CHAPTER 7

Unitary Method, Time & Work, Pipes & Cisterns

7.1 Unitary method, time & work

(i) **If 'A' can do a piece of work in n days, then at a uniform rate of working 'A' will finish $\left(\frac{1}{n}\right)^{th}$ work in one day.**

(ii) **If $\frac{1}{n}$ of a work is done by 'A' in one day, then 'A' will take n days to complete the full work.**

(iii) **If 'A' does $\left(\frac{1}{n}\right)^{th}$ of a work in one hour then to complete the full work, 'A' will take n hrs.**

(iv) **If 'A' does three times faster work than 'B', then ratio of work done by A and B is 3 : 1 and ratio of time taken by A and B is 1 : 3.**

(v) **A, B and C can do a piece of work in T_1, T_2 and T_3 days, respectively. If they have worked for D_1, D_2 and D_3 days, respectively, then**

Amount of work done by A = $\frac{D_1}{T_1}$

Amount of work done by B = $\frac{D_2}{T_2}$

and, Amount of work done by C = $\frac{D_3}{T_3}$

Also, the amount of work done by A, B and C together

$$= \frac{D_1}{T_1} + \frac{D_2}{T_2} + \frac{D_3}{T_3}.$$

which will be equal to 1, if the work is complete.

7.2

If A can do a piece of work in X days and B can do the same work in Y days, then both of them working together will do the same work in $\frac{XY}{X+Y}$ days.

NUMERICAL CHALLENGE 7.1

A can finish a piece of work by working alone in 6 days and B, while working alone, can finish the same work in 12 days. If both of them work together, then in how many days, the work will be finished ?

Solution

Here X = 6 and Y = 12.

∴ Working together, A and B will complete the work in

$= \frac{XY}{X+Y}$ days $= \frac{6\times12}{6+12}$ days, i.e., 4 days.

7.3

If A, B, and C, while working alone, can complete a work in X, Y and Z days, respectively, then they will together complete the work in $\frac{XYZ}{XY+YZ+ZX}$ days.

NUMERICAL CHALLENGE 7.2

A, B anc C can complete a piece of work in 10, 15 and 18 days, respectively. In how many days would all of them complete the same work working together?

Solution

Here X = 10, Y = 15 and Z = 18.

Therefore, the work will be completed in

$$= \frac{XYZ}{XY+YZ+ZX} \text{ days}$$

$$= \frac{10\times15\times18}{10\times15+15\times18+18\times10} \text{ days}$$

i.e., $\frac{2700}{600}$ or, $4\frac{1}{2}$ days,

7.4

Two persons A and B, working together, can complete a piece of work in X days. If A, working alone, can complete the work in Y days, then B, working alone, will complete the work in $\frac{XY}{Y-X}$ days.

NUMERICAL CHALLENGE 7.3

A and B working together take 15 days to complete a piece of work. If A alone can do this work in 20 days, how long would B take to complete the same work?

Solution

Here X = 15 and Y = 20.

Therefore B alone will complete the work in $\frac{XY}{Y-X}$ days = $\frac{15\times20}{20-15}$ = 60 days.

7.5

If A and B, working together, can finish a piece of work in X days, B and C in Y days, C and A in Z days, then

(i) A, B and C working together, will finish the job in $\left(\frac{2XYZ}{XY+YZ+ZX}\right)$ days.

(ii) A alone will finish the job in $\left(\frac{2XYZ}{XY+YZ-ZX}\right)$ days.

(iii) B alone will finish the job in $\left(\frac{2XYZ}{YZ+ZX-XY}\right)$ days.

NUMERICAL CHALLENGE 7.4

A and B can do a piece of work in 12 days. B and C in 15 days, C and A in 20 days. How long would each take separately to do the same work?

Solution

Here X = 12, Y = 15 and Z = 20.

$\therefore$ A alone can do the work in = $\frac{2XYZ}{XY + YZ - ZX}$

$= \frac{2 \times 12 \times 15 \times 20}{12 \times 15 + 15 \times 20 - 20 \times 12}$ days

or $\frac{7200}{240}$, i.e., 30 days.

B alone can do the work in

$= \frac{2XYZ}{YZ + ZX - XY}$ days

$= \frac{2 \times 12 \times 15 \times 20}{15 \times 20 + 20 \times 12 - 12 \times 15}$ days

or $\frac{7200}{360}$, i.e., 20 days.

C alone can do the work in

$= \frac{2XYZ}{ZX + XY - YZ}$ days

$= \frac{2 \times 12 \times 15 \times 20}{20 \times 12 + 12 \times 15 - 15 \times 20}$ days

or $\frac{7200}{120}$, i.e., 60 days.

7.6

(i) If A can finish a work in X days and B is k times efficient than A, then the time taken by both A and B working together to complete the work is $\frac{x}{1+k}$.

