15. TIME AND WORK

IMPORTANT FACTS AND FORMULAE

1. If A can do a piece of work in n days, then A's 1 day's work $= \frac{1}{n}$.
2. If A's 1 day's work $= \frac{1}{n}$, then A can finish the work in n days.
3. If A is thrice as good a workman as B, then :
   Ratio of work done by A and B = 3 : 1.
   Ratio of times taken by A and B to finish a work = 1 : 3.

SOLVED EXAMPLES

Ex. 1. ***Worker A takes 8 hours to do a job. Worker B takes 10 hours to do the same job. How long should it take both A and B, working together but independently, to do the same job ?*** (IGNOU, 2003)

Sol. A's 1 hour's work $= \frac{1}{8}$, B's 1 hour's work $= \frac{1}{10}$.

(A + B)'s 1 hour's work $= \left(\frac{1}{8} + \frac{1}{10}\right) = \frac{9}{40}$.

$\therefore$ Both A and B will finish the work in $\frac{40}{9} = 4\frac{4}{9}$ days.

Ex. 2. ***A and B together can complete a piece of work in 4 days. If A alone can complete the same work in 12 days, in how many days can B alone complete that work?*** (Bank P.O. 2003)

Sol. (A + B)'s 1 day's work $= \frac{1}{4}$, A's 1 day's work $= \frac{1}{12}$.

$\therefore$ B's 1 day's work $= \left(\frac{1}{4} - \frac{1}{12}\right) = \frac{1}{6}$.

Hence, B alone can complete the work in 6 days.

Ex. 3. ***A can do a piece of work in 7 days of 9 hours each and B can do it in 6 days of 7 hours each. How long will they take to do it, working together $8\frac{2}{5}$ hours a day?***

Sol. A can complete the work in $(7 \times 9) = 63$ hours.

B can complete the work in $(6 \times 7) = 42$ hours.

$\therefore$ A's 1 hour's work $= \frac{1}{63}$ and B's 1 hour's work $= \frac{1}{42}$.

(A + B)'s 1 hour's work $= \left(\frac{1}{63} + \frac{1}{42}\right) = \frac{5}{126}$.

$\therefore$ Both will finish the work in $\left(\frac{126}{5}\right)$ hrs.

Number of days of $8\frac{2}{5}$ hrs each $= \left(\frac{126}{5} \times \frac{5}{42}\right) = 3$ days.

Ex. 4. ***A and B can do a piece of work in 18 days; B and C can do it in 24 days; A and C can do it in 36 days. In how many days will A, B and C finish it, working together and separately ?***

Sol. (A + B)'s 1 day's work $= \frac{1}{18}$, (B + C)'s 1 day's work $= \frac{1}{24}$,

and (A + C)'s 1 day's work $= \frac{1}{36}$.

Adding, we get : 2 (A + B + C)'s 1 day's work $= \left(\frac{1}{18} + \frac{1}{24} + \frac{1}{36}\right) = \frac{9}{72} = \frac{1}{8}$.

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{16}$.

Thus, A, B and C together can finish the work in 16 days.

Now, A's 1 day's work = {(A + B + C)'s 1 day's work} − {(B + C)'s 1 day's work}

$$= \left(\frac{1}{16} - \frac{1}{24}\right) = \frac{1}{48}.$$

$\therefore$ A alone can finish the work in 48 days.

Similarly, B's 1 day's work $= \left(\frac{1}{16} - \frac{1}{36}\right) = \frac{5}{144}$.

$\therefore$ B alone can finish the work in $\frac{144}{5} = 28\frac{4}{5}$ days.

And, C's 1 day's work $= \left(\frac{1}{16} - \frac{1}{18}\right) = \frac{1}{144}$.

$\therefore$ C alone can finish the work in 144 days.

Ex. 5. ***A is twice as good a workman as B and together they finish a piece of work in 18 days. In how many days will A alone finish the work ?***

Sol. (A's 1 day's work) : (B's 1 day's work) = 2 : 1.

(A + B)'s 1 day's work $= \frac{1}{18}$.

Divide $\frac{1}{18}$ in the ratio 2 : 1.

$\therefore$ A's 1 day's work $= \left(\frac{1}{18} \times \frac{2}{3}\right) = \frac{1}{27}$.

Hence, A alone can finish the work in 27 days.

Ex. 6. ***A can do a certain job in 12 days. B is 60% more efficient than A. How many days does B alone take to do the same job ?***

Sol. Ratio of times taken by A and B = 160 : 100 = 8 : 5.

Suppose B alone takes x days to do the job.

Then, $8 : 5 :: 12 : x \Rightarrow 8x = 5 \times 12 \Rightarrow x = 7\frac{1}{2}$ days.

Ex. 7. ***A can do a piece of work in 80 days. He works at it for 10 days and then B alone finishes the remaining work in 42 days. In how much time will A and B, working together, finish the work ?***

Sol. Work done by A in 10 days $= \left(\frac{1}{80} \times 10\right) = \frac{1}{8}$.

Remaining work $= \left(1-\frac{1}{8}\right) = \frac{7}{8}$.

Now, $\frac{7}{8}$ work is done by B in 42 days.

Whole work will be done by B in $\left(42\times\frac{8}{7}\right) = 48$ days.

$\therefore$ A's 1 day's work $= \frac{1}{80}$ and B's 1 day's work $= \frac{1}{48}$.

$\therefore$ (A + B)'s 1 day's work $= \left(\frac{1}{80}+\frac{1}{48}\right) = \frac{8}{240} = \frac{1}{30}$.

Hence, both will finish the work in 30 days.

Ex. 8. ***A and B undertake to do a piece of work for Rs. 600. A alone can do it in 6 days while B alone can do it in 8 days. With the help of C, they finish it in 3 days. Find the share of each.***

Sol. C's 1 day's work $= \frac{1}{3}-\left(\frac{1}{6}+\frac{1}{8}\right) = \frac{1}{24}$.

