

14. TIME AND WORK

Work to be done is usually considered as one unit. It may be, constructing a wall or laying a road, filling up or emptying a tank or cistern or eating certain amount of food. If there is more than one person (or thing) carrying out the work, it is assumed that each person (or thing) does the same amount of work each day and all the persons (or things) do exactly the same amount of work.

For example:

- (i) If a person completes the work in 4 days, he does $\frac{1}{4}$ th of the work on each day and conversely, if a person can complete $\frac{1}{4}$ th of the work in one day, he can complete the work in 4 days.
- (ii) If a tap can fill a tank in 20 minutes, then in one minute, it can fill $\frac{1}{20}$ th part of the tank.
- (iii) If 2 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 $\frac{1}{16}$ th of the work per day.
- (iv) If a A works three times as fast as B, then A takes one-third of the time B takes to complete the work. If the B takes 15 days to complete the work, then A takes 5 days to complete the work. If Raj takes 30 days to complete a task, then Siraj, who is 50% more efficient than Raj takes 20 days to complete the same work.

In Pipes and Cisterns, a filling pipe or tap does positive work and an emptying pipe or a "leak" does negative work.

Wages earned by people doing a work together are to be distributed in the ratio of the total work done by each of them. If a group of people, working at different pace, start and complete a work together, then the earnings have to be divided in the ratio of the work per day of each of them.

1 man can complete $\frac{1}{10}$ th work in 25 days.
 1 man can complete $\frac{1}{250}$ th work in 1 day.
 40 men can complete $\frac{1}{20}$ th work in 1 day.
 800 men can complete 1 work in 1 day.
 1 man can complete 1 work in 800 days.

- Work and men are directly proportional to each other, i.e., if the work increases, the number of men required increases, to complete the work in the same number of days and vice versa.
- 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 and vice-versa.

- Work and days are directly proportional, i.e., if the work increases, the number of days required also increases to complete the work with the same number of men and vice versa.
- Efficiency and days are inversely proportional, i.e., if the efficiency of a person is more then the number of days required to complete the work is less and vice versa.

$$m_1 d_1 = m_2 d_2 \text{ (Man-days product)}$$

$$m_1 d_1 h_1 = m_2 d_2 h_2 \text{ (Man-days-hours)}$$

$$\frac{m_1 d_1 h_1}{w_1} = \frac{m_2 d_2 h_2}{w_2} \text{ (Variation concept)}$$

$$e_1 d_1 = e_2 d_2 \text{ (Efficiency and time taken)}$$

Exercise

Directions for questions 1 to 30: Select the correct alternative from the given choices.

1. a. A can do a work in 12 days and B can finish the same work in 24 days. If they work together, in how many days will they complete the work?
 (1) 10 (2) 8 (3) 9 (4) 6
 b. A, B and C can do a job in 24 days, 30 days and 40 days respectively. In how many days can they finish the job if they work together?
 (1) 8 (2) 11 (3) 9 (4) 10
 c. If A and B together can do a work in 15 days and A alone can do it in 30 days, in how many days can B alone finish the work?
 (1) 25 (2) 40 (3) 30 (4) 35
2. a. A, B and C can complete a job working individually in 10, 20 and 60 days respectively. If they work together, in how many days will they complete the work?
 (1) 12 (2) 10 (3) 6 (4) 8
 b. A can do a work in 16 days which B and C can finish in 20 and 24 days respectively. In how many days can A, B and C together completes a work which is $9\frac{1}{4}$ times the previous work?
 (1) 40 (2) 45 (3) 60 (4) 50
 c. A and B can do a piece of work in 6 days, B and C together in 10 days, C and A together in $7\frac{1}{2}$ days. In how many days can A, B and C individually completes the work?
 (1) 15; 20; 30 (2) 10; 20; 30
 (3) 10; 15; 30 (4) 20; 15; 10
3. Ram, Khan and David can complete a work, working together in 4 days. If Ram and David can do the