(ii) If A and B working together can finish a work in X days and B is k times efficient than A, then the time taken by

(a) A, working alone, to complete the work is (k + 1) X.

(b) B, working alone, to complete the work is $\left(\frac{k+1}{k}\right)$X.

NUMERICAL CHALLENGE 7.5

1. Harbans Lal can do a piece of work in 24 days. If Bansi Lal works twice as fast as Harbans Lal, how long would they take to finish the work working together?

Solution

Here X = 24 and k = 2.

∴ Time taken by harbans Lal and Bansi Lal, working together to complete the work

$= \left(\frac{X}{1+k}\right)$ days.

$= \left(\frac{24}{1+2}\right)$ days, i.e., 8 days.

2. A and B together can do a piece of work in 3 days. If A does thrice as much work as B in given time, find how long A along would take to do the work?

Solution

Here X = 3 and x = 3.

∴ Time taken by A, working alone, to complete the work

$= \left(\frac{k+1}{k}\right)X = \left(\frac{3+1}{3}\right)3 = 4$ days.

7.7

If A working alone takes a days more than A and B together. B working alone takes b days more than A and B together, then the number of days taken by A and B, working together, to finish a job is given by $\sqrt{ab}$.

NUMERICAL CHALLENGE 7.6

A alone would take 8 hrs more to complete the job than if both A and B worked together. If B worked alone, he took $4\frac{1}{2}$ hrs more to complete the job than A and B worked together. What time would they take if both A and B worked together ?

Solution

Here a = 8 and b = $\frac{9}{2}$.

∴ Time taken by A and B, working together, to complete the job.

$= \sqrt{ab}$ days

$= \sqrt{8 \times \frac{9}{2}}$ or 6 days.

7.8

If A is k times more efficient than B and is therefore able to finish a work in ℓ days than B, then

(i) A and B, working together, can finish the work in $\frac{k\ell}{k^2-1}$ days.

(ii) A, working alone, can finish the work in $\frac{\ell}{k-1}$ days.

(iii) B, working alone, can finish the work in $\frac{k\ell}{k-1}$ days.

NUMERICAL CHALLENGE 7.7

A is thrice as good a workman as B and takes 10 days less to do a piece of work than B takes. Find the time in which B alone can complete the work.

Solution

Here k = 3 and ℓ = 10.

$\therefore$ Time taken by B, working alone, to complete the work

$= \frac{k\ell}{k-1}$ days

$= \frac{3\times 10}{3-1}$ days

i.e., 15 days.

7.9

If A can complete $\frac{a}{b}$ part of work in X days, then $\frac{c}{d}$ part of the work will be done in $\frac{b\times c\times X}{a\times d}$ days.

NUMERICAL CHALLENGE 7.8

A can do three-fourth of a work in 12 days. In how many days can he finish one-eighth of the work?

Solution

Here a = 3, b = 4, X = 12, c = 1 and d = 8.

Therefore, number of days required to finish one-eighth of the work

$= \frac{b\times c\times X}{a\times d} = \frac{4\times 1\times 12}{3\times 8}$ = 2 days.

7.10

(i) There are two groups of people with same efficiency. In one M_1 persons can do W_1 works in D_1 time and in the other M_2 persons can do W_2 works in D_2 time. The relationship between the two groups is given by

$$\mathbf{M_1D_1W_2 = M_2D_2W_1}$$

(ii) There are two groups of people with same efficiency. In one M_1 persons can do W_1 works in D_1 time working t_1 hrs a day and M_2 persons can do W_2 works D_2 time working t_2 hrs a day. The relationship between the two groups is given by

$$\mathbf{M_1D_1t_1W_2 = M_2D_2t_2W_1.}$$

NUMERICAL CHALLENGE 7.9

1. If 10 pesons can complete two-fifths of work in 8 days, then find the number of persons required to complete the remaining work in 12 days.

Solution

We have $M_1 = 10, W_2 = \frac{2}{5}, D_1 = 8$

$M_2 = ?, W_2 = \frac{3}{5}, D_2 = 12.$

$\therefore \quad M_1D_1W_2 = M_2D_2W_1$

$\Rightarrow \quad 10 \times 8 \times \frac{23}{5} = M_2 \times 12 \times \frac{2}{5}$

$\Rightarrow \quad M_2 = 10.$

2. If 10 persons can cut 20 trees in 3 days working 12 hrs a day. Then, in how many days can 24 persons cut 32 trees working 4 hrs a day?

Solution

We have, $M_1 = 10.\ W_1\ 20,\ D_1 = 3,\ t_1 = 12$

$M_2 = 24,\ W_2 = 32,\ D_2 = ?,\ t_2 = 4$

$\therefore \quad M_1D_1t_1W_2 = M_2D_2t_2W_1$

$\Rightarrow \quad 10 \times 3 \times 12 \times 32 = 24 \times D_2 \times 4 \times 20$

$\Rightarrow \quad D_2 = 6$ days.

