

### Time & Distance

1. A person crosses a 600 m long street in 5 min. what is his speed in kmph?

$$D = 600 \text{ m} = \frac{600}{100} = 0.6 \text{ Km}$$

$$T = 5 \text{ min} = \frac{5}{60} \text{ h}$$

$$S = \frac{D}{T} = \frac{0.6}{\frac{5}{60}} = 0.6 \times 12 = 7.2 \text{ Kmph}$$

$$= \frac{600 \times \frac{18}{5}}{5/60} = \frac{130 \times 18}{1/12} = 120 \times 12 \times 12 = 1440 \times 12$$

2. An aeroplane covers a certain distance at a speed of 240 Kmph in 5 hours. To cover the same distance in  $1\frac{2}{3}$  hours, it must travel at a speed of

$$S_1 = 240 \text{ Km/h} \quad T_1 = 5 \text{ h}$$

$$D_1 = D_2$$

$$S_2 = ? \quad T_2 = \frac{5}{3} \text{ h}$$

$$S_1 \times T_1 = S_2 \times T_2$$

$$240 \times 5 = S_2 \times \frac{5}{3}$$

$$\frac{240 \times 5}{5/3} = S_2$$

$$240 \times 5 \times \frac{3}{5} = S_2$$

$$S_2 = 720 \text{ kmph.}$$

3. If a person walks at 14 km/h instead of 10 km/h, he would have walked 20 km more. the actual distance travelled by him is:

$$D_1 = x \quad D_2 = x + 20$$

$$S_1 = 10 \text{ km/h} \quad S_2 = 14 \text{ km/h}$$

$$\frac{D_1}{S_1} = \frac{D_2}{S_2}$$

$$\frac{x}{10} = \frac{x+20}{14}$$

$$14x = 10x + 200$$

$$4x = 200$$

$$x = 50 \text{ km}$$

4. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at same time. On the way, however the train lost about 12.5 min while stopping at stations. The speed of the car is:

$$\text{Speed of car} = x \text{ km/h}$$

$$\text{Speed of train} = 1.5x \text{ km/h}$$

$$\text{Distance} = 75 \text{ kms}$$

$$\text{Time of car} = \frac{75}{x}$$

$$\text{Time of train} - 12.5 \text{ min} = \frac{12.5}{60} \text{ h}$$

$$t - \frac{5}{24} = \frac{75}{1.5x} \quad (\text{for train})$$

$$\frac{75}{x} - \frac{5}{24} = \frac{75}{1.5x}$$

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2. An aeroplane covers a certain distance at a speed of 240 Kmph in 5 hours. To cover the same distance in  $1 \frac{2}{3}$  hours, it must travel at a speed of

$$S_1 = 240 \text{ Km/h} \quad T_1 = 5 \text{ h}$$

$$D_1 = D_2$$

$$S_2 = ? \quad T_2 = \frac{5}{3} \text{ h}$$

$$S_1 \times T_1 = S_2 \times T_2$$

$$240 \times 5 = S_2 \times \frac{5}{3}$$

$$\frac{240 \times 5}{5/3} = S_2$$

$$240 \times 8 \times \frac{3}{8} = S_2$$

$$S_2 = 720 \text{ kmph.}$$

3. If a person walks at 14 km/h instead of 10 km/h. he would have walked 20 km more. the actual distance travelled by him is:

$$D_1 = x \quad D_2 = x + 20$$

$$S_1 = 10 \text{ Km/h} \quad S_2 = 14 \text{ Km/h}$$

$$\frac{D_1}{S_1} = \frac{D_2}{S_2}$$

$$\frac{x}{10} = \frac{x+20}{14}$$

$$14x = 10x + 200$$

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$$x = 50 \text{ Km}$$

4. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at same time. On the way, however the train lost about 12.5 min while stopping at stations. The speed of the car is:

$$S \text{ of car} = x \text{ km/h}$$

$$S \text{ of train} = 1.5x \text{ km/h}$$

$$D \text{ of car} = 75 \text{ kms}$$

$$t \text{ of car} = \frac{75}{x}$$

$$t \text{ of train} = \frac{75}{1.5x}$$

$$t - \frac{5}{24} = \frac{75}{1.5x} \quad (\text{for train})$$

$$\frac{75}{x} - \frac{5}{24} = \frac{75}{1.5x}$$

$$\frac{75}{x} - \frac{50}{x} = \frac{5}{24}$$

$$\frac{25}{x} = \frac{5}{24}$$

$$5x = 25 \times 24$$

$$x = \frac{25 \times 24}{5}$$

$$x = 120 \text{ Kmph.}$$

car speed is 120 Km/h.

5. Excluding stoppages, the speed of a bus is 54 Km/h and including stoppages - it is 45 Kmph. For how many minutes does the bus stop per hour?

54 Kmphi (60 min)

$$\frac{54}{60-t} = 45$$

$$\frac{\text{Time-diff}}{\text{excluding}} \times 60 = \frac{1}{54} \times 60$$

$$= 10 \text{ min}$$

6. in a flight of 600 Km, an aircraft was slowed down due to bad weather. its average speed for trip was reduced by 200 Kmph and time of flight increased by 30 min. the duration of flight is:

$$S = x \text{ Km/h}$$

$$T = \frac{D}{S} = \frac{600}{x}$$

$$S_2 = x - 200 \text{ Km/h}$$

$$T_2 = \frac{600}{x-200}$$

$$\frac{600}{x-200} = \frac{600}{x} + 0.5$$

$$\frac{600}{x-200} = \frac{600+0.5x}{x}$$

$$600x = 600x - 1200 + 0.5xx - 200$$

$$x = 0.5x$$

$$x = 800 \text{ Km/h}$$

$$T_1 = 0.75 \text{ h}$$

$$T_2 = 0.75 + 0.5$$

$$= 1.25 \text{ h}$$

$$= 1 \text{ h } 25 \text{ min}$$

7. A man completes a journey in 10h. He travels first half of journey at rate of 21 Km/h and second half at the rate of 24 km/h. find total journey in Km.

$$D = 2 \text{ Km} \quad \text{half} = \frac{x}{2}$$

$$T = \frac{2/2}{21} \quad | \quad T = \frac{x/2}{24}$$

$$\text{Total} = 70 \text{ h}$$

$$\frac{x/2}{21} + \frac{x/2}{24} = 10$$

$$\frac{24x/2 + 21x/2}{168} = 10$$

$$12x + 10.5x = 1680$$

$$22.5x = 1680$$

$$x = 112 \text{ Km}$$

8. the ratio b/w the speeds of two trains is 7:8 if second train runs 400 Km in 4 hr then speed of first train is:

$$\frac{s_1}{s_2} = \frac{7}{8}$$

$$s_2 = \frac{D}{T} = \frac{400}{4} = 100 \text{ Km/h}$$

$$s_1 = 7x \quad s_2 = 8x$$

$$8x = 100 \text{ Km/h}$$

$$x = \frac{100}{8} = 12.5$$

$$\text{speed of first } s_1 = 7x$$

$$= 7 \times 12.5$$

$$= 87.5 \text{ Km/h}$$

9. A man on tour travels first

160 km at 64 km/h and the next 160 km at 80 km/h. the average speed for first 320 km of tour is:

$$\text{first 160 km (T)} = \frac{160}{64} = 2.5 \text{ hr}$$

$$\text{second (T)} = \frac{160}{80} = 2 \text{ hr}$$

$$\text{Total} = 4.5 \text{ h}$$

$$D = 320 \text{ km}$$

$$\text{Average speed} = \frac{320}{4.5} = 71.11 \text{ km/h}$$

10. A car travelling with  $\frac{5}{7}$  of its actual speed covers 42 km in 1hr 40 min 48 sec find actual speed of car.