- same work working individually in 12 and 18 days respectively, in how many days can Khan alone complete the work?
(1) 9 (2) 10 (3) 12 (4) 36
4. 35 men can complete a job in 40 days. Find the time taken by 25 men to complete the job (in days).
(1) 58 days (2) 60 days
(3) 52 days (4) 56 days
5. 30 men can complete a job in 24 days working 6 hrs a day. In how many days can 18 men complete the same job working 8 hrs a day?
(1) 30 (2) 36 (3) 18 (4) 45
6. A work is done by 15 men in 30 days. In how many days can 12 men complete the work given that the time spent per day is decreased by $\frac{1}{4}$ th the previous time?
(1) $42\frac{1}{2}$ (2) 35 (3) 30 (4) 50
7. A work is completed by 15 men in 30 days. In how many days can 12 men complete the work given that the time spent per day is increased by $\frac{1}{4}$ th the previous time?
(1) $22\frac{1}{2}$ (2) 30 (3) 20 (4) 25
8. A and B can do a piece of work in 6 days, B and C together in 10 days, C and A together in $7\frac{1}{2}$ days. In how many days can C individually completes the work?
(1) 12 (2) 30 (3) 10 (4) 20
9. A and B can complete a job working individually in 6 and 12 days. If B starts the work and A joins B after 6 days, in how many days has the whole work been completed?
(1) 2 (2) 6 (3) 8 (4) 12
10. A and B take 30 days and 40 days respectively to complete a job. They started the job together and A left after 15 days. In how many days can B alone complete the remaining part of the job?
(1) 3 (2) 5 (3) 6 (4) 8
11. A garrison of 1200 men is provisioned for 15 weeks at the rate of 3 kg per day per man. How many weeks can the same provisions last for 1500 men at 4 kg per day per man?
(1) 9 (2) 7.5 (3) 15 (4) 12
12. a) A garrison of 1200 men is provisioned for 15 weeks. How many weeks can the same provisions last if 200 men leave after 5 weeks?
(1) 16.5 (2) 17 (3) 18 (4) 12
- b) A group of 60 people can complete a task in 40 days. If 15 people leave after 10 days from the start of the work, then in how many days can remaining people do the remaining work?
(1) 30 (2) 35 (3) 45 (4) 40
13. A works 3 times as fast as B. If B completes a work in 60 days, in how many days can A and B together complete the same work?
(1) 20 days (2) 12 days (3) 15 days (4) 30 days
14. Certain men can complete a work in 160 days. If there were 10 men more, the work would have been completed in 20 days less. How many men were there?
(1) 80 (2) 70 (3) 60 (4) 90
15. A certain number of people can complete a work in 12 days working 6 hours a day. If the number of men is decreased to one-third, the number of days taken increases to 24 days. How many hours a day would they have worked to achieve the above?
(1) 10 (2) 9 (3) 8 (4) 6
16. A and B can complete a work in 12 and 18 days respectively. How much should A take as his share from the total amount of Rs.650 paid for the work?
(1) Rs.390 (2) Rs.250 (3) Rs.260 (4) Rs.325
17. A and B can complete a work in 10 days and 15 days respectively. Together they completed a work and earned a sum of Rs.1250; find the share of B (in Rs.)
(1) 750 (2) 625 (3) 500 (4) 650
18. X can complete a work in 6 days; Y can complete it in 8 days. With the help of Z they completed the work in 3 days and earned Rs.600. Find the share of Z. (in Rs.)
(1) 100 (2) 125 (3) 75 (4) 150
19. A and B can complete a work in 12 and 24 days respectively. After A had worked for 6 days, B joined him, and then they completed the work. How much should A take as his share from the total amount of Rs.300 paid for the work?
(1) Rs.220 (2) Rs.100 (3) Rs.250 (4) Rs.240
20. A and B agreed to do a job for Rs.2000. They can complete the work together in 12 days. If they completed the work in 9 days with the help of C, what is the share of A, given B can complete the entire work on her own in 18 days?
(1) Rs.500 (2) Rs.450 (3) Rs.350 (4) Rs.600
21. Anil can do a piece of work in 18 days, Binoy in 36 days and Charu in 54 days. Anil starts the work and is joined by Binoy after 1 day; Charu joins them after 4 more days. In how many days will the work be completed?

