Work completion by A and B

We are given:

- A can do the work in 45 days → A's 1 day work = $\frac{1}{45}$
- B can do the work in 40 days → B's 1 day work = $\frac{1}{40}$
- They work together for some days (let it be x days)
- A leaves, and B finishes the remaining work in 23 days.

We are to find: **How many days did A work**, i.e., find x

Step-by-step solution:

1. **Work done by B in the last 23 days:**

$$\text{Work done by B} = 23 \times \frac{1}{40} = \frac{23}{40}$$

2. **Remaining work before B worked alone = Total work - Work done by B**

$$\text{Work done together} = 1 - \frac{23}{40} = \frac{17}{40}$$

3. **Work done by A and B together in x days =** $x\left(\frac{1}{45} + \frac{1}{40}\right)$

$$\frac{1}{45} + \frac{1}{40} = \frac{8+9}{360} = \frac{17}{360}$$

4. So,

$$x \cdot \frac{17}{360} = \frac{17}{40}$$

5. Cancel $\frac{17}{17}$ on both sides:

$$\frac{x}{360} = \frac{1}{40} \Rightarrow x = \frac{360}{40} = 9$$

✅ Final Answer: A left after 9 days.

We are given:

- 4 men **or** 6 boys can finish a piece of work in 20 days.

We are to find:
In how many days can 6 men and 11 boys finish it together?

Step-by-step solution:

Step 1: Find total work

If 4 men can do it in 20 days,
Total work = $4 \text{ men} \times 20 \text{ days} = 80 \text{ man-days}$

Also,
If 6 boys can do it in 20 days,
Total work = $6 \text{ boys} \times 20 \text{ days} = 120 \text{ boy-days}$

So we get the **equivalence**:
4 men = 6 boys
→ 1 man = $\frac{6}{4} = \frac{3}{2}$ boys
→ 1 boy = $\frac{2}{3}$ man

Step 2: Convert all to one unit (say men)

Given:
We have 6 men and 11 boys.

Convert 11 boys to equivalent men:

$$11 \text{ boys} = 11 \times \frac{2}{3} = \frac{22}{3} \text{ men}$$

Total effective men =

$$6 + \frac{22}{3} = \frac{18 + 22}{3} = \frac{40}{3} \text{ men}$$

Step 3: Total work = 80 man-days (from earlier)

So time taken =

$$\frac{\text{Total Work}}{\text{Total Men}} = \frac{80}{\frac{40}{3}} = 80 \times \frac{3}{40} = 6 \text{ days}$$

✅ Final Answer: 6 days.

We are given:

- A can do the work in **12 hours** → A's 1 hour work = $\frac{1}{12}$
- B can do the work in **15 hours** → B's 1 hour work = $\frac{1}{15}$

We are to find:
Time taken if A and B work together

Step-by-step solution:

Combined 1 hour work:

$$\frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60} = \frac{3}{20}$$

So together they do $\frac{3}{20}$ of the work in 1 hour.

Total time to complete the work:

$$\text{Time} = \frac{1}{\frac{3}{20}} = \frac{20}{3} = 6\frac{2}{3} \text{ hours}$$

✅ Final Answer: 6 hours 40 minutes.

We are given:

- A and B together can do the work in **12 days** → Combined 1 day work = $\frac{1}{12}$
- B alone can do it in **30 days** → B's 1 day work = $\frac{1}{30}$

We are to find:
Time A alone will take

Step-by-step solution:

Let A's 1 day work be $\frac{1}{x}$.

So,

$$\frac{1}{x} + \frac{1}{30} = \frac{1}{12}$$

Subtract $\frac{1}{30}$ from both sides:

$$\frac{1}{x} = \frac{1}{12} - \frac{1}{30}$$

Take LCM of 12 and 30 → LCM = 60

$$\frac{1}{x} = \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$$

✅ Final Answer: A alone can do the work in 20 days.

We are given:

- A & B → 18 days → Work/day = $\frac{1}{18}$
- B & C → 24 days → Work/day = $\frac{1}{24}$
- C & A → 36 days → Work/day = $\frac{1}{36}$

We are to find:

1. A + B + C's time

2. A's time alone

Step-by-step solution:

Let:

- A's 1-day work = a
- B's 1-day work = b
- C's 1-day work = c

From the given:

- $a + b = \frac{1}{18}$ — (1)
- $b + c = \frac{1}{24}$ — (2)
- $c + a = \frac{1}{36}$ — (3)

Step 1: Add equations (1), (2), (3):

$$(a + b) + (b + c) + (c + a) = \frac{1}{18} + \frac{1}{24} + \frac{1}{36}$$

LHS:

$$2a + 2b + 2c = 2(a + b + c)$$

RHS LCM of 18, 24, and 36 = 72

$$\frac{1}{18} + \frac{1}{24} + \frac{1}{36} = \frac{4 + 3 + 2}{72} = \frac{9}{72} = \frac{1}{8}$$

So,

$$2(a + b + c) = \frac{1}{8} \Rightarrow a + b + c = \frac{1}{16}$$

✅ A + B + C can complete the work in 16 days

Step 2: Find A's 1-day work:

We know:

- $a + b = \frac{1}{18}$
- $a + b + c = \frac{1}{16}$

So subtract:

$$c = \frac{1}{16} - \frac{1}{18} = \frac{9 - 8}{144} = \frac{1}{144}$$

Now use equation (3): $c + a = \frac{1}{36}$

$$\frac{1}{144} + a = \frac{1}{36} \Rightarrow a = \frac{1}{36} - \frac{1}{144} = \frac{4-1}{144} = \frac{3}{144} = \frac{1}{48}$$

✅ A alone can do the work in 48 days.

✅ Final Answers:

- **A + B + C → 16 days**
- **A alone → 48 days**