RATIO AND PROPORTION



Ratio

Often we find the need to compare different quantities in our work. Sometimes, this comparison requires us to take ratio of the quantities. For example, suppose we want to compare three Kabbaddi teams A, B and C in any given year. How do we do it? We have been told that team A has played 5 matches and won 3. Team B has played 12 matches and won 5 and team C has played 18 matches and won 13.

To find out which team is best performing, we should write the ratio of matches won to total matches played for each team.

Performance of teamA(in ratio)	=3:5
	$=\frac{3}{5}$
Performance of team B (in ratio)	=5:12
	$=\frac{5}{12}$
Performance of team C (in ratio)	=13:18
	$=\frac{13}{18}$

But we can't say which team is best on the basis of these ratios because the number of matches won and the number of matches played is different for each team and therefore the denominators are different. We should make the denominator common in all ratios. On doing this:

Performance of team A =
$$\frac{3 \times 36}{5 \times 36} = \frac{108}{180}$$

Performance of team B = $\frac{5 \times 15}{12 \times 15} = \frac{75}{180}$

Performance of team C = $\frac{13 \times 10}{18 \times 10} = \frac{130}{180}$

By looking at these figures we can say that team C was the best performing team.

Try these



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- The area of which of the following smaller plots is biggest as compared to the main plot -
 - (a) 5 cm square from 5 meter square
 - (b) 3 cm square from 30 meter square
 - (c) 9 cm square from 10 meter square

Practical uses of ratios

Getting information from given statements

Often, we draw conclusions from given facts. For example, we know that the total surface area of earth is 510 million square kilometers, of which almost 360 million square kilometers is water and 150 million square kilometers is land. On the basis of these figures we can find out the ratio of water to land on the surface of the earth and also the percentage of surface of earth covered by water and the percentage which is land.

Given facts and figures

- (i) The total surface area of earth is 510 million square kilometers
- (ii) Area covered by water is 360 million square kilometers
- (iii) Area covered by land is 150 million square kilometers
- (A) Ratio of water to land on the surface of earth = 360: 150

$$=\frac{360}{150}$$

 $=\frac{12}{5}$ or 12:5

The ratio of water to land on the surface of earth is 12:5.

(B) Ratio of area covered by water to total surface area = 360:510

 $= \frac{360}{510} = \frac{12}{17} = 12:17$ In percentage $= \frac{360}{510} \times 100\%$ = 70.58%

Similarly, we can find out the percentage of earth's surface which is land.

In the example taken above, we compared the performance of three teams. We can also look at the performance of the same team in different years. Let us understand through an example-**Example-1:** The performance of the State Hockey team of Chhattisgarh in national level matches is shown below:

- 1. Played 12 matches in 2016 and won 10.
- 2. Played 10 matches in 2015 and won 7.
- 3. Played 11 matches in 2014 and won 8.

From the given data for three years, tell in which year did the team play best? Explain giving reasons.

Solution: To conclude from the performance data given, we need to first convert into ratios and then percentages.

1.	Performance in year 2016 (in ratio)	=10:12
	Inpercentage	$=\frac{10}{12}\times100\%$
		= 83.34%
2.	Performance in 2015 (in ratio)	=7:10
	Inpercentage	$=\frac{7}{10}\times 100\%$
		= 70%
3.	Performance in 2014 (in ratio)	=8:11
	Inpercentage	$=\frac{8}{11}\times 100\%$
		= 72.73%

The performance of the team in the years 2016, 2015 and 2014 was 83.34%, 70% and 72.73% respectively. Therefore, we can conclude that the team performed better in 2016 as compared to the previous two years.

Example-2. The water-level in the river Mahanadi increased 5 inches per hour on an average in the month of August whereas it increased 3 feet per day on an average in the month of September. Find out the month in which the increase in water level was more.

Solution: Rate of increase in water level in the month of August = 5 inches per hour Rate of increase in water level in the month of September = 3 feet per day

= 36 inches per 24 hours

= 1.5 inches per hour

$$=\frac{36 \text{ inch}}{24 \text{ hour}}$$

_	1.5 inch
_	1 hour
=	1.5 inch per hour

Rate of increase in water level in the month of September is 1.5 inches per hour which is less than the rate of increase in water level in the month of August, 5 inches per hour. **Example-3.** Two groups complete a given task in 14 and 21 days respectively. How long would they take to complete the task if they work together?

