CHAPTER – 6
TIME AND WORK

Work to be done is usually considered as one unit. It may be constructing a wall or a road, filling up or emptying a tank or cistern or eating certain amount of food.

There are some basic assumptions that are made in the problems on Time and Work. These are taken for granted and are not specified in every problem.

(i) If a person (or one member of the workforce) does some work in a certain number of days, then we assume (unless otherwise explicitly stated in the problem) that he does the work uniformly, i.e., he does the SAME amount of work everyday.

For example, if a person can do some work in 15 days, he does $1/15^{th}$ of the work in one day.

If a person completes the work in 4 days, he does $1/4^{th}$ of the work on each day and conversely, if a person can complete $1/4^{th}$ of the work in one day, he can complete the work in 4 days.

If a tap can fill a tank in 20 minutes, then in one minute, it can fill $1/20^{th}$ part of the tank.

(ii) If there is more than one person (or members of "workforce") carrying out the work, it is assumed that each person (or members of the workforce), unless otherwise specified, does the same amount of work each day. This means they share the work equally.

If two people together can do the work in 8 days it means that one man can do it in 16 days. This, in turn means, each person can do $1/16^{th}$ of the work per day.

If a man works three times as fast as a boy does, the man takes one-third of the time the boy takes to complete the work. If the boy takes 12 days to complete the work, then the man takes 4 days to complete the work.

This method is known as **"UNITARY METHOD"**, i.e., the time taken per **"Unit Work"** or number of persons required to complete "Unit Work" or work completed by "Unit Person" in "Unit Time", etc., is what is first calculated.

We should recollect the fundamentals on variation (direct and inverse) here.

- Time remaining constant, Work and Men are directly proportional to each other, i.e., if the work increases the number of men required to complete the work in the same number of days increases proportionately and vice-versa.
- Work remaining constant, Men and Days are inversely proportional, i.e., if the number of men increases, the number of days required to complete the same work decreases in inverse proportion and vice-versa.
- The number of workingmen remaining constant, Work and Days are directly proportional i.e., if the work increases, the number of days required to complete the work with the same number of working men also proportionately increases and vice-versa.

The concept of MANDAYS is very important and useful here. The number of men multiplied by the number of days that they take to complete the work will give the number of mandays required to do the work. The total number of mandays required to complete a specific task will remain a constant. So, if we change one of the variables - men or days - the other will change accordingly so that their product will remain constant (remember from our knowledge of VARIATION, two variables whose product is a constant are said to be inversely proportional to each other). The two variables - men and days - are inversely proportional to each other, when work is constant.

Examples

6.01. If 15 men take 60 days to complete a job, find the time taken by 45 men to complete it.

Sol: Number of Mandays required to complete the job = 900. Time taken by 45 men to complete it

$= \frac{900}{45}$ i.e. 20 days

6.02. 18 men take 20 days to complete a job working 12 hours a day. Find the number of days that 15 men will take to complete it if they work 9 hours a day.

Sol: Total time for which 18 men work = 240 hours. Number of man hours required to complete the job = (18) (240) man hours.
Number of days taken by 15 men working 9 hours a day to complete it

$= \frac{(18)(240)}{(15)(9)} = 32$

Hence, in general we can say that

> If M_1 men can do W_1 work in D_1 days working H_1 hours per day and M_2 men can do W_2 work in D_2 days working H_2 hours per day (where all men work at the same rate), then
> $$\frac{M_1\ D_1\ H_1}{W_1} = \frac{M_2\ D_2\ H_2}{W_2}$$

6.03. 20 men take 10 days to complete a job working 12 hours a day. Find the number of men required to complete a job, twice as large, in 30 days working 8 hours a day.

Sol: Number of man hours required to complete the job = (20) (10) (12) = 2400
Number of men required to complete a job twice as large = $\frac{2(2400)}{(30)(8)} = 20$

Alternative method:
$M_1 = 20$, $D_1 = 10$, $H_1 = 12$
$D_2 = 30$, $H_2 = 8$
$_2 = 2W_1$

$$M_2 = \frac{M_1 D_1 H_1 W_2}{W_1 D_2 H_2} = \frac{(20)(10)(12)(2W_1)}{W_1(30)(8)} = 20\ .$$

If two persons A and B can individually do some work in p and q days respectively, we can find out how much work can be done by them together in one day. Since A can do $1/p^{th}$ part of the work in one day and B can do $1/q^{th}$ part of the work in one day, the two of them together do $(1/p + 1/q)^{th}$ part of the work in one day.

From this we can find out the number of days that they take to complete the work.

> If A can do a piece of work in p days and B can do it in q days then A and B together can complete the same in $\frac{\mathbf{pq}}{\mathbf{p+q}}$ **days**.

6.04. A and B can complete a job in 10 days and 12 days respectively. Find the time taken to complete it, if both A and B work together.

Sol: Time taken by them to complete it
$= \frac{(10)(12)}{10+12} = \frac{60}{11}$ days

6.05. A and B together can complete a job in 12 days. A alone can complete it in 24 days. Find the time taken by B to complete it.

Sol: Part of the job that A and B can complete in a day $= \frac{1}{12}$
Part of the job that A can complete in a day
$= \frac{1}{24}$
Part of the job that B can complete in a day
$= \frac{1}{12} - \frac{1}{24} = \frac{1}{24}$
$\therefore$ B can complete it in 24 days.

6.06. Ajay and Bala working together can complete a job in 16 days. Ajay alone can complete it in 18 days. Both work together for 4 days and then Bala leaves. Find the time taken by Ajay to complete the remaining work.

Sol: Part of the job that can be done by both in a day $= \frac{1}{16}$
Part of the job that can be done by them in 4 days $= 4 \times \frac{1}{16} = \frac{1}{4}$
Remaining part of the job $= \frac{3}{4}$
Time taken by Ajay to complete it
$= \frac{3}{4}(18) = 13.5$ days

6.07. A and B together can complete a job in 12 days. B and C together can complete it in 20 days. A and C together can complete it in 10 days. Find the times taken by each of A, B and C to complete it.

Sol: Suppose that A, B and C take a days, b days and c days respectively to complete the job.
Given, $\frac{1}{a} + \frac{1}{b} = \frac{1}{12}$ ———— (A)
$\frac{1}{b} + \frac{1}{c} = \frac{1}{20}$ ———— (B)
$\frac{1}{a} + \frac{1}{c} = \frac{1}{10}$ ———— (C)
Adding (A), (B) and (C),
$2\left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right) = \frac{14}{60}$
$\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{7}{60}$ ———— (D)
$\therefore$ By (D) – (A), $\frac{1}{c} = \frac{1}{30}$
c = 30
By (D) – (B), $\frac{1}{a} = \frac{1}{15}$
a = 15
By (D) – (C), $\frac{1}{b} = \frac{1}{60}$
b = 60

6.08. P and Q together can complete a job in 12 days. Q and R together can complete it in 15 days. P and R together can complete it in 18 days. All the three work together for 3 days and then R leaves. In how many days can P and Q complete the remaining work?

