EXERCISE NO. 1

SET – A

-:1.1:-

Simplify the following ratios

i)
- **a) 40:32**
- **b) 48:80**
- **c) 24:16**
- **d) 12:32**

ii)
- **a) 4:12:16**
- **b) 25:75:35**
- **c) 13:39:52**
- **d) 18:54:90**

SOLUTION

(i)

a) 40 : 32
10 : 8
5 : 4

b) 48 : 80
12 : 20
3 : 5

c) 24 : 16
3 : 2

d) 12 : 32
3 : 8

(ii)

a) 4 : 12 : 16
1 : 3 : 4

b) 25 : 75 : 35
5 : 15 : 7

c) 13 : 29 : 52
1 : 3 : 4

d) 18 : 54 : 90
2 : 6 : 10
1 : 3 : 5

-:1.2:-

Find the missing quantities in each of the following.

a) $\frac{4800}{600} = \frac{2000}{x}$

b) $\frac{648}{108} = \frac{x}{50}$

c) $\frac{45.6}{x} = \frac{76.5}{25.5}$

d) $\frac{x}{8\frac{3}{4}} = \frac{6}{14}$

SOLUTION

a) $\frac{4800}{600} = \frac{2000}{x}$

$4800:600::2000:x$

$x \times 4800 = 600 \times 2000$

$x = \frac{600 \times 2000}{4800} = 250$

b)
$$\frac{648}{108} = \frac{x}{50}$$
$$648:108::x:50$$
$$648 \times 50 = 108 \times x$$
$$108x = 648 \times 50$$
$$x = \frac{648 \times 50}{108} = 300$$

c)
$$\frac{45.6}{x} = \frac{76.5}{25.5}$$
$$45.6:x :: 76.5:25.5$$
$$45.6 \times 25.5 = 76.5 \times x$$
$$76.5x = 45.6 \times 25.5$$
$$x = \frac{45.6 \times 25.5}{76.5} = 15.2$$

d)
$$\frac{x}{8\frac{3}{4}} = \frac{6}{4} \Rightarrow \frac{x}{\frac{35}{4}} = \frac{6}{14}$$
$$\frac{4x}{35} = \frac{6}{14}$$
$$4x : 35 = 6 : 4$$
$$56x = 35 \times 6$$
$$16x = 35 \times 6$$
$$x = \frac{35 \times 6}{56} = 3\frac{3}{4}$$

-:1.3:-

Distribute a stock of 6000 electric fans to the three dealers in ratio 3:5:4.

SOLUTION

Total stock of electric fans = 6000 fan
Ratio of fans to three dealers
$$3 : 5 : 4$$
Sum of ratios = 3 + 5 + 4 = 12

$$\text{Share of first dealer} = \frac{3}{12} \times 6000 = 1500 \text{ fans}$$

$$\text{Share of second dealer} = \frac{5}{12} \times 6000 = 2500 \text{ fans}$$

$$\text{Share of third dealer} = \frac{4}{12} \times 6000 = 2000 \text{ fans}$$

-:1.4:-

Three people invest Rs. 900, Rs. 600, Rs. 300 respectively in a business. How should they share out profit of Rs. 900.

SOLUTION

The ratio of investment of three person

Rs. 900 : Rs. 600 : Rs. 300

9 : 6 : 3

3 : 2 : 1

Sum of ratios = 3+2+1 = 6

Total profit = Rs. 900

$$\text{Share of first person} = \frac{3}{6} \times 900 = \text{Rs. } 450$$

$$\text{Share of 2nd person} = \frac{2}{6} \times 900 = \text{Rs. } 300$$

$$\text{Share of thrid person} = \frac{1}{6} \times 900 = \text{Rs. } 150$$

-:1.5:-

If Rs. 750 is received as the profit on an investment of Rs. 2500. What return might be expected on an investment of Rs. 3850.

SOLUTION

Let x be the expected profit on an investment of Rs. 3850. The estimated value is greater, so we form the proportion with smaller value first.

Profit (Rs.)	Investment (Rs.)
750	2500
x	3850

It is a direct proportion. Applying the fundamental principle of proportion.

$$750 \times 3850 = x \times 2500$$

$$x \times 2500 = 750 \times 3850$$

$$x = \frac{750 \times 3850}{2500}$$

$$= \text{Rs. } 1155$$

-:1.6:-

In a partnership, A invested Rs. 8000, B Rs. 6000 and C Rs. 5000. If their profits totaled Rs. 12000, how much did each receive if the profits were divided in the ratio of their investment?

SOLUTION

The ratio of investment of three person A, B and C is

Rs. 8000 : Rs. 6000 : Rs. 5000

8 : 6 : 5

Sum of ratios $= 8 + 6 + 5 = 19$

$$\text{A's Share of profit} = \frac{8}{19} \times 12000 = \text{Rs. } 5052$$

$$\text{B's Share of profit} = \frac{6}{18} \times 12000 = \text{Rs. } 3789.47$$

$$\text{C's Share of profit} = \frac{5}{19} \times 12000 = \text{Rs. } 3157.90$$

-:1.7:-

The cost of building 1.5 miles of a certain highway was Rs. 420,000; what was the cost of 4.5 miles of that highway.

SOLUTION

Let x be the cost of building 4.5 miles highway. The estimated value is greater so we form the proportion with first ratio smaller.

Distance (miles)	Cost (Rs.)
1.5	420000
4.5	x

1.5 : 4.5 : 420000 : x

It is the problem of direct proportion. Applying the fundamental principle of proportion.

$$1.5 \times x = 4.5 \times 420000$$

$$x = \frac{4.5 \times 420000}{1.5}$$

$$= \text{Rs.}12,60,000$$

-:1.8:-

A cylindrical tank 24 feet high, now holds 375 gallons of water 9 feet deep. How many gallons will it hold when full.

SOLUTION

Let x be the number of gallons of water to fill the full tank. The estimated value is greater, we form the proportion with first ratio smaller.