Soultion: Let the work done by group one in 14 days = 1

Therefore, the work done by group one in 1 day = $\frac{1}{14}$

Similarly, the work done by group two in 21 days = 1

Therefore, the work done by group two in 1 day = $\frac{1}{21}$

Total work done by the two groups in one day $=\frac{1}{14} + \frac{1}{21} = \frac{5}{42}$

That is, the two groups together complete $\frac{5}{42}$ work in 1 day.

Thus, the two groups together complete the task in $\frac{5}{42}$ days = $8\frac{2}{5}$

Exercises -1



- In a cricket match, batsman Dheerendra scores 19 runs in 25 balls and gets out, Mahendra scores 14 runs in 19 balls and is sent back to the pavilion and Ravindra scores 9 runs in 16 balls. Who scored fastest and who was the slowest?
- 2. In a 100 m race, Ram runs at a speed of 12 km per hour leaving Shyam 5 meters behind. What was Shyam's speed?
- 3. The volume of salt water on earth is 38214 million cubic kilometers and that of fresh water is 1386 million cubic kilometers. Tell the ratio of fresh water to salt water on earth? What is the percentage of fresh water on earth? And the percentage of salt water?
- 4. Mahesh cuts the paddy crop in a field in 12 days. Gayatri cuts the same crop in 9 days. How many days would be needed to cut the crop if they both work together?
- 5. Arun and Ashwini complete a task by themselves in 20 and 25 days respectively. Can you tell the percentage by which Arun works more efficiently than Ashwini?
- 6. Sanjay and Shiva together complete a task in 16 days. Sanjay takes 24 days to complete the task when he works alone. How many days will Shiva take to complete the task when he works alone?

Dividing into two or more parts

Often we need to divide a quantity into two or more parts. In dividing into more than two parts we come across three situations. First, we may have to divide into three equal parts. We can easily find out how much each person will get. Second, we may to divide in such a manner that the first person gets more than the second who gets more than the third. And in third situation we may have to divide the quantity in a certain ratio, for example, dividing some money between three persons in the ratio a:b:c.

An example of dividing in a fixed ratio

Three friends Lata, Sonu and Purendra started a business worth Rs.15 lacs by contributing Rs.3 lacs, Rs.5 lacs and Rs.7 lacs respectively. At the end of the year, they earned a profit of Rs.2,25,000. What would be each person's share in the profit? Will each person get the same share of profit? If not, then how the profit should be divided? Let us see. Since, each person contributed different amounts to the business therefore the profit should be divided accordingly. The initial contribution by the three was in the ratio 3:5:7. Therefore, they should respectively get 3k, 5k and 7k parts of the profit..

That is, 3k + 5k + 7k = 22500015k = 225000 $k = \frac{225000}{15}$ k = 15000

Thus, Lata will get 3k parts that is Rs.45000, of the profit. Sonu will get 5k parts that is Rs.75000, of the profit. And, Purendra will get 7k parts that is Rs.105000, of the profit.

Think and Discuss

What w	vill be the distribution process in the following three situations?	1 mon
(i)	Each person gets the same amount?	(P
(ii)	One person gets 10 more than the other?	CMED
(iii)	When one gets in a fixed ratio?	

Example:-4. If a 75cm long line segment is divided into three parts in the ratio 3:5:7 then what will be the length of each part?

Solution: On dividing a 75cm long line segment into three parts in the ratio 3:5:7 the length of each part would be 3k, 5k and 7k respectively.

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Therefore,
$$3k + 5k + 7k = 75$$

 $15k = 75$
 $k = \frac{75}{15}$
 $k = 5$

Therefore, the length of one part will be 3k or 15 cm. The length of second part will be 5k or 25 cm. The length of third part will be 7k or 35 cm.

Try these

1.