7.11

If a men and b women can do a piece of work in n days, then c men and d women can do the work in $\left(\frac{nab}{bc+ad}\right)$ days.

NUMERICAL CHALLENGE 7.10

12 men or 15 women can do a work in 14 days. In how many days, 7 men and 5 women would complete the work?

Solution

Here a = 12, b = 15, n = 14, c = 7 and d = 5.

Required number of days = $\frac{nab}{bc+ad} = \left(\frac{14\times12\times15}{15\times7+12\times5}\right)$ days

$= \frac{168}{11}$ days or $15\frac{3}{11}$ days.

7.12 Pipes and cisterns

1. If an inlet can completely fill the empty tank in X hrs, the part of the tank filled in 1 hr = $\frac{1}{X}$.

2. If an outlet can empty the full tank in Y hrs, the part of the tank emptied in 1 hr = $\frac{1}{Y}$.

3. If both inlet and outlet are open, net part of the tank filled in 1 hr = $\frac{1}{X} - \frac{1}{Y}$.

NUMERICAL CHALLENGE 7.11

1. A pipe can fill a tank in 5 hrs. Find the part of tank filled in one hour.

Solution

The part of the tank filled in 1 hr = $\frac{1}{5}$.

2. A pipe can fill a tank in 28 mins. Find the time in which $\frac{1}{7}$ part of the tank will be filled.

Solution

We have, $\frac{1}{28}$ part of the tank is filled in 1 min.

$\therefore \frac{1}{7}$ part of the tank is filled in $\frac{28}{7}$ mins

= 4 mins.

3. A pipe can empty a cistern in 40 mins. Find the time in which $\frac{3}{4}$ part of the cistern will be emptied.

Solution

We have, $\frac{1}{40}$ part of the cistern is emptied in = 1 min.

$\therefore$ $\frac{3}{4}$ part of the cistern is emptied in

$= 40 \times \frac{3}{4} = 30$ mins.

4. A pipe can empty a cistern in 12 hrs. Find the part of the cistern emptied in 4 hrs.

Solution

We have, part of the cistern emptied in 1 hr = $\frac{1}{12}$,

$\therefore$ part of the cistern emptied in 4 hrs = $\frac{1}{12} \times 4 = \frac{1}{3}$.

5. A tap can fill a cistern is 8 hrs and another can empty it in 16 hrs. If both the taps are opened simultaneously, find the time (in hrs) to fill the cistern.

Solution

Here X = 8 and Y = 16.

$\therefore$ Part of the cistern filled in 1 hr

$$= \frac{1}{X} - \frac{1}{Y}$$

$$= \frac{1}{8} - \frac{1}{16} = \frac{1}{16}$$

Total time taken to fill the cistern = 16 hrs.

7.13

Two pipes A and B can fill (or empty) a cistern in X and Y hrs, respectively. while working alone. If both the pipes are opened together, the the time taken to fill (or empty) the cistern is given by

$\left(\frac{XY}{X+Y}\right)$ **hrs.**

NUMERICAL CHALLENGE 7.12

Two pipes A and B can fill a cistern in 20 and 30 mins, respectively. If both the pipes are opened simultaneously, how long will it take to fill the cistern?

Solution

Here X = 20 and Y = 30.

$\therefore$ Part of the cistern filled by (A + B) in 1 min

$$= \frac{1}{X} + \frac{1}{Y} = \frac{1}{20} + \frac{1}{30} = \frac{5}{60} = \frac{1}{12}.$$

$\therefore$ Both the pipes A and B together will fill the cistern in 12 mins.

7.14

Three pipes A , B and C can fill a cistern in X, Y and Z hrs, respectively, while working alone. If all the three pipes are opened together, the time taken to fill the cistern is given by

$$\left(\frac{XYZ}{XY+YZ+ZX}\right)\textbf{hrs.}$$

NUMERICAL CHALLENGE 7.13

Two pipes A and B can separately fill a cistern is 8 hrs and 12 hrs, respectively, while a third pipe C can empty it in 6 hrs, respectively, in what time will the cistern be full, if all the pipes are opened together?

Solution

There X = 8, Y = 12 and Z = – 6.

$\therefore$ The cistern will be full in

$$= \left(\frac{8\times 12\times -6}{8\times 12-12\times 6-6\times 8}\right)\text{hrs}$$

$$= \left(\frac{576}{24}\right)\text{hrs or 24 hrs.}$$

7.15

Two pipes A and B can fill a cistern in X hrs and Y hrs, respectively. There is also and outlet C. If all the three pipes are opened together, the tank is full in Z hrs. The time taken by C to empty full tank is given by

$$\left(\frac{XYZ}{XZ+YZ-XY}\right)\textbf{ hrs.}$$

NUMERICAL CHALLENGE 7.14

Two taps A and B can fill a cistern in 30 mins and 60 mins, respectively. There is third exhaust tap C at the bottom of the tank. If all taps are opened at the same time, the cistern will be full in 45 mins. In what time can exhaust tap C empty the cistern when full?