Height (feet)	Water (in gallon)
9	375
24	x

It is the problem of direct proportion. Applying the fundamental principle of proportion.

$$9 \times x = 24 \times 375$$

$$x = \frac{24 \times 375}{9} = 1000 \text{ gallons}$$

-:1.9:-

A jet airplane traveled 100 miles in 9 minutes. To the nearest mile, what was its rate per hours?

SOLUTION

Let x be the distance travelled in one hour or in 60 minutes. The estimated value is greater, so we form the proportion as:

Time (in minutes)	Distance (miles)
9	100
60	x

It is the problem of direct proportion. Applying the fundamental principle of proportion.

$$9 \times x = 60 \times 100$$

$$x = \frac{60 \times 100}{9} = 666.67 \text{ miles}$$

-:1.10:-

A space ship in orbit has an average speed of 11400 m.p.h. At that rate, how many minutes would it take to travel 3000 miles?

SOLUTION

Let x be the minutes taken to travel 3000 miles. The estimated value is smaller, so we form the proportion as:

Distance (miles)	Time (in minutes)
11400	60
3000	x

It is the problem of direct proportion. Applying the fundamental principle of proportion.

$$11400 \times x = 3000 \times 60$$

$$x = \frac{3000 \times 60}{11400}$$

$$= 15.79 \text{ miles}$$

-:1.11:-

A train covers 144 km distance in two hours. What distance will at cover in 50 minutes with the same speed.

SOLUTION

Let x be the distance covered in 50 minutes. The estimated value (distance) is smaller, so we form the proportion with first ratio greater

Distance (km)	Time (in min)
144	120
x	50

It is the problem of direct proportion. Applying the fundamental principle of proportion.

$$144 \times 50 = x \times 120$$

$$x \times 120 = 144 \times 50$$

$$x = \frac{144 \times 50}{120} = 60 \text{ km}$$

144 : x :: 120 : 50

-:1.12:-

A bus travels 200 kilometers in 3 hours. How much time is needed for a journey of 450 kilometers.

SOLUTION

Let x be the time for a journey of 450 km.
The ratio of distance to time is

$$200 : 3$$

Hence $$200 : 3 :: 450 : x$$

Applying the fundamental law of proportion, we get

$$200x = 3 \times 450$$

$$x = \frac{3 \times 450}{200} = 6\frac{3}{4} \text{ hours}$$

-:1.13:-

Six men can paint a house in four days. How long would it take to paint the house if two men are employed.

SOLUTION

Let x be the number of days when 2 men are employed to paint the house. The number of men are decreased but the number of days increased. This is the inverse proportion. The proportion is:

Men	Days
6	4
2	x

$$6 : 2 :: 4 : x$$

For inverse proportion, we invert the first ratio and write the proportion as:

$$2 : 5 :: 4 : x \text{ (inverse)}$$

Applying the fundamental principle of proportion

$$2 \times x = 6 \times 4$$

$$x = \frac{6 \times 4}{2} = 12 \text{ days}$$

-:1.14:-

A factory can produce 72 washing machines in 9 days.

a) How many machines can it produce in the following days.

i) 1 day ii) 10 days iii) 24 days

b) **How may days will it take to produce the following numbers of machines.**
i) 8 machines ii) 16 machines iii) 126 machines

SOLUTION

(a)

(i) Let x be the number of machines produced in one day.
The estimated value is smaller, so we form the proportion with first ratio as greater

Machines	Days
72	9
x	1

$$\frac{72}{x} = \frac{9}{1}$$

$$72 : x :: 9 : 1$$

Applying the fundamental principle of proportion,

$$72 \times 1 = x \times 9$$

$$9x = 72$$

$$x = 8 \text{ machines}$$

(ii) Let x be the number of machines produced in 10 days.
The estimated value is greater, so we form the proportion with first ratio as smaller.

Machines	Days
9	72
10	x

$$\frac{9}{10} = \frac{72}{x}$$

$$9 : 10 :: 72 : x$$

Applying the fundamental principle of proportion

$$x \times 9 = 720$$

$$x = \frac{720}{9} = 80 \text{ machines}$$

(iii) Let x be the number of machines to be produced in 24 days.

Days	Machines
9	72
24	x

$$\frac{9}{24} = \frac{72}{x}$$

$$9 : 24 :: 72 : x$$

Applying the fundamental principle of proportion

$$9x = 24 \times 72$$

$$x = 192 \text{ machines}$$

(b)

(i) Let x be the number of days to produce 8 machines.
The estimated value is smaller, the first ratio will be greater.

Machines	Days
72	9
8	x

$$\frac{72}{8} = \frac{9}{x}$$

$$72 : 8 :: 9 : x$$

Applying the fundamental principle of proportion

$$72x = 8 \times 9$$

$$x = 1 \text{ day}$$

(ii) Let x be the number of days to produce 16 machines.
The estimated value is smaller, so we form the proportion with first ratio as greater.

Machines	Days
72	9
16	x

$$\frac{72}{16} = \frac{9}{x}$$

$$72 : 16 :: 9 : x$$

Applying the fundamental principle of proportion

$$72x = 16 \times 9$$

$$72x = 144$$

$$x = 2 \text{ days}$$

(iii) Let x be the number of day to produce 126 machines.

The estimated value is greater, so we form the proportion with first ratio as smaller.

Days	Machines
9	72
x	126

$$\frac{9}{x} = \frac{72}{126}$$

$$9 : x :: 72 : 126$$

Applying the fundamental principle of proportion

$$9 \times 126 = x \times 72$$

$$72x = 9 \times 126$$

$$x = 15\frac{3}{4} \text{ days}$$

-:1.15:-

A woman can walk 48 km in 6 hours.

a) How long will she take to walk the following distances:
i) 16 km ii) 40 km iii) 143 km

b) How far can she walk in
i) 2 hrs ii) 5 hrs iii) 7 ½ hrs

SOLUTION

(i) The estimated value (time) is smaller, so we form the proportion with first ratio as greater. Let x be the time used to walk 16 km.

