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 man days required to do the work. The total number of man days 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, in how many days can 10 men complete the same job?

Sol: If 15 men can complete the job in 60 days, then the number of man days required for the job is $15 \times 60 = 900$.
If this job is to be done by 10 men, the number of man days will still be the same. The number of days they will take to complete the same job is 900/10 = 90 days.

6.02. Fifteen men take 20 days to complete a job working 8 hours a day. How many hours a day should 20 men work to complete the job in 12 days?

Sol: Since 15 men take 20 days at 8 hours per day, the total man hours required for the job is $15 \times 20 \times 8 = 2400$. If 20 men are working on the same job, the number of man hours required for the job will still be the same. Hence the number of hours they should work per day is 2400 / (20) (12) = 10.
Therefore, 20 men can complete the work in 12 days working 10 hours per day.

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. A piece of work can be done by 24 men in 4 days working 10 hours a day. How many men are needed to complete another work which is twice as large as the first one in 48 days working 8 hours a day?

Sol: The problem can be solved by using the man days concept as shown in 6.02 example, or using the following formula.

$$\frac{M_1 D_1 H_1}{W_1} = \frac{M_2\ D_2\ H_2}{W_2}$$

Here $W_1 = 1$ and $W_2 = 2$, $M_1 = 24$, $H_1 = 10$, $D_1 = 4$ $H_2 = 8$, and $D_2 = 48$

$$\frac{24 \times 10 \times 4}{1} = \frac{M_2 \times 48 \times 8}{2} \Rightarrow M_2 = 5.$$

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 work in $\frac{\mathbf{pq}}{\mathbf{p+q}}$ **days**.

6.04. A can do a piece of work in 10 days. B can do the same work in 15 days. In how many days can the work be completed if A and B work together?

Sol: As A can do the work in 10 days in one day he can complete $1/10^{th}$ of the work. Similarly work done by B in one day
$= 1/15^{th}$.
∴ The work done by A and B in one day
$= \frac{1}{10}+\frac{1}{15}=\frac{1}{6}$
∴ They can complete it in 6 days.
Alternately, using the formula,
A and B together can do the work in $\frac{10\times15}{10+15}=\frac{150}{25}$ = 6 days.

6.05. A and B together can do a piece of work in 24 days and A alone can complete the work in 36 days. How long will B alone take to complete the work?

Sol: In a day, A and B together can do $1/24^{th}$ part of the work. In a day, A alone can do $1/36^{th}$ part of the work. In a day, work done by B alone is
(work done by A and B) – (work done by A)
i.e. $\frac{1}{24}-\frac{1}{36}=\frac{1}{72}$.
Therefore, B alone can complete the work in 72 days.

6.06. Girish and Harish can complete a job in 24 days working together. Girish alone can complete it in 32 days. Both of them worked together for 8 days and then Girish left. How long will Harish take to complete the remaining work?

Sol: Work done in one day by both together
$= 1/24^{th}$
∴ Work done by them in 8 days
$= (8) \times (1/24) = 1/3^{rd}$
Remaining work = $1 - \frac{1}{3}=\frac{2}{3}$.
Work done by Harish in 1 day
$=\frac{1}{24}-\frac{1}{32}=\frac{1}{96}$.
Since only two-thirds work is left, Harish will do the remaining work in $(2/3) \times 96 = 64$ days.

6.07. A and B together can do a piece of work in 36 days, B and C can do it in 48 days and A and C can do it in 72 days. How long would each take to do the work?

Sol: Work done by A and B together in one day
$= 1/36^{th}$ ------ (1)
Work done by B and C together in one day
$= 1/48^{th}$ ------ (2)
Work done by A and C together in one day
$= 1/72^{th}$ ------ (3)
Adding (1) + (2) + (3), we get 2 (A + B + C)'s 1 days work
$= \frac{1}{36}+\frac{1}{48}+\frac{1}{72}=\frac{9}{144}=\frac{1}{16}$
A, B and C together can finish, in 1 day, $\frac{1}{2}\left(\frac{1}{16}\right) = \frac{1}{32^{th}}$ part of the work.
Work done by A in 1 day
$= \frac{1}{32}-\frac{1}{48}=\frac{1}{96}$.
Therefore, A alone can do it in 96 days.
Work done by B in 1 day
$= \frac{1}{32}-\frac{1}{72}=\frac{5}{288}$.
Therefore B alone can do it in 288/5 i.e., $57^{3}/_{5}$ days.
Work done by C in 1 day
$= \frac{1}{32}-\frac{1}{36}=\frac{1}{288}$.
Therefore, C alone can do it in 288 days.

6.08. A and B can do a work in 18 days. B and C can do it in 24 days and A and C can do it in 36 days. They all work together for 4 days and then A left. In how many more days can B and C finish the remaining work?

Sol: By using a procedure similar to previous example, we get 2 (A + B + C)'s 1 day's work
$= \frac{1}{18}+\frac{1}{24}+\frac{1}{36}=\frac{9}{72}=\frac{1}{8}$. A, B and C can finish the work in 16 days. Work done by A, B and C in 4 days
$= 4 \times 1/16 = 1/4$th.
∴ Work remaining = 1 – 1/4 = 3/4
B and C can finish the remaining work in
$3/4 \times 24 = 18$ more days.

6.09. A can do a work in 18 days. When he had worked for 2 days, B joined him. If both A and B complete the remaining work in 4 more days, in how many days can B alone finish the whole work?

Sol: Work done by A in one day = $1/18^{th}$.
Number of days A worked = 2 + 4 = 6.
Therefore, total work done by A
$= 6 \times 1/18$
$= 1/3^{rd}$.
The remaining two-thirds, of the total work is done by B in 4 days.
Therefore, B takes $4 \times 3/2 = 6$ days to finish the whole work.

6.10. A and B together can do a piece of work in 16 days. B and C together can do the same work in 32 days. After A worked for 4 days, B for 12 days, C takes up the work and finishes it alone in 48 days. In how many days will each of them complete the work?