$$T = 1 \text{ h } 40 \text{ min } 48 \text{ sec}$$

$$\begin{aligned} &= 1 + \frac{40}{60} + \frac{48}{3600} \\ &= 1 + \frac{2}{3} + \frac{2}{75} \\ &= 1 + 0.67 + 0.027 \\ &= 1.697 \text{ hr} \end{aligned}$$

$$\text{Speed} = \frac{42}{1.697} = \frac{42}{1697} \text{ km/h}$$

$$= 42 \times \frac{1000}{1697} = 24.75 \text{ km/h}$$

$$\begin{aligned} \text{actual} &= \frac{5}{7} \times 24.75 \\ &= 0.71 \times 24.75 \\ &= 17.57 \text{ km/h} \end{aligned}$$

$$11. D = 30 \text{ km}$$

$$A \text{ Time} = x+2 \quad \text{Sameer's time} = x$$

$$A \text{ S} = \frac{30}{x+2}$$

A doubles his speed  $2S$

$$S = \frac{30}{2S}$$

$$\frac{30}{2S} = x-1 \quad (1 \text{ hour less})$$

$$\frac{30}{2 \times \frac{30}{x+2}} = x-1$$

$$\frac{30}{\frac{60}{x+2}} = x-1 \Rightarrow \frac{x+2}{2} = x-1$$

$$x=4$$

$$\text{Abhay's S} = \frac{30}{x+2} = \frac{30}{6} = 5 \text{ km/h}$$

$$12. \text{ Distance to A} = x \text{ km}$$

$$T_1 = \frac{x}{10} \quad T_2 = \frac{x}{15}$$

$$\frac{x}{10} - \frac{x}{15} = 2$$

$$\frac{6x-4x}{60} = 2 \Rightarrow 2x = 120 \quad (x = 60 \text{ km})$$

$$T_1 = \frac{60}{10} = 6 \text{ h} \quad T_2 = 4 \text{ h}$$

$$T \text{ at reach 1pm} = 5 \text{ hr}$$

$$D = \frac{60 \times 12}{8} = 12 \text{ km/h}$$

$$14. D \text{ on foot} = x$$

$$D \text{ on bicycle} = 61-x \text{ km}$$

$$T \text{ on foot} = \frac{x}{4}$$

$$T \text{ on bicycle} = \frac{61-x}{9}$$

$$\text{Time (total)} = 9$$

$$\frac{x}{4} + \frac{61-x}{9} = 9$$

$$9x + 4(61-x) = 9$$

36

$$9x + 244 - 4x = 324$$

$$5x = 80$$

$$\boxed{X = 16 \text{ km}}$$

### Train Problems

1. A train running at the speed of 60 km/hr covers a pose in 9 seconds. what is the length of the train?

$$S = 60 \text{ km/hr}$$

$$T = 9 \text{ sec}$$

$$D = S \times T$$

$$= 60 \times \frac{1}{3600} \times 9$$

$$= 30 \times \frac{1}{400}$$

$$= 150 \text{ m}$$

$$\text{length} = 150 \text{ m}$$

2. A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going in 10 sec. the speed of the train is

$$TL = 125 \text{ m} = D$$

$$S = 5 \text{ km/h}$$

$$T = 10 \text{ sec}$$

$$S = \frac{D}{T} = \frac{125}{10} = 12.5 \text{ m/s}$$

$$\Rightarrow 12.5 \times \frac{18}{5} = 45 \text{ Km/h}$$

$$\begin{aligned} \text{Speed of train} &= \text{Relative speed} + \\ &\quad \text{Speed of man} \\ &= 50 \text{ km/h.} \end{aligned}$$

3. The length of the bridge, which a train 130 m long and travelling at 45 km/h can cross in 30 sec is.

$$TL = 130 \text{ m} \quad S = 45 \text{ km/h}$$

$$T = 30 \text{ sec}$$

$$D = S \times T$$

$$TL + BL = S \times T$$

$$130 + BL = 45 \times \frac{1}{3600} \times 30$$

$$= 45 \times 25$$

$$BL = 15 \times 25 = 135$$

$$BL = 37.5 = 135$$

$$BL = 245 \text{ m}$$

4. Two trains running in opposite directions cross a man standing on the platform in 27 sec and 17 sec respectively and they cross each other in 23 sec. the ratio of their speeds is

$$T_1 = 27 \text{ sec}, \quad T_2 = 17 \text{ sec}$$

$$T_1 = \frac{D_1}{S_1} \quad T_2 = \frac{D_2}{S_2}$$

$$\frac{27S_1 + 17S_2}{S_1 + S_2} = 23$$

$$27S_1 + 17S_2 = 23S_1 + 23S_2$$

$$4S_1 = 6S_2$$

$$2S_1 = 3S_2$$

$$\frac{S_1}{S_2} = \frac{3}{2} = 3:2$$

5. A train passes a station platform in 36 sec and a man standing on the platform in 20 sec. if speed of train is 54 km/h. what is length of platform m?

$$\text{man crosses } T = 20 \text{ sec}$$

$$S = 54 \text{ km}$$

$$\begin{aligned} \text{Length of train} &= 54 \times \frac{18}{36} \times 20 \\ &= 300 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{Total distance} &= \frac{18}{54} \times \frac{18}{36} \times 36 \\ &= 54 \text{ m} \end{aligned}$$

$$PL = TL - LT = 240 \text{ m}$$

## Train problems

1. A train running at the speed of 60 Km/hr crosses a pole in 9 seconds. What is the length of the train?

$$S = 60 \text{ Km/hr}$$

$$T = 9 \text{ sec}$$

$$D = S \times T$$

$$= 60 \times \frac{5}{18} \times 9$$

$$= 30 \times 5$$

$$= 150 \text{ m/s}$$

$$\text{length} = 150 \text{ m}$$

2. A train 125 m long passes a man, running at 5 Km/hr in the same direction in which the train is going in 10 sec, the speed of the train is

$$TL = 125 \text{ m} = D$$

$$S = 5 \text{ Km/hr}$$

$$T = 10 \text{ sec}$$

$$S = \frac{D}{T} = \frac{125}{10} = 12.5 \text{ m/s}$$

$$\Rightarrow 12.5 \times \frac{18}{5} = 45 \text{ Km/hr}$$

$$\begin{aligned} \text{Speed of train} &= \text{Relative speed} + \\ &\quad \text{Speed of man} \\ &= 50 \text{ Km/h.} \end{aligned}$$

3. The length of the bridge, which a train 130 m long and travelling at 45 Km/h can cross in 30 sec is.

$$TL = 130 \text{ m} \quad S = 45 \text{ Km/h}$$

$$T = 30 \text{ sec}$$

$$D = S \times T$$

$$TL + BL = S \times T$$

$$130 + BL = 45 \times \frac{5}{18} \times 30$$

$$= \frac{45 \times 25}{3}$$

$$BL = 15 \times 25$$

$$BL = 375 - 130$$

$$BL = 245 \text{ m}$$

4. Two trains running in opposite directions cross a man standing on the platform in 27 sec and 17 sec respectively and they cross each other in 23 sec. The ratio of their speeds is

$$T_1 = 27 \text{ sec} \quad T_2 = 17 \text{ sec}$$

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$$27S_1 + 17S_2 = 23S_1 + 23S_2$$

$$4S_1 = 6S_2$$

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$$\frac{S_1}{S_2} = \frac{3}{2} = 3:2$$

