Work and Time

1. A can work 5 times faster than B and takes 60 days less than B to complete the work. In how many days does A and B individually can complete the work?

   a) A = 20 days; B = 100 days
   b) A = 20 days; B = 80 days
   c) A = 15 days; B = 75 days
   d) A = 10 days; B = 50 days

   Solution -

   > **Speed of Work / Efficiency** $\propto \dfrac{1}{\text{Time needed}}$
   >
   > So more the efficiency, less time is needed to do the task.

   Hence, if A is 5 times faster than B, then B needs 5 times more time than A.
   Let A need 'n' days to complete the work.
   So B will need 5n days.
   Also, 5n – n = 60 ⟶ Given
   ∴ **n = 15 days = Days needed by A to complete work individually**
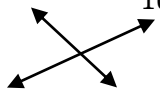   **Days needed by B to complete work individually = 5n = 5 x 15 = 75 days**

2. If 24 men can finish a work in 10 days, then find the number of days required to complete the same work by 30 men?
   a) 8 days
   b) 6 days
   c) 3 days
   d) 7.5 days

   Solution -
   24 men complete work in 10 days.
   ∴ In 1 day work done by 24 men $= \dfrac{1}{10}$

   In 1 day work done by 30 men = **?**

$$\therefore ? \text{ x } 24 = \frac{1}{10} \text{ x } 30$$

$$\therefore ? = \frac{1}{8} = \text{Amount of work done by 30 men in one day}$$

> **Tip:**
>
> If A completes work in 'n' days, in 1 day he completes $\frac{1}{n}$ amount of work.
>
> Conversely, if A completes $\frac{1}{n}$ amount of work in 1 day, he completes entire work in 'n' days.

Thus in this case,
30 men complete entire work in 8 days.

3. 35 men can make 70 toys in 8 days by working 8 hours a day. How many days will 56 men need to make 84 toys by working 12 hours every day?

a) 6 days
b) 4 days
c) 2 days
d) 3 days

Solution -

> **Tip:**
> Men = M; Days = D; Time/Hours = T; Work = W
>
> $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
>
> **Note that -** W_2 is on left side and W_1 is on right side

M1 = 35; D1 = 8; T1 = 8 hours; W1 = 70 toys
M2 = 56; D2 = ? ; T2 = 12 hours; W2 = 84 toys

$$\therefore 35 \text{ x } 8 \text{ x } 8 \text{ x } 84 = 56 \text{ x } ? \text{ x } 12 \text{ x } 70$$

$$\therefore ? = 4 \text{ days} = \text{Number of days needed.}$$

4. A can do a work in 3 days. B can do the same work in 6 days and C can do the same work in 7 days. If they work together, in how many days will they take to complete the work?

a) $\frac{11}{10}$ Days

b) $\frac{15}{16}$ Days

c) $\frac{14}{9}$ Days

d) $\frac{16}{7}$ Days

<u>Solution</u> -

A can do the work in 3 days. So in 1 day A does $\frac{1}{3}$ amount of work

B can do the work in 6 days. So in 1 day B does $\frac{1}{6}$ amount of work

C can do the work in 7 days. So in 1 day C does $\frac{1}{7}$ amount of work

When they work together, in 1 day they complete how much work?

In one day - A, B and C together complete $= \frac{1}{3} + \frac{1}{6} + \frac{1}{7} = \frac{9}{14}$ **amount of work**

> **Tip:**
> If A completes $\frac{1}{n}$ amount of work in 1 day, he completes entire work in 'n' days.

A, B and C together complete the entire work in $\frac{14}{9}$ days.

5. P and Q together can do a work in 18 days. P alone can do the same work in 27 days. In how many days can Q alone do the same work?

a) 54 days
b) 36 days
c) 45 days
d) 9 days

<u>Solution</u> -

P can do the work in 27 days. So in 1 day P does $\frac{1}{27}$ amount of work

Let Q do the work in N days. So in 1 day Q does $\frac{1}{N}$ amount of work

P and Q together do the work in 18 days.

