dfrac{3}{25} \times 100\% = 3 \times 4\% = 12\%$

Thus, the percentage of carbon in chalk is 12%.

(ii) Given, quantity of carbon in chalk stick = 3 g

Let the weight of chalk be x g.

Then,   12% of $x = 3$

$\Rightarrow$ $\dfrac{12}{100} \times x = 3$ $\Rightarrow$ $12x = 300$

$\Rightarrow$ $x = \dfrac{300}{12}$ or $x = 25$

Thus, the weight of the chalk stick is 25 g.

Q8. **Amina buys a book for ₹ 275 and sells it at a loss of 15%. How much does she sell it for?**

Sol. Given, the cost price of a book = ₹ 275

Loss per cent = 15%

Loss = Loss % of C.P.

= 15% of 275

$= ₹ \left(\dfrac{15}{100} \times 275 \right) = ₹ \dfrac{4,125}{100}$

Loss = ₹ 41.25

Therefore,   S.P. = C.P. – Loss

= ₹ (275 – 41.25)

= ₹ 233.75

Thus, Amina sells a book for ₹ 233.75.

Q9. **Find the amount to be paid at the end of 3 years in each case:**

(a) Principal = ₹ 1,200 at 12% p.a.

(b) Principal = ₹ 7,500 at 5% p.a.

Sol. **(a)** Given, principal (P) = ₹ 1,200; rate (R) = 12% p.a.; time (T) = 3 years

$$S.I. = \dfrac{P \times R \times T}{100} = ₹ \dfrac{1200 \times 12 \times 3}{100}$$

$$= ₹ (12 \times 12 \times 3) = ₹ 432$$

Amount = Principal + S.I.

= ₹ (1200 + 432)

= ₹ 1,632

(b) Given, principal (P) = ₹ 7,500; rate (R) = 5% p.a.; time (T) = 3 years

$$S.I. = \dfrac{P \times R \times T}{100} = ₹ \dfrac{7,500 \times 5 \times 3}{100}$$

$$= ₹ (75 \times 15)$$

$$\text{S.I.} = ₹ 1,125$$

$$\text{Amount} = \text{Principal} + \text{S.I.}$$

$$= ₹ (7,500 + 1,125)$$

$$= ₹ 8,625.$$

Q10. **What rate gives ₹ 280 as interest on a sum of ₹ 56,000 in 2 years?**

Sol. Given,   principal (P) = ₹ 56,000;

simple interest (S.I.) = ₹ 280;

time (T) = 2 years

Let the rate of interest be R% p.a.

We know, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \qquad 280 = \frac{56,000 \times R \times 2}{100}$$

$$\Rightarrow \qquad R = \frac{280 \times 100}{56,000 \times 2} = \frac{28,000}{1,12,000}$$

or $$R = 0.25\%$$

Thus, the rate on the sum is 0.25% p.a.

Q11. **If Meena gives an interest of ₹ 45 for one year at 9% rate p.a.. What is the sum she has borrowed?**

Sol. Given,   Simple interest (S.I.) = ₹ 45;   rate (R) = 9% p.a.;

time (T) = 1 year

Let the sum be ₹ P.

Therefore, $$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \qquad 45 = \frac{P \times 9 \times 1}{100}$$

$$\Rightarrow \qquad 4,500 = 9P$$

$$\Rightarrow \qquad P = \frac{4,500}{9}$$

or $$P = ₹ 500$$

Thus, the sum, she has borrowed is ₹ 500.

□□