5. A train passes a station platform in 36 sec and a man standing on the platform in 20 sec. If speed of train is 54 Km/h. What is length of platform?

$$\text{man crosses } T = 20 \text{ sec}$$

$$S = 54 \text{ Km}$$

$$\begin{aligned} \text{Length of train} &= 54 \times \frac{18}{18} \times 20 \\ &= 300 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{Total distance} &= 54 \times \frac{18}{18} \times 36 \\ &= 540 \text{ m} \end{aligned}$$

$$PL = TL - LT = 240 \text{ m}$$

6. A train 240 m long passes a pole in 24 sec. How long will it take to pass a platform 650m long

$$TL = 240 \text{ m} \quad T = 24 \text{ sec}$$

$$PL = 650 \text{ m} \quad T = ?$$

$$\text{Speed of train} = \frac{240}{24} \times 5 = 10 \text{ m/s}$$

$$\text{Total dis} = 240 + 650 = 890 \text{ m}$$

$$\text{Time} = \frac{D}{S} = \frac{890}{10} = 89 \text{ sec.}$$

7. Two trains of equal length are running on parallel lines in the same direction at 46 km/hr and 36 km/hr. the faster train passes the slower train in 36 sec. The length of each train is:

$$TL = TL \quad S_1 = 46 \text{ km/hr} \quad S_2 = 36 \text{ km/hr}$$

$$RS = S_1 - S_2 = 10 \text{ km/hr}$$

$$\begin{aligned} & 10 \times 5 \\ & = 50 \times 5 \\ & = 250 \times 18 \\ & = 2.78 \text{ m/s} \end{aligned}$$

$$\begin{aligned} \text{Distance} &= 2.78 \times 36 \\ &= 100.08 \text{ m} \quad (\text{for two trains}) \\ \text{for each} &= \frac{100.08}{2} = 50.04 \\ &= 50 \text{ m} \end{aligned}$$

8. A train 360 m long is running at a speed of 45 km/hr. in what time will it pass a bridge 140 m long?

$$TL = 360 \text{ m} \quad S = 45 \text{ km/hr}$$

$$\begin{aligned} T \text{ of train} &= \frac{D}{S} = \frac{360}{45} \\ &= \frac{360 \times 5}{45 \times 5} \\ &= \frac{360 \times 6}{72} \end{aligned}$$

$$\therefore \frac{72 \times 6}{15} = \frac{432}{15} = 28.8 \text{ sec}$$

$$\text{Total distance} = 500 \text{ m}$$

$$\begin{aligned} \text{Time} &= \frac{500}{45 \times 5} \\ &= \frac{500}{225} = \frac{500 \times 18}{225} \\ &= 40 \text{ sec} \end{aligned}$$

9. Two trains of equal length are running on parallel lines in moving in opposite directions 60 km/h and 90 km/h. Their lengths are 1.10 km and 0.9 km the time taken by the slower train to cross the faster train in seconds is:

$$\begin{aligned} RS &= 60 + 90 = 150 \text{ km/hr} \\ &= 150 \times \frac{5}{18} \\ 6) \frac{250}{24} (41.6 &= \frac{250}{6} \\ &= 41.6 \text{ m/s} \end{aligned}$$

$$\begin{aligned} \text{Total distance} &= 1.10 + 0.9 \\ &= 2 \text{ km} \\ &= 2000 \text{ m} \end{aligned}$$

$$\begin{aligned} T &= \frac{2000}{41.6} = \frac{2000 \times 10}{416} \\ 416) \frac{20000}{1664} (48 &= \frac{20000}{416} \\ &= \frac{3360}{3328} \\ &= 48 \text{ sec} \end{aligned}$$

10. A jogger running at 9 kmph alongside a railway track in 240 m ahead of engine of a 120 m long train running at 45 km/h in same direction. In how much time will train pass jogger?  $TL = 120 \text{ m} \quad S = 45 \text{ kmph}$

$$\begin{aligned}
 RS &= 45 \pm 9 \\
 &= 36 \text{ Kmph} \\
 &= \frac{36 \times 5}{18} \text{ m/s} \\
 &= 10 \text{ m/s}
 \end{aligned}$$

$$D = TL + PL = 360 \text{ m}$$

$$\begin{aligned}
 T &= \frac{D}{S} = \frac{360}{10} \\
 &= 36 \text{ sec}
 \end{aligned}$$

11. A 270 m long train running at the speed of 120 kmph crosses another train running in opposite direction at speed of 80 km/h in 9 sec. what is length of other train?

$$\begin{aligned}
 TL &= 270 \text{ m} \quad S = 120 \text{ Km/h} \\
 S &= 80 \text{ Km/h} \\
 T &= 9 \text{ sec}
 \end{aligned}$$

$$RS = 120 + 8 = 200 \text{ km/h}$$

$$\begin{aligned}
 9) \frac{500(55.5)}{45} &= \frac{200 \times 5}{100} \\
 &= \frac{500}{9} \\
 &= 55.5 \text{ m/s}
 \end{aligned}$$

$$\begin{aligned}
 TD &= RS \times T = 55.5 \times 9 \\
 &= 500 \text{ m} \\
 \text{other train} &= 500 - 270 \\
 &= 230 \text{ m}
 \end{aligned}$$

12. A goods train runs at the speed of 72 kmph and crosses a 250 m long platform in 26 sec what is length of goods train?

$$S = 72 \text{ Km/h}$$

$$PL = 250 \text{ m} \quad T = 26 \text{ sec}$$

$$D = S \times T$$

$$250 + TL = \frac{72 \times 5}{18} \times 26$$

$$\begin{aligned}
 TL &= 20 \times 26 - 250 \\
 &= 520 - 250 = 270 \text{ m}
 \end{aligned}$$

13. Two trains, each 100 m long moving in opposite directions, cross each other in 8 sec. if one is moving twice as fast as the other then speed of faster train is

$$TL = 100 \text{ m} \quad T = 8 \text{ sec}$$

$$\begin{aligned}
 S \text{ of slower train} &= x \text{ m/s} \\
 S \text{ of faster train} &= 2x \text{ m/s}
 \end{aligned}$$

$$RS = x + 2x = 3x$$

$$\text{Total } D = 100 + 100 = 200 \text{ m}$$

$$D = S \times T$$

$$200 = 3x \times 8$$

$$\frac{200}{8} = 3x$$

$$x = \frac{200}{3 \times 8} = \frac{100}{24} = 25$$

$$x = \frac{25}{3} \text{ m/s}$$

$$S_2 = 2 \times \frac{25}{3} = \frac{50}{3} \text{ m/s}$$

$$\frac{50}{3} \times \frac{18}{9} = 60 \text{ Km/hr}$$

14. Two trains 140 m and 160 m long moving in opposite directions cross ea at a speed of 60 Km/h and 40 Km/h in opposite directions on parallel tracks. the time which they take to cross each other is,

$$D_1 = 140 \text{ m} \quad D_2 = 160 \text{ m}$$

$$S_1 = 60 \text{ Km/h} \quad S_2 = 40 \text{ Km/h}$$

$$\begin{aligned}
 RS &\approx S_1 + S_2 \approx 100 \text{ Km/h} \\
 &= \frac{100 \times 5}{18} \\
 &= \frac{250}{9} \text{ m/s}
 \end{aligned}$$

$$TD = 140 + 160 = 300 \text{ m}$$

$$\begin{aligned}
 \text{Time} &= \frac{300}{\frac{250}{9}} \\
 &= \frac{300 \times 9}{250} = \frac{108}{25} = 4.32 \text{ sec} \\
 &= \frac{54}{5} = 10.8 \text{ sec}
 \end{aligned}$$