- Divide Rs.651 between Amit, Anil and Ankita in such a way that for every one rupee that Amit gets, Anil gets Rs.5 and Ankita gets Rs.25.
- Richa opened her piggybank and got Rs.10, Rs.5, Rs.2 and Rs.1 coins in the ratio 2:3:5:7. She told her mother that she now had Rs.520. Can you find out the number of each of the coins?

Example-5. Some money was distributed in the ratio 11:13:17 between three students A, B and C. If A got Rs.451 then find the amounts received by student B and student C. Also, find out the total money which was distributed.

Solution: Suppose A, B and C got Rs.11k, 13k and 17k respectively. If student A received Rs.451 then,

Sum received by student A, 11k = 451 that is $k = \frac{451}{11} = 41$

We now know that the value of k is 41. Therefore, we can easily find out the share received by students B and C.

Student B's share = $13k = 13 \times 41 = Rs.533$

Student C's share = $17k = 17 \times 41 = Rs. 697$.

Total money distributed between students A, B and C = 451 + 533 + 697

= 1681.

Can Rs. 63 thousand be distributed in the ratio 5:7:9 between students A, B Example-6. and C so that they only receive Rs.500 notes? If yes, then find the amount received by each student.

Solution: When Rs. 63 thousand is distributed between students A, B and C, they will get 5k, 7k and 9k respectively.

That is, 5k + 7k + 5k = 63 thousand

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21k = 63 thousand or $k = \frac{63}{21}$ thousand = 3 thousand Thus, Student A gets = $5k = 5 \times 3 = 15$ thousand Student B gets = $7k = 7 \times 3 = 21$ thousand Student C gets = $9k = 9 \times 3 = 27$ thousand

These amounts can be distributed solely in Rs.500 notes

Example-7. In a business partnership, contributing share of businessmen A and B is in the ratio 3:2 and that of A and C is in the ratio 2:1. A, B and C earn a profit of Rs.178,100 in their business. How much will each of them get individually?

Solution: Since contributing share of businessmen A and B is in the ratio 3:2 and that of A and C is in the ratio 2:1 therefore to get the mutual ratio we will have to get equivalent ratios with A. To do this, we will look at the ratio between businessmen B and A. The ratio is 2:3 or 4:6. Contributing ratio between businessmen A and C is 2:1 or 6:3. Thus, contributing ratios of businessmen B, A and C are 4:6:3.

Profit will be distributed in the ratio 4:6:3 of their contributing shares. Therefore, they will get 4k, 6k and 3k of the profit respectively.

So,
$$4k + 6k + 3k = 178100$$

 $13k = 178100$

$$k = \frac{178100}{13}$$

k = 13700

Thus, Profit received by A is 6k that is, Rs.82200. Profit received by B is 4k that is, Rs.54800. Profit received by C is 3k that is, Rs.41100.

Try this

 Sita has Rs.8200 where the number of Rs.500 notes is twice that of Rs.100 and the number of Rs.1000 notes is three times that of Rs.100. Find the number of Rs.1000 notes with Sita.



2. Divide Rs. 2890 between A, B and C such that A:B = 1:2 and B:C = 3:4.

Dividing a quantity in any ratio

Divide a quantity x into three parts such that the ratio between the parts is a:b:c. Here, x can be of any value and type and a, b, c can be any natural numbers.

We have to divide the quantity x in the ratio a:b:c. We can write this as follows:

$$ak + bk + ck = x$$

 $(a + b + c)k = x$
 $k = \frac{x}{(a+b+c)}$

Therefore, the first part of x is ak that is $\frac{ax}{(a+b+c)}$

the second part of x is bk that is

 $\frac{bx}{(a+b+c)}$ $\frac{cx}{(a+b+c)}$

the third part of x is ck that is

We found that the three quantitates obtained after distribution are respectively

$$\frac{ax}{(a+b+c)}, \frac{bx}{(a+b+c)}$$
 and $\frac{cx}{(a+b+c)}$

Example-8. Suppose we have 40 liters of a mixture of milk and water which is 10% water. The milk seller added some more water to this mixture. The new mixture has 20% water. How much more water was added?

