# 8 Unitary Method and Time and Work

## Unitary Method.

The method in which the value of a unit quantity is first calculated to get the value of the any quantity is called unitary method.

There are two types of variation.

1) Direct Variation.

Increase in one quantity causes increase in the other. and decrease in one quantity causes decreases in the other.

eg: The cost of articles varies directly as the number of articles.

2) Inverse Variation.

Increase in one quantity causes decrease in the other and decrease in one quantity causes increase in the other.

eg: Speed varies inversely as time.

## Exercise 8(A)

1. At a party 8 packets of chips are served for every batch of 5 students. How many packets would be served if 40 students were present in the party?

Using direct variation.

Ratio of packets = Ratio of students.

Let $x$ be the no: of packets required for 40 students

$$8 : x = 5 : 40$$

$$\frac{8}{x} = \frac{5}{40}$$

$$5x = 8 \times 40$$

$$x = \frac{8 \times 40^{8}}{5}$$

$$= \underline{64 \text{ packets}}$$

2. A person at a speed of 72 km/h travels by car from Delhi to Chandigarh in 10 hours. What should be the average speed of the car so that the person can complete the journey in 8 hours?

Using inverse variation

Ratio of speed = Inverse ratio of time

Let $x$ be the speed of car sothat the person can complete the journey in 8 hours.

$\therefore 72 : x = 8 : 10$

$$\frac{72}{x} = \frac{8}{10}$$

$$72 \times 10 = 8 \times x$$

$$\frac{\overset{9}{72} \times 10}{8} = x$$

$$90 = x$$

$$\therefore x = 90$$

$\therefore$ 90 km/h average speed required to complete the journey in 8 hours

3. 28 pumps can empty a reservoir in 18 hours. In how many hours can 42 such pumps do the same work?

Using inverse variation

Ratio of pumps $\overset{\text{Inverse}}{=}$ Ratio of time

Let $x$ be the time required to empty the reservoir using 42 pumps

$$\therefore 28 : 42 = x : 18$$

$$\frac{28}{42} = \frac{x}{18}$$

$$28 \times 18 = x \times 42$$

$$\frac{\overset{4}{\cancel{28}} \times \overset{3}{\cancel{18}}}{\cancel{42}_{\cancel{7}}} = x$$

$$12 = x$$

$\therefore$ 12 h required to empty the reservoir using 42 pumps

4. A contractor who had a work force of 630 persons undertook to complete a portion of a stadium in 14 months. He was asked to complete the job in 9 months. How many extra persons had he to employ?

Using inverse variation.

Ratio of number of persons = Inverse ratio of months.

Let $x$ be the number of persons required to complete the job in 9 months.

$\therefore \quad 630 : x = 9 : 14$

$$\frac{630}{x} = \frac{9}{14}$$

$$630 \times 14 = 9 \times x$$

$$\frac{630 \times 14}{9} = x$$

$$980 = x$$

$\therefore$ 980 persons required to complete the job in 9 months.

$\therefore$ Extra persons had to be employ = $980 - 630 = 350$ persons.

Exercise 8(B):

1. One man can do a piece of work in 3 hours; another can do the same piece of work in 2 hours. How long will they take, if they work together?

Let the persons be A and B

A's one hour work = $\frac{1}{3}$

B's one hour work = $\frac{1}{2}$

$\therefore$ (A and B)'s one hour work = $\frac{1}{3} + \frac{1}{2}$

$= \frac{2+3}{6}$

$= \frac{5}{6}$.

$\therefore$ A and B together can complete the work with in $\frac{6}{5}$ hours

ie $1\frac{1}{5}$ hours

2. Amar and Vijay together can do a piece of work in 10 days, but Amar alone can do it in 15 days. How many days would Vijay alone take to do the same work?

(Amar and Vijay)'s one day work = $\frac{1}{10}$

ie $\frac{1}{A} + \frac{1}{B} = \frac{1}{10}$

Amar's one day work = $\frac{1}{15}$

ie $\frac{1}{A} = \frac{1}{15}$.

$\therefore \frac{1}{A} + \frac{1}{B} = \frac{1}{10}$

$\frac{1}{15} + \frac{1}{B} = \frac{1}{10}$

$\frac{1}{B} = \frac{1 \times 3}{10 \times 3} - \frac{1 \times 2}{15 \times 2}$

$= \frac{3-2}{30}$

$= \frac{1}{30}$

$\therefore$ Vijay alone can complete the work with in 30 days.

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$\therefore$

5 | 10, 15
2, 3

HW

3. A cistern can be filled by one tap in 4 hours and by other in 5 hours. How long will it take to fill if both taps are opened together?

work done by one tap in 1 hour = $\frac{1}{4}$

work done by the other tap in one hour = $\frac{1}{5}$

∴ work done by both the taps in

1 hour = $\frac{1}{4} + \frac{1}{5}$

$= \frac{1\times5 + 1\times4}{20}$.

$= \underline{\underline{\frac{9}{20}}}$.

∴ Both the taps when opened together will fill the cistern in $\frac{20}{9}$ hours

ie $2\cdot\frac{2}{9}$ hours.

HW Exercise 8(B) 8.