15. A train 110 m long is running with speed of 60 km/h in what time will it pass a man who is running at 6 km/h in direction opposite to that which train is going?

$$S_1 (\text{Train}) = 60 \text{ km/h} \quad S_2 (\text{man}) = 6 \text{ km/h}$$

$$RS = 66 \text{ km/h} = \frac{66 \times 5}{18 \times 6} = \frac{55}{3} \text{ m/s}$$

$$T = \frac{110}{\frac{55}{3}} = \frac{110 \times 3}{55} = 6 \text{ sec}$$

### Percentages

1. A batsman scored 110 runs which included 3 boundaries and 8 sixes. What percent of his total score did he make by running between wickets?

$$\text{Runs from boundaries} = 3 \times 4 = 12$$

$$\text{Runs from Sixes} = 8 \times 6 = 48$$

$$\text{Total} = 12 + 48 = 60$$

$$\text{Runs made by running} = 110 - 60 = 50$$

$$\text{Percent} = \text{Runs made} / \text{Total runs} \times 100$$

$$\text{II) } \frac{50}{110} \times 100 = \frac{50}{11} = 45.45\%$$

2. Two students appeared at an examination one of them secured 9 marks more than the others and his marks was 56% of sum of their marks. the marks obtained by them are:

marks obtained therefore

$$x, x+9$$

$$\downarrow \\ 56\% \text{ of total sum}$$

$$x+9 = 0.56(x+x+9)$$

$$x+9 = 0.56(2x+9)$$

$$x+9 = 1.12x + 5.04$$

$$x - 1.12x = 5.04 - 9$$

$$-0.88x = -3.96$$

$$x = \frac{-3.96}{-0.88}$$

$$\frac{0.56 \times 2}{1.12}$$

$$\frac{0.56 \times 9}{4.94}$$

$$\frac{1.08}{4.94}$$

$$\frac{1.12}{4.94}$$

$$\frac{9.05}{4.94}$$

$$\frac{5.94}{4.94}$$

$$x - \frac{5.94}{22} = \frac{148.5}{22}$$

$$22) 148.5 \\ x - \frac{3.96}{0.12} = 33$$

$$x = 33, x+9 = 42$$

3. A fruit seller had some apples. He sells 40% apples and still has 420 apples originally, he had:

$$\text{sold} = 40\%$$

$$\text{remaining} = 420 \text{ apples} \\ \downarrow 60\%$$

$$60\% \rightarrow 420$$

$$40\% \rightarrow x \rightarrow 280$$

$$60 \times x = 420 \times 40$$

$$6x = 16800$$

$$x = \frac{16800}{6} = 280$$

$$\text{total} = 420 + 280 = 700 \text{ apples}$$

4. 1 to 70 1 or 9 in unit digit

nos with 1 in unit place:

$$1, 11, 21, 31, 41, 51, 61 - 7$$

with 9 in unit's place:

$$9, 19, 29, 39, 49, 59, 69 - 7$$

$$\text{percent} = \frac{14}{70} \times 100 = 20\%$$

5. If  $A = x\% \text{ of } y$  and  $B = y\% \text{ of } x$   
then which of following is true?

If  $20\% \text{ of } a = b$

then  $b\% \text{ of } 20$  is same  
as:

$$A = x\% \text{ of } y \quad B = y\% \text{ of } x \\ = \frac{x}{100} \times y \quad = \frac{y}{100} \times x$$

$$20\% \text{ of } a = b$$

$$b\% \text{ of } 20 = \frac{b}{100} \times 20$$

$$20\% \text{ of } a = \frac{20}{100} \times a$$

$$b\% \text{ of } 20 = \frac{20}{100} \times a / \frac{100}{100} \times 20$$

$$= \frac{20a}{100} \times \frac{1}{100} \times 20 \\ = \frac{400a}{1000}$$

$$= 0.4 \text{ of } a = 4\% \text{ of } a$$

6. In a certain school,  $20\%$  of students are below 8 years of age. The number of students above 8 years of age is of number of students of 8 years of age which is  $48$ . Total no. of students in school?

$20\% \rightarrow$  below 8 years

$48 \rightarrow$  above and = 8 years

$\downarrow$   
 $80\%$ .

$80\% \rightarrow 48$

$20\% \rightarrow x$

$$80 \times x = 48$$

$$x = 12$$

Total  $x$

7. Two numbers  $A$  and  $B$  are such that sum of  $5\%$  of  $A$  and  $4\%$  of  $B$  is two-third of sum of  $6\%$  of  $A$  and  $8\%$  of  $B$ . Find the ratio of  $A:B$ .

$A$  and  $B$ .

$$5\% \text{ of } A + 4\% \text{ of } B = \frac{2}{3} (6\% \text{ of } A + 8\% \text{ of } B)$$

$$\frac{5}{100} \times A + \frac{4}{100} \times B = \frac{2}{3} \left( \frac{6}{100} \times A + \frac{8}{100} \times B \right)$$

$$\frac{5A}{100} + \frac{4B}{100} = \frac{2}{3} \left( \frac{6A+8B}{100} \right)$$

$$\frac{5A+4B}{100} = \frac{2}{3} \times \frac{6A+8B}{100}$$

$$\frac{5A+4B}{6A+8B} = \frac{2}{3}$$

$$15A + 12B = 12A + 16B$$

$$3A = 4B$$

$$\frac{A}{B} = \frac{4}{3}$$

8. A student multiplied a number by  $3/5$  instead of  $5/3$ . What is % error in the calculation?

$\frac{3}{5}$  instead of  $\frac{5}{3}$

Absolute error = Correct - Incorrect

$$= \frac{5}{3}x - \frac{3}{5}x \\ = \frac{25x - 9x}{15} = \frac{16}{15}x$$

Percentage error =  $\frac{\text{Absolute error}}{\text{Correct}} \times 100$

$$= \frac{\frac{16}{15}x}{\frac{5}{3}x} \times 100 \\ = \frac{16}{5} \times 100 = 64\%$$

9. In an election b/w two candidates, one got 55% of total valid votes, 20% of votes were invalid. If total number of votes was 7500, the no. of valid votes that other candidate got was:

55% valid 20% invalid

$$\text{Total} = 7500$$

$$\text{invalid} = \frac{20}{100} \times 7500 = 1500$$

$$\text{valid} = 6000$$

$$6000 \rightarrow 100\%$$

$$45\% \rightarrow 45\%$$

$$45 \times 6000 = 100x$$

$$45 \times 60 = x$$

$$x = 2700 \text{ valid votes}$$

10. Three candidates, contested an election and received 1136, 7636 and 11628 votes respectively. What % of total votes did the winning candidate got?