Sol: Part of the job that can be done by P, Q and R in a day $= \frac{1}{2}\left(\frac{1}{12} + \frac{1}{15} + \frac{1}{18}\right)$
Part of the job completed in 3 days
$= 3\left[\frac{1}{2}\left(\frac{1}{12} + \frac{1}{15} + \frac{1}{18}\right)\right] = \frac{37}{120}$
Remaining part of the job $= \frac{83}{120}$
This can be completed by P and Q in
$\frac{\frac{83}{120}}{\frac{1}{12}} = 8{\cdot}3$ days

6.09. A can complete a job in 16 days. He started the work and after 4 days, B joined him. They completed the job in 4 more days. Find the number of days in which B alone can complete it.

Sol: Part of the job done by A in a day $= \frac{1}{16}$
A worked for a total of 8 days
$\therefore$ A completed $(8)\left(\frac{1}{16}\right) = \frac{1}{2}$ of the job.
Hence, B can complete the remaining $\frac{1}{2}$ of the job in 4 days.
$\therefore$ B alone can complete the entire job in 8 days.

6.10. P and Q together can complete a job in $14\frac{2}{5}$ days . Q and R together can complete it in $20\frac{4}{7}$ days. P and R together can complete it in 16 days. Find the time taken by each of them to complete the job.

Sol: Part of the job that P and Q can do in a day $= \frac{5}{72}$

Part of the job that Q and R can do in a day $= \frac{7}{144}$

Part of the job that P and R can do in a day $= \frac{1}{16}$

Let the times taken by P, Q and R to complete the job be p days, q days and r days respectively.

$\frac{1}{p}+\frac{1}{q}=\frac{5}{72}$ --- (A)

$\frac{1}{q}+\frac{1}{r}=\frac{7}{144}$ --- (B)

$\frac{1}{p}+\frac{1}{r}=\frac{1}{16}$ --- (C)

Adding (A) and (B) and subtracting (C),

$\Rightarrow \frac{2}{q}=\frac{5}{72}+\frac{7}{144}-\frac{1}{16} = \frac{8}{144}$

q = 36

substituting q = 36, in (A),

we get p = 24

substituting q = 36 in (B),

we get r = 48.

6.11. To complete a job, P takes half as long as Q and R together take. Q takes 8 times as long as P and R together take. All the three together can complete the job in $\frac{20}{3}$ days. Find the time taken by each of P, Q and R to complete it.

Sol: Let the times taken by P, Q and R be p days, q days and r days respectively.

Given $\frac{1}{p}=2\left(\frac{1}{q}+\frac{1}{r}\right)$

$\Rightarrow \frac{3}{p}=2\left(\frac{1}{p}+\frac{1}{q}+\frac{1}{r}\right)$ ———— (A)

Given $\frac{1}{q}=\frac{1}{8}\left(\frac{1}{p}+\frac{1}{r}\right)$

$\Rightarrow \frac{8}{q}=\frac{1}{p}+\frac{1}{r}$

$\Rightarrow \frac{9}{q}=\frac{1}{p}+\frac{1}{q}+\frac{1}{r}$ ———— (B)

Given $\frac{1}{p}+\frac{1}{q}+\frac{1}{r}=\frac{3}{20}$ ———— (C)

$\therefore$ From (A) and (C), $\frac{3}{p}=\frac{6}{20}$

p = 10

From (B) and (C), $\frac{9}{q}=\frac{3}{20}$

q = 60

$\frac{1}{r}=\frac{3}{20}-\left(\frac{1}{10}+\frac{1}{60}\right)$

r = 30

6.12. 10 boys or 20 girls can complete a job in 10 days. Find the time taken by 10 boys and 20 girls to complete it.

Sol: Part of the job that can be done by a boy in a day = $\frac{1}{100}$.

Part of the job that can be done by a girl in a day = $\frac{1}{200}$.

Part of the job that can be done by 10 boys and 20 girls = $10\left(\frac{1}{100}\right)+20\left(\frac{1}{200}\right)=\frac{1}{5}$

$\therefore$ They can complete the job in 5 days.

Alternative method:

10 boys are as efficient as 20 girls.

$\therefore$ 10 boys and 20 girls are as effective as 20 boys.

$\therefore$ They will take $\frac{10}{2}$ = 5 days to complete the job.

6.13. If there are 4 more men in a work force, they will take 8 days less to complete a job. Instead if there are 8 men more in it, they will take 12 days less to complete it. Find the ratio of the number of men and the time they take (in days) to complete it.

Sol: Let the number of men be x and the number of days they take to complete the job be y.

$(x + 4)(y - 8) = xy \Rightarrow 4y - 8x = 32$ ——— (A)

$(x + 8)(y - 12) = xy \Rightarrow 8y - 12x = 96$ —— (B)

solving (A) and (B), we get

x = 8 and y = 24

$\therefore$ x : y = 8 : 24 = 1 : 3

6.14. 3 men and 4 women can complete a job in 10 days. 24 men and 2 women can complete it in 2 days. Find the time taken by 11 men and 3 women to complete it.

Sol: Let the parts of the job done by a man and a woman each day be m units and w units respectively.

Given, $3m + 4w = \frac{1}{10}$ ———— (A)

$24m + 2w = \frac{1}{2}$ ——— (B)

Solving for m and w,

$m=\frac{1}{50}$ and $w=\frac{1}{100}$

$11m + 3w = \frac{1}{4}$

$\therefore$ Time taken by 11 men and 3 women to complete the job is 4 days.

6.15. X is twice as fast as Y and hence takes 30 days less than Y to complete a job. Find the time taken by X and Y together to complete it.

Sol: Let the time taken by X to complete the job be n days.
Time taken by Y to complete the job = 2n days
$n = 2n - 30 \Rightarrow n = 30$
Time taken by X and Y together to complete it
$= \frac{(n)\,(2n)}{n+2n} = 20$ days

6.16. Sita can complete a job in 6 days working 8 hours a day. Gita can complete it in 3 days working 12 hours a day. In how many days can they together complete it working 4 hours a day?

Sol: Numbers of hours taken by Sita and Gita to complete the job are 48 hours and 36 hours respectively.

They together can complete $\frac{1}{48}+\frac{1}{36}=\frac{7}{144}$th of the job in an hour.

$\therefore$ They can complete the job in $\frac{144}{7}$hours.

$\therefore$ They can complete the job in $\frac{\frac{144}{7}}{4}=\frac{36}{7}$days .

6.17. P and Q can complete a job in 20 days and 30 days respectively. P started it and after 10 days, Q joined. In how many days will they complete the remaining work?

Sol: Part of the job completed by P and Q in a day
$= \frac{1}{20}+\frac{1}{30}=\frac{1}{12}$.
Suppose that the remaining work is completed in x days.
Then $x\left(\frac{1}{12}\right)+10\left(\frac{1}{20}\right)=1$
x = 6

6.18. A contractor decided to complete a job in 30 days for which he employed 20 men in the beginning. After 10 days he released that the job could not be completed on time. Hence he employed 15 more men and thus completed the job on time. Find the number of extra days it would have taken to complete the job if the additional men were not employed.