$\therefore$ A : B : C = Ratio of their 1 day's work $= \frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1$.

$\therefore$ A's share = Rs. $\left(600\times\frac{4}{8}\right)$ = Rs. 300, B's share = Rs. $\left(600\times\frac{3}{8}\right)$ = Rs. 225.

C's share = Rs. [600 − (300 + 225)] = Rs. 75.

Ex. 9. ***A and B working separately can do a piece of work in 9 and 12 days respectively. If they work for a day alternately, A beginning, in how many days, the work will be completed ?***

Sol. (A + B)'s 2 days' work $= \left(\frac{1}{9}+\frac{1}{12}\right) = \frac{7}{36}$.

Work done in 5 pairs of days $= \left(5\times\frac{7}{36}\right) = \frac{35}{36}$.

Remaining work $= \left(1-\frac{35}{36}\right) = \frac{1}{36}$.

On 11th day, it is A's turn. $\frac{1}{9}$ work is done by him in 1 day.

$\frac{1}{36}$ work is done by him in $\left(9\times\frac{1}{36}\right) = \frac{1}{4}$ day.

$\therefore$ Total time taken $= \left(10+\frac{1}{4}\right)$ days $= 10\frac{1}{4}$ days.

Ex. 10. ***45 men can complete a work in 16 days. Six days after they started working, 30 more men joined them. How many days will they now take to complete the remaining work ?***

Sol. (45 × 16) men can complete the work in 1 day.

$\therefore$ 1 man's 1 day's work $= \frac{1}{720}$.

45 men's 6 days' work $= \left(\frac{1}{16}\times 6\right) = \frac{3}{8}$. Remaining work $= \left(1-\frac{3}{8}\right) = \frac{5}{8}$.

75 men's 1 day's work $= \frac{75}{720} = \frac{5}{48}$.

Now, $\frac{5}{48}$ work is done by them in 1 day.

$\therefore$ $\frac{5}{8}$ work is done by them in $\left(\frac{48}{5} \times \frac{5}{8}\right) = 6$ days.

Ex. 11. ***2 men and 3 boys can do a piece of work in 10 days while 3 men and 2 boys can do the same work in 8 days. In how many days can 2 men and 1 boy do the work?***

Sol. Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y.

Then, $2x + 3y = \frac{1}{10}$ and $3x + 2y = \frac{1}{8}$.

Solving, we get : $x = \frac{7}{200}$ and $y = \frac{1}{100}$.

$\therefore$ (2 men + 1 boy)'s 1 day's work $= \left(2 \times \frac{7}{200} + 1 \times \frac{1}{100}\right) = \frac{16}{200} = \frac{2}{25}$.

So, 2 men and 1 boy together can finish the work in $\frac{25}{2} = 12\frac{1}{2}$ days.

EXERCISE 15A

(OBJECTIVE TYPE QUESTIONS)

Directions : ***Mark (✓) against the correct answer :***

1. A does a work in 10 days and B does the same work in 15 days. In how many days they together will do the same work ? **(R.R.B. 2003)**

   (*a*) 5 days (*b*) 6 days (*c*) 8 days (*d*) 9 days

2. A can finish a work in 18 days and B can do the same work in half the time taken by A. Then, working together, what part of the same work they can finish in a day ?

   (*a*) $\frac{1}{6}$ (*b*) $\frac{1}{9}$ (*c*) $\frac{2}{5}$ (*d*) $\frac{2}{7}$

   (S.S.C. 2002)

3. A tyre has two punctures. The first puncture alone would have made the tyre flat in 9 minutes and the second alone would have done it in 6 minutes. If air leaks out at a constant rate, how long does it take both the punctures together to make it flat ?

   (*a*) $1\frac{1}{2}$ minutes (*b*) $3\frac{1}{2}$ minutes (*c*) $3\frac{3}{5}$ minutes (*d*) $4\frac{1}{4}$ minutes

   (D.M.R.C. 2003)

4. A, B and C can complete a piece of work in 24, 6 and 12 days respectively. Working together, they will complete the same work in : **(C.B.I. 2003)**

   (*a*) $\frac{1}{24}$ day (*b*) $\frac{7}{24}$ day (*c*) $3\frac{3}{7}$ days (*d*) 4 days

5. A man can do a job in 15 days. His father takes 20 days and his son finishes it in 25 days. How long will they take to complete the job if they all work together ?

   (*a*) Less than 6 days (*b*) Exactly 6 days

   (*c*) Approximately 6.4 days (*d*) More than 10 days

   (Hotel Management, 2003)

6. A man can do a piece of work in 5 days, but with the help of his son, he can do it in 3 days. In what time can the son do it alone ? **(S.S.C. 2004)**

   (*a*) $6\frac{1}{2}$ days (*b*) 7 days (*c*) $7\frac{1}{2}$ days (*d*) 8 days

7. A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With the help of C, they did the job in 4 days only. Then, C alone can do the job in : (S.S.C. 2003)

(a) $9\frac{1}{5}$ days (b) $9\frac{2}{5}$ days (c) $9\frac{3}{5}$ days (d) 10 days

8. A takes twice as much time as B or thrice as much time to finish a piece of work. Working together, they can finish the work in 2 days. B can do the work alone in : (S.S.C. 2002)

(a) 4 days (b) 6 days (c) 8 days (d) 12 days

9. X can do $\frac{1}{4}$ of a work in 10 days, Y can do 40% of the work in 40 days and Z can do $\frac{1}{3}$ of the work in 13 days. Who will complete the work first ?

(a) X (b) Y (c) Z (d) X and Z both

10. P, Q and R are three typists who working simultaneously can type 216 pages in 4 hours. In one hour, R can type as many pages more than Q as Q can type more than P. During a period of five hours, R can type as many pages as P can during seven hours. How many pages does each of them type per hour ?