A, B, C

1136, 7636, 11628 votes

$$\text{Total} = 20400$$

$$20400 \rightarrow 100\%$$

$$11628 \rightarrow x$$

$$20400x = 1162800$$

$$x = \frac{11628}{204} \\ = 57\%$$

11. Two tailors X and Y are paid a total of RS. 550 per week by employer. If X is paid 120% of sum paid to Y, how much Y paid per week?

$$x + y = 550 \text{ per week}$$

$$x = 120\% \text{ of } y = 1.2y$$

$$\text{Total} = x + y$$

$$550 = 1.2y + y$$

$$550 = 2.2y$$

$$\frac{550}{2.2} = y$$

$$\frac{5500}{22} = y$$

$$y = 250 \text{ per week}$$

12. Rajeev buys good worth RS. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax @ 10%. Find amount he will have to pay for goods.

$$6650 \quad \text{rebate } 6\%$$

$$\text{sales tax} = 10\%$$

$$\text{Rebate} = 6\% \text{ of } 6650 \\ = 0.06 \times 6650 = 399$$

$$\text{price} = \text{original} - \text{Rebate} \\ = 6251$$

$$\text{Sales tax} = 10\% \text{ of } 6251 \\ = 0.10 \times 6251 = 625.1$$

$$\text{Final} = 6251 + 625.1 = 6876.1$$

13. The population of a town increased from 1,75,000 to 2,162,500 in a decade. The average % increase of population per year:

$$1,75,000 \rightarrow 2,162,500 \text{ in 10 years}$$

$$\text{increase} = 87,500$$

$$\text{Percent} = \frac{\text{increase}}{\text{initial}} \times 100$$

$$= \frac{87,500}{1,75,000} \times 100$$

$$= \frac{87,500}{175} \times \frac{100}{35} = 50\%$$

Q5. Grauri went to the stationers and bought things worth Rs 25, out of which 30 paise went on sales tax on taxable purchases, if the tax was 6%, then what was cost of tax-free items?

$$\text{Cost} = 25, \text{ Tax} = 30 \text{ paise} = 0.30 \text{ Tax rate } 6\%.$$

$$\text{Tax amount} = 6\% \text{ of } x =$$

$$0.30 = 0.06x$$

$$\frac{30}{6} = x$$

$$x = 5 \text{ (tax items)}$$

$$\begin{aligned}\text{tax-free} &= \text{Total} - \text{tax items} \\ &= 25 - 5 - 0.30 \\ &= 20 - 0.30 \\ &= 19.70\end{aligned}$$

### Averages

1. In the first 10 overs of a cricket game, the rate of run was only 3.2 what should be run rate in remaining 40 overs to reach target of 282 runs?

$$10 \text{ overs} \rightarrow 3.2 \text{ (run rate)}$$

$$40 \text{ overs} \rightarrow ?$$

$$\text{target} = 282 \text{ runs}$$

$$\text{Runs} = 3.2 \times 10 = 32$$

$$\text{Runs remain} = 282 - 32 = 250$$

$$\begin{aligned}\text{Run rate} &= \frac{\text{Runs remains}}{\text{overs}} \\ &= \frac{250}{40} \\ &= 6.25\end{aligned}$$

2. A family consists of two grandparents, two parents and three grandchildren. The average age of grandparents is 67 years, that of parents 35 years and that of grandchildren is 6 years. What is the average age of family?

$$a, b, c, d, e, f, g$$

$$a+b = 67$$

$$c+d = 35$$

$$e+f+g = 6$$

$$\begin{aligned}\text{two grandparents} &= 64 \times 2 \\ &= 134\end{aligned}$$

$$\text{Parents} = 35 \times 2 = 70$$

$$\text{Child} = 6 \times 3 = 18$$

$$\text{total} = 222$$

$$\text{Average age} = \frac{222}{7}$$

$$= 31 \frac{7}{7}$$

$$= 31 \frac{5}{7} \text{ years}$$

3. A grocer has a sale of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230, RS 6562 for 5 consecutive months. How much sale must he have in 6th month so that he gets an average sale of Rs 6500?

$$\text{average} = 6500$$

$$6435 + 6927 + 6855 + 7230$$

$$+ 6562 + x = 6500$$

$$34100 + x = 39000$$

$$\begin{array}{r} 39000 \\ - 34100 \\ \hline 4900 \end{array}$$

$$x = 39000 - 34100$$

$$x = 4900$$

4. The average of 20 numbers is 0. Of them, at most how many may be greater than 0?

average of 20 num = 0  
19 number (+) and equal

20 no is negative

if 19 is number

$$\text{average} = \frac{19 \times 1 - 19}{20} = \frac{19 - 19}{20} = 0$$

so 19 nos > 0

5. The avg weight of 8 person's increases by 2.5 Kg when a new person comes in place of one of them weighing 65 kg. what might be weight of new person?

avg weight of 8 person's increased by 2.5 kg

$$\text{total weight of 8} = x$$

$$\text{Average} = \frac{x}{8}$$

$$\text{new weight} = \frac{x}{8} + 2.5$$

$$\text{weight after replacement} = x - 65 + \frac{\text{new person weight}}{8}$$

$$\text{Average} = \frac{x - 65 + \text{new person weight}}{8}$$

$$\frac{x}{8} + 2.5 = \frac{x - 65 + npw}{8}$$

$$x + 20 = x - 65 + npw$$

$$85 = npw$$

6. The captain of a cricket team of 11 members is 26 years and wicket keeper is 3 years older. if the ages of these two are excluded the average age of the remaining players is one year less than average age of whole team. average age of average age of team x team is:

$$\text{ca age} = 26$$

$$\text{Wk} = 26 + 3 = 29$$

$$\text{age of whole team} = 11x$$

Total age of remaining =  
 $11x - 26 - 29$

$$= 11x - 55$$

$$\text{average} = \frac{11x - 55}{9}$$

Given average =  $x - 1$

$$\frac{11x - 55}{9} = x - 1$$

$$11x - 55 = 9x - 9$$

$$2x = 46$$

$$(x = 23)$$

7. The average monthly income of P and Q is RS. 5050 the average monthly income of Q and R is RS. 6250 and the average monthly income of P and R is 5200. the monthly income of P is:

$$\text{Average P \& Q} = 5050$$

$$Q \text{ and } R = 6250$$

$$P \text{ and } R = 5200$$

$$\frac{P+Q}{2} = 5050 \Rightarrow P+Q = 10100$$

$$Q+R = 12500$$

$$P+R = 10400$$

$$(P+Q) + (P+R) - (Q+R) = 10100 + 10400 - 12500$$

$$2P = 20500 - 12500$$

$$2P = 8000$$

$$P = 4000$$

$$10100$$

$$10400$$

$$20500$$

$$12500$$

$$8000$$

8. The average of husband, wife and their child 3 years ago was 27 years and that of wife and child 5 years ago was 20 years. the present age of husband is:

Average of H, W, C is 27

3 years ago.