Distance	Time
48	6
16	x

$$48 : 16 :: 6 : x$$

$$48x = 16 \times 6$$

$$x = \frac{96}{48} = 2 \text{ hours}$$

(ii) The estimated value (time) is smaller, so we form the proportion with first ratio as greater. Let x be the time used to walk 40 km.

Distance	Time
48	6
40	x

$$\frac{48}{40} = \frac{6}{x}$$

$$48 : 40 :: 6 : x$$

Applying the fundamental principle of proportion

$$48x = 40 \times 6$$

$$x = \frac{40 \times 6}{48} = 5 \text{ hours}$$

(iii) The estimated value (time) is greater, so we form the proportion with first ratio as smaller. Let x be the time used to walk 143 km.

Time	Distance
6	48
x	143

$$\frac{6}{x} = \frac{48}{143}$$

$$6 : x :: 48 : 143$$

Applying the fundamental principle of proportion

$$6 \times 143 = x \times 48$$

$$48x = 6 \times 143$$

$$x = \frac{6 \times 143}{48} = 17\frac{7}{8} \text{ hours}$$

(b)

(i) The estimated value (distance) is smaller, so we form the proportion with first ratio as greater. Let x be the distance to be covered in two hours.

Distance	Time
48	6
x	2

$$\frac{48}{x} = \frac{6}{2}$$

$$48 : x :: 6 : 2$$

Applying the fundamental principle of proportion

$$48 \times 2 = 6x$$

$$6x = 48 \times 2$$

$$x = 16 \text{ km}$$

(ii) The estimated value (distance) is smaller, so we form the proportion with first ratio as greater. Let x be the distance to be covered in 5 hours.

Distance	Time
48	6
x	5

$$\frac{48}{x} = \frac{6}{5}$$

$$48 : x :: 6 : 5$$

Applying the fundamental principle of proportion

$$48 \times 5 = 26x$$

$$6x = 48 \times 5$$

$$x = \frac{45 \times 5}{6} = 40 \text{ km}$$

(iii) The estimated value (distance) is greater, so we form the proportion with first ratio as smaller. Let x be the distance to be covered in 7½ hours.

Time	Distance
6	48
7½	x

$$\frac{6}{7\frac{1}{2}} = \frac{48}{x}$$

$$6 : \frac{15}{2} :: 48 : x$$

Applying the fundamental principle of proportion

$$6x = \frac{15}{2} \times 48$$

$$6x = 15 \times 24$$

$$x = \frac{15 \times 24}{6} = 60 \text{ km}$$

-:1.16:-

A well produces 2846 cu ft water in 3 ½ hr. How many hours will it take the well to produce 14230 cu ft of water.

SOLUTION

The estimated value (time) is greater, so we form the proportion with first ratio as smaller. Let x be the time used to produce required amount of water.

Time (hrs)	Water in cu ft
3½	2846
x	14230

$$\frac{3.5}{x} = \frac{2846}{14230}$$

$$3.5 : x :: 2846 : 14230$$

Applying the fundamental principle of proportion

$$3.5 \times 14230 = x \times 2846$$

$$2846x = 3.5 \times 14230$$

$$x = \frac{3.5 \times 14230}{2846} = 17\frac{1}{2} \text{ hrs}$$

-:1.17:-

A bus runs 100 km in 8 litres of diesel. How much diesel is needed to run 250 km.

SOLUTION

The estimated value diesel in litres is greater, so we form the proportion with first ratio as smaller. Let x be the amount of diesel required.

Diesel (in litres)	Distance (km)
8	100
x	250

$$\frac{8}{x} = \frac{100}{250}$$

$$8 : x :: 100 : 250$$

Applying the fundamental principle of proportion

$$8 \times 250 = x \times 100$$

$$100x = 250 \times 8$$

$$x = \frac{250 \times 8}{100} = 20 \text{ litres}$$

-:1.18:-

If 15 dozens of eggs cost Rs. 202.50. How much will 96 eggs cost?

SOLUTION

Let x be the cost for 96 eggs that is 8 dozen eggs. The estimated value is smaller, so we form the proportion with first ratio greater

$$202.50 : X :: 15 : 8$$

Cost (in Rs.)	Eggs (in dozen
202.50	15
x	8

It is the problem of direct proportion. Applying the fundamental principle of proportion.

$$202.50 \times 8 = x \times 15$$

$$x \times 15 = 202.50 \times 8$$

$$x = \frac{202.50 \times 8}{15} = \text{Rs.}108$$

-:1.19:-

8 men take 48 hours to dig a garden.

a) How long will be taken by the following numbers of men.

i) 12 men ii) 32 men iii) 40 men

b) How many men will be required to dig the garden in the following times.

i) 24 hrs. ii) 96 hrs. iii) 32 hrs.

SOLUTION

(a)

(i) Let x be the time to be used to dig the garden, then

In this problem, 12 men will dig the garden in less than 48 hours.

Hours	Men
48	8
X	12

Here one quantity is decreased while the other is increased. So this is the problem of inverse proportion.

$$48 : x :: 8 : 12$$

As it is an inverse proportion, we invert the first ratio and write the proportion as:

$$x : 48 :: 8 : 12$$

Applying the fundamental principle of proportion

$$12x = 48 \times 8$$

$$x = \frac{48 \times 8}{12} = 32 \text{ hrs}$$

(ii) Let x be the time to be used to dig the garden.
In this problem, 32 men will dig the garden in less time.

Hours	Men
48	8
x	32

Here one quantity is decreased when the other is increased. It is the problem of inverse proportion.

$$48 : x :: 8 : 32$$

As it is an inverse proportion, we invert the first ratio and write the proportion as:

$$x : 48 :: 8 : 32$$

Applying the fundamental principle of proportion

$$32x = 48 \times 8$$

$$x = \frac{48 \times 8}{32} = 12 \text{ hrs}$$

(iii) Let x be the time to be used to dig the garden.