Solution

Here X = 30, Y = 60 and Z = 45.

Exhaust tap C can empty the cistern in

$$= \left(\frac{XYZ}{XZ+YZ-XY}\right)\text{mins}$$

$$= \left(\frac{30\times 60\times 45}{30\times 45\times 60\times 45-30\times 60}\right)\text{ mins}$$

= 36 mins.

7.16

A tank takes X hrs to be filled by a pipe. But due to a leak, it is filled in Y hrs. The amount of time in which the leak can empty the full tank.

$$= \left(\frac{XY}{Y-X}\right) \text{hrs.}$$

NUMERICAL CHALLENGE 7.15

A pipe can fill a tank in 12 hrs. Due to leakage in the bottom, it is filled in 24 hrs. If the tank is full, how much time will the leak take to empty it?

Solution

Here X = 12 and Y = 24.

The time taken by the leak to empty the full tank

$$= \left(\frac{XY}{Y-X}\right) \text{hrs} = \left(\frac{12\times 24}{24-12}\right) \text{hrs or 24 hrs.}$$

7.17

A cistern has a leak which can empty it in X hrs. A pipe which admits Y litres of water per hour into the cistern is turned on and now the cistern is emptied in Z hrs. The capacity of the cistern is

$$\left(\frac{XYZ}{Z-X}\right) \text{litres.}$$

NUMERICAL CHALLENGE 7.16

A leak in the bottom of a tank can empty the full tank in 6 hrs. An inlet pipe fills water at the rate of 4 litres per minute. When the tank is full, the inlet is opened and due to leak, the tank is empty in 8 hrs. Find the capacity of the tank.

Solution

Here X = 6, Y = 4 × 60 = 240 and Z = 8.

∴ The capacity of the tank is

$$= \left(\frac{XYZ}{Z-X}\right) \text{ litres} = \left(\frac{6\times 240\times 8}{8-6}\right) \text{litres}$$

= 5760 litres.

7.18

One pipe A fill k times faster than other pipe B.

(i) If B can fill a cistern in x hrs, then the time in which the cistern will be full, if both the fill pipes are opened together, is $\left(\frac{x}{k+1}\right)$ hrs.

(ii) If A can fill a cistern in y hrs, then the time in which the cistern will be full, if both the fill pipes are opened together, is $\left(\frac{k}{k+1}\right)$ y hrs.

NUMERICAL CHALLENGE 7.17

1. One fill pipe A is 10 times faster than second fill pipe B. If B can fill a cistern in 55 mins, then find the time when the cistern will be full if both fill pipes are opened together.

Solution

Here k = 10 and x = 55.

$\therefore$ Cistern will be full in

$= \left(\frac{x}{k+1}\right)$ mins

$= \left(\frac{55}{10+1}\right)$ mins or 5 mins.

2. One fill pipe A is 4 times faster than second fill pipe B. If A can fill a cistern in 15 mins, then find the time when the cistern will be full if both fill pipes are opened together.

Solution

Here k = 4 and y = 15.

$\therefore$ Cistern will be full in

$= \left(\frac{k}{k+1}\right)y$ mins $= \left(\frac{4}{4+1}\right)15$ mins

= 12 mins.

7.19

If one fill pipe A is k times faster and takes x mins less time than the other fill pipe B, then

(i) The time taken to fill a cisten, if both the pipes are opened together is $\left(\frac{kx}{(x-1)^2}\right)$ mins.

(ii) A will fill the cistern in $\left(\frac{x}{k-1}\right)$ mins.

(iii) B will fill the cistern in $\left(\frac{kx}{k-1}\right)$ mins.

NUMERICAL CHALLENGE 7.18

One fill pipe A is 5 times faster than second fill pipe B and takes 32 mins less than fill pipe B. When will the cistern be full if both fill pipes are opened together?

Solution

Here k = 5 and x = 32.

$\therefore$ Cistern will be full in

$= \frac{kx}{(k-1)^2}$ mins $= \frac{5\times 32}{(5-1)^2}$ mins

= 10 mins

1. A is twice as efficient as B, and finish the task 20 days earlier than B. Find number of days required of finish the task by A.

(1) 20 days (2) 40 days

(2) 10 days (3) 30 days

Sol. Let A can complete the work in x days, then B requires 2x days to finish the same work. According to given condition A finish the task 20 days earlier than B i.e. $2x - x = x = 20$ days.