Solution: Water in original mixture = 10% of 40 liters = 4 liters And milk = 40 - 4 = 36 liters. Suppose x liters of water is added to this mixture. Then water in the new mixture = (4+x) liters And milk = 36 liters. Given that ratio of water to milk in the new mixture is 20% and 80% Ratio of water to milk = 20:80 = 1:4

Thus,
$$\frac{4+x}{36} = \frac{1}{4}$$

16 + 4x = 36
x = 5

So 5 liters of water were added to the original mixture.

Exercises-2

- 1. The runs scored by three batsmen A, B and C in a cricket match are in the ratio A:B =B:C=1:2. If the total of their runs is 364 then find the runs scored individually be each batsman.
- 2. The salaries of three workers A, B and C are in the ratio 2:3:5. If their salaries are respectively increased by 15%, 10% and 20% then what will be the ratio of their new salaries?
- 3. Three persons earn a profit of Rs.70,000 in a business which they to divide in the ratio A:B = 4:2 and B:C = 10:5. How much money will each person get? The money received by A would be how many times the money received by C?
- 4. A bag Rs.1, Rs.2 and Rs.5 coins. If the coins are in the ratio 1:2:5 and the total money in the bag is Rs.1590 then find the number of each type of coin.
- 5. We have 100 liters of a mixture of milk and water which is 10% water. How much more pure milk should be added so that the new mixture has only 5% water?

Proportion

In class 9th exam, the marks scored by Maria in different subjects are as follows: $\frac{78}{100}$ in Hindi, $\frac{35}{50}$ in English, $\frac{30}{50}$ in Sanskrit, $\frac{70}{100}$ in maths, $\frac{90}{100}$ in science and $\frac{72}{100}$ in social science. What can you say about Maria's performance in the different subjects?

To compare the different marks first the basic marks should be same in all subjects. That is if in English the marks are 35 out of 50 then they will be 70 out of 100 or we can write $\frac{70}{100}$ as well.

Similarly, we can write the marks in Sanskrit as $\frac{30}{50} = \frac{2 \times 30}{2 \times 50} = \frac{60}{100}$

Now we can draw some conclusions.

Actually, $\frac{35}{50}$ and $\frac{70}{100}$ or $\frac{30}{50}$ and $\frac{60}{100}$ are equivalent ratios which means that the values of these ratios are same.

That is
$$\frac{35}{50} = \frac{70}{100}$$
 or $\frac{30}{50} = \frac{60}{100}$



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The relation between two equivalent ratios is known as proportion.

If a:b and c:d are equal then we can write them as a:b = c:d or we can also show them as a:b::c:d.

Here, '::' is the symbol for proportion. And a,b,c and d are terms of the proportion. The first term is a and the fourth term is d and they are called the extreme terms. Similarly, c and b are known as the middle terms.

Therefore, if a,b,c and d are proportional then

$$\therefore \qquad \qquad \frac{a}{b} = \frac{c}{d}$$
Or $ad = bc$

This means that the product of the middle terms of a proportion is equal to the product of the extreme terms.

If we know any three of the four terms then we can find the value of the fourth term using the relation given above. Let us see a few examples-

Example-9. Find the fourth term of 7, 3, 21.

Solution: We have been given the first three terms and let the fourth term be x.

7:3::21:*x*

\Rightarrow	$\frac{7}{3} = \frac{21}{x}$
\Rightarrow	$7 \times x = 3 \times 21$
\Rightarrow	$\mathbf{x} = \frac{3 \times 21}{7}$
· .	<i>x</i> = 9

Therefore, the fourth term is 9.

Example-10. What should be subtracted from each of 54,71,75 and 99 so that the remaining terms are proportional.

Solution: Suppose we subtract y from each term.

Then,

$$(54 - y) : (71 - y) :: (75 - y) (99 - y)$$

$$\Rightarrow \qquad \frac{(54 - y)}{(71 - y)} = \frac{(75 - y)}{(99 - y)}$$

$$\Rightarrow \qquad (54 - y) (99 - y) = (75 - y) (71 - y)$$

$$\Rightarrow 5346 - 153x + y^2 = 5325 - 146x + y^2$$
$$\Rightarrow 153x - 146x = 5346 - 5325$$
$$\Rightarrow 7x = 21$$
$$\Rightarrow x = \frac{21}{7}$$
$$\Rightarrow x = 3$$

That is, if we subtract 3 from each term then the resulting terms will be proportional. Check for yourself.

