14. Chain Rule

★ Important facts & formulae.

$$\text{if} \quad a\uparrow \Rrightarrow b\uparrow$$
$$\rightarrow \text{directly proportional}$$

$$\text{if} \quad a\downarrow \Rrightarrow b\uparrow$$
$$\rightarrow \text{Indirect Proportion}$$

Remark : In solving questions by chain rule, we compare every item with the term to be found out.

Q.1) 15 toys $\rightarrow$ ₹234
35 toys $\rightarrow$ x

$$15x = 234 \times 35$$

$$x = \frac{234 \times 35}{15}$$

$$\begin{array}{r} 5 \\ 78 \\ \times\ 7 \\ \hline 546 \end{array}$$

$$\therefore x = ₹546$$

Q.2) 36 men $\rightarrow$ 25 hours
15 mens $\rightarrow$ x hours

$$15 \times x = 36 \times 25$$

$$\therefore x = \frac{36 \times 25}{15}$$

$$\boxed{\therefore x = 60 \text{ hours}}$$

Q.3)
$$6 \text{ men} \to 15 \text{ days} \to ₹2100$$
$$9 \text{ men} \to 12 \text{ days} \to ₹x$$

$$6 \times 15 \times x = 2100 \times 9 \times 12$$

$$\therefore x = \frac{\overset{420}{\cancel{2100}} \times 9 \times \overset{2}{\cancel{12}}^{\,6}}{\cancel{15} \times \cancel{6}}_{\,3}$$

$$\boxed{x = ₹2150}$$

$$\begin{array}{r} 420 \\ \times\ 6 \\ \hline 2520 \end{array}$$

Q.4)
$$20 \text{ men} \to 6 \text{ days} \to 56 \text{ metres}$$
$$35 \text{ men} \to 3 \text{ days} \to x \text{ metres}$$

$$20 \times 6 \times x = 56 \times 35 \times 3$$

$$\therefore x = \frac{\overset{28}{\cancel{56}} \times \overset{7}{\cancel{35}} \times \cancel{3}^{\,1}}{\underset{5}{\cancel{\underset{10}{20}}} \times \cancel{6}^{\,2} \cdot 1}$$

$$\boxed{x = 49 \text{ metres}}$$

Q.5)
$$15 \text{ men} \to 9 \text{ hours} \to 16 \text{ days}$$
$$18 \text{ men} \to 8 \text{ hours} \to x \text{ days}$$

$$18 \times 8 \times x = 15 \times 9 \times 16$$

$$\therefore x = \frac{15 \times 9 \times \cancel{16}^{\,2}}{18 \times \cancel{8}_{\,1}}$$

$$\therefore \boxed{x = 15 \text{ days}}$$

Q.6) 9 engines → 8 hours → 24 coal
8 engines → 13 hours → x coal

$$\overset{3}{\cancel{9}} \times 8 \times \frac{1}{3} \times x = 24 \times \overset{2}{\cancel{8}} \times 13 \times \frac{1}{4}$$

$$x = \frac{24 \times 2 \times 13}{\cancel{8} \times 3}$$

$$\boxed{x = 26 \text{ coal}}$$

Q.7)

117 men → 8 hours → 33 days → $\frac{4}{7}$

x men → 9 hours → 13 days = $\frac{3}{7}$

Less work Less men (Direct)
Less days more men (indirect)
more hours less men (indirect)

$$x \times 9 \times 13 \times \frac{\overset{3}{\cancel{4}}'}{\cancel{7}} = \frac{\overset{1}{\cancel{3}}}{\cancel{7}} \times 33 \times \overset{11}{\cancel{8}} \times \overset{2}{\cancel{117}}$$

$$x = \frac{11 \times 2 \times \cancel{117}^{9}}{\cancel{13}_{1}}$$

$$13 \times 9 = 117 \quad (2)$$

$$= 22 \times 9$$

$$x = 198 \checkmark$$

$$198 - 117 \to 81$$

Q.8) 3300 men → 25 days → 850

    x men → 17 days → 825

Less days more men (Indirect)
less ration, more men (Indirect)

$$x \times 17 \times 825 = 850 \times 25 \times 3300$$

3
17
$\times$ 5
8 5

850

$$\therefore \quad x = \frac{850 \times 25 \times 3300}{17 \times 825}$$

$$x = 5000 \text{ strength of mens.}$$

Final ans → 5000 - 3300
           → 1700 //

$\begin{array}{r} 5|000 \\ -3300 \\ \hline 700 \end{array}$