So in one day they complete $= \frac{1}{18}$ amount of work

Also, in one day together they complete = 1 day work of P + 1 day work of P

$$\therefore \frac{1}{18} = \frac{1}{27} + \frac{1}{N}$$

$$\therefore N = 54 \text{ days}$$

6. P and Q can do a work in 12 days. Q and R can do the same work in 16 days, and R and P can do it in 24 days. Find the time in which P, Q and R can finish the work together.

a) $9\frac{3}{4}$ days

b) 10 days

c) $11\frac{1}{4}$ days

d) $10\frac{2}{3}$ days

<u>Solution</u> -

P + Q can do the work in 12 days. So in 1 day they do $\frac{1}{12}$ amount of work

Q + R can do the work in 16 days. So in 1 day they do $\frac{1}{16}$ amount of work

R + P can do the work in 24 days. So in 1 day they do $\frac{1}{24}$ amount of work

Adding these, $(P+Q)+(Q+R)+(R+P) = \frac{1}{12} + \frac{1}{16} + \frac{1}{24} = \frac{3}{16}$

$\therefore 2(P+Q+R) = \frac{3}{16}$

$P+Q+R = \frac{\frac{3}{16}}{2} = \frac{3}{32}$ = Work done in 1 day by P, Q and R together

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Tip:

If A completes $\frac{1}{n}$ amount of work in 1 day, he completes entire work in 'n' days.

P, Q and R together complete the entire work in $\frac{32}{3}$ days. $= 10\frac{2}{3}$ days

7. If 12 men or 16 women can do a work in 172 days, how long will 21 men and 15 women to do the same work?

   a) 64 days
   b) 60 days
   c) 86 days
   d) 75 days

   <u>Solution</u> -

   12 men = 16 women

   $\therefore$ 1 man $= \frac{4}{3}$ women

   21men + 15 women $= 21$ x $\frac{4}{3}$ women + 15 women = 43 women

   In such cases, where no work is mentioned, take work done = 1

   > **Tip:**
   > Men = M; Days = D; Time/Hours = T; Work = W
   >
   > $M_1D_1T_1W_2 = M_2D_2T_2W_1$
   >
   > **Note that -** W_2 is on left side and W_1 is on right side

   $\therefore$ 16 women x 172 days x 1 = 43 women x **? days** x 1

   $\therefore$ **? = 64 = Number of days taken by 21 men & 15 women to complete the work**

8. P can do a work in 30 days. Q is 25% more efficient than P in completing the same work. In how many days will Q complete the work?

   a) 37.5 days
   b) 22.5 days
   c) 20 days

d) 24 days

<u>Solution</u> -

Q is 25% more expert than P

$$25\% = \frac{25}{100} = 0.25$$

This means, if P is 1, then Q is (1+0.25) = 1.25

P takes 30 days to do the work.

Q will take $= \dfrac{30}{1.25} = 24$ days to get the work done

9. If 3 men can do a work in 2 days and 4 boys can do the same work in 6 days, then in how many days will the same work be completed by 8 men and 8 boys?

a) 2 days
b) $\dfrac{3}{5}$ **Days**
c) 1.5 Days
d) $\dfrac{3}{4}$ Days

<u>Solution</u> -

In 1 day 3 men do $\dfrac{1}{2}$ amount of work ; So, in 1 day, 1 man does $\dfrac{\frac{1}{2}}{3} = \dfrac{1}{6}$ work

In 1 day, 8 men do $\dfrac{1}{6}$ x 8 $= \dfrac{4}{3}$ amount of work

In 1 day 4 boys do $\dfrac{1}{6}$ amount of work; So, in 1 day, 1 boy does $\dfrac{\frac{1}{6}}{4} = \dfrac{1}{24}$ work

In 1 day, 8 boys do $\dfrac{1}{24}$ x 8 $= \dfrac{1}{3}$ amount of work

In 1 day, 8 men and 8 boys do $\dfrac{4}{3} + \dfrac{1}{3} = \dfrac{5}{3}$ amount of work

$\therefore$ 8 men and 8 boys together complete the entire work in $\frac{3}{5}$ days.
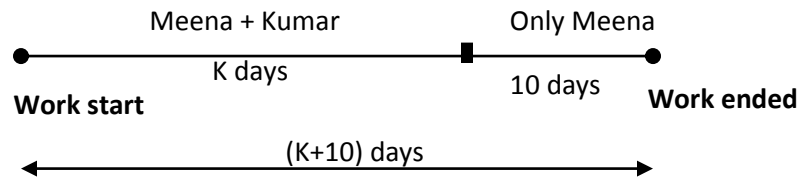
10. Meena can do a piece of work in 20 days. Kumar can do it in 30 days. They start working together on the work but 10 days before the completion of the work, Kumar leaves. In how many days does the total work get completed?

a) 20 days
b) 12 days
c) 6 days
d) 16 days

Solution -

Tip:
Understanding and solving such problems is very easy by drawing a line.