Continued proportion

Quantities where the ratio between the first and second term is the same as the ratio between the second and third term which is the same as the ratio between the third and fourth term and so on.

That is, is a,b,c,d... are the quantities then and $\frac{a}{b} = \frac{b}{c} = \frac{c}{d} = \frac{d}{e}$ then they

are in continued proportion.

Since a:b:c then b is the mean proportional of a and c, that is, a:b::b:c

Or
$$\frac{a}{b} = \frac{b}{c}$$

 $\Rightarrow \qquad b^2 = ac$
 $\Rightarrow \qquad b = \pm \sqrt{ac}$

Thus, we can find the value of the middle term.

Example-11. Find the mean proportional of 6 and 54.

Solution: Suppose x is the mean proportional of 6 and 54.

Then

$$6:x::x:54$$

$$\Rightarrow x \times x = 6 \times 54$$

$$\Rightarrow x^{2} = 6 \times 6 \times 3 \times 3$$

$$\Rightarrow x = \sqrt{6 \times 6 \times 3 \times 3}$$

$$\Rightarrow x = 6 \times 3 = 18$$
Thus, 18 is the mean proportional of 6 and 54.

Example-12. Find the third proportional of 8xy and $4x^2y$.

Solution: Suppose m is the third proportional of 8xy and $4x^2y$, then

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$$8xy: 4x^2y: m \implies 8xy: 4x^2y: : 4x^2y: m$$
$$\frac{8xy}{4x^2y} = \frac{4x^2y}{m} \implies 8xy \times m = 4x^2y \times 4x^2y$$

 \Rightarrow

 \Rightarrow

$$m = \frac{4x^2y \times 4x^2y}{8xy} \implies m = 2x^3y$$

Thus, the third proportional is $2x^3y$.

Example-13. If a:b::c:d then prove that

$$\frac{d^2-c^2}{b^2-d^2} = \frac{ac}{bd}$$

a = bk, c = dk

Solution:

Let $\frac{a}{b} = \frac{c}{d} = k$

So,

From (1) and (2), we can say that

Think and Discuss

$$\frac{a^2 - c^2}{b^2 - d^2} = \frac{ac}{bd}$$

L.H.S. = R.H.S.

Inverse Proportion

We know that the quantity of goods purchased using a fixed amount of money decreases as the cost increases. On the other hand, the quantity increases if rates are slashed. If we increase (or decrease) the speed of a cycle or a bus or a car then the time taken to cover the same distance decreases (or increases). Similarly, the time taken to carry out some work increases or decreases depending on whether we decrease or increase the number of workers. All these are inverse proportions or relations.



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Think of some more examples of inverse proportions or inverse relations.

Inverse proportions have several applications. Let us see some examples.

Example-14. 12 labourers working 8 hours a day can finish a piece of wall in 9 days. If 24 labourers work 6 hours a day, then the days required to finish the same piece of wall will be how many?

Solution: The number of labourers and the time taken to complete the wall are inversely related to each other. 12 labourers take $8 \times 9 = 72$ hours to complete the task.

If the number of labourers is increased to 24 and the number of work hours is decreased to 6 and supposing that the days taken to complete the wall are x then time taken = 6 hours \times x = 6x hours.

Since, work was completed under both conditions therefore there is an inverse relation between the number of labourers and the time taken which we can write as follows: number of labourers number of labourers :: time taken (in hrs) time taken (in hrs)

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:

$$12 : 24 :: 6x$$

$$\Rightarrow \frac{12}{24} = \frac{6x}{72}$$

$$\Rightarrow 72 \times 12 = 6x \times 24$$

$$\Rightarrow x = \frac{72 \times 12}{24 \times 6}$$

$$x = 6$$

Therefore, if the number of hours of work per day is reduced to 6 from 8 and the number of workers is increased to 24 from 12 then the time taken to complete the wall will be 6 days. **Example-15.** The electricity bill is Rs.40 if 200 CFL bulbs are lighted for 6 days for four

hours each day. How many CFL bulbs can be lighted for three hours every day for 15 days so that the electricity bill is Rs.48?