Sol: Work done by A and B in 1 day = $1/16^{th}$
Work done by B and C in 1 day = $1/32^{nd}$
A worked for 4 days, B worked for 12 days and C worked for 48 days to complete the work.
Denoting work done by A, B and C in one day as a, b and c, we have $4a + 12b + 48c = 1$
$\Rightarrow 4a + 4b + 8b + 8c + 40c = 1$

$$4\left(\frac{1}{16}\right) + 8\left(\frac{1}{32}\right) + 40c = 1$$

$$\frac{1}{4} + \frac{1}{4} + 40c = 1;\ 40c = \frac{1}{2} \Rightarrow c = \frac{1}{80}.$$

C takes 80 days to finish the work.

$$\text{B's 1 day work} = \frac{1}{32} - \frac{1}{80} = \frac{3}{160}$$

Hence B takes 160/3 i.e., $53^1/_3$ days to finish the work.

$$\text{A's 1 day work} = \frac{1}{16} - \frac{3}{160} = \frac{7}{160}.$$

Hence A takes 160/7 i.e., $22^6/_7$ days to finish the work.

6.11. To do a certain work, C alone takes thrice as long as A and B together. A alone would take twice as long as B and C together. All three together complete the work in 3 days. How long would each take separately?

Sol: As C takes thrice as long as A and B together, (A + B)'s one day work = 3 times of C's one day work.
Adding 1 time C's one-day work to both sides, 4 times C's one day work
= (A + B + C)'s one day work i.e. $1/3^{rd}$.
Hence C's one day work = $1/12^{th}$.
As A takes twice as long as B and C together, (B + C)'s one day work = 2 times of A's one day work. Adding 1 time A's one day work to both sides, 3 times A's one day work = (A + B + C)'s 1 day work i.e. $1/3^{rd}$.
A's one day work = $1/9^{th}$.
B's one day work

$$= \frac{1}{3} - \left(\frac{1}{12} + \frac{1}{9}\right) = \frac{12-3-4}{36} = \frac{5}{36}.$$

Hence A alone takes 9 days to complete the work, B alone takes 36/5 i.e., $7^1/_5$ days to complete the work and C alone takes 12 days to complete the work.

6.12. Three men or five women can construct a wall in 68 days. How long will it take for 5 men and 3 women to complete the same work?

Sol: Given 3m = 5w where m is the work done by one man in one day and w is the work done by one woman in one day.
$\Rightarrow 1m = 5w/3$
Now $5m + 3w = 5(5w/3) + 3w$

$$= \frac{25w}{3} + \frac{9w}{3} = \frac{34w}{3}$$

If 5 women can do the work in 68 days, (34/3) women can finish it in $5 \times 68 \times (3/34) = 30$ days.

6.13. If 15 boys and 20 men take 4 days to do a piece of work and 12 boys and 13 men take 6 days to do the same work, find the time taken by 2 men and 8 boys to complete the same work.

Sol: Given 15 boys + 20 men can do the work in 4 days and 12 boys + 13 men can do the same work in 6 days. Let m and b be the works done by a man and a boy in one day respectively. As the persons in both the cases are doing the same work, number of mandays will be same.
Therefore, 4(15b + 20m) = 6(12b + 13m)
$\Rightarrow$ m = 6b. Hence [15b + 20m] is equal to [15b + 120b] i.e. 135b.
Time taken by 2 men and 8 boys i.e.
12b + 8b = 20b, to complete the work
$= (135 \times 4) / 20 = 27$ days.

6.14. A certain number of men can do a work in 24 days. If there were 3 more men, the work can be done in 6 days less. How many men were there?

Sol: Let the initial number of men be P. Number of days is 24. So number of man days is 24 P. If there are 3 more men i.e., P + 3 men, it is completed in 24 – 6 = 18 days. So 24P = (P + 3) 18
$\Rightarrow$ P = 9. Therefore, there were 9 men.

6.15. X is 4 times as fast as Y and is able to complete the work in 90 days less than Y. Find the time in which they can complete the work working together.

Sol: As X is 4 times as fast as Y, if Y does the work in 4 days, X does it in 1 day i.e. the difference is 3 days.
If the difference is 3 days, X takes 1 day and Y takes 4 days. If the difference is 90 days (i.e. 30 times), X takes 30 days and Y takes 120 days.
Let time taken by them working together to complete the work is t days (say).

$$\frac{1}{t} = \frac{1}{30} + \frac{1}{120} = \frac{5}{120} = \frac{1}{24}$$

t = 24

6.16. Savita, can finish a work in 48 days working 9 hours a day. Rani can finish the same work in 36 days working 16 hours a day. In how many days can they finish it working together for $7^5/_7$ hours a day?

Sol: **Method 1**

Number of hours taken by Savita
$= 48 \times 9 = 432$.

Number of hours taken by Rani
$= 36 \times 16 = 576$.
Together they will do, $\frac{(432+576)}{(432)(576)}$

$= \frac{7}{1728}$th work in 1 hour.
Hence they will take (1728/7) hours i.e. working 1 hour a day, (1728/7) days. Therefore, working $7^5/_7$ hours a day they can complete the work in
$\frac{1728}{7} \times \frac{7}{54} = 32$ days.

Method 2:

At 9 hrs/day, Savita takes 48 days. If S is the work/hour of Savita, then total work
$= 48 \times 9 \times S$ ----- (1)
Similarly, total work $= 36 \times 16 \times R$ ---- (2), where R is the work/hour of Rani.
Equating (1) and (2), the relation is
$48 \times 9 \times S = 36 \times 16 \times R$;
$\Rightarrow 3S = 4R$ ------ (3)
When Savita and Rani work together, work done per hour = (S + R).
They work $7\frac{5}{7}$ hrs/day.
If they take d days for the work, total work
$= d \times (54 / 7) \times (S + R)$ ------ (4)
Equating (1) and (4), the relation is
$48 \times 9 \times S = d \times (54 /7) \times (S + R)$
Multiplying with 4, and then replacing 4R by 3S, the relation is
$4 \times 48 \times 9 \times S = d \times (54/7) \times (4S + 4R)$
$\Rightarrow 7 \times 4 \times 48 \times 9 \times S = d \times 54 \times 7S$;
$\Rightarrow 32 = d$.
Hence they take 32 days.