In 1 day, Meena does $\frac{1}{20}$ work; And in 1 day, Kumar does $\frac{1}{30}$ work

As seen above, **Meena works alone for 10 days**.

In 10 days Meena completes $\frac{1}{20}$ x 10 $= \frac{1}{2}$ work

Remaining work $= 1 - \frac{1}{2}$ $= \frac{1}{2}$ = Done by Meena and Kumar both together.

Total Work done = Total days x Work done by all in 1 day

Let Meena and Kumar work together for total K days.

$\therefore \frac{1}{2} = K \text{ x } (\frac{1}{20} + \frac{1}{30})$

$\therefore$ **K = 6 days = Days when Meena and Kumar worked together**

Entire work is completed in (6 days + 10 days) = 16 days.
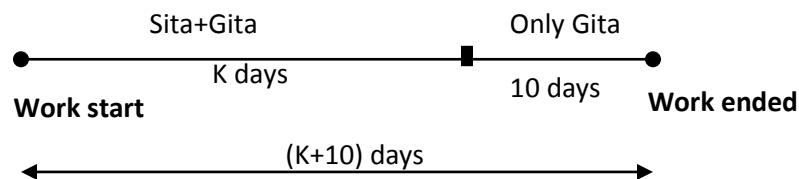
11. Sita and Gita can do a work in 20 days and 25 days, respectively. Both begin together but after a few days, Sita leaves. Then Gita finishes the remaining work in 10 days. After how many days did Sita leave?

a) $6\frac{2}{3}$ Days

b) 5 Days

c) $8\frac{1}{5}$ Days

d) $10\frac{2}{5}$ Days

<u>Solution</u> -

> **Tip:**
> Understanding and solving such problems is very easy by drawing a line.

In 1 day Sita does $\frac{1}{20}$ work; And in 1 day Gita does $\frac{1}{25}$ work

As seen above, **Gita works alone for 10 days**.

In 10 days Gita completes $\frac{1}{25}$ x 10 $= \frac{2}{5}$ work

Remaining work $= 1 - \frac{2}{5} = \frac{3}{5} =$ **Done by Sita and Gita together**

Total Work done = Total days x Work done by all in 1 day

Let Sita and Gita work together for total K days.

$\therefore \frac{3}{5} = K \times (\frac{1}{20} + \frac{1}{25})$

$\therefore K = \frac{20}{3} = 6\frac{2}{3}$ days $=$ **Days when Sita and Gita worked together**

Thus Sita leaves after $6\frac{2}{3}$ days.

12. When P alone does a work, he takes 25 days more than the time taken by P and Q working together to complete the work. But Q alone takes 9 days more than the time taken by P and Q working together to complete the work. In what time, P and Q together finish this work?

a) 18 days
b) 20 days
c) 25 days
d) 15 days

<u>Solution</u> -

Let P and Q together finish the work in 'N' days.

So, P when working alone takes 16 days more to complete the entire work.

And, Q when working alone takes 9 days more to complete the entire work.

Tip:
In such cases, use the following trick -
$$N = \sqrt{\textbf{Extra days of P x Extra days of Q}}$$

$\therefore N = \sqrt{25 \text{ x } 9} = 15 \text{ days} = \text{Number of days in which P and Q together finish the work}$

Work and Wages

1. Ramesh can do a work in 5 days. Suresh can do the same work in 7 days. The total amount given for this work to them is Rs. 480. If both are working together, then what will be the share of Suresh?

a) Rs. 180
b) Rs. 300
c) Rs. 280
d) Rs. 200

<u>Solution</u> -

Tip:

$$\text{Share of Income} \propto \frac{1}{\textbf{Number of days OR Time taken}}$$

$\therefore$ If ratio of time taken is a : b or $\frac{a}{b}$, then share of income is b : a or $\frac{b}{a}$

Ramesh can do a work in 5 days and Suresh in 7 days.

