

Exercise 4.12

Q.1

Let the time taken by B be x Time taken by A = $x - 10$

Time taken by team work = 12 days

ATQ,

$$\frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$$

$$\frac{x-10+x}{x^2-10x} = \frac{1}{12}$$

$$12(2x-10) = x^2-10x$$

$$24x - 120 = x^2 - 10x$$

$$x^2 - 10x - 24x + 120 = 0$$

$$x^2 - 34x + 120 = 0$$

$$x^2 - 4x - 30x + 120 = 0$$

$$x(x-4) - 30(x-4) = 0$$

$$(x-4)(x-30) = 0$$

$$x-4=0$$

$$\boxed{x=4}$$

(Neglected)

$$x-30=0$$

$$\boxed{x=30}$$

 $\therefore$ Time taken by B = $\boxed{30 \text{ days}}$

Q.4

Let the time taken by faster pipe be x .Time taken by slower pipe = $x+5$ Time taken to fill tank by both pipes together = $11 \frac{1}{9}$ mins

$$= \frac{100}{9} \text{ mins}$$

ATQ,

$$\frac{1}{x} + \frac{1}{x+5} = \frac{9}{100}$$

$$\frac{x+5+x}{x^2+5x} = \frac{9}{100}$$

$$100(2x+5) = 9(x^2+5x)$$

$$200x + 500 = 9x^2 + 45x$$

$$9x^2 + 45x - 200x - 500 = 0$$

$$9x^2 - 155x - 500 = 0$$

$$9x^2 - 180x + 25x - 500 = 0$$

$$9x(x-20) + 25(x-20) = 0$$

$$(x-20)(9x+25) = 0$$

$$x-20=0$$

$$\boxed{x=20}$$

$$9x+25=0$$

$$\boxed{x = \frac{-25}{9}}$$

(Neglected)

$\therefore$ Time taken by faster pipe = $\boxed{20 \text{ mins}}$

Time taken by slower pipe = $20 + 5 = \boxed{25 \text{ mins}}$

3-5 Let the larger pipe fill the tank in x hrs & the smaller pipe fill the tank in y hrs.

ATQ,

$$\frac{4}{x} + \frac{9}{y} = \frac{1}{2} \quad \text{--- (1)}$$

also given

$$y = 10 + x \quad \text{--- (2)}$$

Putting value of y in (1)

$$\frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$$

$$4x + 40 + 9x = 1$$

$$x^2 + 10x = 2$$

$$2(13x + 40) = x^2 + 10x$$

$$26x + 80 = x^2 + 10x$$

$$x^2 + 10x - 26x - 80 = 0$$

$$x^2 - 16x - 80 = 0$$

$$x^2 - 20x + 4x - 80 = 0$$

$$x(x - 20) + 4(x - 20) = 0$$

$$(x - 20)(x + 4) = 0$$

$$x - 20 = 0$$

$$\boxed{x = 20}$$

$$x + 4 = 0$$

$$\boxed{x = -4}$$

(Neglected)

Putting value of x in ②

$$y = 10 + x$$

$$y = 10 + 20$$

$$\boxed{y = 30}$$

∴ Larger ~~top~~ pipe can fill the tank in 20 hrs
and the smaller pipe can fill in 30 hrs.

Q. 6 Let the time taken by larger tap be x & the time taken by smaller tap be y .

Time taken to fill tank together = $\frac{1}{\frac{1}{x} + \frac{1}{y}} = \frac{15}{8}$ hrs

ATQ,

CASE I

$$x = y - 2$$

$$y = x + 2 \quad \text{--- (1)}$$

CASE II

$$\frac{1}{x} + \frac{1}{y} = \frac{8}{15}$$

Putting value of y

$$\frac{1}{x} + \frac{1}{x+2} = \frac{8}{15}$$

$$\frac{2+2+x}{x^2+2x} = \frac{8}{15}$$

$$15(2x+2) = 8(x^2+2x)$$

$$30x + 30 = 8x^2 + 16x$$

$$8x^2 + 16x - 30x - 30 = 0$$

$$8x^2 - 14x - 30 = 0$$

$$4x^2 - 7x - 15 = 0$$

$$4x^2 - 12x + 5x - 15 = 0$$

$$4x(x-3) + 5(x-3) = 0$$

$$(x-3)(4x+5) = 0$$

$$x - 3 = 0$$

$$\boxed{x = 3}$$

$$4x + 5 = 0$$

$$\boxed{x = -\frac{5}{4}}$$

(Neglected)

Putting value of x in (1)

$$y = x + 2$$

$$y = 3 + 2$$

$$\boxed{y = 5}$$

∴ The larger tap takes 3 hrs and the smaller tap takes 5 hrs.