W and C 20 years - 5 years ago

$$\frac{(H-3) + (W-3) + (C-3)}{3} = 27$$

$$H + W + C - 9 = 81$$

$$H + W + C = 80$$

$$\Rightarrow \frac{(W-5) + (C-5)}{2} = 20$$

$$W + C - 10 = 40$$

$$W + C = 50$$

$$\Rightarrow H + W + C = 80$$

$$H + 50 = 80$$

$$H = 40 \text{ years.}$$

9. A car owner buys petrol at Rs. 7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What approximately is average cost per litre of petrol if he spends Rs 4000 each year?

for 1st year: cost: 7.50

$$\text{Spent} = 4000$$

$$\text{Total} = \frac{4000}{7.50} = \frac{533.33}{18} = 533.33 \text{ liters}$$

$$2^{\text{nd}} \text{ year: } \frac{4000}{8} = 500$$

$$3^{\text{rd}} \text{ year: } \frac{4000}{8.50} = 470.59$$

$$\text{Total liters} = 533.33 + 500 + 470.59$$

$$= 1504$$

$$\text{Average cost per litre} = \frac{12000}{1504} = 8$$

$$94) 750(7.9 \\ 658 \\ \hline 820$$

$$= 7.9$$

10.

$$65 < W < 72$$

$$60 < W < 70$$

$$W \geq 68$$

$$65 < W \leq 68$$

$$65, 66, 67, 68$$

$$\text{Average} = \frac{65 + 66 + 67 + 68}{4}$$

$$= \frac{266}{4} = 66.5 \text{ kg}$$

11. The average weight of A, B, C is 45 kg. If average weight of A and B be 40 kg and that of B and C be 43 kg then weight of B is:

$$\frac{A+B+C}{3} = 45 \quad \frac{A+B}{2} = 40 \quad \frac{B+C}{2} = 43$$

$$A+B+C = 135$$

$$A+86 = 135$$

$$A = 49$$

$$\Rightarrow A+B = 80 \Rightarrow$$

$$49+B = 80$$

$$B = 31 \text{ kg}$$

12. The average weight of 16 boys in a class is 50.25 kg and that of remaining 8 boys is 45.15 kg. Find average weights of all boys.

$$\text{Average of 16 boys} = 50.25 \text{ kg}$$

$$8 \text{ boys} = 45.15 \text{ kg}$$

$$\frac{x}{16} = 50.25, \frac{x}{8} = 45.15$$

$$\text{Weight of 16 boys} = 50.25 \times 16 \\ = 804$$

$$\text{Weight of 8 boys} = 45.15 \times 8 \\ = 361.2$$

$$\text{Total} = 804.0$$

$$361.2$$

$$1165.2$$

$$\text{Average weight} = \frac{1165.2}{24}$$

$$240) \overline{1165.2} (43 - 48.5 \text{ kg}$$

$\begin{array}{r} 960 \\ \hline 2052 \\ 1920 \end{array}$

13 A library has an average of 510 visitors on Sundays and 240 on other days. The average no. of visitors per day in a month of 30 days beginning with a Sunday is:

510 → Sundays

240 → other days.

$$\text{per month 5 Sundays} = 5 \times 510 = 2550$$

$$\text{other days} = 25 \times 240 = 6000$$

$$\text{Total} = 8550$$

$$\text{average} = \frac{\text{total visitors}}{\text{Days}}$$

$$= \frac{8550}{30}$$

$$= 285$$

### Simple Interest

1. A sum of money at simple interest amount to Rs. 815 in 3 years and to Rs 854 in 4 years. The sum is:

$$SI = \frac{P \times T \times R}{100}$$

$$SI \text{ for one year} = A \text{ after 4 years} - 3 \text{ years}$$

$$= 854 - 815$$

$$= 39$$

$$SI \text{ for 3 years} = A \text{ after 3 years} - \text{Principal}$$

$$= 815 - P$$

SI is same for every year

$$39 = \frac{815 - P}{3}$$

14. If the average marks of three batches of 55, 60 and 45 students respectively then, average marks of all the students is:

$$\text{for 1 batch} = 55 \times 50 = 2750$$

$$2^{\text{nd}} \text{ batch} = 60 \times 55 = 3300$$

$$45 \times 60 = 2700$$

$$\text{total marks} = 2750$$

$$3300$$

$$2700$$

$$\overline{18750}$$

$$\text{total students} = 160$$

$$\text{average} = \frac{8750}{160}$$

$$(16) \overline{875} (54)$$

$$\begin{array}{r} 80 \\ -75 \\ \hline 5 \end{array}$$

$$= 54.68$$

$$\overline{54.68}$$

$$117 = 815 - P$$

$$P = 815 - 117$$

$$\overline{815}$$

$$P = 698$$

$$\overline{117}$$

$$\overline{698}$$

2. Mr. Thomas invested an amount of Rs. 13,900 divided in two different schemes A and B at the SI rate of 14% p.a. and 11% p.a. if amount of SI earned in 2 years be Rs. 3508, what was amount invested in Scheme B?

Total Amount 13,900  
Interest = 3508

Invested amount be  $x$  (A)  
Interest rate for A = 14% p.a.

$$B = 11\% \text{ p.a.}$$

Interest earned from A in 2 years

$$\frac{x \times 2 \times 14}{100}$$

$$\text{from } B = \frac{(13900 - x) \times 2 \times 11}{100}$$

Total interest = from A + B

$$3508 = \frac{x \times 2 \times 14}{100} + \frac{(13900 - x) \times 2 \times 11}{100}$$

$$3508 = \frac{28x}{100} + \frac{(13900 - 22x)}{100}$$

$$350800 = 28x + 308000 - 22x$$

$$\frac{308000}{42800} = 6x$$

$$x = 7133.3$$

$$\begin{aligned} \text{for } B &= 13900 - x \\ &= 13900 - 7133.3 \\ &= 6766.6 \end{aligned}$$

3. A sum fetched a total SI of RS. 4016.25 at rate of 9% p.a. in 5 years. What is the sum?

$$SI = 4016.25$$

Rate of interest = 9% p.a.

$$T = 5 \text{ years}$$

Principal sum = ?

$$SI = \frac{PTR}{100}$$

$$\begin{aligned} P &= \frac{SI \times 100}{TR} = \frac{4016.25 \times 100}{5 \times 9} \\ &= \frac{4016.25 \times 20}{9} \\ &= 8925 \end{aligned}$$

4. How much time will it take for an amount of RS. 450 to yield 81 as interest at 4.5% per annum of SI?

$$A = 450$$

$$SI = 81 \quad R = 4.5 \quad T = ?$$

$$A = P + SI$$

$$450 = P + 81 \Rightarrow 369$$

$$T = \frac{SI \times 100}{P \times R}$$

$$T = \frac{81 \times 100^2}{369 \times 4.5} = \frac{18}{4.5} = \frac{180}{45} = 4 \text{ years}$$

5. Reena took a loan of RS 1200 with simple interest for as many years as rate of interest. She paid RS. 432 as interest at end of loan period, what was rate of interest?

$$P = 1200 \quad I = 432$$

$$R = T$$

$$I = \frac{PTR}{100}$$

$$432 = \frac{1200 \times R \times R}{100}$$

$$\frac{43200}{1200} = R \times R$$

$$36 = R^2$$

$$R = 6.1 \quad T = 6 \text{ years}$$

6. A sum of RS 12,500 amounts to RS. 15,500 in 4 years at rate of SI. What is R of interest?

$$P = 12,500 \quad A = 15,500$$

$$T = 4 \text{ years}$$

$$SI = A - P = 15,500 - 12,500 = 3000$$

$$R = \frac{SI \times 100}{P \times T} = \frac{3000 \times 100^2}{12,500 \times 4} = \frac{300000}{50000} = 6$$

$$= \frac{30 \times 25}{125} = \frac{750}{125} = 6\%$$

$$= 6\%$$

7. An automobile financier claims to be lending money at 5%, but he includes the interest every 6 months for calculating the principal. If he charging an interest of 10%, then effective rate of interest becomes.

$$P_1 = 725 \quad P_2 = 362.50 \\ T_1 = 12 \quad T_2 = 4 \text{ months}$$

Interest for 1st loan

$$\frac{725 \times R \times 12}{100}$$

$$\text{2nd loan} = \frac{362.5 \times R \times 4}{100}$$

$$\text{Total} = \frac{725 \times R \times 12}{100} + \frac{362.5 \times R \times 4}{100}$$

$$33.50 = \frac{725 \times 12R}{100} + \frac{362.5 \times 4R}{100}$$

$$33.50 = 8700R + 1450R$$

$$33.50 = 10150R$$

$$R = \frac{33.50}{10150} = 0.289$$

$$2.89\%.$$

8. A lent RS 5000 to B for 2 years and RS 3000 to C for 4 years on 5% at the same rate of interest received 2200 in all from both of them as interest. the rate of interest per annum is:

$$SI = 2200$$

$$SI \text{ from B} = \frac{5000 \times R \times 2}{100}$$

$$= 100R$$

$$SI \text{ from C} = \frac{3000 \times R \times 4}{100}$$

$$= 120R$$

$$\text{Total} = 220R$$

$$2200 = 220R$$

$$R = 10\%.$$

9. A sum of RS 725 is lent in the beginning of a year at certain rate of interest. After 8 months a sum of RS 362.50 more is lent but at the rate twice the former. At end of Year 33.50 is earned as interest from both loans. What was original rate of interest?