Ratio of days of Ramesh to Suresh = 5:7

So their **share of income will be** →Ramesh's Income: Suresh's income = 7:5

∴ **Suresh's income** $= \dfrac{5}{5+7}$x 480 **= Rs. 200**

2. P, Q and R get Rs.1105 for doing a job together. While working alone, P, Q and R need 7days, 8 days and 11 days respectively to complete the job. Then what would be the share of each?
   a) P = Rs. 440; Q = Rs. 385; R = Rs. 280
   b) P = Rs. 500; Q = Rs. 400; R = Rs. 205
   c) P = Rs. 445; Q = Rs. 375; R = Rs. 285
   d) P = Rs. 446; Q = Rs. 381; R = Rs. 278

Solution -

P takes 7 days; Q takes 8 days and R takes 11 days to complete the job

Ratio of days taken is **P:Q:R = 7:8:11**

> **Tip:**
>
> **If ratio of time taken is a:b : c , then share of income is in ratio**
> **bc : ac : ca**
>
> **Easy way to remember –**
> Share of 'a' will only have 'bc' and not 'a'
> Share of 'b' will only have 'ac' and not 'b'
> Share of 'c' will only have 'ab' and not 'c'

Hence, Ratio of income share is

Income of P : Income of Q : Income of R = 8 x 11 : 7 x 11 : 7 x 8 = 88:77 : 56

Share of P $= \dfrac{88}{88+77+56}$ x Total Amount $=\dfrac{88}{221}$ x 1105 **= Rs. 440**

$$\text{Share of Q} = \frac{77}{221} \times 1105 = \textbf{Rs. 385}$$

$$\text{Share of R} = \frac{56}{221} \times 1105 = \textbf{Rs. 280}$$

3. Wages of 44 women for 56 days comes to Rs.29568. How many men are needed for 47days to receive Rs. 16920, if the daily wages of a man being 5 times those of a woman?

a) 9 men
b) 8 men
c) 6 men
d) 5 men

<u>Solution</u> -

$$\text{1 day wage of 44 women} = \frac{\text{Rs.29568}}{\text{56 days}}$$

$$\textbf{1 day wage of 1 woman} = \frac{29568}{\text{56 days x 44 women}} = \textbf{Rs. 12}$$

1 day wage of 1 man = 5 x 12 = Rs. 60
Using above concept,

$$\text{1 day wage of 1 man} = \frac{\text{Rs.16920}}{\text{47 days x Number of Men}} = \text{Rs. 60}$$

$$\therefore \textbf{Number of men} = \frac{\textbf{16920}}{\textbf{47x 60}} = \textbf{6 men}$$

4. Ramesh can do a work in 15 days. Vijay and Ramesh together do the same work in 10days. They received Rs. 1155 for that work. What is share of Ramesh and Vijay?
a) Ramesh = Rs. 770; Vijay = Rs. 385
b) Ramesh = Rs. 605; Vijay = Rs. 550
c) Ramesh = Rs. 550; Vijay = Rs. 605
d) Ramesh = Rs. 385; Vijay = Rs. 770

<u>Solution</u> -

$$\text{Ramesh's 1 day work} = \frac{1}{15}$$

$$\text{(Ramesh + Vijay)'s 1 day work} = \frac{1}{10} = \text{1 day work of Ramesh + 1 day work of Vijay}$$

$$\therefore \text{1 day work of Vijay} = \frac{1}{10} - \frac{1}{15} = \frac{1}{30}$$

Ratio of 1 day work of Ramesh and Vijay is given by **Ramesh : Vijay** $= \frac{1}{15} : \frac{1}{30} = \textbf{2:1}$

If you work more you get proportionately more money

$\therefore$ Share of Ramesh : Share of Vijay $= 2 : 1$

Share of Ramesh $= \frac{2}{2+1}$ x Total Amount $= \frac{2}{3}$ x 1155 $= \textbf{Rs. 770}$

Share of Vijay $= \frac{1}{3}$ x 1155 $= \textbf{Rs. 385}$

5. P, Q and R take a job for Rs. 640. P and Q together finish 2/5thof the work and rest is done by R alone. What is the share of R?

a) Rs. 256
b) Rs. 420
c) Rs. 340
d) Rs. 384

Solution -

P and Q finish 2/5th of the work so remaining work $= 1 - \frac{2}{5} = \frac{3}{5}$

C does 3/5th of the work so **share of C in income** $= \frac{3}{5}$x 640 $= \textbf{Rs. 384}$

6. A and B took a job for Rs. 7200. A alone can do it in 12 days. B alone can do it in 16 days. They completed the work in 6 days with the help of C. Find the share of C.

a) Rs. 1200
b) Rs. 900
c) Rs. 800
d) Rs. 600

Solution -

$$\text{1 day work of A} = \frac{1}{12} \qquad ; \qquad \text{1 day work of B} = \frac{1}{16}$$