Sol: Number of mandays required to complete the job
= (20) (10) + (20 + 15) (20) = 900 man days.
If the additional men were not employed,
number of extra days = $\frac{900}{20}-30=15$ days.

6.19. A and B can complete a job in 18 days and 36 days respectively. They work on alternate days with A starting the job. In how many days will the job be completed?

Sol: Part of the job completed in the first 2 days
$= \frac{1}{18}+\frac{1}{36}=\frac{1}{12}$
$\therefore$ To complete the job, 12 cycles of 2 days i.e., a total of 24 days will be required.

6.20. P and Q together can complete a job in 8 days and 16 days respectively. They work on alternate days with Q starting the job. In how many days will the job be completed?

Sol: Part of the job completed by P and Q in the first 2 days = $\frac{1}{8}+\frac{1}{16}=\frac{3}{16}$
After 5 cycles of 2 days, i.e., after 10 days, $\frac{15}{16}$th of the job will be completed.

Remaining part = $\frac{1}{16}$th . Q will work on the 11th day and he takes exactly one day to complete the remaining part.
$\therefore$ The job will be completed in 11 days.

In general, money earned should be shared by people doing the work together in the ratio of the **SHARE OF WORK** done by each of them.

For example, if A does 2/5th of the work, then he should get 2/5th of the total earnings for the work. If the remaining 3/5th of the work is done by B and C in the ratio of 1 : 2, then the remaining 3/5th of the earnings (after paying A) should be shared by B and C in the ratio of 1 : 2. Suppose ₹500 is paid to A, B and C together for doing the work, then A will get ₹200 (which is 2/5 of ₹500), B will get ₹100 and C, ₹200 (because the remaining ₹300 after paying A is to be divided in the ratio 1 : 2 between B and C).

When people work for the same number of days each, then the ratio of the total work done will be the same as the work done by each of them PER DAY. Hence, if all the people involved work for the same number of days, then the earnings can directly be divided in the ratio of **work done per day** by each of them.

6.21. A, B and C can complete a job in 4 days, 5 days and 6 days respectively. They work together and complete it. If their total wage is ₹3700, find A's wage.

Sol: Ratio of the wages of A, B and C = Ratio of the work done by A, B and C = Ratio of the daily work done by A, B and C
$= \frac{1}{4}:\frac{1}{5}:\frac{1}{6}=15:12:10$
$\therefore$A's wage = $\frac{15}{37}(3700)$ = ₹1500

6.22. X, Y and Z take a job on contract for ₹8000. X and Y started the job and completed $\frac{4}{5}$th of the job. Z then took over and completed the remaining work. Find Z's share.

Sol: Part of the job completed by $Z=\frac{1}{5}$
$\therefore$Z's share = $\frac{8000}{5}$ = ₹1600

6.23. P, Q and R can together earn ₹3100 in 10 days. Q and R together can earn ₹1320 in 6 days. P and R together can earn ₹1050 in 5 days. Find R's daily earning.

Sol: Total daily wage of P, Q and R = $\frac{₹3100}{10}$ = ₹310

Total daily wage of Q and R = $\frac{₹1320}{6}$ = ₹220

Total daily wage of P and R = $\frac{₹1050}{5}$ = ₹210

Total daily wage of P, Q and 2R = ₹430

∴ R's daily wage = ₹120

6.24. Two men undertake a job for ₹960. They can complete it in 16 days and 24 days. They work along with a third man and take 8 days to complete it. Find the share that the third man should get.

Sol: The amount payable should be proportional to the fraction of work done.

Part of the job done by the third man

$= 1-\left(\frac{8}{16}+\frac{8}{24}\right)=\frac{1}{6}$.

∴ The third man should get $\frac{₹960}{6}$ = ₹160

PIPES AND CISTERNS

There can be pipes (or taps) filling (or emptying) tanks with water. The time taken by different taps (to fill or empty the tank) may be different. Problems related to these can also be dealt with in the same manner as the foregoing problems on Work have been dealt with.

There is only one difference between the problems on regular Work (of the type seen earlier on in the chapter) and those in Pipes and Cisterns. In Pipes and Cisterns, a filling pipe or tap does positive work and an emptying pipe or a leak does negative work.

6.25. Pipes P and Q can fill a tank in 20 minutes and 30 minutes respectively. If they are opened simultaneously, in how much time can they fill it?

Sol: If a pipe takes x hours to fill a tank and another takes y hours to fill it, they can fill it in $\frac{xy}{x+y}$ hours.

In this problem, x = 20 and y = 30

$\therefore \frac{xy}{x+y}=12$

6.26. Pipes X and Y take 10 minutes and 20 minutes respectively to fill an empty tank. Pipe Z takes 40 minutes to empty a full tank. Find the time taken to fill the empty tank if all the three pipes are opened simultaneously.

Sol: Part of the tank filled per minute when all the three pipes are opened = $\frac{1}{10}+\frac{1}{20}-\frac{1}{40}=\frac{1}{8}$

∴ They would take 8 minutes to fill the tank.

6.27. Pipes P and Q take 24 minutes and 36 minutes respectively to fill an empty tank. If both take 18 minutes to fill the tank along with an outlet pipe R, find the time R would take to empty the full tank.

Sol: Let the time taken by R to empty the tank be r minutes.

$\frac{1}{24}+\frac{1}{36}-\frac{1}{r}=\frac{1}{18}$

r = 72

6.28. Pipes X and Y can fill a tank in 30 minutes and 60 minutes respectively. Both pipes are opened simultaneously. After how much time should X be closed so that the tank is filled in 30 minutes?

Sol: Let us say pipe X should be closed after n minutes.

i.e. pipe X is in operation for n minutes and pipe Y for all the 30 minutes.

So, $\frac{n}{30}+\frac{30}{60}=1 \Rightarrow n = 15$

6.29. Pipes P, Q and R together can empty a full tank in 6 hours. All the three pipes are opened simultaneously and after 2 hours, P is closed. The tank is emptied in another 6 hours. Find the time in which P can empty the tank.

Sol: Part of the tank that can be emptied by P, Q and R per hour = $\frac{1}{6}$.

Part of the tank that was emptied by P, Q and R in 2 hours = $\frac{1}{3}$

Part of the tank which was emptied by Q and R per hour = $\frac{1-\frac{1}{3}}{6}=\frac{1}{9}$

Time in which P can empty the tank

$= \frac{1}{\frac{1}{6}-\frac{1}{9}}$ i.e. 18 hours.

6.30. A tank has a leak at its bottom which empties it at 6 litres/minute. It also has a filling tap which can fill the tank in 6 hours. The tank takes 18 hours to become full. Find the capacity of the tank.