Hours	Men
48	8
X	40

$$48 : x :: 8 : 40$$

As it is an inverse proportion, we invert the first ratio and write the proportion as:

$$x : 48 :: 8 : 40$$

Applying the fundamental principle of proportion

$$40x = 48 \times 8$$

$$x = \frac{48 \times 8}{40} = 9.6 \text{ hrs}$$

(b)

Let x be the number of men required to dig the garden.

(i)

Men	Hours
8	48
x	24

Decrease in time will increase the number of men. It is the problem of inverse proportion.

$$8 : x :: 48 : 24$$

Invert the first ratio and write the proportion as:

$$x : 8 :: 48 : 24$$

Applying the fundamental principle of proportion

$$24x = 8 \times 48$$

$$x = \frac{8 \times 48}{24} = 16 \text{ men}$$

(ii)

Hours	Men
48	8
96	x

$$48 : 96 :: 8 : x$$

As it the problem of inverse proportion. Invert the first ratio and write the proportion as:

$$96 : 48 :: 8 : x$$

Applying the fundamental principle of proportion

$$96x = 48 \times 8$$

$$x = \frac{48 \times 8}{96} = 4 \text{ men}$$

(iii)

Men	Hours
8	48
x	32

$$8 : x :: 48 : 32$$

It is the problem of inverse proportion, invert the first ratio

$$x : 8 :: 48 : 32$$

Applying the fundamental principle of proportion

$$32x = 8 \times 48$$

$$x = \frac{8 \times 48}{32} = 12 \text{ men}$$

-:1.20:-

A car take 8 hrs. To do a journey at 90 km/h.

a) How long would it take at the following speeds.

i) 144 km/h ii) 80 km/h iii) 60 km/h

b) What speed would be required to do it in the following times.

i) 10 hrs ii) 18 hrs iii) 6 hrs

SOLUTION

(a)

Let x be the time used at the given speed.

(i)

Speed (km/h)	Time (hrs)
90	8
144	x

$$90 : 144 :: 8 : x$$

As it is an inverse proportion

$$144 : 90 :: 8 : x$$

Applying the fundamental principle of proportion

$$144x = 90 \times 8$$

$$x = \frac{90 \times 8}{144} = 5 \text{ hrs}$$

(ii)

Time (hrs)	Speed (km/h)
8	90
x	80

$$8 : x :: 90 : 80$$

As it is an inverse proportion

$$x : 8 :: 90 : 80$$

Applying the fundamental principle of proportion

$$80x = 8 \times 90$$

$$x = \frac{8 \times 90}{80} = 9 \text{ hrs}$$

(iii)

Time (hrs)	Speed (km/h)
8	90
x	60

$$8 : x :: 90 : 60$$

As it is an inverse proportion

$$x : 8 :: 90 : 60$$

Applying the fundamental principle of proportion

$$60x = 8 \times 90$$

$$x = \frac{8 \times 90}{60} = 12 \text{ hrs}$$

(b)

Let x be the speed to do the journey in the required time.

(i)

Speed (km/h)	Time (hrs)
90	8
x	10

$$90 : x :: 8 : 10$$

As it is an inverse proportion

$$x : 90 :: 8 : 10$$

Applying the fundamental principle of proportion

$$10x = 90 \times 8$$

$$x = \frac{90 \times 8}{10} = 72 \text{ km / h}$$

(ii)

Speed (km/h)	Time (hrs)
90	8
x	18

$$90 : x :: 8 : 18$$

As it is an inverse proportion, so

$$x : 90 :: 8 : 18$$

Applying the fundamental principle of proportion

$$18x = 90 \times 8$$

$$x = \frac{90 \times 8}{18} = 40 \text{ km / h}$$

(iii)

Time (hrs)	Speed (km/h)
8	90
6	x

$$8 : 6 :: 90 : x$$

As it is an inverse proportion

$$6 : 8 :: 90 : x$$

Applying the fundamental principle of proportion

$$6x = 8 \times 90$$

$$x = \frac{8 \times 90}{6} = 120 \text{ km / h}$$

-:1.21:-

A Suzuki car runs 150 km in 10 litres of petrol. How much petrol would be used to go 280 km?

SOLUTION

Let x be the petrol in litres to go 280 km.

Petrol (litres)	Distance (km)
10	150
x	280

$$10 : x :: 150 : 280$$

Is the problem of direct proportion.

Applying the fundamental principle of proportion

$$10 \times 280 = x \times 150$$

$$150x = 10 \times 280$$

$$x = \frac{10 \times 280}{150} = 18\frac{2}{3} \text{ litres}$$

-:1.22:-

Supper express takes 4¼ hours at a speed of 60 km/h to go from Faisalabad to Multan. How fast must the train travel for the same distance in 3½ hours.

SOLUTION

Let x be the speed of supper express to reach Multan in required time.

Time (hrs)	Speed (km/h)
$\frac{17}{4}$	60
$\frac{7}{2}$	x

$$\frac{17}{4} : \frac{7}{2} :: 60 : x$$

This is the problem of inverse proportion.

$$\frac{7}{2} : \frac{17}{4} :: 60 : x$$

Applying the fundamental principle of proportion

$$\frac{7}{2}x = \frac{17}{4} \times 60$$

$$\frac{7}{2}x = 17 \times 15$$

$$x = \frac{(17 \times 15)2}{7} = 73 \text{ km / h approxi.}$$

-:1.23:-

In a factory 12 men complete the work in 20 days, how long it will take to complete the same work by 8 workers.

SOLUTION

Let x be the number of days to compile the work with required workers.