1 day work of A+B+C $= \dfrac{1}{6}$ = 1 day work of A + 1 day work of B + 1 day work of C

∴ 1 day work of C $= \dfrac{1}{6} - (\dfrac{1}{12} + \dfrac{1}{16}) = \dfrac{1}{48}$

Ratio of 1 day work of A, B and C $= \dfrac{1}{12} : \dfrac{1}{16} : \dfrac{1}{48} = $ **4:3:1** $\longrightarrow$ Multiplied by 48

If you work more you get proportionately more money

∴ Share of income of A, B and C is also in ratio 4:3:1 respectively.

Share of C $= \dfrac{1}{4+3+1}$ x Total Amount $= \dfrac{1}{8}$ x 7200 = **Rs. 900**

7. P can do a job in 30 days, while Q alone can do it in 45 days. They work together for 15 days and rest of the job is done by R in 6 days. They get Rs.15000 for the whole job. What will be R's share?

a) Rs. 5000
b) Rs. 2500
c) Rs. 7500
d) Rs. 1500

<u>Solution</u> -

Total work of P = 1day work of P x 15 days $= \dfrac{1}{30}$x 15 $= \dfrac{1}{2}$

Total work of Q $= \dfrac{1}{45}$x 15 $= \dfrac{1}{3}$

∴ Total work done by P and Q $= \dfrac{1}{2} + \dfrac{1}{3} = \dfrac{5}{6}$

Remaining work = 1-$\dfrac{5}{6} = \dfrac{1}{6}$= **This is done by R**

Share of R = Total work done by R x Total Amount $= \dfrac{1}{6}$ x 15000 = **Rs. 2500**

8. A man and a boy received Rs. 1800 as wages for 3 days for a job they did together. The man's efficiency in the work was 5 times that of the boy. What is the daily wages of the boy?

a) Rs. 100
b) Rs. 500
c) Rs. 300
d) Rs. 900

<u>Solution</u> -

Wages for 1 day for both $= \dfrac{\text{Rs.1800}}{3} = $ Rs. 600

Man is 5 times more efficient than boy, so he does 5 times more work than the boy.

If you work more you get proportionately more money

So man gets 5 times more money than boy.

∴ **Ratio of wages of 1 day of man to wages of 1 day of boy is 5:1**

Daily wage of boy $= \dfrac{1}{5+1}$ x Wages for 1 day for both $= \dfrac{1}{6}$ x 600 = **Rs. 100**

9. Parthiv was appointed for a 100 days job. The condition was that he will be paid Rs. 24 for every working day. But he will also be fined Rs.12 for every day he is absent. At the end he got Rs.420. For how many days, he was absent?

a) 45 Days
b) 55Days
c) 75 Days
d) 64 Days

<u>Solution</u> -

Let Parthiv be absent for K days.

So, he worked for (100-K) days and got Rs. 420

He was fined for K days hence, his fine = Rs. 12 x K = 12K

∴ 420 = (100-K) x Rs. 24 – 12K

∴420 = 2400 – 24K – 12K

∴ **K = 55 = Parthiv was absent for these many days**

10. Total wages of 6 men, 4 women and 8 boys is Rs. 26. If the wages of 6 men is equal to that of 8 women and the wages of 4 women is equal to that of 6 boys, then find out the total wages of 8 men, 6 women and 4 boys?

a) Rs. 32
b) Rs. 24
c) Rs. 25
d) Rs. 29

<u>Solution</u> -

Let Daily wages of →Men=M; Women=W and Boys=B

6M=8W and 4W=6B $\longrightarrow$ **1**

Also, 6M+4W+8B = Rs. 26

∴8W+4W+8 $\left(\frac{4W}{6}\right)$ = Rs.26 $\longrightarrow$ Substituting values of M and B from **1**

∴W = Rs. 1.5 = Daily wages of 1 woman

∴M = $\left(\frac{8W}{6}\right)$ = Rs. 2 = Daily wages of 1 man

Also, B = $\left(\frac{4W}{6}\right)$ = Rs. 1= Daily wages of 1 boy

Wage of 8 men, 6 women, 4 boys = (8 x 2) + (6 x 1.5) + (4 x 1) = Rs. 29

11. P, Q and R get Rs. 10800 for doing a work in 18 days. P and R get Rs. 3760 for doing the same work in 10 days, while Q and R get Rs. 6080 for doing the same work in 20 days. Find the amount received by R per day?