6.17. A alone can do a work in 36 days and B alone can do it in 54 days. If C takes five times as long as A and B together, how long will B and C together take to complete the same work?

Sol: As A can do the work in 36 days and B in 54 days, when they work together, they take $\frac{36 \times 54}{36+54} = \frac{108}{5}$ days.
Given, C takes 5 times the time A and B together take; i.e. C takes $5 \times (108/5) = 108$ days to do the work.
If B and C work together, they can complete the work in $\frac{54 \times 108}{54+108} = 36$ days.

6.18. A and B each working alone can do a work in 15 days and 25 days respectively. They started the work together but B left after sometime and A finished the remaining work in 7 days. After how many days from the start did B leave?

Sol: A's work for 7 days $= 7 \times 1/15 = 7/15^{th}$ part of the work. The remaining $8/15^{th}$ part of the work was done by A and B together.
Work done by A and B in a day
$= \frac{1}{15} + \frac{1}{25} = \frac{8}{75}$.
Number of days they worked together
$= \frac{8/15}{8/75} = 5$ days. Hence, B left after 5 days from the start of work.

6.19. A contractor decided to complete a work in 60 days and employed 60 men at the beginning and 30 men additionally after 20 days and got the work completed as per schedule. If he had not employed the additional men, how many extra days would he have needed to complete the work?

Sol: Total mandays required for the work
$= 60 \times 20 + 90 \times 40 = 4800$
To complete 4800 mandays work, 60 men will take 4800/60 = 80 days.
$\therefore$ Extra days needed = 80 – 60 = 20

6.20. A group of 45 men is employed to complete some work in 58 days. After 40 days, an additional 15 men are employed and the work is finished three days earlier. If the additional men had not been employed, how many more days would it have taken beyond the expected period?

Sol: 60 men complete the remaining work in 58 – 40 – 3 = 15 days.
45 men will do it in $60 \times 15/45 = 20$ days. Extra time taken = 20 – 18 = 2 days

6.21. A and B working separately can do a piece of work in 3 days and 6 days respectively. They work on alternate days, B works on the first day. In how many days will the work be completed?

Sol: Since they are working on alternate days, let us consider a time period of two days in which B does one day's work and A does the next day's work.
In a period of two days, work done by B and A = $\frac{1}{6} + \frac{1}{3} = \frac{1}{2}$.
Since they complete 1/2 of the work in a period of two days, they need one more period of two days to complete the work remaining i.e., they take $2 \times 2 = 4$ days.

6.22. A and B working separately can do a piece of work in 12 days and 20 days respectively. They work on alternate days A works on the first day. In how many days will the work be done?

Sol: Since they are working on alternate days with A starting the work, let us consider a period of two days. In a period of two days, work done by A and B
$= \frac{1}{12} + \frac{1}{20} = \frac{5+3}{60} = \frac{2}{15}$
If we consider 7 such time periods of 2 days (we are considering 7 periods because in the fraction 2/15 the numerator 2 goes 7 times in the denominator 15).
Work done $= 7 \times (2/15) = (14/15)$
Remaining work $= 1 - (14/15) = 1/15$.
Now it is A's turn since 7 whole number of periods are over.

Time taken by A to finish 1/15th part of the work = (1/15) / (1/12) = 4/5 days.
So, total time taken to complete the work is $14^4/_5$ days.

6.23. A and B working separately complete a work in 8 days and 12 days respectively. They work on alternate days A works on the first day. In how many days will the work be completed?

Sol: In a period of 2 days, work done by A and B $= \frac{1}{8}+\frac{1}{12}=\frac{5}{24}$.
In 4 such time periods of 2 days i.e. 8 days. (we are considering 4 periods because in the fraction 5/24 the numerator 5 goes 4 times in the denominator 24), work done is 20/24th.
Remaining work $= 1 - \frac{20}{24}=\frac{4}{24}=\frac{1}{6}$.
Now it is A's turn, since 4 whole number of periods are over.
But A can do only 1/8th part of the work in a day.
So the remaining work after A works for 1 day $= \frac{1}{6}-\frac{1}{8}=\frac{1}{24}$.
Now it is B's turn to do 1/24th part of the work; and he takes (1/24) / (1/12) = (1/2) a day.
Total number of days taken
$= (4 \times 2) + 1 + 1/2 = 9^1/_2$ days.

When people work together and earn money for the work, the money has to be shared by all the people doing the work.

Wages

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.

6.24. A, B and C can do a piece of work in 6 days, 4 days and 3 days respectively. They completed a work together and received ₹540 for the job. What is C's share?

Sol: Since they work for the same number of days, the ratio in which they share the money is the ratio of work done per day.
Ratio of work done per day by A, B and C
$= \frac{1}{6}:\frac{1}{4}:\frac{1}{3} = 2:3:4$.
Hence C's share = (4/9) (540) = ₹240.

6.25. A, B and C contract a work for ₹7,500. A and B together complete 2/5th of the work and then C takes over and finishes the work. What is the amount received by C?

Sol: Work done by C alone = 1 – (2/5) = 3/5.
Therefore, C's share = (3/5) (7500)
= ₹4,500.

6.26. Wages for 80 women for 60 days are ₹43,200. How many men must work for 40 days to earn ₹57,600, if the daily wages for a man is four times that of a woman?

Sol: Daily Wages of a woman $= \frac{43,200}{80\times 60} = ₹9$.
Daily Wages of a man $= 4 \times 9 = ₹36$.
Therefore, number of men $= \frac{57,600}{36\times 40} = 40$.

6.27. A, B and C together can earn ₹3,240 in 18 days. A and C can earn ₹1,200 in 10 days whereas B and C can earn ₹1,820 in 14 days. Find the daily earnings of C.

Sol: Daily Wages of (A + B + C)
= 3240/18 = 180 ----- (1)
Daily Wages of (A + C)
= 1200/10 = 120 ------ (2)
Daily Wages of (B + C)
= 1820/14 = 130 ------ (3)
(2) + (3) – (1), leads to:
(A + C) + (B + C) – (A + B + C)
= 120 + 130 – 180 $\Rightarrow$ C = 70

6.28. Two men undertake a work for ₹480. They can do the work individually in 24 days and 40 days. If they complete the work in 10 days with the help of a boy, how should they divide the total amount paid to them?