Sol: Let the time that would be taken by the leak to empty the full tank be x hours.

$\therefore \frac{1}{6}-\frac{1}{x}=\frac{1}{18}$

x = 9

∴ Capacity of the tank = (6) (9) (60)

= 3240 litres.

Concept Review Questions

Directions for questions 1 to 35: For the Multiple Choice Questions, select the correct alternative from the given choices. For the Non-Multiple Choice Questions, write your answer in the box provided.

1. If ten men can do a job in ten days, what fraction of the job can be done by one man in one day?

(A) $\frac{1}{10}$ (B) $\frac{1}{100}$ (C) $\frac{1}{20}$ (D) $\frac{1}{2}$

2. A man can eat an apple in one day. How many apples can six men eat in six days?

3. If a man cuts the grass of a lawn in T minutes, what part of the lawn can he cut in 30 minutes?

(A) 30/T (B) T-30 (C) T/30 (D) 30-T

4. X men can complete a work in 120 days. If there were 10 men more, the work would be completed in 20 days less. Find the value of X.

5. Ten men can do a piece of work in 15 days. How many men are needed to complete a work which is five times as large as the first one, in 10 days?

6. Nine men can complete a job in 15 days. If a man works thrice as fast as a woman, find the number of days taken by 15 women to complete the job.

(A) 20 (B) 24 (C) 27 (D) 36

7. A man can complete a job in four days working ten hours a day. In how many days can he complete it if he works eight hours a day?

8. Three men can complete a job in 3 days, working 3 hours a day. In how many days can 9 men complete it working 1 hour a day?

(A) 6 (B) 1.5 (C) 3 (D) 9

9. If X's rate of doing work is 40% more than that of Y, find the ratio of their rates.

(A) 7 : 5 (B) 5 : 7 (C) 49 : 25 (D) 25 : 49

10. The times taken by X and Y to complete a job are in the ratio of 5 : 6. Find the ratio of the work they can complete in an hour.

(A) 6 : 5 (B) 5 : 6 (C) 25 : 36 (D) 1 : 1

11. The ratio of the times taken by A, B and C to complete a job is 3 : 4 : 6. Find the ratio of the work they can complete in an hour.

(A) 6 : 4 : 3 (B) 4 : 3 : 2
(C) 2 : 3 : 4 (D) 3 : 4 : 6

12. A can complete a job in 60 days. B can complete it in 15 days. Find the number of days taken by them to complete the job, if they work together.

13. X and Y can complete a job in 30 days. If X can complete it in 60 days, find the number of days taken by Y to complete it.

(A) 45 (B) 90 (C) 75 (D) 60

14. Adam can complete a job in 25 days. Adam and Chris together can complete it in $9^3/_8$ days. In how many days can Chris alone complete the job?

(A) $12^5/_8$ (B) 10 (C) 25 (D) 15

15. A works 4 times as fast as B. If B completes a job in 60 days, then in how many days can A and B together complete the same job?

(A) 24 (B) 12 (C) 18 (D) 15

16. A can complete a piece of work 3 times as fast as B. If A and B together can complete the work in 6 days, how many days would B alone take to complete the work?

(A) 8 (B) 12 (C) 4 (D) 24

17. P and Q working together, can complete a job in 48 days. The ratio of their rates of doing work is 3 : 5. Find the time taken by the faster person to complete the job. (in days)

18. P can complete a job in 60 days. Q is 25% less efficient than P. Find the time in which Q can complete it (in days).

(A) 75 (B) 80 (C) 90 (D) 45

19. The ratio of the rates of doing work of P, Q and R is 3 : 4 : 5. If they completed a job working together, what part of it did P complete?

(A) $\frac{1}{4}$ (B) $\frac{20}{47}$

(C) $\frac{1}{3}$ (D) None of these

20. Amar, Bharat and Charu can complete a job in 12, 24 and 24 days respectively. If they all work together, how long will they take to complete the same work?

(A) 18 days (B) 6 days
(C) 20 days (D) 16 days

21. Anand, Bhanu and Chandra can complete a work in 4 days. Anand and Chandra can do the same work in 8 and 16 days respectively. How many days will Bhanu alone take to complete the same work?

(A) 16 (B) 20
(C) 8 (D) 12

22. P and Q can complete a job in 12 days. Q and R can complete it in 20 days. R and P can complete it in 15 days. Find the time taken by P, Q and R working together, to complete it.

(A) 10 days (B) 20 days
(C) 5 days (D) 8 days

23. P and Q can complete a job in 10 days. Q and R can complete it in 12 days. P and R can complete it in 20 days. Who is the slowest of the three workers?
(A) P (B) Q
(C) R (D) Cannot be determined

24. Somu and Ramu can do a job in 60 and 40 days respectively. They earned ₹450 for completing work together. What is the share of Somu? (in ₹)

25. Gautham and Karan can complete a job in 4 hours and 12 hours respectively. If they work alternatively for one hour each, with Gautham starting the job, when will the job be completed? (in hours)

26. X and Y can do a piece of work in 12 days and 18 days respectively. If they work on alternate days starting with X how many days will they take to finish the job?
(A) $14^1/_2$ (B) $14^1/_3$
(C) $15^1/_3$ (D) $15^1/_2$

27. A can complete a job in 20 days. B can complete it in 30 days. If they work on alternate days, the job would be completed in the
(A) least number of days if A starts the job.
(B) least number of days if B starts the job.
(C) the same time irrespective of whoever starts the job.

28. X can complete a job in 6 days. Y can complete it in 10 days. If they work on alternate days, the job would be completed in the
(A) least number of days if X starts the job.
(B) least number of days if Y starts the job.
(C) the same time irrespective of whoever starts the job.

29. Find the number of days for which 120 kg of ration will be sufficient for a family of 6 members if each member consumes 2.5 kg of rations per day.

30. Two pipes X and Y can fill a cistern in 6 and 12 minutes respectively. How long will it take to fill the cistern, if both the pipes are opened simultaneously?
(A) 9 minutes (B) 4 minutes
(C) 8 minutes (D) 3 minutes

31. Tap A can fill an empty tank in six hours. Tap B can fill it in nine hours. Find the time taken (in hours) if the two taps are opened together to fill the tank.

32. Tap X can fill a tank in 10 hours. Tap Y can fill it in 15 hours. If the two taps fill the tank together, what fraction of the tank is filled by X?
(A) 1/10 (B) 1/6 (C) 2/3 (D) 3/5

33. Pipe A can fill an empty tank in 9 hours. Pipe B can empty a full thank in 18 hours. If both pipes are opened simultaneously when the tank is empty, find the time taken to fill the tank. (in hours)
(A) 24 (B) 27 (C) 18 (D) 36

34. It takes 3 hours to fill a tank but due to a leakage it takes 4 hours. How long would the leak take to empty a full tank?
(A) 14 hours (B) 16 hours
(C) 10 hours (D) 12 hours

35. A tank can be filled by two pipes individually in 30 and 20 minutes respectively. There is an emptying pipe which can empty the full tank in 60 minutes. If all three pipes are opened simultaneously then, how much time does it take to fill the empty tank? (in minutes)

Exercise – 6(a)

Directions for questions 1 to 30: For the Multiple Choice Questions, select the correct alternative from the given choices. For the Non-Multiple Choice Questions, write your answer in the box provided.