(a) 14, 17, 20 (b) 15, 17, 22 (c) 15, 18, 21 (d) 16, 18, 22

11. Ronald and Elan are working on an assignment. Ronald takes 6 hours to type 32 pages on a computer, while Elan takes 5 hours to type 40 pages. How much time will they take, working together on two different computers to type an assignment of 110 pages ?

(a) 7 hours 30 minutes (b) 8 hours

(c) 8 hours 15 minutes (d) 8 hours 25 minutes

(SCMHRD, 2002)

12. Two workers A and B are engaged to do a work. A working alone takes 8 hours more to complete the job than if both worked together. If B worked alone, he would need $4\frac{1}{2}$ hours more to complete the job than they both working together. What time would they take to do the work together ?

(a) 4 hours (b) 5 hours (c) 6 hours (d) 7 hours

13. P can complete a work in 12 days working 8 hours a day. Q can complete the same work in 8 days working 10 hours a day. If both P and Q work together, working 8 hours a day, in how many days can they complete the work ? (Bank P.O. 1999)

(a) $5\frac{5}{11}$ (b) $5\frac{6}{11}$ (c) $6\frac{5}{11}$ (d) $6\frac{6}{11}$

14. A and B can do a work in 12 days, B and C in 15 days, C and A in 20 days. If A, B and C work together, they will complete the work in : (S.S.C. 1999)

(a) 5 days (b) $7\frac{5}{6}$ days (c) 10 days (d) $15\frac{2}{3}$ days

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

(a) 4 days (b) 6 days (c) 8 days (d) 12 days

(R.R.B. 2001)

16. A and B can do a piece of work in 72 days; B and C can do it in 120 days; A and C can do it in 90 days. In what time can A alone do it ?

(a) 80 days (b) 100 days (c) 120 days (d) 150 days

17. A and B can do a piece of work in 5 days; B and C can do it in 7 days; A and C can do it in 4 days. Who among these will take the least time if put to do it alone ?

(a) A (b) B (c) C (d) Data inadequate

18. A can do a piece of work in 4 hours; B and C together can do it in 3 hours, while A and C together can do it in 2 hours. How long will B alone take to do it ?

(*a*) 8 hours (*b*) 10 hours (*c*) 12 hours (*d*) 24 hours

(S.S.C. 2002)

19. A can do a certain work in the same time in which B and C together can do it. If A and B together could do it in 10 days and C alone in 50 days, then B alone could do it in : **(S.S.C. 2003)**

(*a*) 15 days (*b*) 20 days (*c*) 25 days (*d*) 30 days

20. A works twice as fast as B. If B can complete a work in 12 days independently, the number of days in which A and B can together finish the work is :

(*a*) 4 days (*b*) 6 days (*c*) 8 days (*d*) 18 days

(Asstt. Grade, 1997)

21. A is twice as good a workman as B and together they finish a piece of work in 14 days. The number of days taken by A alone to finish the work is :

(*a*) 11 (*b*) 21 (*c*) 28 (*d*) 42

22. A is thrice as good a workman as B and therefore is able to finish a job in 60 days less than B. Working together, they can do it in : **(S.S.C. 1999)**

(*a*) 20 days (*b*) $22\frac{1}{2}$ days (*c*) 25 days (*d*) 30 days

23. A and B can do a job together in 7 days. A is $1\frac{3}{4}$ times as efficient as B. The same job can be done by A alone in : **(S.S.C. 2003)**

(*a*) $9\frac{1}{3}$ days (*b*) 11 days (*c*) $12\frac{1}{4}$ days (*d*) $16\frac{1}{3}$ days

24. Sakshi can do a piece of work in 20 days. Tanya is 25% more efficient than Sakshi. The number of days taken by Tanya to do the same piece of work is :

(*a*) 15 (*b*) 16 (*c*) 18 (*d*) 25

(Hotel Management, 2003)

25. A is 30% more efficient than B. How much time will they, working together, take to complete a job which A alone could have done in 23 days ?

(*a*) 11 days (*b*) 13 days (*c*) $20\frac{3}{17}$ days (*d*) None of these

(Hotel Management, 1998)

26. A does half as much work as B in three-fourth of the time. If together they take 18 days to complete the work, how much time shall B take to do it ?

(*a*) 30 days (*b*) 35 days (*c*) 40 days (*d*) None of these

27. A is 50% as efficient as B. C does half of the work done by A and B together. If C alone does the work in 40 days, then A, B and C together can do the work in :

(*a*) $13\frac{1}{3}$ days (*b*) 15 days (*c*) 20 days (*d*) 30 days

28. Two workers A and B working together completed a job in 5 days. If A worked twice as efficiently as he actually did and B worked $\frac{1}{3}$ as efficiently as he actually did, the work would have been completed in 3 days. A alone could complete the work in :

(*a*) $5\frac{1}{4}$ days (*b*) $6\frac{1}{4}$ days (*c*) $7\frac{1}{2}$ days (*d*) None of these

29. A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is : **(S.S.C. 2000)**

(*a*) $\frac{1}{4}$ (*b*) $\frac{1}{10}$ (*c*) $\frac{7}{15}$ (*d*) $\frac{8}{15}$

30. A can finish a work in 18 days and B can do the same work in 15 days. B worked for 10 days and left the job. In how many days, A alone can finish the remaining work ?

(*a*) 5 (*b*) $5\frac{1}{2}$ (*c*) 6 (*d*) 8

(Bank P.O. 2002)

31. A and B can complete a work in 15 days and 10 days respectively. They started doing the work together but after 2 days B had to leave and A alone completed the remaining work. The whole work was completed in : **(S.S.C. 2004)**

(*a*) 8 days (*b*) 10 days (*c*) 12 days (*d*) 15 days

32. A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in :

(*a*) 5 days (*b*) 6 days (*c*) 10 days (*d*) $10\frac{1}{2}$ days

(S.S.C. 2003)

33. A machine P can print one lakh books in 8 hours, machine Q can print the same number of books in 10 hours while machine R can print them in 12 hours. All the machines are started at 9 a.m. while machine P is closed at 11 a.m. and the remaining two machines complete the work. Approximately at what time will the work be finished ? **(Bank P.O. 2003)**

(*a*) 11:30 a.m. (*b*) 12 noon (*c*) 12:30 p.m. (*d*) 1 p.m.