Sol: The 1st man can do 1/24th of the work in 1 day and since he works for 10 days, he does (10) (1/24) = 5/12th of the work. So he should get (5/12) (480) = ₹200
The 2nd man can do 1/40th part of the work in 1 day and since he works for 10 days, he does (10) (1/40) = 1/4th of the work. So he should get (1/4) (480) = ₹120.
Since the two men earned a total of ₹200 + ₹120 = ₹320, the balance of ₹480 – ₹320 = ₹160 will be paid to the boy.

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.

6.29. Two pipes A and B separately can fill an empty tank in 30 minutes and 45 minutes respectively. If both the pipes are opened simultaneously, how long will it take to fill the empty tank?

Sol: Part of the tank filled by A in 1 minute = $1/30^{th}$. Part of the tank filled by B in 1 minute = $1/45^{th}$. Part of the tank filled by both A and B in one minute

$= \frac{1}{30}+\frac{1}{45}=\frac{1}{18}$.

The tank can be filled in 18 minutes.

6.30. Pipe A can fill an empty tank in 24 minutes, pipe B in 36 minutes and pipe C can empty a full tank in 72 minutes. If all of them work together, find the time taken to fill the tank.

Sol: Work done by the pipes A, B and C together in 1 minute $= \frac{1}{24}+\frac{1}{36}-\frac{1}{72}=\frac{1}{18}$.

So, the empty tank can be filled in 18 minutes.

6.31. Two pipes can fill an empty tank in 40 minutes and 60 minutes respectively. There is an outlet pipe C. If all the 3 pipes are opened simultaneously, the empty tank can be filled in 48 minutes. How much time will it take for C alone to empty the full tank?

Sol: Part of the tank emptied by C in one minute $= \frac{1}{40}+\frac{1}{60}-\frac{1}{48}=\frac{1}{48}$.

$\therefore$ C can empty the full tank in 48 minutes.

6.32. Two pipes A and B can fill an empty tank in 40 minutes and 60 minutes respectively. If both pipes are opened simultaneously, after how much time should A be closed so that the tank is filled in 36 minutes?

Sol: B works for 36 minutes. In 1 min, B fills $1/60^{th}$ part of the tank i.e. in 36 minutes, it fills 36(1/60) = 3/5. The remaining $2/5^{th}$ is filled by A. Since A fills the tank fully in 40 minutes, it takes $(2/5) \times 40$ = 16 minutes to fill $2/5^{th}$ part of the tank. So A should be closed after 16 minutes.

6.33. Three taps A, B and C together can fill an empty tank in 4 hours. A, B and C are opened simultaneously. After 1 hour, C is closed and the tank is filled in 6 more hours. Find the time in which C alone can fill the tank.

Sol: Work done by A, B and C in 1 hour = $1/4^{th}$.

Remaining part of the tank = 1 – (1/4) = 3/4

Time taken by (A and B) to fill this $3/4^{th}$ part of the tank = 6 hours.

$\Rightarrow$ A and B together fill the tank in 6/(3/4) 8 hours. Now, we know A, B and C take 4 hours and A and B take 8 hours.

Part of the tank filled by C in 1 hour

$= \frac{1}{4}-\frac{1}{8}=\frac{1}{8}$.

So, C alone can fill the tank in 8 hours.

Concept Review Questions

Directions for questions 1 to 20: 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 30 men can do a job in 30 days, find the part of the job that can be completed by 1 man in 1 day.

(A) $\frac{1}{30}$ (B) $\frac{1}{90}$

(C) $\frac{1}{900}$ (D) None of these

2. If a man completes a job in 6 days working 6 hours a day, in how many days can he complete the job working 9 hours a day?

3. 2 men can complete a job in 8 days working 8 hours a day.

(i) How many men are required to complete the job in 4 days working 4 hours a day?
(A) 8 (B) 16 (C) 12 (D) 4

(ii) How many men are required to complete twice the job working 4 hours a day for 4 days?

4. Varma can read a book in k minutes. What part of the book can he read in 8 minutes?(k > 8)

(A) 8 + k (B) $\frac{8}{k}$ (C) $\frac{k}{8}$ (D) $\frac{k-8}{k}$

5. P is twice as fast as Q and R together. Working together, all three can do a work in 21 days. In how many days can Q and R together do the work?
(A) 48 (B) 63 (C) 54 (D) 72

6. A and B working together can complete a job in 30 days. The ratio of their efficiencies is 3 : 2. In how many days can the faster person complete the job?

7. If the ratio of the individual times taken by P, Q and R to complete a job is 2 : 3 : 6, find the ratio of the parts of the jobs done by P, Q and R in an hour.
(A) 2 : 3 : 6 (B) 6 : 3 : 2 (C) 3 : 2 : 1 (D) 1 : 2 : 3

8. If X is 40% more efficient than Y, find the ratio of the efficiencies of X and Y.
(A) 5 : 3 (B) 3 : 5 (C) 5 : 7 (D) 7 : 5

9. P and Q completed a job working together in x days. P takes (x + 8) days to complete the job, Q takes (x + 18) days to complete the job. Find x.

10. The ratio of the efficiencies of P, Q and R is 4 : 5 : 6. If they completed a job working together, find the fraction of the job done by P.

(A) $\frac{1}{5}$ (B) $\frac{1}{3}$ (C) $\frac{4}{15}$ (D) $\frac{7}{15}$

11. For how many days will 75 kg of ration be sufficient for a family of 6 members if each member consumes 1.25 kg of ration per day?

12. X and Y can complete a job in 15 days working together. Y and Z can complete the job in 20 days working together. X and Z can complete the job in 30 days working together. Who is the slowest of the 3 workers?
(A) X (B) Y
(C) Z (D) Cannot be determined

13. 9 men can complete a job in 20 days. If a woman works at one-third the rate of a man, in how many days can 15 women complete the job?