So, A can finish the task in 20 days and B can finish the same task in 40 days.

2. A is three times as efficient as B and finish the task 32 days ahead of B. Find the number of days required to finish the task if both are working simultaneously.

(1) 11 days (2) 12 days

(2) 13 days (3) 14 days

Sol. Let A requires x days then

B requires 3x days

$3x - x = 2x \Rightarrow 32$

$x = 16$ days

$x = 16$

$3x = 48$ days

Together they can finish

$$\frac{1}{16}+\frac{1}{48}=\frac{4}{48} \text{ part} = \frac{1}{12}\text{part}$$

Thus 12 days are required by them to finish the task.

3. Vinod can do 25% of a piece of work in 5 days. How many days will he take to complete the work ten times?

(1) 150 days (2) 250 days

(3) 200 days (4) 180 days

Sol. 25% part or $\frac{1}{4}$ part in 5 days

then 1 part in $\frac{5}{1/4} = 20$ days

days required to complete ten times work

$= 20 \times 10 = 200$ days

4. 6 men can do piece of work in 12 days. How many men are needed to do the work in 18 days?

(1) 3 men (2) 6 men

(3) 4 men (4) 2 men

Sol. Here Man $\times$ Day $= 6 \times 12 = 72$

$m \times 18 = 72$, $m = \frac{72}{18} = 4$

5. 4 men and 3 women finish a job in 6 days. And 5 men and 7 women can do the same job in 4 days. How long will 1 man and 1 women take to do the work?

(1) $22\left(\frac{2}{7}\right)$ days (2) $25\left(\frac{1}{2}\right)$ days

(3) $5\left(\frac{1}{7}\right)$ (4) $12\left(\frac{7}{22}\right)$ days

Sol. Let man completes m part in a day and women completes w part in a day then

$$4m + 3w = \frac{1}{6} \quad \text{.... (i)}$$

$$5m + 7w = \frac{1}{4} \quad \text{....(ii)}$$

after simplifying we get

$$20m + 15w = \frac{5}{6}$$

$20m + 28w = 1$

So $13w = \frac{1}{6}$

$$w = \frac{1}{78} \quad \text{....(iii)}$$

from (i) & (iii) we get, $m = \frac{5}{156}$

$$m + w = \frac{5}{156}+\frac{1}{78}=\frac{7}{156}$$

So it require $\frac{156}{7}$ days $= 22\frac{2}{7}$

6. If 8 boys and 12 women can do a piece of work in 25 days. In how many days can the work be done by 6 boys and 11 women working together?

(1) 15 days

(2) 10 days

(3) 12 days

(4) Cannot be deteremined

Sol. $8B + 12w = \frac{1}{25}$ ....(i)

now to calculate

$6B + 11w = ?$

It because we have 1 equation but two variables.

7. A can do a place of work in 10 days and B can do the same work in 20 days. With the help of C, they finish the work in 5 days. How long will it take for C alone to finish the work?

(1) 20 days (2) 10 days

(3) 35 days (4) 15 days

Sol. $\frac{1}{5}-\frac{1}{10}-\frac{1}{20}=\frac{1}{20}$

This is C's one day work so 20 days are required for C alone to finish task

8. A can do a piece of work in 20 days. He work at it for 5 days and then B finishes it in 10 more days. In how many days will A and B together finish the work?

(1) 8 days (2) 10 days

(3) 12 days (4) 6 days

Sol. A's one day work = $\frac{1}{20}$

in 5 day a can complete $\frac{1}{20}\times 5 = \frac{1}{4}$ part

remaining work = $\frac{3}{4}$ part

$\therefore$ B finish $\frac{3}{4}$ part in 10 days

$\therefore$ B finish 1 part in $\frac{10}{3/4} = \frac{40}{3}$ days

together they can finish it in

$$\frac{1}{\frac{1}{20}+\frac{3}{40}} = \frac{1}{\frac{1}{8}} = 8 \text{ days}$$

9. Sashi can do a piece of work in 25 days and Rishi can do it in 20 days. They work for 5 days and then Sashi goes away. In how many more days will Rishi finish the work?

(1) 10 days (2) 12 days

(3) 14 days (4) None of these

Sol. Shashi's days work = $\frac{1}{25}$

Rishi days work = $\frac{1}{20}$

together they can finisy $\frac{1}{25}+\frac{1}{20}$

$= \frac{9}{100}$ part in a day

$\therefore$ Work in 5 days $\frac{9}{100}\times 5 = \frac{45}{100}$ part

$\frac{55}{100}$ part is remaining. Rishi can finish it in

$$\frac{\left(\frac{55}{100}\right)}{\left(\frac{1}{20}\right)} = 11 \text{ days}$$

10. Manoj takes twice as much time as Ajay and thrice as much as Vijay to finish a piece of work. Together they finish the work in 1 day. What is the time taken by Manoj to finish the work?