Men	Days
12	20
8	x

$$12 : 8 :: 20 : x$$

It is the problem of inverse proportion.

$$8 : 12 :: 20 : x$$

Applying the fundamental principle of proportion

$$8x = 12 \times 20$$

$$x = \frac{12 \times 20}{8} = 30 \text{ men}$$

-:1.24:-

A group of 42 men can construct a house in 60 days working 8 hours a day. How many days are required to construct the same house by 60 workers, if they work 7 hours day.

SOLUTION

Let x be the number of days to complete the house by 60 workers, if they work 7 hours a day.

Ratio of men = 60 : 42 (inverse)

Ratio of hours = 7 : 8 (inverse)

In proportion

$$\begin{matrix} 60 : 42 \\ :: 60 : x \\ 7 : 8 \end{matrix}$$

By applying the fundamental principle of proportion

$$x \times 7 \times 60 = 60 \times 42 \times 8$$

$$420x = 60 \times 42 \times 8$$

$$x = \frac{60 \times 42 \times 8}{420} = 48 \text{ days}$$

-:1.25:-

100 men finished a job in 12 days working 6 hours a day. How many men will do the same job in 15 days to work 8 hours a day.

SOLUTION

Let x be the number of men who finish the work in 15 days to work 8 hours a day.

Ratio of days = 15 : 12 (inverse)

Ratio of men = 100 : 6 (inverse)

In proportion

$$\begin{matrix} 15 : 12 \\ :: 100 : x \\ 8 : 6 \end{matrix}$$

By applying the fundamental principle of proportion

$$x \times 8 \times 15 = 100 \times 12 \times 6$$

$$x = \frac{100 \times 12 \times 6}{8 \times 15} = 60 \text{ men}$$

-:1.26:-

In a hotel 10 men stay 16 days costs Rs. 8000. How many days, 15 men can stay with the amount Rs. 9750.

SOLUTION

Let x be the number of days to stay in hotel 15 men with amount Rs. 9750.

Ratio of men = 15 : 10 (inverse)
Ratio of amount = 8000 : 9750 (direct)
Ratio of days = 16 : x

In proportion

$$15 : 10 :: 16 : x$$
$$8000 : 9750$$

By applying the fundamental principle of proportion

$$x \times 8000 \times 15 = 16 \times 10 \times 9750$$

$$x = \frac{16 \times 10 \times 9750}{8000 \times 15} = 13 \text{ days}$$

-:1.27:-

50 men working 8 hours a day can complete a building in 35 days. How many hours a day. 70 men work to complete the same work in 25 days.

SOLUTION

Let x be the number of hours a day to complete the building by 60 men to work 25 days.

Ratio of men = 70 : 50 (inverse)
Ratio of days = 25 : 35 (inverse)
Ratio of hours = 8 : x

In proportion

$$70 : 50 :: 8 : x$$
$$25 : 35$$

By applying the fundamental principle of proportion

$$x \times 25 \times 70 = 8 \times 50 \times 25$$

$$x = \frac{8 \times 50 \times 35}{25 \times 70} = 8 \text{ hours}$$

-:1.28:-

25 workers complete a job in 20 days working 8 hours a day. In how many days 20 workers will complete the work for 10 hours a day?

SOLUTION

Let x be the number of days to finish the work by 20 workers working 10 hours a day.

Ratio of men = 20 : 25 (inverse)

Ratio of hours = 10 : 8 (inverse)

Ratio of days = 20 : x

In proportion

$$\begin{matrix} 20 : 20 \\ :: 20 : x \\ 10 : 8 \end{matrix}$$

Applying the fundamental principle of proportion

$$x \times 10 \times 20 = 20 \times 25 \times 8$$

$$x = \frac{20 \times 25 \times 8}{10 \times 20} = 20 \text{ days}$$

-:1.29:-

In a factory, a group of 50 workers 10 hours daily to make 500 units in 10 days. There is demand of 720 units in 12 days. How many workers are needed if they work 8 hours daily.

SOLUTION

Let x be the number of workers to make 720 units in 12 days working 8 hours daily.

Days	Hours	Units	Workers
10	10	500	50
12	8	720	x

Ratio of days = 12 : 10 (inverse)

Ratio of hours = 8 : 10 (inverse)

Ratio of units = 500 : 720 (direct)

Ratio of workers = 50 : x

In proportion

$$\begin{matrix} 12 : 10 \\ 8 : 10 :: 50 : x \\ 500 : 720 \end{matrix}$$

Applying the fundamental principle of proportion

$$x \times 500 \times 8 \times 12 = 50 \times 10 \times 10 \times 720$$

$$x = \frac{50 \times 10 \times 10 \times 720}{500 \times 8 \times 12} = 75 \text{ workers}$$

-:1.30:-

A fleet of 15 similar cars, uses 625 litres of petrol in 5 days. How long will 600 litres if 3 cars are laid up for repairs?

SOLUTION

Let x be the number of days to use 600 litre petrol by 12 cars.

Cars	Petrol (in litre)	Days
15	625	5
12	600	x

Ratio of men = 12 : 15 (inverse)
Ratio of hours = 625 : 600 (direct)
Ratio of days = 5 : x

In proportion

12 : 15
:: 5 : x
625 : 600

Applying the fundamental principle of proportion

$$x \times 625 \times 12 = 5 \times 15 \times 600$$

$$x = \frac{5 \times 15 \times 600}{625 \times 12} = 6 \text{ days}$$

SET – B

-:1.1:-

A and B are partners sharing profit and loss in the ratio of 3:2. A new partner C is admitted and ¼ share of profit is given. What is the new profit sharing ratio?