14. P and Q can complete a job in 12 days working together. Q and R can complete the job in 20 days working together. P and R can complete the job in 15 days working together. In how many days can P, Q and R complete the job working together?
(A) 5 (B) 10 (C) 15 (D) 20

15. X can complete a job in 30 days. Y can complete the job in 60 days. Both work together along with Z to complete the job in 10 days. Find the share of Z (in ₹) in a total of ₹6000 paid for the work.

16. P can complete a job in 30 days. Q can complete the job in 60 days. If they work on alternate days, the job would be completed in the
(A) least possible time, if P starts the job.
(B) least possible time, if Q starts the job.
(C) same time, irrespective of who starts the job.

17. A can complete a job in 2 days. B can complete the job in 4 days. If they work on alternate days, the job would be completed in the
(A) least possible time, if A starts the job.
(B) least possible time, if B starts the job.
(C) same time, irrespective of who starts the job

18. P, Q and R take 20 days, 30 days and 40 days respectively to complete a job. The three work in a rotation to complete the job with only 1 person working on a day. Who should start the job so that the job is completed in the least possible time?
(A) P (B) Q
(C) R (D) Any one of the three

19. An inlet pipe takes 8 hours to fill a tank. An outlet pipe takes 12 hours to empty it. If both pipes are opened simultaneously, in how many hours will the tank be filled?

20. Tap A takes 4 hours to fill a tank. Tap B takes 6 hours to fill the tank. If both the taps were opened simultaneously, by the time the tank was full, what fraction of the tank was filled by tap A?

(A) 3.2 hours, $\frac{2}{5}$ (B) 3.2 hours, $\frac{3}{5}$

(C) 2.4 hours, $\frac{2}{5}$ (D) 2.4 hours, $\frac{3}{5}$

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. P and Q can complete a job in 12 days working together. If P alone can complete it in 20 days, in how many days can Q alone complete it?
(A) 32 (B) 24 (C) 20 (D) 30

2. A can do a piece of work in 24 days and B in 48 days. B joins A after A had worked alone for 6 days. In how many more days would the work get completed?

3. Rajesh and Rakesh working alone can complete a piece of work in 12 and 24 days respectively, Rajesh started the work and after a few days Rakesh joined him and the work was completed in 10 days. After how many days did Rakesh join Rajesh?

4. A, B and C working independently can complete a certain piece of work in 20, 30 and 60 days respectively. All the three of them worked together for 5 days and then A left. B and C worked for the next 5 days and then B left. The remaining work was then completed by C. What portion of the work did C complete?
(A) 1/12 (B) 5/12 (C) 7/12 (D) 6/12

5. A can complete a piece of work in 12 days which B and C can complete in 16 and 20 days respectively. All the three of them started the work, but A left after 4 days, B left 2 days before the completion of the work. In how many days was the work completed?
(A) $7^1/_{27}$ (B) $8^1/_{14}$ (C) $9^1/_{16}$ (D) $10^1/_{27}$

6. If 20% of a certain quantity of work is done by A and after that the remaining 80% of the work is done by B, the work will be completed in 20 days. If 80% of the work is done by A and after that the remaining 20% of the work is done by B, the work will be completed in 30 days. If A & B work together how many days are required to complete the work?
(A) $11^1/_9$ (B) $10^1/_9$ (C) 12 (D) 15

7. A takes 1 day to complete a job. B takes twice the time as A to complete the job. C takes twice the time as B to complete the job. D takes twice the time as C to complete the job. Two of the four when working together take atmost 40% of the time to complete the job that the other two would take working together. Find the faster pair.
(A) A, D (B) A, C
(C) A, B (D) Cannot be determined

8. The ratio of the rates of work of A, B and C is 1 : 3 : 2. The total wages of A, B and C for working for 15, 20 and 25 days respectively are ₹5000. Find the total wages of the three (in ₹), if A works for 10 days, B for 15 days and C for 12 days.

9. A certain quantity of work can be completed by A, B and C in 20, 15 and 30 days respectively and an amount of ₹4000 is paid for that work. Another quantity of work can be completed by A, B and C in 15, 25, 10 days respectively and an amount of ₹10,000 is paid for this work. If both the works are completed by A, B and C together, who got the minimum amount of the three?
(A) A (B) B
(C) C (D) Cannot be determined

10. Mahesh, Suresh and Naresh together can complete a work in 4 days. The wages paid to Mahesh, Suresh and Naresh for completing the work are ₹6300, ₹7350 and ₹8400 respectively. Find the number of days in which Naresh alone can complete the work.

11. A boy is trying to cover a distance of 100 m up a ramp. He takes a jump forward and covers 2 m, but every time he jumps forward, he also slips backwards by 1 m. How many jumps would be required to cover the distance?
(A) 99 (B) 100
(C) 98 (D) None of these

12. 25 men take 20 days to construct a wall 10 m high. How many men would be required to construct a similar wall, which is 8 m high, if the work is planned to be completed in 10 days?

13. 64 men working 8 hours a day plan to complete a piece of work in 9 days. However 5 days later they find that they had completed only 40% of the work. They now wanted to finish the remaining portion of the work in 4 more days. Find the number of hours per day that they need to work in order to achieve the target.

14. Working individually A, B, C, D and E can complete a piece of work in 8, 12, 16, 20 and 24 days respectively. A starts the work, after 2 days B and E take over from him and they work for the next 3 days. C then works to complete half of the remaining work and then D completes the other half. How long did the work last?
(A) 10 days (B) $11^3/_4$ days
(C) 14 days (D) 15½ days

15. Anil and Bala agreed to complete a work in 14 days. They also agreed to forfeit thrice the amount of wages corresponding to the unfinished work if they failed to complete the work in 14 days. As they could not complete the work in 14 days, they lost $\frac{3}{8}$ th of the amount that they would have together received had they completed the work in time. If Anil alone can complete the work in 80 days, the time that Bala alone would take to complete the work is _____.
(A) 24 days (B) 20 days
(C) 30 days (D) 40 days

16. P and Q can do a work in 12 and 16 days respectively. If they work on alternate days, beginning with Q, then in how many days will the work be completed?