10. A man took loan from a bank at rate of 12.1% pa SI. After 3 years he had to pay 5400 interest only for a period. The principal amount borrowed by him was:

$$R = 12.1 \quad T = 3 \text{ years}$$

$$SI = 5400 \quad A = 2$$

$$SI = \frac{P \times T \times R}{100}$$

$$5400 = \frac{P \times 3 \times 12}{100}$$

$$\frac{15}{180000} \frac{5400}{3 \times 12} = P$$

$$P = 15000$$

11. A sum of money amounts to RS. 9800 after 5 years and RS. 12005 after 8 years at the same rate of SI. The rate of interest per annum is:

$$P = 9800 \text{ (after 5)} = 12005 \text{ (after 8)}$$

$$T = 8 \text{ years}$$

$$12005 = \frac{9800 \times 8 \times R}{100}$$

$$12005 = 98 \times 8 \times R$$

12005  
7.5%

SI for 2 years =  $12005 - 9800$

$\rightarrow 2205$

P = 9800

T = 3 years

$$SI = \frac{PTR}{100} \Rightarrow \frac{9800 \times 3 \times R}{100}$$
$$\frac{668.10}{2305 \times 100} = R$$
$$\frac{9800 \times 3}{75} = R$$

12. What will be the ratio of SI earned by certain amount at same R for 6 years and that for 9 years?

$$T_1 = 6 \text{ years } T_2 = 9$$

SI  $\propto$  T

$$S_1 : S_2 = T_1 : T_2$$

$$= 6 : 9$$

$$= 2 : 3$$

Compound interest  $CI = P \left[ 1 + \frac{R}{100} \right]^T - P$

$$CA = P \left[ 1 + \frac{R}{100} \right]^T$$

1. A bank offers 5.1% calculated on half-yearly basis. A customer deposits RS 1600 each on 1st Jan and 1st July of a year. At the end of the year, the amount he would have gained by way of interest is:

$$R = 5.1. = 2.5 \text{ (half-year)}$$

$$\text{Time} = 6 \text{ m} = 0.5 \text{ years}$$

$$P = 1600$$

$$I = PTR = 1600 \times 2.5 \times 0.5$$

2. The difference b/w simple and compound interests compounded annually on a certain sum of money for 2 years at 4% per annum is Re. 1; the sum is:

$$\begin{aligned} \text{SI for 2 years} &= \frac{P \times R \times T}{100} \\ &= P \times \frac{4 \times 2}{100} \\ &= 0.08P \end{aligned}$$

$$\begin{aligned} \text{CI for 2 years} &= P \left[ 1 + \frac{R}{100} \right]^2 - P \\ &= P (1 + 0.04)^2 - P \end{aligned}$$

$$\begin{aligned} &= P (1.04)^2 - P \\ &= 1.0816P - P \\ &= 0.0816P \end{aligned}$$

CI and SI Diff is 1

$$\begin{aligned} 0.0816P - 0.08P &= 1 \\ 0.0016P &= 1 \\ P &= \frac{1}{0.0016} \\ P &= 625 \end{aligned}$$

3. There is 60% increase in an amount in 6 years at SI. What will be the CI of Rs 12,000 after 3 years at same rate?

$$CI = P \left[ 1 + \frac{R}{100} \right] T - P$$

$$SI = 60\% \text{ of } P = 0.6P$$

$$SI = PTR/100 = P \times R \times \frac{6}{100}$$

$$0.6 = P \times R \times \frac{6}{100}$$

$$R = 0.6 \times 100 \times \frac{1}{6}$$

$$R = 10\%$$

$$CI = 12000 \left[ 1 + \frac{10}{100} \right]^3 - 12000$$

$$= 12000 (1.1)^3 - 12000$$

$$= 12000 \times 1.331 - 12000$$

$$= \frac{15972}{12000}$$

$$= 39.72$$

4. What is the difference b/w CI on 5000 for 1 year at 4% per annum compounded yearly

and half-yearly?

$$P = 5000 \quad T = 1 \text{ year} \quad R = 4\%$$

$$P = 5000 \quad T = 0.5 \text{ yr} \quad R = 2\%$$

$$CI = 5000 \left[ 1 + \frac{4}{100} \right]^1 - 5000$$

$$= 5000 (1 + 0.04) - 5000$$

$$= 5000 (1.04) - 5000$$

$$= 52000 - 5000 = 2000$$

$$= 200$$

$$CI \text{ for half year} = 5000 \left( 1 + \frac{2}{100} \right)^2 - 5000$$

$$= 5000 (1 + 0.02)^2 - 5000$$

$$= 5000 (1.02)^2 - 5000$$

$$= 5000 \times 1.0404 - 5000$$

$$= 202$$

difference 2

5. The CI on Rs 30,000 at 7% per annum is Rs 4347. The period (in years):

$$R = 7\% \quad CI = 4347$$

$$P = 30,000 \quad T = ?$$

$$CI = 30,000 \left[ 1 + \frac{7}{100} \right]^T - 30,000$$

$$4347 = 30,000 \left[ 1.07 \right]^T - 30,000$$

$$\frac{4347 + 30,000}{30,000} = (1.07)^T$$

$$1.1449 = (1.07)^T$$

$$\log(1.1449) = \log(1.07)^T$$

$$\log 2 = \log T$$

$$T = 2 \text{ years}$$

6. What will be the CI on a sum of Rs 25,000 after 3 years at rate of 12% p.c.p.a?

$$P = 25,000 \quad R = 12\% \quad T = 3$$

$$CI = 25,000 \left[ 1 + \frac{12}{100} \right]^3 - 25,000$$

$$= 25,000 (1.12)^3 - 25,000$$

$$= 25,000 \times 1.4049 - 25,000$$

$$= 35,123.2 - 25,000$$

$$= 10,123.2$$

7. At what rate of CI per annum will a sum of 12,000 becomes Rs. 1348.32 in 2 years?

$$A = 1200 \quad C_1 = 1348.32$$

$T = 2$  years

$$1348.32 = 1200 \left[ 1 + \frac{R}{100} \right]^2 - 1200$$

$$1348.32 - 1200 =$$

$$1.124803 = \left( 1 + \frac{R}{100} \right)^2$$

$$(1.124803)^{-1} = 1 + \frac{R}{100}$$

$$1.06 = 1 + \frac{R}{100} \Rightarrow 0.06 = \frac{R}{100}$$

$$R = 6.1\%$$

8. The least number of complete years in which a sum of money put out at  $20\% \text{ C.I.}$  will be more than doubled is:

$$\text{If } P = 10, A = 20$$

$$A = P \left( 1 + \frac{R}{100} \right)^T$$

$$20 = 10 \left( 1 + \frac{20}{100} \right)^T$$

$$2 = \left( 1 + 0.2 \right)^T$$

$$2 = (1.2)^T$$

$$\log(2) = T \log(1.2)$$

$$T = \frac{2}{1.2} = \frac{20}{12} = 1.666\ldots$$

$$\approx 3.8$$

9. Albert invested an amount of Rs. 8000 in a fixed deposit scheme for 2 years at  $C_1$  rate

5 p.c.a How much amount will Albert get on maturity of fixed deposit?