SOLUTION

We can find the common denominator to equivalent fractions.
When profit is 3 : 2, then share of A and B are

$$\frac{3}{5}, \frac{2}{5}$$

When partner C is admitted, then the ratio is:

$$\frac{3}{5}:\frac{2}{5}:\frac{1}{4} = \frac{3\times4}{5\times4}:\frac{2\times4}{5\times4}:\frac{1\times5}{4\times5}$$

$$= \frac{12}{20}:\frac{8}{20}:\frac{5}{20}$$

Total of ratios = 12 + 8 + 5 = 25
New profit ratio is:

$$\text{A's Share} = \frac{12}{25}$$

$$\text{B's Share} = \frac{8}{25}$$

$$\text{C's Share} = \frac{5}{25}$$

-:1.2:-

Mr. Ajmal had Rs. 42000. He owed Rs. 4000. He died and burial expenses were Rs. 2000. He left behind one widow, 3 sons and 2 daughters. The balance is to be paid in the ratio 1/8 to widow, while the share of each son will be twice as compared to daughter. Find the share of each.

SOLUTION

Total Estate	= Rs. 42000
Debt	= Rs. 4000
	Rs. 38000
Burial Expenses	= Rs. 2000
Balance	**= Rs. 36000**

$$\text{Share of widow} = 36000 \times \frac{1}{8} = \text{Rs. } 4500$$

Balance = Rs. 36000 – 4500 = Rs. 31500

Ratio of a son and a daughter is 2 : 1

There are 3 sons and 2 daughters

So $2 + 2 + 2 + 1 + 1 = 8$ shares

$$\text{Share of each Son} = \frac{2}{8} \times 31500 = \text{Rs. } 7875$$

$$\text{Share of each Daughter} = \frac{1}{8} \times 31500 = \text{Rs. } 3937.50$$

-:1.3:-

As estate of Rs. 168000 is to be divided among the heirs in the ratio of 1/4: 1/3 : 2/5 : 5/12. What is the share of each member.

SOLUTION

The ratio of shares is

$$\frac{1}{4} : \frac{1}{3} : \frac{2}{5} : \frac{5}{12}$$

We can find the common denominator to equivalent fractions:

$$\frac{1}{4} : \frac{1}{3} : \frac{2}{5} : \frac{5}{12} = \frac{1\times15}{4\times15} : \frac{1\times20}{3\times20} : \frac{2\times12}{5\times12} : \frac{5\times5}{12\times5}$$

$$= \frac{15}{60} : \frac{20}{60} : \frac{24}{60} : \frac{25}{60}$$

Ratio = 15 : 20 : 24 : 25

Sum of ratio = 15 + 20 + 24 + 25 = 84

$$\text{Frist Share} = \frac{15}{84} \times 168000 = \text{Rs. } 30000$$

$$\text{Second Share} = \frac{20}{84} \times 168000 = \text{Rs. } 40000$$

$$\text{Third Share} = \frac{24}{84} \times 168000 = \text{Rs. } 48000$$

$$\text{Fourth Share} = \frac{25}{84} \times 168000 = \text{Rs. } 50000$$

-:1.4:-

A contractor agreed to mix gravel, sand and cement in the ratio 8:5:3 in concrete work. He used 48000 lbs of mixture in completion of work. What is the quantity of each material used?

SOLUTION

The ratio of Gravel, Sand and Cement is 8 : 5 : 3

Sum of ratio = 8 + 5 + 3 = 16

Total mixture = 48000 lbs

$$\text{Gravel} = \frac{8}{16} \times 48000 = 24000 \text{ lbs}$$

$$\text{Sand} = \frac{5}{16} \times 48000 = 15000 \text{ lbs}$$

$$\text{Cement} = \frac{3}{16} \times 48000 = 9000 \text{ lbs}$$

-:1.5:-

Three milkmen mixes milk with water in the following ratios:

First milkman's ratio = 7 : 1

Second milkman's ratio = 9 : 2

Third milkman's ratio = 10 : 1

Who is more dishonest out of three milkmen?

SOLUTION

Here three ratios are

$$7:1 = \frac{1}{7}; \qquad 9:2 = \frac{2}{9}; \qquad 10:1 = \frac{1}{10}$$

$$\frac{1}{7} : \frac{2}{9} : \frac{1}{10}$$

We can find the common denominator to equivalent fractions

$$\frac{1\times 90}{7\times 90} : \frac{2\times 70}{9\times 70} : \frac{1\times 63}{10\times 63} = \frac{90}{630} : \frac{140}{630} : \frac{63}{630}$$

Second milkman is more dishonest as his ratio is greater.

-:1.6:-

A provides capital of Rs. 10000 for one year. B provides capital of Rs. 15000 for 8 months and C Rs. 20000 for 3 months. A profit of Rs. 37500 is to be distributed in the ratio of capital.

SOLUTION

Here total profit = Rs. 37500

The ratio of investment of A, B and C is

$$10000 : 15000 : 20000$$

The ratio of time is months of investment is

$$12 : 8 : 3$$

So the ratio of investment with respect to time is

$$10000 \times 12 : 15000 \times 8 : 20000 \times 3$$

$$10 \times 12 : 15 \times 8 : 20 \times 3$$

$$120 : 120 : 60$$

$$2 : 2 : 1$$

Sum of ratios = 2 + 2 + 1 = 5

$$\text{Share of A's Profit} = \frac{2}{5} \times 37500 = \text{Rs.}15000$$

$$\text{Share of B's Profit} = \frac{2}{5} \times 37500 = \text{Rs.}15000$$

$$\text{Share of C's Profit} = \frac{1}{5} \times 37500 = \text{Rs.}7500$$

-:1.7:-

The profit sharing ratio between A and B is 2 : 3. The ratio between B and C is 4 : 7. The firm earned a profit of Rs. 41000. What is the amount of each partner?

SOLUTION

It is the problem of continued ratio.