34. A and B can do a piece of work in 30 days, while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work ? **(C.B.I. 2003)**

(*a*) 18 days (*b*) 24 days (*c*) 30 days (*d*) 36 days

35. X and Y can do a piece of work in 20 days and 12 days respectively. X started the work alone and then after 4 days Y joined him till the completion of the work. How long did the work last ? **(Bank P.O. 2004)**

(*a*) 6 days (*b*) 10 days (*c*) 15 days (*d*) 20 days

36. A and B can together finish a work in 30 days. They worked together for 20 days and then B left. After another 20 days, A finished the remaining work. In how many days A alone can finish the job ? **(S.S.C. 2003)**

(*a*) 40 (*b*) 50 (*c*) 54 (*d*) 60

37. X can do a piece of work in 40 days. He works at it for 8 days and then Y finished it in 16 days. How long will they together take to complete the work ?

(*a*) $13\frac{1}{3}$ days (*b*) 15 days (*c*) 20 days (*d*) 56 days

(Hotel Management, 1999)

38. A, B and C together can complete a piece of work in 10 days. All the three started working at it together and after 4 days A left. Then B and C together completed the work in 10 more days. A alone could complete the work in :

(*a*) 15 days (*b*) 16 days (*c*) 25 days (*d*) 50 days

39. A does $\frac{4}{5}$ of a work in 20 days. He then calls in B and they together finish the remaining work in 3 days. How long B alone would take to do the whole work ?

(*a*) 23 days (*b*) 37 days (*c*) $37\frac{1}{2}$ days (*d*) 40 days

(S.S.C. 2002)

40. A and B together can do a piece of work in 30 days. A having worked for 16 days, B finishes the remaining work alone in 44 days. In how many days shall B finish the whole work alone ? **(C.B.I. 1997)**

(*a*) 30 days (*b*) 40 days (*c*) 60 days (*d*) 70 days

41. A and B together can do a piece of work in 12 days, which B and C together can do in 16 days. After A has been working at it for 5 days and B for 7 days, C finishes it in 13 days. In how many days C alone will do the work ?
(a) 16 (b) 24 (c) 36 (d) 48

42. A and B can do a piece of work in 45 days and 40 days respectively. They began to do the work together but A leaves after some days and then B completed the remaining work in 23 days. The number of days after which A left the work was :
(a) 6 (b) 8 (c) 9 (d) 12
(Bank P.O. 1998)

43. A can do a piece of work in 14 days which B can do in 21 days. They begin together but 3 days before the completion of the work, A leaves off. The total number of days to complete the work is : **(R.R.B. 2002)**
(a) $6\frac{3}{5}$ (b) $8\frac{1}{2}$ (c) $10\frac{1}{5}$ (d) $13\frac{1}{2}$

44. A, B and C can complete a work separately in 24, 36 and 48 days respectively. They started together but C left after 4 days of start and A left 3 days before the completion of the work. In how many days will the work be completed ?
(a) 15 days (b) 22 days (c) 25 days (d) 35 days

45. A, B and C together earn Rs. 300 per day, while A and C together earn Rs. 188 and B and C together earn Rs. 152. The daily earning of C is :
(a) Rs. 40 (b) Rs. 68 (c) Rs. 112 (d) Rs. 150

46. A, B and C are employed to do a piece of work for Rs. 529. A and B together are supposed to do $\frac{19}{23}$ of the work and B and C together $\frac{8}{23}$ of the work. What amount should A be paid ? **(C.B.I. 1997)**
(a) Rs. 315 (b) Rs. 345 (c) Rs. 355 (d) Rs. 375

47. Kim can do a work in 3 days while David can do the same work in 2 days. Both of them finish the work together and get Rs. 150. What is the share of Kim ?
(a) Rs. 30 (b) Rs. 60 (c) Rs. 70 (d) Rs. 75
(S.S.C. 1999)

48. If A can do $\frac{1}{4}$ of a work in 3 days and B can do $\frac{1}{6}$ of the same work in 4 days, how much will A get if both work together and are paid Rs. 180 in all ?
(a) Rs. 36 (b) Rs. 60 (c) Rs. 108 (d) Rs. 120

49. A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C ? **(S.S.C. 2004)**
(a) Rs. 375 (b) Rs. 400 (c) Rs. 600 (d) Rs. 800

50. A sum of money is sufficient to pay A's wages for 21 days and B's wages for 28 days. The same money is sufficient to pay the wages of both for :
(a) 12 days (b) $12\frac{1}{4}$ days (c) 14 days (d) $24\frac{1}{2}$ days

51. A can do a piece of work in 10 days; B in 15 days. They work for 5 days. The rest of the work was finished by C in 2 days. If they get Rs. 1500 for the whole work, the daily wages of B and C are :
(a) Rs. 150 (b) Rs. 225 (c) Rs. 250 (d) Rs. 300

52. A and B together can complete a work in 12 days. A alone can complete it in 20 days. If B does the work only for half a day daily, then in how many days A and B together will complete the work ? **(R.R.B. 2003)**
(a) 10 days (b) 11 days (c) 15 days (d) 20 days

53. A alone can complete a work in 16 days and B alone in 12 days. Starting with A, they work on alternate days. The total work will be completed in : (S.S.C. 2004)
(a) 12 days (b) 13 days (c) $13\frac{5}{7}$ days (d) $13\frac{3}{4}$ days

54. A, B and C can do a piece of work in 11 days, 20 days and 55 days respectively, working alone. How soon can the work be done if A is assisted by B and C on alternate days ?
(a) 7 days (b) 8 days (c) 9 days (d) 10 days