(A) $13\frac{1}{4}$ (B) $13\frac{2}{3}$ (C) $13\frac{3}{4}$ (D) $13\frac{1}{3}$

17. Pipe A can fill a tank in half the time in which pipe B can fill the same tank. If both the pipes are opened simultaneously, it takes 8 hours to fill the tank. In how many hours can A alone fill the tank?

18. Two pipes P_1 and P_2 can fill a tank in 40 minutes and 60 minutes respectively. Both the pipes are opened simultaneously and after 10 minutes P_1 was closed. In how much more time (in minutes) would the tank be full?

19. Three taps P, Q and R can fill a tank in 8, 10 and 12 hours respectively. Tap P is opened at 8:00 a.m., tap Q at 10:00 a.m. and tap R at 11:00 a.m. At what time would the tank be full?

(A) 12:12 p.m. (B) 12:25 p.m.
(C) 12:42 p.m. (D) 12:58 p.m.

20. Four pipes A, B, C and D can fill a tank in 6, 8, 10 and 12 hours respectively. If pipe A was opened at 7:00 a.m., pipe B at 8:00 a.m., pipe C at 9:00 a.m. and pipe D at 10:00 a.m., at what approximate time, at what time was the tank filled?

(A) 10:19 a.m. (B) 10:25 a.m.
(C) 10:40 a.m. (D) 10:50 a.m.

21. There are three taps P, Q and R. P takes thrice as much time as Q and R together to fill a tank. Q takes twice as much time as P and R together to fill the tank. In how much time (in hours) can R fill the tank individually, if the three together require 10 hours to fill the tank when opened simultaneously?

22. Three taps A, B and C can fill a tank in 20, 30 and 40 minutes respectively. All the taps are opened simultaneously and after 5 minutes tap A was closed and then after 6 minutes tap B was closed. At that moment a leak developed which can empty the full tank in 60 minutes. What is the total time taken (in minutes) for the tank to be completely full?

23. Three taps A, B and C can individually fill a cistern in 7, 14 and 21 hours respectively. Tap A is opened first for one hour and then tap A is closed and tap B is opened for one hour. Tap B is then closed and tap C is then opened for one hour after which tap C is closed and tap A opened again. This process is continued till the tank is filled. In how much time will the tank be completely full?

(A) 7 hours (B) 11 hours
(C) 13 hours (D) 17 hours

Directions for questions 24 and 25: These questions are based on the following information.

There are 4 types of pipes which are connected to an empty tank.
Type A can fill the tank in 20 hours.
Type B can fill the tank in 25 hours.
Type C can empty the tank in 40 hours.
Type D can empty the tank in 50 hours.

24. If 3 type-A pipes, 2 type-B pipes, 4 type-C pipes and 5 type-D pipes are used, in how many hours will the tank be filled?

(A) $33\frac{1}{3}$ (B) 25
(C) $41\frac{2}{3}$ (D) None of these

25. One type-A, one type-B, one type-C and a certain number of type-D pipes are used and the tank is filled in 40 hours. Find the number of type-D pipes used.

26. Two pipes P and Q can fill a tank in 8 and 24 hours respectively. There is an outlet exactly at 2/3rd of the height above the base which can empty the top one-third of the tank in 4 hours. In how many hours, will the empty tank be full, if both the pipes and the outlet are opened simultaneously?

27. Two pipes A and B can fill a tank in 20 hours and 30 hours respectively. Both the pipes were opened simultaneously and just when the tank should have been full, it was noticed that an emptying pipe was also open. The emptying pipe was then closed and it took 6 hours more to fill the tank. In how much time (in hours) can the emptying pipe empty the tank?

28. A and B are inlet pipes while C is an outlet pipe. Pipe A supplies water at 50 ltrs/hour. B can fill a tank in 4 hours while C can empty it in 12 hours. All the pipes are simultaneously opened and the tank gets filled in 1 hour. What is the capacity of the tank? (in litres)

(A) 120 (B) 60
(C) 54 (D) None of these

29. Three pipes X, Y and Z are fitted to an empty tank, they are opened simultaneously. The time taken by X to fill the tank is six times the time taken by all the three pipes to fill the tank. The time taken by Y to fill the tank is 40 hours less than seven times the time taken by all the three pipes to fill the tank. The time taken by Z to fill the tank is 10 hours more than the time taken by all the three pipes to fill the tank. If the time taken to fill the tank is an integer (in hours), then find the most efficient pipe.

(A) X (B) Y
(C) Z (D) All are equally efficient

30. N filling pipes, P_1, P_2, ……P_N (where N > 10), are attached to a tank. The rate of filling of P_i, where i > 1, is equal to thrice the combined rate of filling of all the lower numbered pipes. If the time taken by P_{N-3} to fill the tank is 128 minutes, find the time (in minutes) taken by P_N to fill the tank.

Exercise – 6(b)

Directions for questions 1 to 40: 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 x men can produce p units in k days working h hours a day, then how many men can produce m units in h days working k hours a day?
(A) m p/x (B) mpx
(C) mx/p (D) mx

2. 30 men working 7 hours per day can do a piece of work in 18 days. In how many days can 21 men working 8 hours a day do the same piece of work?
(A) $22^3/_5$ (B) $22^2/_5$
(C) $22^1/_2$ (D) None of these

3. A tap can fill a tank in 3 hours and another tap can empty it in 4 hours. When the tank is empty and both taps are opened simultaneously, how long will it take to fill the tank (in hours)?

4. Two pipes A and B can fill a tank in 10 minutes and 20 minutes respectively. If both pipes are opened simultaneously, after how many minutes should B be closed so that the tank is full in 8 minutes?

5. A and B can do a piece of work in 12 days, B and C can do it in 15 days, C and A can do it in 20 days. They all work together for 4 days and then C leaves. In how many days can A and B finish the remaining work?
(A) 36/7 (B) 18/4 (C) 36/5 (D) 36/3

6. A and B can do a piece of work in 15 days and 20 days respectively. They worked on alternate days with A starting the work. In how many days will the work be completed?