(1) 6 days (2) 3 days

(3) 2 days (4) None of these

Sol. M : A : V

2 : 1 : 2/3 or 6 : 3 : 3

Let Manoj takes 6x days, Ajay takes 3x days and Vijay 2x days then $\frac{1}{6x}+\frac{1}{3x}+\frac{1}{2x}=1$

$$\frac{1}{x}\left[\frac{1}{6}+\frac{1}{3}+\frac{1}{2}\right]=1$$

$\frac{1}{x}=1$, So $x = 1$

Manoj will take 6 days

11. In a fort there was sufficient food for 200 soldiers for 31 day. After 27 days 120 soldiers left the fort. For how many extra days will the rest of the food last for the remaining soldiers?

(1) 12 days (2) 10 days

(3) 8 days (4) 6 days

Sol. Man × Day = Man ×Day

200 × 31 = 6200

After 27 days

200 × 27 = 5400 Man.

Day is finished

remaining = 800

Man ×Day = 800

80. Day = 800

Day = 10

12. A cistern is normally filled in 5 hours. However, it takes 6 hours when there is leak in its bottom. If the cistern is full, in what time shall the leak empty it?

(1) 6 hrs (2) 5 hrs (3) 30 hrs (4)15 hrs

Sol. In one hour $\frac{1}{5}$ part is filled now leak can empty in

x hour then $\frac{1}{5}-\frac{1}{x}=\frac{1}{6}$

$\Rightarrow \frac{1}{5}-\frac{1}{6}=\frac{1}{x}$

$\Rightarrow \frac{1}{30}=\frac{1}{x}$, x = 30 hours

13. Pipe A and B running together can fill a cistern in 6 minutes. If B takes 5 minutes more than A to fill the cistern, then the time in which A and B will fill the cistern separately will be respectively?

(1) 15 min, 20 min (2) 15 min, 10 min

(3) 10 min, 15 min (4) 25 min, 20 min

Sol. Let pipe A can fill in x and pipe B in x + 5 minutes

$$\frac{1}{x}+\frac{1}{x+5}=\frac{1}{6}$$

or $$\frac{x(x+5)}{2x+5}=6$$

x = 10, x + 5 = 15

14. There are two pipes in a tank. Pipe A is for filling the tank and Pipe B is for emptying the tank. If A can fill the tank in 10 hours and B can empty the tank in 15 hours then find how many hours will it take to completely fill a half empty tank?

(1) 30 hours (2) 15 hours

(3) 20 hours (4) 33.33 hours

Sol. $\frac{1}{10}-\frac{1}{15}=\frac{5}{150}=\frac{1}{30}$

So it takes 30 hours to fill the tank and 15 hours to fill half the tank

15. There are three Taps A, B and C in a tank. They can fill the tank in 10 hrs, 20 hrs and 25 hrs respectively. At first, all of them are opened simultaneously. Then after 2 hours tap C is closed and A and B kept running. After the 4th hour, tap B is also closed. The remaining work is done by Tap A alone. Find the percentage of the work done by Tap A by itself.

(1) 32 % (2) 52%

(3) 75% (4) None of these

Sol.

	A	B	C		
Isthours	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{25}$	$\frac{1}{100}$part	
IIsthours	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{25}$	$\frac{19}{100}$part	
IIIsthours	$\frac{1}{10}$	$\frac{1}{20}$	×	$\frac{3}{20}$	$\frac{15}{100}$part
IVsthours	$\frac{1}{10}$	$+\frac{1}{20}$	×	$\frac{3}{20}$	$\frac{15}{100}$part

So remaining part after 4 hour is

$$\frac{\frac{32}{100}}{\frac{1}{10}}=3.2\,\text{hours}$$

% of work done by A

$$\frac{(10+10+10+10+32)}{100}\times 100 = 72\%$$

1. A pipe can fill a tank in 15 hours. The tank develops a hole and 10% of water leaks out. The pipe will now fill the tank in
(1) 16 hrs 40 minutes (2) 18 hrs 40 minutes
(3) 20 hrs (4) 17 hrs 30 minutes

2. Two taps A and B fill a tank separately in 24 minutes and 40 minutes respectively and a waste pipe C releases 30 liters per minute. If all the pipes are opened the tank is filled in an hour. The capacity of the tank is
(1) 750 liters (2) 900 liters
(3) 800 liters (4) 600 liters

3. Meena can type 500 words in 10 minutes and Leena can type 400 words in 10 minutes. They can together type 3600 words in
(1) 50 minutes (2) 40 minutes
(3) 80 minutes (4) 100 minutes