a) Rs. 95
b) Rs. 126
c) Rs. 80
d) Rs. 200

<u>Solution</u> -

1day wage of P and R = P+ R = $\dfrac{Rs.3760}{10}$ = Rs. 376

1 day wage of Q and R $= Q + R = \dfrac{\text{Rs.}6080}{20} = $ Rs. 304

1 day wage of P, Q and R $= P + Q + R = \dfrac{\text{Rs.}10800}{18} = $ Rs. 600

$\therefore P + 304 = 600$ ⟶ Put value of Q+R

$\therefore$ P = Rs. 296

$\therefore$ **R = 376-P = 376-296 = Rs. 80 = Amount received by R per day**

Chain Rule / Unitary Method

1. 20 fishermen can catch 20 fish in 20 minutes. As per this, how many fish can 400 fishermen catch in 6 hours 40 minutes?

   a) 8000
   b) 4000
   c) 20
   d) 2000

   <u>Solution</u> -

   > **Tip:**
   > Men = M; Days = D; Time/Hours = T; Work = W
   >
   > $$M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$$
   >
   > **Note that -** W_2 is on left side and W_1 is on right side

   6 hours 40 minutes = 400 minutes

   $\therefore$ 20 fishermen x 20 minutes x ? = 400 fishermen x 400 minutes x 20 fish

   $\therefore$ **? = 8000 fish = Are caught by 400 fishermen in 400 minutes**

2. 40 boys working 9 hours per day paint a house in 96 days. How many hours per day 48 boys need to work so they can paint the house in 45 days?

a) 24
b) 16
c) 18
d) 27

<u>Solution</u> -

> **Tip:**
> Men = M; Days = D; Time/Hours = T; Work = W
>
> $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
>
> **Note that -** W_2 is on left side and W_1 is on right side

Take work done = 1
∴ 40 boys x 96 days x 9 hours x 1 = 48 boys x 45 days x **? hours** x 1
∴ **? = 16 hours = 48 boys need to work these many hours per day**

3. 2500 children in a school had enough chocolates for 40 days. But some children never came to school and the chocolates lasted for 50 days. How many children never came to school?
   a) 700
   b) 1000
   c) 400
   d) 500

<u>Solution</u> -

> **Tip:**
> Men = M; Days = D; Time/Hours = T; Work = W
>
> $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
>
> **Note that -** W_2 is on left side and W_1 is on right side

Take work done = 1
Let number of children who never came = C.
So **children who came = 2500-C**
∴ 2500 children x 40 days x 1 = (2500-C) children x 50 days x 1
∴ **C = 500 = Children who never came to school**

4. In a palace, supplies are available for 35 days for only 75 people. 15 Guests arrive in the palace for vacation on day 1 itself. For how many days will these supplies be sufficient for all these people?
a) 90 days
b) 11.25 days
c) 42 days
d) 22.5 days

Solution -

Total people after guests come = 75+15 = 90
75 people : 35 days

90 people : **? days**
∴ **? = 42 days= Supplies will last for these many days**

5. 4 women and 4 children start working together. How many days will they need to paint a house completely, if 3 women alone can paint the house in 18 days and 6 children too alone can do the same in 18 days?
a) 6 days
b) 4.5 days
c) 27 days
d) 9 days

Solution -

> **Tip:**
> Men = M; Days = D; Time/Hours = T; Work = W
>
> $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
>
> **Note that -** W_2 is on left side and W_1 is on right side

To complete work in 18 days we need either 3 men or 6 boys.
∴ **1 man = 2 boys**
Take work done = 1
∴ 3 men x 18 days x 1 = (4 men + 4 boys) x **? days** x 1

> **Remember - Convert either all men to boys or all boys to men.**

∴ 6 boys x 18 days x 1 = (8 boys + 4 boys) x **? days** x 1
∴ **? = 9 days= they will need these many days**

6. Ramesh and Suresh start cleaning a pool together. They do it in 26 days but for the last 6 days only Ramesh was working. When Suresh works alone, in how much time will he completely clean the pool, if Ramesh and Suresh together can clean the pool in 24 days?

a) 36 days
b) 72 days
c) 52 days
d) 13 days

Solution -

Let work done by **Ramesh in 1 day** $= \dfrac{1}{R}$ & by **Suresh in 1 day** $= \dfrac{1}{S}$

