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

   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

   6 hours 40 minutes = 400 minutes
   ∴ 20 fishermen x 20 minutes x ? = 400 fishermen x 400 minutes x 20 fish
   ∴ ? = **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

   Solution -

   > **Tip:**
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   > $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
   >
   > **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

   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

   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** $= \frac{1}{R}$ & by **Suresh in 1 day** $= \frac{1}{S}$

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

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

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

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

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

$\therefore \frac{1}{36} + \frac{1}{S} = \frac{1}{24}$

∴ 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:**
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>
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>
> **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) $\frac{4}{3}$ times more efficient
b) $\frac{7}{15}$ times more efficient
c) $\frac{3}{4}$ times more efficient
d) $\frac{7}{12}$ times more efficient

Solution -

> **Tip:**
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>
> $$M_1D_1T_1W_2 = M_2D_2T_2W_1$$
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Let the former type be E times efficient.
So, **1 former type pump = E x latter type pumps**
So 1F = E x L
∴ 12F x 18 hours x 40 litres = 16L x 24 hours x 30 litres
∴ (12 x E x L) x 18 x 40 = 16 L x 24 x 30 ⟶ **Put value of F i.e. 1F**
∴ E = $\frac{4}{3}$ = 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

Solution -

> **Tip:**
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>
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>
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Remaining work = $1-\frac{1}{3} = \frac{2}{3}$

Let number of more girls needed be G

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

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

∴ 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

Solution -

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 $\frac{90P}{100}$ amount each hour

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

Total oxygen is constant

∴ 72P x 54 = 90 x $\frac{90P}{100}$ x H

∴ H = 48 hours = Number of hours 90 patients can use the oxygen