$$A = ? \quad R = 5\% \quad T = 2 \text{ years}$$

$$P = 8000$$

$$A = 8000 \left( 1 + \frac{5}{100} \right)^2$$

$$= 8000 \left[ 1 + 0.05 \right]^2$$

$$= 8000 (1.05)^2 \frac{1.05 \times 1.05}{100 \times 100}$$

$$= 8000 \times 1.1025 \frac{0.05 \times 0.05}{100 \times 100}$$

$$= 8820$$

10. The effective annual rate corresponding to nominal rate of  $6.1\%$  per annum payable  $\frac{1}{2}$  yearly is:

$$A = P \left( 1 + \frac{R}{n} \right)^n$$

$$= 100 \left( 1 + \frac{3}{100} \right)^2$$

$$= 100 (1.03)^2$$

$$= 100 \times 1.0609 \frac{1.03 \times 1.03}{100 \times 100}$$

$$= 106.09$$

$$\text{effective rate} = \frac{\text{Amou} - \text{princi}}{\text{princi}} \times 100$$

$$\frac{P * 100}{100}$$

$$= \frac{106.09 - 100}{100 * 100}$$

$$= \frac{06.09}{10000}$$

$$= \frac{6.09}{100}$$

$$= 6.09\%$$

## Profit and Loss

1.  $CP = 4700 + 800 = 5500$

$$SP = 5800$$

$$\text{Profit} = 5800 - 5500 = 300$$

$$\text{Gain \%} = \frac{300}{5500} \times 100$$

$$\frac{300}{5500} \times 100 = \frac{300}{275} \times 100 = 5.45\%$$

2.  $CP = 20 \quad SP = x$

$$\text{Profit} = 25\% \rightarrow 0.25$$

$$CP \text{ of } 20 = SP \text{ of } x$$

$$\text{Profit} = \frac{SP - CP}{CP} \times 100$$

$$25\% = \frac{SP - CP}{CP} \times 100$$

$$SP = 1.25 \text{ CP}$$

$$20CP = x \quad 1.25CP$$

$$20 = 1.25x$$

$$x = \frac{20}{1.25} = \frac{2000}{125} = 16$$

$$\frac{125}{125} \times 2000 = 16$$

3.  $CP = x, SP = y$

$$\text{Profit} = x - y$$

$$SP = 2y$$

$$\text{Profit} = 2y - x$$

Profit triple

$$3(y-x)$$

$$2y - x = 3y - 3x$$

$$2x = y$$

$$\text{Ori profit} = y - x = 2x - x = x$$

$$\text{Profit \%} = \frac{x}{x} \times 100 = 100\%$$

4. Let  $CP = 100$

$$\text{Profit} = 320\% \text{ of } CP$$

$$= 3.2 \times 100 = 320$$

$$SP = CP + \text{Profit} = 420$$

$$CP = 125\% \text{ of } CP = 1.25 \times 100 = 125$$

$$SP = 420$$

$$\text{Profit} = 420 - 125 = 295$$

$$\text{Profit \%} = \frac{295}{420} \times 100 = \frac{295}{294} \times 100$$

$$= 0.702 \times 100 = 70.23\%$$

5.  $CP = 6 \text{ toffees} = 1 \text{ rupee} \quad \text{gain} = 20\%$

$$SP = CP + \text{Profit}$$

$$= 1 + 20\% \text{ of } 1 \text{ rupee}$$

$$= 1 + 0.2$$

$$= 1.2 \text{ rupee}$$

$$CP = 1/6 \text{ rupee} \quad SP = 1.2 \text{ rupee}$$

$$SP \text{ per one} = \frac{1.2}{6} = 0.2$$

$$\text{Toffee} = \frac{1}{0.2} = 5$$

6.  $CP = x = 1600$

$$SP_1 = 1920 \quad SP_2 = 1280 \quad p = 25\%$$

$$\text{Profit \%} = \frac{1920 - x}{x} \times 100$$

$$\text{Loss \%} = \frac{x - 1280}{x} \times 100$$

$$P\% = L\%$$

$$\frac{1920 - x}{x} \times 100 = \frac{x - 1280}{x} \times 100$$

$$1920 + 1280 = 2x$$

$$\frac{3200}{2} = x$$

$$x = 1600$$

$$SP = CP + P \text{ of } CP$$

$$= 1600 + 0.25 CP$$

$$= 1600 + 0.25(1600)$$

$$= 1600 + 400$$

$$> 2000$$

$$7. CP = x$$

$$SP = 392$$

$$\text{Gain} \% = 22.5\%$$

$$P = SP - CP$$

$$SP = CP + P \text{ or } CP$$

$$392 = x + 0.225x$$

$$392 = 1.225x$$

$$x = \frac{392}{1.225}$$

$$x = 320$$

$$P = 392 - 320 = 72 \text{ RS}$$

$$8. CP = 1400, SP = 15\% \text{ of } CP$$

$$\text{LOSS} = 0.15 \times 1400 = 210$$

$$SP = CP - \text{LOSS}$$

$$= 1400 - 210 = 1190$$

$$9. \text{Dozens} = 20$$

$$\text{Rate} = 375$$

$$CP = 20 \times 375 = 7500$$

$$\text{Profit} = 4920 - 7500 = 420$$

$$\text{Profit \%} = \frac{420}{7500} \times 100 = \frac{70 \times 2}{375} = 1.83\%$$

$$\frac{75}{375} \frac{420(5.6)}{450} = 5.6\%$$

$$10. CP \text{ of 6 articles} = 5/6 = 0.83$$

$$SP \text{ of 5} = 6/5 = 1.2$$

$$\text{Gain} = SP - CP = 0.37$$

$$\% = \frac{0.37}{0.83} \times 100$$

$$= 44\%$$

$$11. CP = x$$

$$CP \text{ of 17 balls} = 17x$$

$$\text{Loss} = CP \text{ of 5} = 5x$$

$$SP = 720$$

$$CP - SP = \text{LOSS of 5 balls}$$

$$17x - 720 = 5x$$

$$12x = 720$$

$$x = 60$$

$$CP = 60$$

$$12. CP = x$$

$$SP = 0.15x$$

$$CP - SP = \text{LOSS}$$

$$x - 0.15x = 18,700$$

$$0.85x = 18,700$$

$$x = \frac{18,700}{0.85} = 22,000$$

$$x = 22,000 - 670$$

$$SP = 22,000 + 0.15(22,000)$$

$$= 25,130$$

$$13. CP \text{ for 100 oranges} = 350$$

$$SP \text{ for 100 oranges} = 484 \times \frac{16}{15}$$

$$= 400$$

$$\text{Profit} = 400 - 350 = 50$$

$$\% = \frac{50}{350} \times 100$$

$$= \frac{500}{35} = 14.29\% \text{ p.a.}$$