Solution: Suppose x bulbs can be lighted for three hours every day for 15 days so that the electricity bill is Rs.48.

In the first case,

We are given that one bulb is lighted for four hours every day for six days

Total time that one bulb is on $= 6 \times 4 = 24$ hours.

Then, total time that 200 bulbs are on = 24×200 hours.

Similarly, in the second case,

We are given that x bulbs are lighted for three hours every day for 15 days

$$x \times 15 \times 3 = 45x$$

Here as the time increases the electricity bill will also increase or we have a direct relation (proportion).

Total Time 200 bulbs : Electricity bill :: Total Time x bulbs : Electricity bill are lighted are lighted

 200×24 : 40 :: 45x : 48

$$\frac{200 \times 24}{40} = \frac{45x}{48}$$
$$x = \frac{200 \times 24 \times 48}{45 \times 40} = 128$$

Thus x = 128 CFL bulbs can be lighted for three hours every day for 15 days so that the electricity bill is Rs.48.

Example-16. 15 persons do a certain piece of work in 40 days. How many persons will be needed to complete one-fourth of the work in 15 days?

Solution: 15 persons complete 1 work in 40 days.

So, time taken by 15 persons to do $\frac{1}{4}$ work = $40 \times \frac{1}{4} = 10$ days.

Suppose, x persons do $\frac{1}{4}$ work in 15 days.

We know that number of persons and number of days are inversely proportional.

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Number of personsnumber of days15 persons : x persons:: 15 days : 10 days

$$\frac{15}{x} = \frac{15}{10}$$
$$x = 10$$

Thus, 10 persons will complete ¹/₄ work in 15 days.

Example-17. Two taps A and B can fill a tank in 30 minutes and 40 minutes respectively. A third tap C can empty the tank in 60 minutes. If all three taps are opened together, how long will it take the tank to fill up?

Solution: Since part filled by tap A in 30 minutes = 1

Therefore, part filled in 1 minute by tap A = $\frac{1}{30}$

Since part filled by tap B in 40 minutes = 1

Therefore, part filled in 1 minute by tap B = $\frac{1}{40}$

Since part emptied by tap C in 60 minutes = 1

Therefore, part emptied in 1 minute by tap C = $\frac{1}{60}$

If all three taps are opened together, then two will fill and one will empty the tank.

Thus, part filled in 1 minute =
$$\frac{1}{30} + \frac{1}{40} - \frac{1}{60}$$

= $\frac{4+3-2}{120}$
= $\frac{5}{120}$

Since, time taken to fill 5/120 parts is 1 minute

Therefore, time taken to fill the entire tank = $=\frac{1}{\frac{5}{120}}$

$$=\frac{120}{5}$$

24 minutes

Example-18. Apump fills a tank in 2 hours but due to a leak it takes 3 hours to fill it. If the tank is full how long will it take to empty due to the leak?

Solution: Part of tank filled by the pump in 2 hours = 1

Therefore, part of tank filled by the pump in 1 hour = $\frac{1}{2}$

Suppose part of tank emptied by the leak in x hours = 1

Then part of tank emptied by the leak in 1 hour = $\frac{1}{r}$

Since, even with the leak the tank gets full in 3 hours,

Therefore, part of tank filled by the pump in spite of the leak in 3 hours = 1

and, part of tank filled by the pump in spite of the leak in 1 hour = $\frac{1}{3}$

Part of tank filled by the pump in spite of the leak in 1 hour = [part of tank filled by the pump in 1 hour - part of tank emptied by the leak in 1 hour]

$$\frac{1}{3} = \frac{1}{2} - \frac{1}{x}$$
$$\frac{1}{3} = \frac{x - 2}{2x}$$
$$2x = 3x - 6$$
$$x = 6$$

Therefore, in 6 hours the leak will cause the tank to become empty.