55. A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day ?
(a) 12 days (b) 15 days (c) 16 days (d) 18 days
(R.R.B. 2002)

56. A and B can separately do a piece of work in 20 and 15 days respectively. They worked together for 6 days, after which B was replaced by C. If the work was finished in next 4 days, then the number of days in which C alone could do the work will be :
(a) 30 (b) 35 (c) 40 (d) 60

57. A, B and C can do a piece of work in 36, 54 and 72 days respectively. They started the work but A left 8 days before the completion of the work while B left 12 days before the completion. The number of days for which C worked is :
(a) 4 (b) 8 (c) 12 (d) 24

58. Twenty women can do a work in sixteen days. Sixteen men can complete the same work in fifteen days. What is the ratio between the capacity of a man and a woman ?
(a) 3 : 4 (b) 4 : 3 (c) 5 : 3 (d) Data inadequate
(B.S.R.B. 1998)

59. 10 men can complete a piece of work in 15 days and 15 women can complete the same work in 12 days. If all the 10 men and 15 women work together, in how many days will the work get completed ? (S.B.I.P.O. 1999)
(a) 6 (b) $6\frac{1}{3}$ (c) $6\frac{2}{3}$ (d) $7\frac{2}{3}$

60. Seven men can complete a work in 12 days. They started the work and after 5 days, two men left. In how many days will the work be completed by the remaining men ?
(a) 5 (b) 6 (c) 7 (d) 8 (e) None of these

61. 12 men complete a work in 9 days. After they have worked for 6 days, 6 more men join them. How many days will they take to complete the remaining work ?
(a) 2 days (b) 3 days (c) 4 days (d) 5 days (e) None of these
(R.R.B. 2002)

62. Three men, four women and six children can complete a work in seven days. A woman does double the work a man does and a child does half the work a man does. How many women alone can complete this work in 7 days ? (S.B.I.P.O. 2003)
(a) 7 (b) 8 (c) 12
(d) Cannot be determined (e) None of these

63. A man, a woman and a boy can complete a job in 3, 4 and 12 days respectively. How many boys must assist 1 man and 1 woman to complete the job in $\frac{1}{4}$ of a day ?
(a) 1 (b) 4 (c) 19 (d) 41
(S.S.C. 2000)

64. 10 men and 15 women together can complete a work in 6 days. It takes 100 days for one man alone to complete the same work. How many days will be required for one woman alone to complete the same work ? (Bank P.O. 1999)
(a) 90 (b) 125 (c) 145 (d) 150 (e) None of these

65. 12 men can complete a piece of work in 4 days, while 15 women can complete the same work in 4 days. 6 men start working on the job and after working for 2 days, all of them stopped working. How many women should be put on the job to complete the remaining work, if it is to be completed in 3 days ? **(S.B.I.P.O. 2000)**

(*a*) 15 (*b*) 18 (*c*) 22
(*d*) Data inadequate (*e*) None of these

66. Twelve children take sixteen days to complete a work which can be completed by eight adults in twelve days. Sixteen adults started working and after three days ten adults left and four children joined them. How many days will they take to complete the remaining work ?

(*a*) 3 (*b*) 4 (*c*) 6 (*d*) 8 (*e*) None of these

67. 10 women can complete a work in 7 days and 10 children take 14 days to complete the work. How many days will 5 women and 10 children take to complete the work ?

(*a*) 3 (*b*) 5 (*c*) 7
(*d*) Cannot be determined (*e*) None of these **(Bank P.O. 2003)**

68. Sixteen men can complete a work in twelve days. Twenty-four children can complete the same work in eighteen days. Twelve men and eight children started working and after eight days three more children joined them. How many days will they now take to complete the remaining work ?

(*a*) 2 days (*b*) 4 days (*c*) 6 days (*d*) 8 days (*e*) None of these

69. Twenty-four men can complete a work in sixteen days. Thirty-two women can complete the same work in twenty-four days. Sixteen men and sixteen women started working and worked for twelve days. How many more men are to be added to complete the remaining work in 2 days ? **(Bank P.O. 1999)**

(*a*) 16 (*b*) 24 (*c*) 36 (*d*) 48 (*e*) None of these

70. 5 men and 2 boys working together can do four times as much work as a man and a boy. Working capacities of a woman and a boy are in the ratio :

(*a*) 1 : 2 (*b*) 2 : 1 (*c*) 1 : 3 (*d*) 3 : 1

71. If 12 men and 16 boys can do a piece of work in 5 days; 13 men and 24 boys can do it in 4 days, then the ratio of the daily work done by a man to that of a boy is :

(*a*) 2 : 1 (*b*) 3 : 1 (*c*) 3 : 2 (*d*) 5 : 4
(S.S.C. 1999)

72. 4 men and 6 women can complete a work in 8 days, while 3 men and 7 women can complete it in 10 days. In how many days will 10 women complete it ?

(*a*) 35 (*b*) 40 (*c*) 45 (*d*) 50
(S.S.C. 2004)

73. One man, 3 women and 4 boys can do a piece of work in 96 hours, 2 men and 8 boys can do it in 80 hours, 2 men and 3 women can do it in 120 hours. 5 men and 12 boys can do it in :

(*a*) $39\frac{1}{11}$ hours (*b*) $42\frac{7}{11}$ hours (*c*) $43\frac{7}{11}$ hours (*d*) 44 hours

74. If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days, the time taken by 15 men and 20 boys in doing the same type of work will be : **(S.S.C. 1999)**