4. Two pipes A and B fill a cistern in 24 minutes and 32 minutes respectively. Assuming that both pipes are opened simultaneously, when must the first tap be turned off so that the cistern may be filled in 16 minutes ?
(1) After 10 minutes (2) After 12 minutes
(3) After 8 minutes (4) After 16 minutes

5. A, B and C are employed to do a piece job for Rs. 529. A and B together are supposed to do 19/23 of the work. C should be paid
(1) Rs. 115 (2) Rs. 92
(3) Rs. 200 (4) Rs. 250

6. A tank has a capacity of 240 liters. A pipe can empty 1/ 4th of the tank in 5 minutes and another pipe can empty 1/3rd of the tank in 6 minutes. The tank is filled and both the pipes are opened for 3 minutes. How much of the water is now left in the tank?
(1) 160 liters (2) 164 liters
(3) 196 liters (4) 200 litres

7. Sixteen men can complete a work in fifteen days. Twenty four children can do the same work in twenty days. In how many days will eight men and eight children together complete the same job?
(1) 16 (2) 15
(3) 20 (4) None of the above

8. A and B can do a piece of work in 24 days, B and C can do it in 18 days and A and C in 12 days. Working together they will finish the work in nearly
(1) 9 days (2) 10 days
(3) 11 days (4) 8 days

9. Ram can complete a work in 12 days, while Rajan can finish it in 18 days. Ram works on it for 8 days and then Rajan starts working on it. Then the work will be finished in
(1) 6 days (2) 7 days
(3) 8 days (4) 9 days

10. Two pipes A and B can fill an empty tank in 8 hours and 12 hours respectively, If the pipes are opened alternately every hour, the tank will be full earlier if
(1) A is opened first
(2) B is opened first
(3) It will take same time no mater which pipe is opened first
(4) None of these

11. B is twice as fast as A. If A can complete a job in 36 days, how long will it take for both A and B together to complete the same job?
(1) 24 days (2) 18 days (3) 12 days (4) 9 days

12. A contractor undertakes to make a road in 72 days and employs 24 men. After 48 days, he finds that only half of the road is made. How many extra men should he now employ to complete the road in time?
(1) 36 men (2) 24 men
(3) 21 men (4) None of these

13. A and B can do a piece of work in 5 days, B and C together can do it in 4 days, If B is twice as good a workman as C, then in how many days A alone can do it?
(1) 30 days (2) 18 days (3) 9 days (4) 10 days

14. 20 men working 9 hours per day can complete a work in 12 days. To complete the same work in 15 days working 12 hours a day, the number of men required is
(1) 15 (2) 14
(3) 12 (4) 11

15. A, B and C can do a piece of work in 24, 30 and 40 days respectively. They began the work together but C left the work four days before the completion of the work. The work was completed in
(1) 11 days (2) 10 days
(3) 12 days (4) 14 days

16. Three pipes A, B and C can fill a cistern in 6 hours. After working together for 2 hours C is closed and A and B fill it in 7 hours C alone can fill the cistern in
(1) 14 hrs (2) 21 hrs
(3) 10.5 hrs (4) 12 hrs

17. A and B can do a work in 8 days, B and C can do the same work in 12 days. A, B and C together can finish it in 6 days. A and C together will do it in :

(1) 4 days (2) 6 days

(3) 8 days (4) 12 days

18. A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is :

(1) $\frac{1}{4}$ (2) $\frac{1}{10}$ (3) $\frac{7}{15}$ (4) $\frac{8}{15}$

19. Two pipes A and B can fill a tank in 24 min. and 32 min. respectively. If both the pipes are opened simultaneously, after how much time B should be closed so that the tank is full in 18 minutes?

(1) 7 min (2) 8 min (3) 9 min (4) 10 min

20. A can do a piece of work in 10 days and B can do it in 15 days. After they have worked together for 4 days, A goes away and B completes the remaining work. In how many days does B complete the remaining work ?

(1) 10 (2) 5 (3) 15 (4) 20

21. A and B can do 4/5th and 3/5 th of a piece of work in 15 days and 10 days respectively. In how many days can A and B, working together complete the work if B worked for 5 days without A ?

(1) $6\frac{2}{17}$ (2) $6\frac{10}{17}$ (3) $11\frac{3}{17}$ (4) $6\frac{12}{17}$

22. If 4 men or 6 women can do a piece of work in 24 days, then how many men should join 3 women to complete the work in 16 days ?

(1) 6 (2) 5 (3) 4 (4) 2

23. A is twice as efficient as B and they together can complete a piece of work in 24 days. Find the number of days, that A alone takes to complete the work.

(1) 36 (2) 18 (3) 48 (4) 30

24. Working individually, A, B and C can finish a piece of work in 16 days, 20 days and 30 days respectively. In how many days can A, B and C together complete a work which is $3\frac{1}{2}$ times the previous work ?