- (1) 11 (2) 9 (3) 8 (4) 6
22. Pipe A can fill a tank in 20 minutes. Pipe B can fill it in 30 minutes. In how many minutes can pipe A and B together fill the tank?
(1) 15 (2) 10 (3) 12 (4) 8
23. Two pipes X and Y can fill an empty cistern in 10 and 15 minutes respectively. How long will it take to fill the empty cistern, if both the pipes are opened?
(1) 8 min (2) 6 min (3) 7 min (4) 9 min
24. A tap A can fill a tank in 20 hours and another tap B can fill the tank in 30 hours. Both taps are opened at 6 a.m. and after some time B is closed. If the tank is filled by 9 p.m., then at what time was tap B closed?
(1) 1 p.m. (2) 2: 30 p.m.
(3) 1: 30 p.m. (4) 12: 30 p.m.
25. Tap P can fill the tank in 18 minutes; tap Q can fill it in 15 minutes and tap R can empty the full tank in 45 minutes. If all the three taps opened together, then in how many minutes the tank will be filled?
(1) 10 (2) 12 (3) 15 (4) 18
26. An empty tank can be filled by two pipes individually in 30 minutes and 60 minutes respectively. There is a leak pipe which can empty a full tank in 45 minutes. If all the three pipes are open, how much time does it take to fill an empty tank?
(1) 18 min (2) 36 min (3) 20 min (4) 24 min
27. Three taps A, B, C can fill an empty cistern in 12, 18 and 24 minutes. Three minutes after A was opened, B was also opened. After 3 more minutes, the C was opened and A, B were shut. Find the time taken to fill the cistern after closing A, B.
(1) 10 min (2) 12 min (3) 8 min (4) 15 min
28. A can work 3 times as fast as B, who works half as fast as C. If all of them can complete the work together in 10 days, how many days will A take to complete the work, individually?
(1) 10 (2) 20 (3) 30 (4) 25
29. A and B can complete a job in 3 and 6 hours respectively. If they work alternatively for one hour each, with A starting the job, when will the job be completed?
(1) 2 hrs (2) 4 hrs (3) 3 hrs (4) 4½ hrs
30. P can paint a wall in 12 hours whereas Q can paint the same wall in 18 hours. If they work alternatively for 1 hour each, starting with P, in how much time will they complete the work?
(1) 14½ hours (2) 14 $\frac{1}{3}$ hours
(3) 14 hours (4) 7 hours
31. Anni and Binni can individually complete a work in 15 and 25 days respectively. In how many days can Anni and Binni complete the work, if they work on alternate days
(a) starting with Anni (b) starting with Biinni?
(1) 18; 19 (2) 18; 19 $\frac{1}{5}$
(3) 18 $\frac{2}{5}$; 19 (4) 18 $\frac{3}{5}$; 19
32. A, B and C can complete a certain work in 8, 16, and 12 days respectively. If they work in rotation with one day each in the order of A, B and C, in how many days will the work be completed?
(1) 11 (2) 10 $\frac{3}{5}$ (3) 10 $\frac{2}{3}$ (4) 12
33. 3 men and 6 women can complete a task in 6 days; where as 10 men and 15 women can complete the same task in 2 days. In how many days can 2 men and 3 women complete the same task?
(1) 8 (2) 10 (3) 15 (4) 12
34. 5 men and 15 boys can do a job in 2 days and if 2 men are as efficient as 3 boys, then in how many days can 3 men and 3 boys do the same job?
(1) 6 (2) 9 (3) 10 (4) 5
35. A can do a piece of work in 8 days, B can work three times faster than the A, C can work five times faster than A. How many days will they take to do the work together?
(1) 3 days (2) 8/9 days (3) 4 days (4) 9/8

Time & Work													
1	2,4,3	6	4	11	1	16	1	21	1	26	2	31	4
2	3,3,3	7	2	12	4,4	17	3	22	3	27	3	32	1
3	1	8	2	13	3	18	3	23	2	28	2	33	2
4	4	9	3	14	2	19	3	24	3	29	2	34	1
5	1	10	2	15	2	20	1	25	1	30	2	35	2