Both complete work in 24 days. So **in 1 day, together** they complete $= \dfrac{1}{24} = \dfrac{1}{R} + \dfrac{1}{S}$

For **20 days** both work together, so **work done by them** $= 20 \left(\dfrac{1}{R} + \dfrac{1}{S} \right) = \dfrac{5}{6}$

Remaining work $(1 - \dfrac{5}{6} = \dfrac{1}{6})$ is done by Ramesh alone in 6 days

Work done by Ramesh in 6 days $= \dfrac{1}{6} = 6 \left(\dfrac{1}{R} \right)$

∴ **R = 36 = days needed by Ramesh to complete the work alone**

∴ $\dfrac{1}{36} + \dfrac{1}{S} = \dfrac{1}{24}$

∴ **S = 72 = days needed by Suresh to complete the work alone**

7. Posters stuck by a child is equal to the half the posters stuck by an adult. 20 adults and 16 children can stick all posters in 10 days. When 8 adults and 12 children start working together, in what time will they stick all the posters?
a) 20 days
b) 24 days
c) 40 days
d) 25 days

Solution -

Tip:
Men = M; Days = D; Time/Hours = T; Work = W

$$M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$$

Note that - W_2 is on left side and W_1 is on right side

1 child sticks half the posters stuck by 1 adult
∴ **1 adult = 2 children**
Take work done = 1
∴ (20 adults + 16 children) x 10 days x 1 = (8 adults + 12 children) x **? days** x 1

> **Remember -** Convert either all adults to children or all children to adults.

∴ 56 children x 10 days x 1 = 28 children x **? days** x 1
∴ **? = 20 days = they will need these many days**

8. 12 pumps of one type pump 30 litres of water when each is running for 18 hours per day. But a set of 16 pumps of other type pump 40 litres of water when each is running for 24 hours per day. How efficient are former type of pumps than latter type?

a) $\dfrac{4}{3}$ **times more efficient**

b) $\dfrac{7}{15}$ **times more efficient**

c) $\dfrac{3}{4}$ **times more efficient**

d) $\dfrac{7}{12}$ **times more efficient**

Solution -

> **Tip:**
> Men = M; Days = D; Time/Hours = T; Work = W
>
> $$M_1 D_1 T_1 W_2 = M_2 D_2 T_2 W_1$$
>
> **Note that -** W_2 is on left side and W_1 is on right side

Let the former type be E times efficient.
So, **1 former type pump = E x latter type pumps**
So 1F = E x L

$\therefore$ 12F x 18 hours x 40 litres = 16L x 24 hours x 30 litres

$\therefore$ (12 x E x L) x 18 x 40 = 16 L x 24 x 30 $\longrightarrow$ Put value of F i.e. 1F

$\therefore$ E = $\dfrac{4}{3}$ = these many times more efficient

9. 75 girls complete one-third decoration of a building in 40 hours. Now they have only 50 hours to complete the rest of the decoration. How many more girls are necessary to help them complete the task?

a) **45 girls**

b) 150 girls

c) 100 girls

d) 55 girls

<u>Solution</u> -

> **Tip:**
> Men = M; Days = D; Time/Hours = T; Work = W
>
> $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
>
> **Note that -** W_2 is on left side and W_1 is on right side

Remaining work = $1 - \dfrac{1}{3} = \dfrac{2}{3}$

Let number of more girls needed be G

Thus (75+G) girls complete $\dfrac{2}{3}$ work in 50 hours.

$\therefore$ 75 girls x 40 hours x $\dfrac{2}{3}$ = (75+G) x 50 hours x $\dfrac{1}{3}$

$\therefore$ G = 45 = these many more girls are needed

10. A tank has oxygen for 72 patients and can last for 54 hours for them. If patients reduce their oxygen consumption by 10%, then 90 patients can use this oxygen supply for how many hours?

a) 24 hours

b) **48 hours**

c) 36 hours

d) 42 hours

<u>Solution</u> -

Let each patient breathe P amount of oxygen every hour.
So 72 patients breathe 72P oxygen in one hour

With 10% reduction each patient will breathe $\dfrac{90P}{100}$ amount each hour

So 90 patients breathe $90\dfrac{90P}{100}$ amount in one hour

Total oxygen is constant

$\therefore 72P \times 54 = 90 \times \dfrac{90P}{100} \times H$

$\therefore H = 48 \text{ hours} = \text{Number of hours 90 patients can use the oxygen}$