1. Anwar would have to incur ₹600, ₹900 and ₹1200 as the expenses if he got a job done by A, B and C respectively. The daily wages of A, B and C are ₹100, ₹60 and ₹40 respectively. Find the cost to Anwar of getting the job done by all three of them (in ₹).
(A) 600 (B) 800 (C) 750 (D) 900

2. A group of 50 salesmen plan to achieve their target for the next 30 days by working 12 hours a day. Due to various reasons they put in only 10 hours a day for the first 15 days. Now, if 10 men leave and the rest continue working for only 10 hours a day, how many days more than the initially estimated time will they require to meet their target?
(A) 11¼ (B) 12¾ (C) 13¼ (D) 13¾

3. P and Q can complete a piece of work in 20 days, Q and R in 15 days and P and R in 12 days. In how many days can P, Q and R respectively complete the work if they work individually?
(A) 30, 60, 20 (B) 45, 60, 180
(C) 30, 45, 90 (D) 45, 60, 20

4. A team of two people A and B, who can complete a piece of work together in 40 days, begin the work. C joins them after 8 days and the work gets completed in 24 days after C joins them. In how many days can C alone complete the work?

5. Akbar can do a piece of work in 40 days and Ajay can do the same in 60 days. Akbar works on the piece of work alone for some days. Then Ajay joins him and together they complete the work 10 days earlier than the time Akbar alone would have taken. After how many days did Ajay join Akbar?
(A) 19 (B) 12 (C) 15 (D) 20

6. P can complete a job in 27 days. He starts it and after three days Q joins him. They work together for six days. P then leaves and R takes his place. Q and R complete the job in 12 more days. If Q takes at most 54 days to complete the job, then which of the following cannot be a possible value of the number of days taken by R to complete it?
(A) 36 (B) 34 (C) 40 (D) 38

7. P, Q and R are three machines. They produce electronic gadgets. The ratio of the rates of P, Q and R is 3 : 4 : 5. P worked for 6 days, Q worked for 8 days and R worked for 10 days. They manage to produce 400 gadgets. How many gadgets would they have produced in the same time if P's rate doubled and Q's rate tripled?

8. A man builds 1/8th part of a wall every day. Out of the length of the wall built per day, 20% falls off at the end of the day till the wall is completely built. In how many days can he complete the construction of the wall?
(A) 8 (B) 10 (C) $9^1/_5$ (D) $9^4/_5$

9. Raman can do a piece of work in half the time taken by Kapil. Sunil can do the same work in one-third of the time taken by Raman. All three of them work on it for 30 days after which Kapil leaves. Sunil and Raman complete the remaining work in 18 more days. How many days would it take for Raman alone to complete the total work?
(A) 52 (B) 414 (C) 138 (D) 207

10. The efficiency of a man is reduced by half every two hours. At maximum efficiency, he could have completed the job in 150 hours. How many hours does it take him to complete the job, if his efficiency becomes maximum after every 8 hours, and then reduces as mentioned above?

11. A man starts a piece of work. Starting from the second day onwards, every day a new man joins. With every new man joining, the work that each man can do per day doubles. The work is completed in 5 days. On which day would they have completed the work, if the work that each of them could do per day had remained constant?

12. Beginning with the second day, the amount of work Ram can do per day keeps doubling everyday he works. Saleem can always do the work done by Ram in 40% less time. Owing to this increasing ability, Saleem and Ram complete the job together in 2 days. How many days would it have taken if their efficiencies had remained constant?
(A) 4 (B) 6 (C) 5 (D) 3

13. Vivek, Rameshwar and Bhuvan divide a work amongst themselves in the ratio of 2 : 3 : 5. Their rates of work are in the ratio 1 : 2 : 3. It takes Vivek 12 days to complete his part. What is the amount of work completed by them in 8 days from the start?
(A) 29/40 (B) 11/45
(C) 4/5 (D) 31/45

14. Praveen, Shiva and Sunny, each working alone, take 20, 10 and 5 days respectively to make 2000 hats, each. If the defects in their production are 10%, 20% and 40% respectively, approximately, how many days will it take them working together to make 10,000 non-defective hats?
(A) 22 (B) 20 (C) 18 (D) 20.4

15. Pipe A can fill a cistern in 18 minutes. Pipe B can fill the cistern in 24 minutes. Pipe C can empty the cistern in 36 minutes. At 10 a.m., pipe A is opened. At 10 : 10 a.m, pipe C is opened. At 10 : 15 a.m, pipe B is opened. The time at which the cistern would be full is approximately
(A) 10 : 40 (B) 10 : 36 a.m.
(C) 10 : 27 a.m. (D) 10 : 20 a.m.

16. A number of crabs are kept in a jar of height 40 cm. One crab climbs up by 3 cm in a minute and in the subsequent minute it is pulled down by the other crabs by 1 cm. If this cycle of alternate up and down movements of the crab repeats until it reaches the top, then in how many minutes will the crab reach the top of the jar? (Assume once it reaches the top it is not pulled down)?
(A) 40 mins (B) 39 mins
(C) $38^2/_3$ mins (D) $37^1/_3$ mins

17. Niranjan, Rajesh and Vinayak can complete a piece of work in 10, 15 and 12 days respectively. All the three of them started working and after an integral number of days (y) Niranjan stopped working and Rajesh stopped working exactly (y) days before the work got completed. If the number of days, taken to complete the work is an integer, in how many days did the work get completed?

18. Krishna and Rama can complete a piece of work in 20 days and 30 days respectively. With the help of Gopi, they complete the work in 6 days. If the total amount paid for the work is ₹720, what are the daily earnings of Gopi?
(A) ₹40 (B) ₹480 (C) ₹360 (D) ₹60

19. P, Q and R together can complete a job in 5 days. The wages paid to P, Q and R for completing the job were ₹4050, ₹5400 and ₹6750 respectively. In how many days can P working alone, complete the job?
(A) 20 (B) 24 (C) 30 (D) 36

20. Alok and Sachin agree to complete a piece of work in 20 days. They also agree to forfeit double the amount of wages corresponding to the uncompleted part of work, if they fail. If Alok alone can complete the work in 40 days and they lost 1/3rd of the pay due for the total work, in how many days can Sachin alone complete the work?
(A) 30 (B) 60 (C) 40 (D) 80

21. (i) Rakesh and Ramesh take 30 days and 60 days respectively to complete a job. They work on alternate days to complete it with Rakesh starting the job. Find the time in which the job is completed (in days).
(A) 60 (B) 80 (C) 40 (D) 90

(ii) If Rakesh and Ramesh had instead taken 10 days and 12 days respectively to complete the job, find the time in which the job would have been completed (in days).
(A) $10\frac{1}{3}$ (B) $10\frac{5}{6}$ (C) 11 (D) $10\frac{1}{2}$

22. A contractor was assigned a task to be completed in 120 days. He initially hired 48 men to complete the task. But after 60 days, only two–fifths of the task was completed. How many more men should he hire after 60 days in order to complete the task on time?