Total Profit = Rs. 41000

A	:	B	:	C
2	:	3		
		4	:	7
8	:	12	:	21

Sum of Ratios = 8 + 12 + 21 = 41

$$\text{Share of A's Profit} = \frac{8}{41} \times 41000 = \text{Rs. } 8000$$

$$\text{Share of B's Profit} = \frac{12}{41} \times 41000 = \text{Rs. } 12000$$

$$\text{Share of C's Profit} = \frac{21}{41} \times 41000 = \text{Rs. } 21000$$

-:1.8:-

A storekeeper can keep 720 cans of vegetables. The owner wants to buy peas, beans and corn in the ratio of 3 : 4 : 5. What is the size of order of each kind.

SOLUTION

Total Cans = 720 cans

Ratio of Vegetables cans

Peas : Beans : Corn = 3 : 4 : 5

Sum of ratios = 3 + 4 + 5 = 12

$$\text{Order of Peas} = \frac{3}{12} \times 720 = 180 \text{ cans}$$

$$\text{Order of Beans} = \frac{4}{12} \times 720 = 240 \text{ cans}$$

$$\text{Order of Corn} = \frac{5}{12} \times 720 = 300 \text{ cans}$$

-:1.9:-

A farmer has 840 acres of land for planting rice, wheat, cotton and fodder in the ratio of 5 : 4 : 3 : 2 respectively. What are acres used for each crop.

SOLUTION

Total Land = 840 acres

Ratio of Rice, Wheat, Cotton and Fodder is

Rice : Wheat : Cotton : Fodder

5 : 4 : 3 : 2

Sum of ratios = 5 + 4 + 3 + 2 = 14

$$\text{Land used for Rice} = \frac{5}{14} \times 840 = 300 \text{ acres}$$

$$\text{Land used for Wheat} = \frac{4}{14} \times 840 = 240 \text{ acres}$$

$$\text{Land used for Cotton} = \frac{3}{14} \times 840 = 180 \text{ acres}$$

$$\text{Land used for Fodder} = \frac{2}{14} \times 840 = 120 \text{ acres}$$

-:1.10:-

A milk man mixes milk with water in the ratio 7 : 2 respectively. He has 81 litre of mixed milk. What is the quantity of pure milk?

SOLUTION

Total mixed Milk = 81 litre

Ratio of Milk to Water is

Milk : Water = 7 : 2

Sum of ratios = 7 + 2 = 9

$$\text{Amount of Pure Milk} = \frac{7}{9} \times 81 = 63 \text{ litre}$$

-:1.11:-

The property of a person is valued Rs. 330000. He has two wives, one son and 4 daughters. The share of wife is 1/8 each. The share of a son is double than share of each daughter. Distribute the property.

SOLUTION

Total value of property = Rs. 3,30,000

He has 2 Wives, 1 son and 4 daughter

$$\text{Share of each Wife} = \frac{1}{8} \times 330000 = \text{Rs. } 41250$$

Share of both Wives = Rs. 41250 + Rs. 41250 = Rs. 82500

Balance = Total – Wives' share

= Rs. 330000 – Rs. 82500 = Rs. 247500

Shares of Son and Daughters

2 : 1 : 1 : 1 : 1

Sum of Ratios = 2 + 1 + 1 + 1 +1 = 6

$$\text{Share of Son} = \frac{2}{6} \times 247500 = \text{Rs. } 82500$$

$$\text{Share of each Daughter} = \frac{1}{6} \times 247500 = \text{Rs. } 41250$$

-:1.12:-

The estate of a person consists of 400 cows and 1200 goats. He had a widow, 3 sons and 4 daughters. The claim of widow is 1/8. The share of a son is double than a daughter. Distribute the cows and goats among them.

SOLUTION

Total Number of Cows = 400

Total Number of Goats = 1200

$$\text{Cow's Share of Widow} = \frac{1}{8} \times 400 = 50 \text{ cows}$$

$$\text{Goats Share of Widow} = \frac{1}{8} \times 1200 = 150 \text{ goats}$$

Remaining Cows = 350 & Remaining Goats = 1050

He has 3 Sons and 4 Daughters. Ratio is

$$2 : 2 : 2 : 1 : 1 : 1 : 1$$

Sum of Ratios = 2 + 2 + 2 + 1 + 1 + 1 + 1 = 10

$$\text{Cow's Share of each Son} = \frac{2}{10} \times 350 = 70 \text{ cows}$$

$$\text{Cow's Share of each Daughter} = \frac{1}{10} \times 350 = 35 \text{ cows}$$

$$\text{Goat's Share of each Son} = \frac{2}{10} \times 1050 = 210 \text{ goats}$$

$$\text{Goat's Share of each Daughter} = \frac{1}{10} \times 1050 = 105 \text{ goats}$$

-:1.13:-

The tool expenses of a factory are Rs. 2552. The machine hours of two departments A and B are 1800 and 1500 respectively. Distribute the tool expenses on basis of machine hours.

SOLUTION

Total Expenses = Rs. 2550

Ratios of Machine hours of A and B Departments

A : B = 1800 : 1500

18 : 15

6 : 5

Sum of Ratios = 6 + 5 = 11

$$\text{Expenses of A Department} = \frac{6}{11} \times 2552 = \text{Rs. } 1392$$

$$\text{Expenses of B Department} = \frac{5}{11} \times 2552 = \text{Rs. } 1160$$

-:1.14:-

Javaid is half as old as Rashid and Rashid is half as old as Naveed. The sum of their ages is 105 years. Calculate the ages of Javaid, Rashid and Naveed.

SOLUTION

Ratios of ages are as

Javaid is half as old as Rashid i.e. Rashid is double as old as Javaid

So the ratio is 1 : 2

Similarly Rashid is half as old as Naveed. that is Naveed is double as old as Rashid

So, ratio is 1 : 2

Hence

Javaid : Rashid : Naveed

1 : 2

1 : 2

1 : 2 : 4

Sum of Ratios = 1 + 2 + 4 = 7

$$\text{Javaid's Age} = \frac{1}{7} \times 105 = 15 \text{ years}$$

$$\text{Rashid's Age} = \frac{2}{7} \times 105 = 30 \text{ years}$$

$$\text{Naveed's Age} = \frac{4}{7} \times 105 = 60 \text{ years}$$

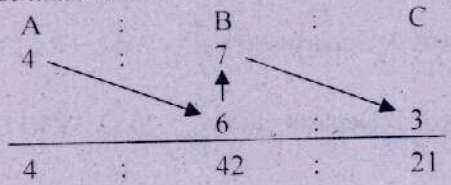
-:1.15:-

A purchase manager paid carriage of rupees for A, B and C materials. The weight ratio is A : B = 4 : 7 and B : C = 6 : 3. What is carriage for each material.