(*a*) 4 days (*b*) 5 days (*c*) 6 days (*d*) 7 days

ANSWERS

1. (b)	2. (a)	3. (c)	4. (c)	5. (c)	6. (c)	7. (c)	8. (b)	9. (c)
10. (c)	11. (c)	12. (c)	13. (a)	14. (c)	15. (c)	16. (c)	17. (a)	18. (c)
19. (c)	20. (a)	21. (b)	22. (b)	23. (b)	24. (b)	25. (b)	26. (a)	27. (a)
28. (b)	29. (d)	30. (c)	31. (c)	32. (c)	33. (d)	34. (a)	35. (b)	36. (d)
37. (a)	38. (c)	39. (c)	40. (c)	41. (b)	42. (e)	43. (c)	44. (a)	45. (a)
46. (b)	47. (b)	48. (d)	49. (b)	50. (a)	51. (b)	52. (c)	53. (d)	54. (b)
55. (b)	56. (c)	57. (d)	58. (b)	59. (c)	60. (e)	61. (a)	62. (a)	63. (d)
64. (e)	65. (a)	66. (e)	67. (c)	68. (b)	69. (b)	70. (b)	71. (a)	72. (b)
73. (c)	74. (a)							

SOLUTIONS

1. A's 1 day's work $= \frac{1}{10}$ and B's 1 day's work $= \frac{1}{15}$.

   $\therefore$ (A + B)'s 1 day's work $= \left(\frac{1}{10} + \frac{1}{15}\right) = \frac{1}{6}$.

   So, both together will finish the work in 6 days.

2. A's 1 day's work $= \frac{1}{18}$ and B's 1 day's work $= \frac{1}{9}$.

   $\therefore$ (A + B)'s 1 day's work $= \left(\frac{1}{18} + \frac{1}{9}\right) = \frac{1}{6}$.

3. 1 minute's work of both the punctures $= \left(\frac{1}{9} + \frac{1}{6}\right) = \frac{5}{18}$.

   So, both the punctures will make the tyre flat in $\frac{18}{5} = 3\frac{3}{5}$ min.

4. (A + B + C)'s 1 day's work $= \left(\frac{1}{24} + \frac{1}{6} + \frac{1}{12}\right) = \frac{7}{24}$.

   So, A, B and C together will complete the job in $\frac{24}{7} = 3\frac{3}{7}$ days.

5. 1 day's work of the three persons $= \left(\frac{1}{15} + \frac{1}{20} + \frac{1}{25}\right) = \frac{47}{300}$.

   So, all the three together will complete the work in $\frac{300}{47} = 6.4$ days.

6. Son's 1 day's work $= \left(\frac{1}{3} - \frac{1}{5}\right) = \frac{2}{15}$.

   $\therefore$ The son alone can do the work in $\frac{15}{2} = 7\frac{1}{2}$ days.

7. (A + B + C)'s 1 day's work $= \frac{1}{4}$, A's 1 day's work $= \frac{1}{16}$, B's 1 day's work $= \frac{1}{12}$.

   $\therefore$ C's 1 day's work $= \frac{1}{4} - \left(\frac{1}{16} + \frac{1}{12}\right) = \left(\frac{1}{4} - \frac{7}{48}\right) = \frac{5}{48}$.

   So, C alone can do the work in $\frac{48}{5} = 9\frac{3}{5}$ days.

8. Suppose A, B and C take x, $\frac{x}{2}$ and $\frac{x}{3}$ hours respectively to finish the work.

Then, $\left(\frac{1}{x}+\frac{2}{x}+\frac{3}{x}\right)=\frac{1}{2} \Rightarrow \frac{6}{x}=\frac{1}{2} \Rightarrow x=12$.

So, B takes 6 hours to finish the work.

9. Whole work will be done by X in $(10 \times 4) = 40$ days.

Whole work will be done by Y in $\left(40 \times \frac{100}{40}\right) = 100$ days.

Whole work will be done by Z in $(13 \times 3) = 39$ days.

$\therefore$ Z will complete the work first.

10. Let the number of pages typed in one hour by P, Q and R be x, y and z respectively. Then,

$$x+y+z=\frac{216}{4} \Rightarrow x+y+z=54 \quad ...(i)$$

$$z-y=y-x \Rightarrow 2y=x+z \quad ...(ii)$$

$$5z=7x \Rightarrow x=\frac{5}{7}z \quad ...(iii)$$

Solving (i), (ii) and (iii), we get $x = 15$, $y = 18$, $z = 21$.

11. Number of pages typed by Ronald in 1 hour $= \frac{32}{6}=\frac{16}{3}$.

Number of pages typed by Elan in 1 hour $= \frac{40}{5} = 8$.

Number of pages typed by both in 1 hour $= \left(\frac{16}{3}+8\right)=\frac{40}{3}$.

$\therefore$ Time taken by both to type 110 pages $= \left(110 \times \frac{3}{40}\right)$ hrs $= 8\frac{1}{4}$ hrs $= 8$ hrs 15 min.

12. Let A and B together take x hours to complete the work. Then,

A alone takes $(x + 8)$ hrs and B alone takes $\left(x+\frac{9}{2}\right)$ hrs to complete the work. Then,

$$\frac{1}{(x+8)}+\frac{1}{\left(x+\frac{9}{2}\right)}=\frac{1}{x} \Rightarrow \frac{1}{(x+8)}+\frac{2}{(2x+9)}=\frac{1}{x} \Rightarrow x(4x+25)=(x+8)(2x+9)$$

$$\Rightarrow 2x^2=72 \Rightarrow x^2=36 \Rightarrow x=6.$$

13. P can complete the work in (12×8) hrs. $= 96$ hrs.
Q can complete the work in (8×10) hrs. $= 80$ hrs.

$\therefore$ P's 1 hour's work $= \frac{1}{96}$ and Q's 1 hour's work $= \frac{1}{80}$.

(P + Q)'s 1 hour's work $= \left(\frac{1}{96}+\frac{1}{80}\right)=\frac{11}{480}$.

So, both P and Q will finish the work in $\left(\frac{480}{11}\right)$ hrs.

$\therefore$ Number of days of 8 hours each $= \left(\frac{480}{11} \times \frac{1}{8}\right)=\frac{60}{11}$ days $= 5\frac{5}{11}$ days.

