

## Exercise 8.12

**1. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, find the time taken by B to finish the work.**

**Solution:**

Let's consider that B takes  $x$  days to complete the piece of work.

So, B's 1 day work =  $1/x$

Now, A takes 10 days less than that of B to finish the same piece of work so, that is  $(x - 10)$  days

$\Rightarrow$  A's 1 day work =  $1/(x - 10)$

Same work both working together for 12 days, then

(A and B)'s 1 day's work =  $1/12$

From the question, it's understood that

$$\text{A's 1 day work} + \text{B's 1 day work} = \frac{1}{x - 10} + \frac{1}{x}$$

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

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

$$\Rightarrow 12(2x - 10) = x(x - 10)$$

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

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

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

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

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

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

$$\text{Now, either } x - 30 = 0 \Rightarrow x = 30$$

$$\text{Or, } x - 4 = 0 \Rightarrow x = 4$$

It's clear that the value of  $x$  cannot be less than 10, so the value of  $x = 30$  is chosen.

Therefore, the time taken by B to finish the piece of work is 30 days.

**2. If two pipes function simultaneously, a reservoir will be filled in 12 hours. One pipe fills the reservoir 10 hours faster than the other. How many hours will the second pipe take to fill the reservoir?**

**Solution:**

Let's consider that the faster pipe takes  $x$  hours to fill the reservoir.

Then, the portion of reservoir filled by faster pipe in one hour =  $1/x$

Given that, the slower pipe takes 10 hours more than that of faster pipe to fill the reservoir that is  $(x + 10)$  hours

Portion of reservoir filled by slower pipe =  $1/(x + 10)$

Now, it's given that if both the pipes function simultaneously, the same reservoir can be filled in

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12 hours

Thus, we know that the portion of the reservoir filled by both pipes in one hour =  $1/12$

Now,

Portion of reservoir filled by slower pipe in one hour + Portion of reservoir filled by faster pipe in one hour =  $1/x + 1/(x + 10)$

So, the portion of reservoir filled by both pipes =  $1/12$ , hence

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

$$\Rightarrow 12(2x + 10) = x(x + 10)$$

$$\Rightarrow x^2 - 14x - 120 = 0$$

$$\Rightarrow x^2 - 20x + 6x - 120 = 0$$

$$\Rightarrow x(x - 20) + 6(x - 20) = 0$$

$$\Rightarrow (x - 20)(x + 6) = 0$$

$$\text{Now, either } x - 20 = 0 \quad \Rightarrow x = 20$$

$$\text{Or, } x + 6 = 0 \quad \Rightarrow x = -6 \text{ (can be neglected)}$$

Since the value of time cannot be negative.

Thus, the value of  $x$  is taken as 20 hours.

Therefore the time taken by the slower pipe to fill the reservoir =  $x + 10 = 30$  hours.



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