SOLUTION

Total Carriage Bill = Rs. 11725

Ratio of materials is



Sum of Ratios = 4 + 42 + 21 = 67

$$\text{Carriage Share of Material A} = \frac{4}{67} \times 11725 = \text{Rs. } 700$$

$$\text{Carriage Share of Material B} = \frac{42}{67} \times 11725 = \text{Rs. } 7350$$

$$\text{Carriage Share of Material C} = \frac{21}{67} \times 11725 = \text{Rs. } 3675$$

-:1.16:-

The cost of 20 lbs of tea is Rs. 1700. What should be the cost of 33 lbs of tea?

SOLUTION

Tea (in lbs)	Cost (in Rs.)
20	1700
33	x

20 : 33 :: 1700 : x (Direct proportion)

Applying the fundamental principal of proportion

$$20 \times x = 1700 \times 33$$

$$x = \frac{1700 \times 33}{20} = \text{Rs. } 2805$$

-:1.17:-

18 men complete the job in 30 days. How long it will take to complete the job by 12 workers?

SOLUTION

Workers	Days
18	30
12	x

12 : 18 :: 30 : x (Inverse proportion)

Applying the fundamental principal of proportion

$$12 \times x = 30 \times 18$$

$$x = \frac{30 \times 18}{12} = 45 \text{ days}$$

-:1.18:-

The cost of 5 kilograms of mutton is Rs. 1250. Calculate the cost of 43 kilograms of mutton when rate remains the same.

SOLUTION

Let x be the cost of 43 kgs of mutton.

In this problem estimated value (cost) will be greater, so we form proportion with first ratio as smaller.

No of Kg	Cost (in Rs.)
5	1250
43	x

$$\frac{5}{43} = \frac{1250}{x}$$

5 : 43 :: 1250 : x (Direct proportion)

Applying the fundamental principal of proportion

$$5 \times x = 1250 \times 43$$

$$x = \frac{1250 \times 43}{5} = \text{Rs. } 10750$$

-:1.19:-

The cost of 7 litres of cooking oil is Rs. 525. What is the cost of 25 litres of such oil if the rate is the same.

SOLUTION

Let x be the cost of 25 litres of oil.

In this problem estimated value (cost) will be greater, so we form proportion with first ratio as smaller.

No of Litres	Cost (in Rs.)
7	525
25	x

$$\frac{7}{25} = \frac{525}{x}$$

7 : 25 :: 525 : x (Direct proportion)

Applying the fundamental principal of proportion

$$7 \times x = 525 \times 25$$

$$x = \frac{525 \times 25}{7} = \text{Rs.}1875$$

-:1.20:-

Numan earns Rs. 700 by investing Rs. 20,000. How much Aslam will earn on investment of Rs. 55000 under the same scheme of investment.

SOLUTION

Let x be the earning on investment = Rs. 55000

Earning (Rs.)	Investment (Rs.)
700	20000
x	55000

$$\frac{700}{x} = \frac{20000}{55000}$$

700 : x :: 20000 : 55000 (Direct proportion)

Applying the fundamental principal of proportion

$$700 \times 55000 = 20000 \times x$$

$$20000x = 700 \times 55000$$

$$x = \frac{700 \times 55000}{20000} = \text{Rs.}1925$$

-:1.21:-

A factory manager plan to produce 200 units with the help of 50 workers who work 8 hours a day. How many units can be made by 80 workers if they work 6 hours per day.

SOLUTION

Let x be the units produced working 6 hours by 80 workers.

Ratio of workers = 50 : 80 (Direct proportion)

Ratio of hours = 8 : 6 (Direct proportion)

Ratio of units = 200 : x

In proportion

$$50 : 80 :: 200 : x$$
$$8 : 6$$

Applying the fundamental principle of proportion

$$x \times 8 \times 50 = 200 \times 80 \times 6$$

$$x = \frac{200 \times 80 \times 6}{8 \times 50} = 240 \text{ units}$$

-:1.22:-

A carton factory makes 160 boxes in 16 days with the help of 48 workers. How many days are needed to make 200 boxes with the help of 40 workers.

SOLUTION

Let x be the number of days required.

Days	Workers	Boxes
16	48	160
x	40	200

Ratio of workers = 40 : 48 (Inverse)

Ratio of boxes = 160 : 200 (Direct)

Ratio of days = 16 : x

Proportion is

$$40 : 48 :: 16 : x$$
$$160 : 200$$

Applying the fundamental principle of proportion

$$x \times 160 \times 40 = 16 \times 48 \times 200$$

$$x = \frac{16 \times 48 \times 200}{160 \times 40} = 24 \text{ days}$$

-:1.23:-

A labour force of 15 workers complete the job in 15 days for 8 hours a day. How many days are needed to complete it if 25 workers work for 6 hours a day.

SOLUTION

Let x be the required number of days.

Days	Workers	Hours
15	15	8
x	25	6

Ratio of workers = 25 : 15 (Inverse)
Ratio of hours = 6 : 8 (Inverse)
Ratio of days = 15 : x
Proportion is

$$25 : 15 \;::\; 15 : x$$
$$6 : 8$$

Applying the fundamental principle of proportion

$$x \times 6 \times 25 = 15 \times 15 \times 8$$

$$x = \frac{15 \times 15 \times 8}{6 \times 25} = 12 \text{ days}$$