Try this



Three persons A,B and C can complete a task in 12, 15 and 10 days respectively. If they all work together, how long will they take to complete the task.

Exercise-3



— If the cost of 29 books is Rs.783 then how many books can be purchased in Rs.2214?

- If 14:35::16:x then find the value of x?
- 3. Find the fourth proportion in 2xy, x^2 , y^2
- 4. What should be added to 10, 18, 22, 38 so that they become proportional?
- 5. If b is the mean proportional of a and c then prove that

$$\frac{a^2+b^2}{ab}=\frac{a+c}{b}.$$

- 6. Find the numbers whose mean proportional is 24 and third proportional is 192.
- 7. Find x if (1 + x) : (3 + x) : (6 + x)
- 8. Two numbers are in the ratio 3:5. If 9 is subtracted from both the new ratio is 12:23. Find the first number.
- 9. A task is completed by 45 labourers in 24 days if they work 6 hours per day. How many labourers will be needed to complete the task in 15 days if they work for 8 hours every day?
- 10. A task is completed by 25 persons in 9 days if they work 6 hours per day. How many days will be needed to complete the task if 15 persons work for 9 hours every day?
- 11. A task is completed by 30 persons in 15 days if they work 6 hours per day. How many hours of work will be needed every day if 20 persons have to complete it in 15 days?
- 12. A car leaves Saraipalli, travels at 75 km per hour and reaches Raipur in 4 hours. The next time there was traffic and construction work on the road due to which the speed is decreased by 15 km per hour. How long will the car take to reach Raipur?
- 13. If 10 bulbs are lighted 4 hours every day for 60 days then the electricity bill is Rs. 80. How many bulbs can be lighted for 3 hours every day for 16 days so that the electricity bill is Rs. 40?
- 14. A task is completed by 48 persons in 25 days if they work 8 hours per day. How many days will be needed to complete double the task if 30 persons work for 10 hours every day?
- 15. A and B together complete a task in 24 days, C and B together complete the same task in 18 days, and A and C together complete the task in 12 days. How many days will A take to complete the task if he works alone?
- 16. A task is completed by 15 men in 16 days. How many men will be needed to complete 1/4th of the task in 15 days?
- 17. A camp has sufficient provisions for 120 soldiers. If after 40 days, 40 soldiers were deputed elsewhere, how long will the remaining provisions last for the remaining soldiers?
- 18. If 11 spiders spin 11 webs in 11 days then how many webs will one spider spin in one day?
- 19. To taps together fill a tank in 6 hours. One of the taps alone fills it in 10 hours. How long will it take to fill the tank if only the second tap is open?

2.

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What we have learnt

- 1. In our day to day lives we often have to compare quantities. Some sometimes the comparison is clearer if we take ratios. Therefore, we can better compare quantities by taking their ratios.
 - Whether we want to compare two players or want to buy something from the market, we can decide what is best only by comparing.
- 3. We can only compare two similar quantities that is, comparison is always between two quantities from the same category.
- 4. Sometimes we have to compare two ratios. Comparison of two ratios is called proportion.
- 5. Proportion helps us in dividing a quantity into two or more than two parts.
- 6. Often we see examples in our daily life when increasing or decreasing a quantity leads to decrease or increase of another quantity. These quantities are said to be in inverse proportion.

ANSWER KEY

Exe	rcise	-1					
	1.	Dheerendra	2.	11.4 km/hour	3.	7:193, 3.	5%,96.5%
	4.	$5\frac{1}{7}$ days	5.	One more	6.	48 days	8
Exe	rcise	-2					
	 52,1 ₹40, 4 lite 	04,208 000,₹ 20,000,₹ er	10,000,	four times		2. 23:33 4. 53,19	3:60 06,265
Exe	rcise	-3					
	1.82	2.40		3. $\frac{xy}{2}$	4.2		6. 12 & 48
	7.3	8.27		9.54 workers	10.10	days	11.9 hours/day
	12. 5 h	ours 13.25 b	ulbs	14. 64 days	15. 28	$\frac{4}{5}$ days	16.4 persons
	17.30	days 18.11	days	19. 15 hours			