14. (A + B)'s 1 day's work $= \frac{1}{12}$; (B + C)'s 1 day's work $= \frac{1}{15}$; (A + C)'s 1 day's work $= \frac{1}{20}$.

Adding, we get : 2 (A + B + C)'s 1 day's work $= \left(\frac{1}{12} + \frac{1}{15} + \frac{1}{20}\right) = \frac{12}{60} = \frac{1}{5}$.

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{10}$.

So, A, B and C together can complete the work in 10 days.

15. (A + B + C)'s 1 day's work $= \frac{1}{6}$; (A + B)'s 1 day's work $= \frac{1}{8}$;

(B + C)'s 1 day's work $= \frac{1}{12}$.

$\therefore$ (A + C)'s 1 day's work $= \left(2 \times \frac{1}{6}\right) - \left(\frac{1}{8} + \frac{1}{12}\right) = \left(\frac{1}{3} - \frac{5}{24}\right) = \frac{3}{24} = \frac{1}{8}$.

So, A and C together will do the work in 8 days.

16. (A + B)'s 1 day's work $= \frac{1}{72}$; (B + C)'s 1 day's work $= \frac{1}{120}$; (A + C)'s 1 day's work $= \frac{1}{90}$.

Adding, we get : 2 (A + B + C)'s 1 day's work $= \left(\frac{1}{72} + \frac{1}{120} + \frac{1}{90}\right) = \frac{12}{360} = \frac{1}{30}$.

$\Rightarrow$ (A + B + C)'s 1 day's work $= \frac{1}{60}$.

So, A's 1 day's work $= \left(\frac{1}{60} - \frac{1}{120}\right) = \frac{1}{120}$.

$\therefore$ A alone can do the work in 120 days.

17. (A + B)'s 1 day's work $= \frac{1}{5}$; (B + C)'s 1 day's work $= \frac{1}{7}$; (A + C)'s 1 day's work $= \frac{1}{4}$.

Adding, we get : 2 (A + B + C)'s 1 day's work $= \left(\frac{1}{5} + \frac{1}{7} + \frac{1}{4}\right) = \frac{83}{140}$.

(A + B + C)'s 1 day's work $= \frac{83}{280}$.

A's 1 day's work $= \left(\frac{83}{280} - \frac{1}{7}\right) = \frac{43}{280}$; B's 1 day's work $= \left(\frac{83}{280} - \frac{1}{4}\right) = \frac{13}{280}$;

C's 1 day's work $= \left(\frac{83}{280} - \frac{1}{5}\right) = \frac{27}{280}$.

Thus time taken by A, B, C is $\frac{280}{43}$ days, $\frac{280}{13}$ days, $\frac{280}{27}$ days respectively.

Clearly, the time taken by A is least.

18. A's 1 hour's work $= \frac{1}{4}$; (B + C)'s 1 hour's work $= \frac{1}{3}$; (A + C)'s 1 hour's work $= \frac{1}{2}$.

(A + B + C)'s 1 hour's work $= \left(\frac{1}{4} + \frac{1}{3}\right) = \frac{7}{12}$.

B's 1 hour's work $= \left(\frac{7}{12} - \frac{1}{2}\right) = \frac{1}{12}$.

$\therefore$ B alone will take 12 hours to do the work.

19. (A + B)'s 1 day's work $= \frac{1}{10}$; C's 1 day's work $= \frac{1}{50}$.

(A + B + C)'s 1 day's work $= \left(\frac{1}{10} + \frac{1}{50}\right) = \frac{6}{50} = \frac{3}{25}$ ...(*i*)

Also, A's 1 day's work = (B + C)'s 1 day's work ...(*ii*)

From (*i*) and (*ii*), we get : 2 × (A's 1 day's work) $= \frac{3}{25}$.

$\Rightarrow$ A's 1 day's work $= \frac{3}{50}$.

$\therefore$ B's 1 day's work $= \left(\frac{1}{10} - \frac{3}{50}\right) = \frac{2}{50} = \frac{1}{25}$.

So, B alone could do the work in 25 days.

20. Ratio of rates of working of A and B = 2 : 1. So, ratio of times taken = 1 : 2.

$\therefore$ A's 1 day's work $= \frac{1}{6}$; B's 1 day's work $= \frac{1}{12}$.

(A + B)'s 1 day's work $= \left(\frac{1}{6} + \frac{1}{12}\right) = \frac{3}{12} = \frac{1}{4}$.

So, A and B together can finish the work in 4 days.

21. (A's 1 day's work) : (B's 1 day's work) = 2 : 1.

(A + B)'s 1 day's work $= \frac{1}{14}$.

Divide $\frac{1}{14}$ in the ratio 2 : 1.

$\therefore$ A's 1 day's work $= \left(\frac{1}{14} \times \frac{2}{3}\right) = \frac{1}{21}$.

Hence, A alone can finish the work in 21 days.

22. Ratio of times taken by A and B = 1 : 3.

If difference of time is 2 days, B takes 3 days.

If difference of time is 60 days, B takes $\left(\frac{3}{2} \times 60\right) = 90$ days.

So, A takes 30 days to do the work.

A's 1 day's work $= \frac{1}{30}$; B's 1 day's work $= \frac{1}{90}$.

(A + B)'s 1 day's work $= \left(\frac{1}{30} + \frac{1}{90}\right) = \frac{4}{90} = \frac{2}{45}$.

$\therefore$ A and B together can do the work in $\frac{45}{2} = 22\frac{1}{2}$ days.

23. (A's 1 day's work) : (B's 1 day's work) $= \frac{7}{4} : 1 = 7 : 4$.

Let A's and B's 1 day's work be $7x$ and $4x$ respectively.

Then, $7x + 4x = \frac{1}{7} \Rightarrow 11x = \frac{1}{7} \Rightarrow x = \frac{1}{77}$.