23. A tank is full of water. A drain pipe, which can empty the full tank in 60 minutes, is opened. 18 minutes later another pipe which can fill the empty tank in 30 minutes is opened. After how much time, in total, is the tank full again (in minutes)?
(A) 18 (B) 20 (C) 36 (D) 40

24. P and Q are filling pipes which can fill a tank in 15 and 20 minutes respectively. R is an emptying pipe which can empty the full tank in 30 minutes. The three pipes are operated continuously one after the other in the order of P, Q and R, each being kept opened for 2 minutes until the tank is filled. After how much time will the tank be full?
(A) 30 minutes (B) $32^2/_3$ minutes
(C) 36 minutes (D) 34 minutes

25. Two taps can normally fill a cylindrical tank in 16 hours and 48 hours. But a leak which can empty the tank in 24 hours is present at $(3/4)^{th}$ of the tank's height from the base. Find the time taken to fill the tank if the taps are opened simultaneously (in hours).

26. A swimming pool is fitted with three pipes of uniform rate of flow. The first two pipes operating simultaneously can fill the pool in half the time that the third pipe alone takes to fill the tank. The second pipe, to fill the pool, takes 12 hours more than the first pipe working alone and 8 hours more than the third pipe working alone. Find the time taken by the three pipes individually to fill the pool (in hours).
(A) 12, 16, 18 (B) 16, 28, 20
(C) 12, 24, 16 (D) 8, 20, 12

27. A, B and C are three taps connected to a tank. Time taken by C to fill the tank is $9/2$ times the time taken by A and B to fill it. The time taken by A to fill it is $5/6$ times the time taken by B and C to fill it. A, B and C take $20/11$ hours to fill it. Find the time taken by B to fill it (in hours).
(A) $3\frac{1}{3}$ (B) 5 (C) $6\frac{2}{3}$ (D) 10

28. X and Y are filling pipes. If the bottom $\frac{2}{3}$rds of a tank is filled by X and the rest is filled by Y, the tank will be filled in 14 minutes. If the bottom $\frac{2}{3}$rds of the tank is filled by Y and the rest is filled by X, the tank will be filled in 16 minutes. Find the time taken by the two pipes to fill the tank together (in minutes).

29. If a piece of work can be done by 6 men and 8 women in 10 days or by 8 men and 22 women in 5 days, in how many days will 34 women do a piece of work thrice as large?

30. There are t taps numbered 1, 2 and so on till t, each of which can fill a cistern. The rate of filling of the nth tap is such that it is equal to twice that of all the taps from 1 to (n – 1) put together. If the 18th tap can fill the empty cistern in 2 minutes, then find the time in which the 15th tap alone can fill the empty cistern.
(A) 27 minutes (B) 34 minutes
(C) 54 minutes (D) 72 minutes

Exercise – 6(b)

Directions for questions 1 to 45: For the Multiple Choice Questions, select the correct alternative from the given choices. For the Non-Multiple Choice Questions, write your answer in the box provided.

1. Rajdeep and Pranav can do a piece of work in 15 days and 24 days respectively. Pranav works alone for 10 days and leaves. In how many days can Rajdeep complete the remaining work?
(A) 8 (B) 8¾ (C) 8¼ (D) 7¼

2. Raj can build a wall in 18 days and Kiran can do the same in 30 days. After Raj had built half the wall, Kiran joins him. What is the total number of days taken to build the wall?
(A) 24 (B) $14^5/_8$ (C) $15^1/_2$ (D) $16^1/_2$

3. Raman and Rajan together complete half the work in 18 days. Rajan and Rajiv complete the remaining half in 12 days. If Rajiv alone can complete the work in 36 days, then how many days will it take for Raman alone to complete the work?

4. Kaushik is one and a half times more efficient than Ravi. Kaushik can do a piece of work in 20 days. What portion of the total work can both of them together complete in 10 days?
(A) 3/10 (B) 4/5 (C) 9/10 (D) 7/10

5. Had then been one men less, then the number of days required to do a piece of work would have been one more. If the number of man-days required to complete the work is 56, how many workers were there?

6. In 8 days, Peter can do as much work as Pan can do in 12 days. To do a certain job both together take 36 days. In how many days can Pan, working alone, complete the job?
(A) 60 days (B) 80 days
(C) 108 days (D) 90 days

7. X can complete a job in 36 days and Y can complete it in 45 days. Z can complete the job in z days. Z started the job. After 28 days, X and Y joined. The job was completed in 4 more days. Find z.

8. P can complete a job in 24 days and Q can do it in 72 days. P, Q and R start the job. After six days, P leaves. In 12 more days, Q and R complete the job. Find the time (in days) in which R can complete another job, which is six times as big.
(A) 108 (B) 144 (C) 216 (D) 72

9. Working in pairs, PQ, QR and RP can complete a job in 24 days, 20 days and 30 days respectively. Find the respective times taken by P, Q and R individually to complete the same job (in days).

(A) 48, 80, $\frac{240}{7}$ (B) 80, 48, $\frac{240}{7}$

(C) 80, $\frac{240}{7}$, 48 (D) 48, $\frac{240}{7}$, 80

10. Anushka takes m times the time taken by Bhanu and Chawla to complete a job. Bhanu takes m times the time taken by Anushka and Chawla to complete it. Chawla takes m times the time taken by Anushka and Bhanu to complete it. Find m.
(A) 1 (B) 2 (C) 3 (D) 1/2

11. A gas station needs 80 people to fill air in 20,000 tyres in 84 days. How many people does the gas station need to fill air in 30,000 tyres in 63 days?

12. A frog was at the bottom of a 80 m deep well. It attempted to come out of it by jumping. In each jump it covered 1·15 m but slipped down by 0·75 m. Find the number of jumps after which it would out of the well.
(A) 198 (B) 201 (C) 200 (D) 199

13. The work done by Ananath in 12 hours is equal to the work done by Anand in 15 hours, which in turn is equal to the work done by Arjun in 20 hours. If working together they complete the work in 10 hours, in how many hours can each of them, working alone, complete the work?
(A) 20, 30, 40 (B) 30, 40, 20
(C) 30, 24, 40 (D) 24, 30, 40

14. Pradeep can work 2/3 times as fast as Abishek and Antony together. Pradeep and Antony together can work twice as fast as Abishek. If Antony alone takes 45 days to complete a job, how long (in days) would Pradeep and Abishek individually take to complete the job?
(A) 30, 36 (B) 36, 30
(C) 45, 60 (D) 60, 45

15. Two men or 5 women can complete a piece of work in 15 days. In how many days can 4 men and 5 women complete the same work?
(A) 8 (B) 7 (C) 5 (D) 4

16. The work done by a man in 3 days is equal to the work done by four boys in 2 days. How many men are needed to do a piece of work in 48 days which 72 boys can do in 16 days?