7. A and B together can do a piece of work in 12 days, B and C together can do it in 16 days. All of them started the work together. After working for 5 days, A left. B worked for another 2 days and left. C completed the remaining work after having worked for a total of 13 days. In how many days can C complete the work?
(A) 22 days (B) 23 days
(C) 24 days (D) None of these

8. A man, a woman and a boy can do a piece of work in 3, 4 and 12 days respectively. How many boys must assist one man and one woman to complete the work in one and a half days?
(A) 12 (B) 6
(C) 1 (D) 3

9. 20 workers can reap 120 acres of land in 30 days working 6 hours a day. How many more acres of land can 30 workers working 12 hours a day reap in 15 days?

10. 20 men can finish a piece of work in 30 days. After how many days should 5 men leave the work so that it is finished in 35 days?

11. A group of 25 workers are assigned a task of 330 units. Each worker can do 1 unit / day. They start the task. After every day one more worker joins the group. The task is completed in x days. Find x.
(A) 10 (B) 9 (C) 11 (D) 12

12. A and B together completed a job in 9 days. Had A worked at half his speed and B worked at twice his speed, it would have taken 6 days to complete the job. How much time would it take for B to do the job?
(A) $\frac{27}{4}$ days (B) $\frac{27}{5}$ days
(C) $\frac{27}{2}$ days (D) 27 days

13. Hari can finish a work in 18 days working 6 hours a day. Raghu can finish the same work in 12 days working for 3 hours a day. In how many days can they finish it working together $2^1/_2$hours a day?

14. P can complete a piece of work in 24 days. P worked for 4 days and then Q joined him. The two persons worked for 4 more days and then R took over from them. R finished the remaining 1/3rd of the work in $2^2/_3$ days. In how many days can Q alone complete the work?

15. A work was started by a certain number of men, who completed the work in 15 days. Had there been 4 men less, they would have taken 3 more days to complete the work. Find the number of men.
(A) 24 (B) 28 (C) 32 (D) 35

16. A is 20% more efficient than B. If B can complete a piece of work in 30 days, then in how many days can both A and B complete the work working together?
(A) $11^5/_{11}$ (B) $13^7/_{11}$ (C) $15^7/_{11}$ (D) $17^5/_{11}$

17. Sanjay can do in 16 hours as much work as Vijay can do in 24 hours. Ajay can do the same work in 32 hours. If the three of them work together, they can complete a certain work in 24 hours. In how many hours can Ajay alone complete the work?

18. Pankaj who is twice as efficient as Vinod takes 30 days less to complete a piece of work. In how many days can the two complete the work together?

19. There is a group of persons each of whom can complete a piece of work in 16 days, when they are working individually. On the first day one person works, on the second day another person joins him, on the third day one more person joins them and this process continues till the work is completed. In how many days would the work get completed?
(A) 3¼ (B) $4^1/_3$ (C) $5^1/_6$ (D) $6^1/_5$

20. 3 men and 5 women can complete a work in 12 days, which 5 men and 12 women can complete in 6 days. In how many days can 4 men and 4 women complete the same work?

21. 9 men and 24 women can do a work in 8 days. 8 men and 32 boys can do the same work in 9 days. If 30 women can do the work in 12 days, then how many boys can do the same work in 18 days?

22. A can complete a piece of work in 40 days and B in 60 days. A started the work, worked for two days and then B took over from him, B then worked for the next two days and then A took over from him again and this process continued till the completion of the work. In how many days was the work completed?
(A) 40 (B) 42 (C) 48 (D) 54

23. A can eat 3 apples in 5 days while B can eat 6 apples in 4 days. In how many days can the two persons consume 21 apples?

24. X, Y and Z can complete a piece of work, working individually in 8, 12 and 20 hours respectively. In how much time can Y and Z together complete a work, which X alone can complete in 64 hours?
(A) 25 hours (B) 40 hours
(C) 60 hours (D) 80 hours

25. A piece of work can be completed by ten men in a certain number of days. If there were two men less it would have taken three more days to complete the work. In how many days can 24 men complete the same work?

26. Four persons A, B, C and D produced 256 pieces of item P in 8 hours. B is twice as efficient as A. D is 25% less efficient than A but is three times as efficient as C. How many pieces of P did B produce?
(A) 128 (B) 64 (C) 48 (D) 16

27. Ram, Shyam and Tarun can complete a job in 4 days, 8 days and 16 days respectively. They start the work and Ram leaves after a day. The other two complete the job. Tarun got ₹24000 out of the total ₹90000 paid to the three. As Ram was unwell on the first day, he could not work at his usual capacity. Find the percentage of his usual capacity at which he worked on the first day.
(A) 60% (B) 75% (C) 80% (D) 90%

28. A, B and C working individually can complete a piece of work in 16, 18 and 20 days respectively. If they worked together and earned ₹1089 for the work, then what is the share of B (in ₹)?

29. A, B and C, working individually can complete a piece of work in 10, 15 and 20 days respectively. They completed the work in 4 days with the help of D. If they earned ₹3750 for the entire work, how much did D earn for his work (in ₹)?

30. 20 cows and 40 goats can be kept for 10 days for ₹460. What would be the cost of keeping 50 cows and 30 goats for 12 days if the cost of keeping 5 goats is the same as the cost of keeping 1 cow?
(A) ₹888 (B) ₹965
(C) ₹1007 (D) ₹1104

31. Two pipes can fill a tank in 18 minutes and 27 minutes. A third pipe can empty the tank (when full) in 6 minutes. All the three pipes are opened when the tank was $\frac{2}{3}$rd full. In how many minutes will the tank become empty?

32. Pipes P and Q can fill a tank in 20 minutes and 25 minutes respectively. Both were opened simultaneously. After 4 minutes, P was closed. Find the time taken from then to fill the tank (in minutes).

33. Pipes X and Y can fill a tank in 12 minutes and 18 minutes respectively. Pipe Z can empty it in 24 minutes. All the pipes were opened simultaneously. After 1 minute, Z was closed. The tank would have been filled in another (in minutes).
(A) 5 (B) $5^1/_2$
(C) $6^1/_2$ (D) $6^1/_3$

34. Pipe A can fill a tank in 8 hours. Due to a leak at the bottom it takes 10 hours to fill the tank. In how many hours can the leak empty $3/5^{th}$ of the tank?

