22 Rate

Speed = $\frac{\textit{Distance travelled}}{\textit{Time taken}}$

Units			
Seconds – s	Hours – h	Kilometers – km	meters – m
Kilometers per hours – kmh^{-1}		Meters per seconds – ms^{-1}	

1) Calculate the speed of a train which travel 180 km is 2 hours with uniform speed.

Speed = $\frac{180\ km}{2\ h}$ = 90 kmh^{-1}

2) Find the distance that an aircraft which travels at a uniform speed 210 kmh^{-1}, covers during 20 minutes.

Distance = speed × time

Distance = $210 \times \frac{20}{60}$ = 70 km

3) Find the time it takes for a train of length 30 m travelling at a uniform speed of 90 kmh^{-1} to cross a bridge which is 45 m long.

The total distance travelled in crossing the bridge = 75 m

Speed = 90 kmh^{-1} = $\frac{90 \times 1000}{60 \times 60}$ ms^{-1}

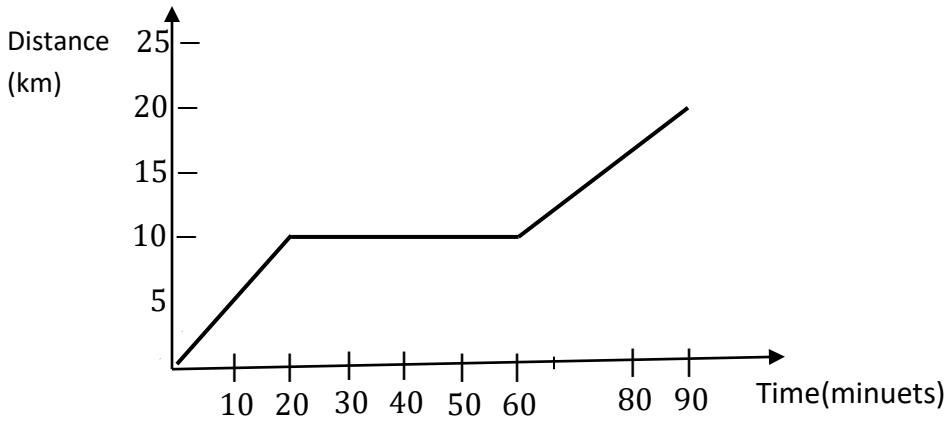
= 25 ms^{-1}

Time taken to cross the bridge = $\frac{75\ m}{25\ ms{-}1}$

= 3 seconds

Do the exercise 22.1 in text book. (Page 47,48)

4) Below is the distance – time graph that shows Amal leaving the house to go to his mother's house and returning.



I. Describe his journey.

Amal 20 minutes to go to mother's house and 40 minutes to stay home and 30 minutes to come back.

II. Find speed when he gets home.

Time = 20 minutes = 1200 seconds Distance = 10km = 10000m

$$\text{Speed} = \frac{10000\ m}{1200\ seconds} = \frac{25}{3} ms^{-1}$$

III. Find the speed way back.

Time = 30 minutes = 1800 seconds Distance = 10km = 10000m

$$\text{Speed} = \frac{10000\ m}{1800\ seconds} = \frac{50}{9} ms^{-1}$$

IV. Find the average speed.

$$\text{The average speed} = \frac{The\ total\ distance\ travelled}{Total\ time\ taken}$$

$$= \frac{10000+10000}{1200+1800} = \frac{20000\ m}{3000\ s} = \frac{20}{3}\ ms^{-1}$$

Do the exercise 22.2 in text book. (Page 51)

$$\text{Rate of change of volume} = \frac{Change\ of\ volume}{Time}$$

1. The capacity of a tank is 600 liters . On an occasion when the tank was completely filled with water, it took 5 minutes for the tank to be emptied by a pipe. Find the rate at which water flowed out through the pipe.

Time = 5 minutes = 5 × 60 = 300 seconds Rate = $\frac{600}{300} = 2\ ls^{-1}$

2. The length , breadth and height of a cuboid shaped water tank are 2m , 1m and 1.5 m respectively. Water flows into the tank at a uniform rate of 6 liter per second. The tank discharges water at a uniform rate 1.5 liters per seconds and at a rate of 2.5 liters per second through two exhaust pipes. If all three pipes were opened at the same time when the tank had 600 liters of water, find out how long it would take to fill the tank completely.

The capacity of tank = 2 × 1 × 1.5 = 3 m^3

= 3 × 1000 =3000 liters

The remaining volume to fill the tank = 3000 – 600 = 2400 liters

The rate at which water flows = 6 ls^{-1}

The rate at which water leaves = 1.5 + 2.5 = 4 ls^{-1}

The rate at which water fill = 6 – 4 = 2 ls^{-1}

The time it takes to fill the tank completely $= \frac{2400}{2}$ = 1200 seconds = 20 minutes

Do the exercise 22.3 in text book. (Page 54)