17. A rectangular tank has dimensions 5 m x 3 m x 2 m. There are three inlet pipes – P, Q, R, which have filling rates of 2 m^3/hr, 3 m^3/hr and 5 m^3/hr respectively. At 9:00 a.m, when the tank was empty, P was opened. Q was opened at 9: 30 a.m. and R was opened at 10:30 a.m. The time at which the tank would be full is _____.
(A) 11:54 a.m. (B) 11:48 a.m.
(C) 12:42 p.m. (D) 12:54 p.m.

18. A man, a woman and a boy can do a piece of work in 2, 4 and 8 days respectively. How many boys must work together with 1 man and 1 woman to complete the work in 1 day?
(A) 5 (B) 4 (C) 2 (D) 1

19. 40 men who can complete a job in 96 days started a job. After 24 days, 20 men joined. After 32 more days, N men left. The remaining men completed the remaining work in 20 more days. Find the value of N.

20. Jadeja, Bhangar, Balaji and Dravid can do a piece of work in 8, 16, 32 and 64 days respectively. Dravid starts the work and Balaji joins him after 1/4th of the work is done, Bhangar joins them after half the work is done and Jadeja joins them after 3/4th work is done. How many days does it take to complete the work?
(A) 30 (B) 32 (C) $25^{2}/_{35}$ (D) $24^{24}/_{35}$

21. A machine of type A which has to produce a set of 1500 bolts, can do so in 30 days. The machine breaks down after 10 days. A machine of type B completes the remaining work in 10 days. In 30 days how many bolts can both of them together produce?

22. Machines P, Q and R can do a piece of work in 20, 30 and 60 days respectively. Machines P, Q and R start the work together. Machine P goes out of order after 5 days. After 3 more days machines Q and R also go out of order. Machine P got repaired by then and it completes the remaining work. What portion of the total work did machine P do?
(A) 3/4 (B) 11/20
(C) 7/20 (D) 3/5

23. A man started a job. Starting from the second day, each day a new man joined with which the capacity of each man doubled. The job was completed in 6 days. On which day will the job be completed if the joining of a new man on a day results in each man working at thrice the rate as he did on the previous day?
(A) 6th (B) 5th (C) 4th (D) 3rd

24. Twenty five persons start a job of digging over an area of 330 m^2. From the second day, a new person joins the group an each day. Each person digs 1 m^2 per day. Find the time taken to complete the job (in days).

25. Some workers have been divided into two groups – A and B – depending on their rate of doing work. Three workers from A and six from B take 20 days to complete a job. Eight from A and 4 from B take 10 days to complete it. Find the time taken by one worker from each group to complete it (in days).
(A) 90 (B) 108 (C) 72 (D) 54

26. Anil can complete a piece of work in 6 days and Mukesh can complete it in 8 days each working alone. Consider two cases in which they work on alternate days. The first case when Anil starts and the second when Mukesh starts. What is the difference of the number of days taken in the two cases?
(A) 1/2 (B) 1/4 (C) 1 (D) $1^{3}/_{4}$

27. Chakri and Bharat can complete a piece of work individually in 24 days and 36 days respectively. They work on alternate days starting with Chakri. Further, they get a holiday after every four days and after the holiday the person who worked on the last day before the holiday now starts the work. After how many days from the start will the work get completed?
(A) $14^{2}/_{5}$ days (B) 36 days
(C) $35^{2}/_{3}$days (D) 35 days

28. A man can begin a work at his maximum rate; but afterwards the rate at which he works follows a cyclic pattern. Every two hours, it reduces by half but after 8 hours, it comes back to its maximum level. He can complete a job in 151 hours at his maximum rate. How many hours would he take to complete the job if his rate follows the cyclic pattern?
(A) 301 (B) 601 (C) 641 (D) 321

29. Sonia can complete a piece of work in 20 days, while Priyanka and Anjali can do it in 30 days each. Sonia works on the first day. Sonia and Priyanka work on the second day and Sonia, Priyanka and Anjali work on the third day. Also Sonia works on the fourth day, Sonia and Priyanka work on the fifth day and Sonia, Priyanka and Anjali work on the sixth day and this cycle is repeated till the work is completed. In how many days is the work completed?
(A) 12 days (B) $13^{1}/_{3}$ days
(C) 14 days (D) $16^{1}/_{2}$ days

30. (i) A man starts a job, working at the rate of 1 unit a day. After each day, another man joins the working group. The man who joins on the xth day of the job works until the job is completed, at x units per day. The job is completed in 4 days. Find the time it would have taken have the man who started the work to complete the job alone (in days).
(A) 20 (B) 10 (C) 16 (D) 24

(ii) Four men start a job. After each day, a man leaves. The x^{th} man who leaves works at x units/day. The job is completed when the last man leaves. What part of the total wages will the last man get?
(A) $\frac{7}{15}$ (B) $\frac{3}{5}$ (C) $\frac{8}{15}$ (D) $\frac{2}{3}$

31. Prakash, Pranay and Pramod working alone can do a piece of work in 20, 30 and 60 days respectively. All three of them start the work together, but after x days Prakash leaves and then after y more days Pranay leaves and Pramod completes the remaining work. If Pranay had not left, Pramod and Pranay would have completed the remaining work in (y + 6) days after Prakash had left. If both Prakash and Pranay had stayed, the work would have been completed in (x + 6) days. What is the total number of days taken to complete the work?

32. In a farm, each cow eats twice as much grass as each sheep. The cost of grass for 10 cows and 40 sheep for 20 days is ₹ 900. Find the cost of grass for 20 cows and 10 sheep for 18 days (in ₹).
(A) 600 (B) 675 (C) 750 (D) 800

33. The cost of grass for 20 cows and 30 sheep for 30 days is ₹720. If the 30 sheep eat double the grass eaten by the 20 cows, then what is the cost of grass eaten by 20 sheep in 15 days?(in ₹)

34. George and Gagan together repair a bridge in 45 days and receive ₹13,500. If Gagan is three times as efficient as George, what is the amount of money he earns in 10 days?
(A) ₹2,000 (B) ₹2,250
(C) ₹2,500 (D) ₹2,750

35. Gokul, Govardhan and Ganesh can do a piece of work in 10, 20 and 30 days respectively. They begin a new job of similar nature and each of them works on it for one third of the total period of work. If they get ₹6,600 for the new job, how much should Govardhan get, given that the amounts distributed are in proportion to the work done by them?
(A) ₹1,800 (B) ₹2,200
(C) ₹3,300 (D) ₹2,400

36. A piece of work when done by a man, a woman and a child costs respectively ₹720, ₹810 and ₹1,080. Their respective daily wages are ₹60, ₹45 and ₹30. If a family consisting of a husband, wife and their child is engaged to complete this work, how much would it cost? (in ₹)

37. A group of men are building a wall. After half the wall has been built, double the number of men join the original group. The wall gets completed 6 days earlier than scheduled. What is the total number of days the initial group of men would have taken to complete the wall?
(A) 18 (B) 16 (C) 14 (D) 12

38. Six small pumps and three large pumps are fitted to a tank. Each small pump works at $2/3^{rd}$ the rate of each large pump. If all the pumps work together, what fraction of the time taken by a single large pump, will they take to fill the tank?
(A) $\frac{1}{6}$ (B) $\frac{1}{7}$ (C) $\frac{1}{8}$ (D) $\frac{1}{9}$

39. Two pipes A and B which can fill a tank in 20 and 30 hours respectively were opened simultaneously. But there was a leak and it took 3 hours more to fill the tank. In how many hours can the leak empty the tank?