35. Pipe A can fill a tank in 12 hours and pipe B can empty the tank in 18 hours. Both pipes are opened at 6 am and after some time B is closed, and the tank is full at 8 pm on the same day. At what time was B closed?
(A) 10 am (B) 8 am
(C) 9 am (D) 11 am

36. Three taps A, B and C together can fill a tank in 6 hours. All the taps are opened simultaneously. After 2 hours C was closed and the tank was filled in 8 more hours. Find the time (in hours) in which C can fill the tank.

37. Pipes A and B can fill a tank in 20 minutes and 30 minutes respectively and C can empty it in 15 minutes. A is opened for a minute and then closed. B is then opened for a minute and then closed. C is then opened for a minute and then closed. This process is repeated until the tank is filled. Find the time taken to fill the tank (in minutes).
(A) 169 (B) 170 (C) 167 (D) 166

38. A is 80% more efficient than B who is 60% more efficient than C. A takes 40 days less than B to complete a work. A starts the work and works for 25 days and then B takes over. B then works for the next 30 days and then C takes over. In how much more time can C complete the remaining work?
(A) 20 days (B) 24 days
(C) 32 days (D) 40 days

39. A piece of work can be completed by A and B in 10 days, B and C in 12 days and C and A in 15 days. A, B and C started working together and then B left after 4 days. C left 3 days after that and then immediately B joined A again to complete the remaining work. In how many days was the work completed?

40. P, Q and R are 3 small pumps fitted to a tank. S is a large pump fitted to the tank. Q is 50% more efficient than P. R is $33^1/_3$% more efficient than Q. S is 50% more efficient than R. Find the ratio of the time taken by the four pumps working together to fill the tank and the time taken by the large pumps to fill it.
(A) $\frac{2}{5}$ (B) $\frac{3}{5}$
(C) $\frac{3}{10}$ (D) $\frac{7}{20}$

Directions for questions 41 to 50: Each question is followed by two statements, I and II. Indicate your responses based on the following directions:

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 statements I and II together but not using I or II alone.
Mark (D) if the question cannot be answered even using statements I and II together.

41. A water pump functions at a uniform rate. How long does it take to fill the tank?
I. The water pump is switched on at 8:00 a.m.
II. By 9:30 a.m., $3/8^{th}$ of the tank is filled by the pump. By 11.00 a.m. $3/4^{th}$ of the tank is filled by the pump.

42. In how many days can a man make 100 pots?
I. A man, a woman and a child together make 10 pots a day, while a woman and a child together can make 15 pots in 3 days.
II. 10 men together take 1 more day than 25 children to make 100 pots. A man can make twice as many pots as a child in a day.

43. 10 soldier ants take 6 hours to build an anthill. How long does it take for 5 queen ants to build the anthill?
I. A queen ant works at half the working rate of a soldier ant.
II. 5 soldier ants and 5 queen ants together take 7½ hours to build the ant hills.

44. How long did Tarun work to construct the wall?
I. Piyush, Rohan, Saurabh and Tarun can individually construct the wall in 10, 15, 20 and 30 days respectively.
II. Initially Piyush started the work. After three days, Rohan and Saurabh joined him and the three together worked for two days, then Tarun joined them and all of them worked until the wall is constructed.

45. Who among Arun, Bhargav and Chadda is the most efficient?
I. To complete a work, Chadda takes 5 times as much time as Arun and Bhargav take working together.
II. To complete a work Arun takes as much time as Bhargav and Chadda take working together.

46. How long would Vidya and Asha take to complete a work if they work on alternate days?
I. They work for six days a week and if one of them works on the first day of one week, the other one works on the first day of the next week.
II. Asha working alone on alternate days completes the work in 35 days while Vidya working alone on every third day completes the work in 25 days.

47. If Varun and Sameer together completed a project in 25 days and earned ₹5000, then what is Sameer's share?
I. Working individually, Sameer takes thrice the time taken by Varun to complete the project.
II. Varun alone can complete the project in 40 days.

48. How long does it take to fill a 330-litre tank?
I. There are a total of 6 taps. First a tap is turned on and then every half an hour an additional tap is turned on till all the taps are turned on.
II. A tap can fill a 20 litre tank in one hour.

49. Rishab's cow and Shrayan's cow can together eat the grass on the farm in 30 days. How long does it take for Rishab's cow to eat the grass on the farm?
I. The two cows along with Vashist's cow can eat the grass on the farm in 20 days.
II. Vashist's cow eats twice as fast as Shrayan's cow.

50. Pipes A,B,C and D have their filling capacities in descending order. They take $2^2/_7$ hours to fill a tank. Find the time taken by B and C to fill it.
I. The maximum time in which the tank can be filled by three of the pipes is $3^9/_{13}$hours
II. The minimum time in which the tank can be filled by three of the pipes is $2^2/_3$ hours.

Key

Concept Review Questions

1. C
2. 4
3. (i) A
   (ii) 16
4. B
5. B
6. 50
7. C
8. D
9. 12
10. C
11. 10
12. C
13. 36
14. B
15. 3000
16. C
17. A
18. A
19. 24
20. D

Exercise – 6(a)

1. D
2. 12
3. 6
4. B
5. A
6. A
7. C
8. 3160
9. B
10. 10.5
11. A
12. 40
13. 15
14. B
15. B
16. C
17. 12
18. 35
19. C
20. A
21. 24
22. 24
23. B
24. A
25. 2
26. 8
27. 24
28. B
29. C
30. 2

Exercise – 6(b)

1. C
2. C
3. 12
4. 4
5. C
6. 17
7. C
8. C
9. 60
10. 15
11. C
12. C
13. 10.8
14. 12
15. A
16. B
17. 104
18. 20
19. C
20. 11
21. 18
22. C
23. 10
24. C
25. 5
26. A
27. C
28. 360
29. 500
30. D
31. 9
32. 16
33. C
34. 24
35. C
36. 12
37. C
38. B
39. 10
40. A
41. A
42. B
43. B
44. C
45. A
46. A
47. B
48. C
49. C
50. C