(1) 30 (2) 25 (3) 24 (4) 20

25. A tap can fill a tank in 48 minutes whereas another tap can empty the full tank in 2 hours. If both the taps are opened at 11:40 a.m., when will the empty tank be filled ?

(1) 12 : 40 p.m. (2) 1:30 p.m.

(3) 1 : 00 p.m. (4) 1:20 p.m.

26. Nitu alone can complete 4/5th of a piece of work in 20 days. She works for 6 days and Deepak replaces her. He completes the work in another 38 days. In how many days can Deepak complete the entire work if he works alone ?

(1) 50 (2) 25

(3) 30 (4) 45

27. A and B can completed a piece of work in 12 days and 24 days respectively. After A had worked for 6 days, B joined him, and then they completed the work. How much should A receive as his share from the total amount of Rs. 180 paid for completing the work ?

(1) Rs.120 (2) Rs.135

(3) Rs.100 (4) Rs.150

28. 6 men and 4 women can do a piece of work in 32 days. 7 men and 12 women can do it in 18 days. In how many days can 18 men and 8 women do the same work, working together ?

(1) 10 (2) 12

(3) 14 (4) 16

29. Two taps A and B can fill a tank in 10 minutes and 15 minutes respectively. In what time will the tank be full if tap B was opened 3 minutes after tap A was opened ?

(1) 6 minutes 12 seconds

(2) 7 minutes 12 seconds

(3) 8 minutes 12 seconds

(4) 9 minutes 12 seconds

30. A certain number of people can complete a piece of work in 12 days working 5 hours a day. If the number of men is decreased by half, how many hours a day should they work, so that the work is to be completed in 15 days ?

(1) 10 (2) 9 (3) 8 (4) 6

31. The ratio of the rate of doing work for a woman and man is 2 : 1. Six women can complete a piece of work in 20 days. If 2 women and 6 men work together, then in how many days will they complete the work ?

(1) 24 (2) 30

(3) 20 (4) None of these

32. A can work twice as fast as B. A and C together can work three times as fast as B. If A, B and C complete a job in 30 days working together, in how many days can each of them complete the work ?

(1) 40, 80, 100 (2) 60, 120, 120

(3) 50, 100, 120 (4) 60, 100, 80

33. P and Q can individually complete a piece of work in 15 and 25 days respectively. In how many days can P and Q complete the work if they work on alternate days,

(a) starting with P (b) starting with Q ?

(1) 18; 19 (2) $18; \frac{191}{5}$

(3) $18\frac{3}{5}; 19$ (4) $18\frac{2}{5}; 19$

34. Wages for 30 women amount to Rs. 60,000 in 36 days. If a man earns double of what a women earns, then how many men must join 15 women to complete the work in 24 days ? How much more is earned by the men than by the women ?

(1) 10 men, Rs. 15,000

(2) 15 men, Rs. 20,000

(3) 15 men, Rs. 30,000

(4) 10 men, Rs. 30,000

35. A, B and C can complete a piece of work in 6, 12 and 18 days respectively. A and B started the work and C joined them after one day. B left just 2 days before the completion of the whole work. In how many days was the work completed ?

(1) 5 (2) 4

(3) 3 (4) 2

36. P worked on a job for 4 hours and then Q joined him. After 8 more hours, P stopped working and Q took 34 more hours to complete the remaining part of the job. If P and Q together can complete the job in 24 hours, how long will it take for each of them (in hours) to complete the job individually ?

(1) 40, 60 (2) 48, 60

(3) 60, 45 (4) 40, 30

37. P, Q and R work together to complete a piece of work in x days. P and R take 20 days and 30 days respectively to complete the work. Q is faster than R and slower than P. If x is an integer, then how many values can it take?

(1) 1 (2) 2

(3) 3 (4) 4

38. P, Q and R started a piece of work. They worked on it for 5 days, after which P left. The other two continued to work for another 5 days after which Q left and the remaining work was completed by R in another 5 days. If Q alone can complete the work in 30 days and R alone takes at least 45 days to complete the work, who completed the maximum part of the work ?

(1) P

(2) Q

(3) R

(4) Cannot be determined

39. A garrison had provisions for 1500 men for 30 days. After some days, 300 more men joined the garrison. The provisions lasted for a total of 26 days from the beginning. After how many days did the new men join ?

(1) 24 (2) 6

(3) 4 (4) 26

40. A can do a piece of work in 18 days, B in 36 days and C in 54 days. A starts the work and is joined by B after 1 day, C joins them after 4 more days. How many more days will be required to complete the work ?

(1) 11 (2) 9

(3) 8 (4) 6

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	4	2	2	2	2	3	3	1	1	3	2	1	3	1	1	3	4	2	2
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	3	1	3	3	1	4	2	2	3	1	2	3	2	2	1	1	1	2	4