40. Two pipes P and Q can fill a cistern in 12 and 18 hours respectively. Both the pipes were opened at 10:00 a.m. and the cistern was full at 6:00 p.m. What could be the minimum possible duration for which one of the pipes must have been closed during that interval?
(A) 4 hours
(B) $2^1/_2$ hours
(C) 2 hours
(D) 4/3 hours

41. N taps numbered from 1 to N are fitted to a tank. The rate at which the nth tap, for n = 1, 2, ……. N fills the tank, equals the sum of the rates of all the taps numbered below it. If the sixth tap can fill it in 80 minutes, find the time in which the ninth tap can fill it (in minutes).

42. A pipe can fill a tank in 4 hours, while a leak which is at one-fourth the height of the tank can empty upto that part in 2 hours. If both are operated simultaneously and initially the tank is full, then when will it be one-fourth full?
(A) 2 hours (B) $2\ ^1/_3$ hours
(C) $1^1/_2$ hours (D) 6 hours

43. Two taps, which can fill a tank in 12 hours and 36 hours, are opened simultaneously. When the tank was supposed to be full, it was found that only $(5/6)^{th}$ of it was full due to a leak at the bottom. Find the time in which the remaining part of the tank would be filled (in hours).

44. A pipe is filling a tank of 200 litres capacity at 5 litres/hr. Because of a leak it takes 80 hours more to fill the tank. What is the rate in litres/hr at which the water is leaking?
(A) 60 (B) 3 (C) 3.33 (D) 80

45. Three taps x, y, z can fill a tank in 18, 24 and 36 hours respectively. x is opened first and y is opened after time 't' and 'z' is opened after '2t', measured from the time x was opened. If the time taken for the tank to fill up is 9/2 hours less than double the time that it would have taken had x, y, z been opened simultaneously, what is the time in hours after which y was opened?
(A) 4 (B) $4^3/_4$ (C) $4^4/_5$ (D) $4^1/_2$

Directions for questions 46 to 55: Each question is followed by two statements I and II. Indicate your responses based on the following directives:

Mark (A) if the question can be answered using one of the statements alone, but cannot be answered using the other statement alone.
Mark (B) if the question can be answered using either statement alone.
Mark (C) if the question can be answered using I and II together but not using I or II alone
Mark (D) if the question cannot be answered even using I and II together.

46. If ten men take six hours to do a piece of work, then how long will five boys take to do the same work?
I. A boy works at 3/4 the rate of a man.
II. Five men and five boys take ten hours to do the work.

47. How long will it take for the tank to get filled when the taps A and B are opened simultaneously?
I. Tap A is a filling tap, and can fill it in two hours.
II. Tap B is an emptying tap, and can empty it in three hours.

48. What is the time taken to fill the tank, if the two pipes A and B are turned on alternately for one minute each?
I. The two pipes together fill the tank in six minutes.
II. One pipe can fill the tank in ten minutes.

49. A, B and C are paid a total amount of ₹529. How much should A be paid?
I. A and B together completed 19/23rd of the work.
II. B and C together completed 8/23rd of the work.

50. From a tank full of water, the water is discharged into a tub through a pipe. What is the quantity of water discharged from the tank in a minute?
I. The tank was emptied in 30 minutes.
II. The dimensions of the tub are 3 m $\times$ 2 m $\times$ 2 m.

51. There are two groups of people P and Q. In P each person works with the same efficiency. In Q each person works with the same efficiency. Is the time taken by one person from P and one person from Q to complete a job more than 6 days?
I. Two persons from P and three persons from Q can complete the job in $\frac{12}{5}$ days.
II. Three persons from P and two persons from Q can complete the job in $\frac{68}{35}$ days.

52. Ajay and Bala completed a job working on alternate days. Find the time taken by them to complete it.
I. Had they worked together they would have completed the job in 20 days.
II. Times taken by Ajay and Bala working individually to complete a similar job are 30 days and 60 days respectively.

53. Pipes A and B can fill a tank in t hours. A can fill it in (t + a) hours. B can fill it in (t + b) hours. Find t.
I. 4a = 9b
II. ab = 144

54. Rohan and Sohan can complete a job in 12 days. Who is the least efficient among Rohan, Sohan and Mohan?
I. Rohan and Mohan can complete the job in 15 days.
II. Mohan and Sohan can complete the job in 20 days.

55. Pipes A, B and C can be used for filing or emptying with the same capacity. If A and B are used for filling and C is used for emptying, a tank would be filled in 6 hours. Find the time taken by C to fill it.
I. If all the pipes are used for filling, the tank would be filled in 2 hours.
II. If B and C are used for filling and A is used for emptying, the tank would be filled in 6 hours.

Key

Concept Review Questions

1. B	6. C	11. B	16. D	21. A	26. B	31. 3.6
2. 36	7. 5	12. 12	17. 76.8	22. A	27. C	32. D
3. A	8. C	13. D	18. B	23. C	28. A	33. C
4. 50	9. A	14. D	19. A	24. 180	29. 8	34. D
5. 75	10. A	15. B	20. B	25. 6	30. B	35. 15

Exercise – 6(a)

1. C	9. D	17. 6	24. B
2. A	10. 320	18. D	25. 15
3. A	11. 16	19. A	26. C
4. 120	12. D	20. B	27. C
5. C	13. C	21. (i) C	28. 7.2
6. B	14. D	(ii) B	29. 15
7. 728	15. D	22. 24	30. C
8. D	16. C	23. C	

Exercise – 6(b)

1. B	9. C	17. D	25. C	32. B	40. D	48. A
2. B	10. B	18. C	26. B	33. 160	41. 10	49. A
3. 72	11. 160	19. 12	27. B	34. B	42. D	50. C
4. D	12. D	20. D	28. D	35. A	43. 1.8	51. A
5. 8	13. D	21. 4500	29. A	36. 810	44. C	52. B
6. D	14. A	22. D	30. (i) A	37. A	45. D	53. A
7. 40	15. C	23. B	(ii) C	38. B	46. B	54. C
8. C	16. 9	24. 11	31. 28	39. 60	47. C	55. A