$\therefore$ A's 1 day's work $= \left(\frac{1}{77} \times 7\right) = \frac{1}{11}$.

24. Ratio of times taken by Sakshi and Tanya = 125 : 100 = 5 : 4.
Suppose Tanya takes x days to do the work.

$5 : 4 :: 20 : x \Rightarrow x = \left(\frac{4 \times 20}{5}\right) \Rightarrow x = 16$ days.

Hence, Tanya takes 16 days to complete the work.

25. Ratio of times taken by A and B = 100 : 130 = 10 : 13.
Suppose B takes x days to do the work.

Then, $10 : 13 :: 23 : x \Rightarrow x = \left(\frac{23 \times 13}{10}\right) \Rightarrow x = \frac{299}{10}$.

A's 1 day's work $= \frac{1}{23}$; B's 1 days work $= \frac{10}{299}$.

(A + B)'s 1 day's work $= \left(\frac{1}{23} + \frac{10}{299}\right) = \frac{23}{299} = \frac{1}{13}$.

$\therefore$ A and B together can complete the job in 13 days.

26. Suppose B takes x days to do the work.

$\therefore$ A takes $\left(2 \times \frac{3}{4}x\right) = \frac{3x}{2}$ days to do it.

(A + B)'s 1 day's work $= \frac{1}{18}$.

$\therefore \frac{1}{x} + \frac{2}{3x} = \frac{1}{18}$ or $x = 30$.

27. (A's 1 day's work) : (B's 1 day's work) = 150 : 100 = 3 : 2.
Let A's and B's 1 day's work be $3x$ and $2x$ respectively.

Then, C's 1 day's work $= \left(\frac{3x + 2x}{2}\right) = \frac{5x}{2}$.

$\therefore \frac{5x}{2} = \frac{1}{40}$ or $x = \left(\frac{1}{40} \times \frac{2}{5}\right) = \frac{1}{100}$.

A's 1 day's work $= \frac{3}{100}$; B's 1 day's work $= \frac{1}{50}$; C's 1 day's work $= \frac{1}{40}$.

(A + B + C)'s 1 day's work $= \left(\frac{3}{100} + \frac{1}{50} + \frac{1}{40}\right) = \frac{15}{200} = \frac{3}{40}$.

So, A, B and C together can do the work in $\frac{40}{3} = 13\frac{1}{3}$ days.

28. Let A's 1 day's work = x and B's 1 day's work = y.

Then, $x + y = \frac{1}{5}$ and $2x + \frac{1}{3}y = \frac{1}{3}$.

Solving, we get : $x = \frac{4}{25}$ and $y = \frac{1}{25}$.

$\therefore$ A's 1 day's work $= \frac{4}{25}$.

So, A alone could complete the work in $\frac{25}{4} = 6\frac{1}{4}$ days.

29. A's 1 day's work $= \frac{1}{15}$; B's 1 day's work $= \frac{1}{20}$.

(A + B)'s 1 day's work $= \left(\frac{1}{15} + \frac{1}{20}\right) = \frac{7}{60}$.

(A + B)'s 4 days' work $= \left(\frac{7}{60} \times 4\right) = \frac{7}{15}$.

$\therefore$ Remaining work $= \left(1 - \frac{7}{15}\right) = \frac{8}{15}$.

30. B's 10 days' work $= \left(\frac{1}{15} \times 10\right) = \frac{2}{3}$. Remaining work $= \left(1 - \frac{2}{3}\right) = \frac{1}{3}$.

Now, $\frac{1}{18}$ work is done by A in 1 day.

$\therefore$ $\frac{1}{3}$ work is done by A in $\left(18 \times \frac{1}{3}\right) = 6$ days.

31. (A + B)'s 1 day's work $= \left(\frac{1}{15} + \frac{1}{10}\right) = \frac{1}{6}$.

Work done by A and B in 2 days $= \left(\frac{1}{6} \times 2\right) = \frac{1}{3}$. Remaining work $= \left(1 - \frac{1}{3}\right) = \frac{2}{3}$.

Now, $\frac{1}{15}$ work is done by A in 1 day.

$\therefore$ $\frac{2}{3}$ work will be done by A in $\left(15 \times \frac{2}{3}\right) = 10$ days.

Hence, total time taken = (10 + 2) = 12 days.

32. (B + C)'s 1 day's work $= \left(\frac{1}{9} + \frac{1}{12}\right) = \frac{7}{36}$.

Work done by B and C in 3 days $= \left(\frac{7}{36} \times 3\right) = \frac{7}{12}$.

Remaining work $= \left(1 - \frac{7}{12}\right) = \frac{5}{12}$.

Now, $\frac{1}{24}$ work is done by A in 1 day.

So, $\frac{5}{12}$ work is done by A in $\left(24 \times \frac{5}{12}\right) = 10$ days.

33. (P + Q + R)'s 1 hour's work $= \left(\frac{1}{8} + \frac{1}{10} + \frac{1}{12}\right) = \frac{37}{120}$.

Work done by P, Q and R in 2 hours $= \left(\frac{37}{120} \times 2\right) = \frac{37}{60}$.

Remaining work $= \left(1 - \frac{37}{60}\right) = \frac{23}{60}$.

(Q + R)'s 1 hour's work $= \left(\frac{1}{10} + \frac{1}{12}\right) = \frac{11}{60}$.

Now, $\frac{11}{60}$ work is done by Q and R in 1 hour.

So, $\frac{23}{60}$ work will be done by Q and R in $\left(\frac{60}{11} \times \frac{23}{60}\right) = \frac{23}{11}$ hours $\approx$ 2 hours.

So, the work will be finished approximately 2 hours after 11 a.m., *i.e*, around 1 p.m.

34. 2 (A + B + C)'s 1 day's work $= \left(\frac{1}{30}+\frac{1}{24}+\frac{1}{20}\right) = \frac{15}{120} = \frac{1}{8}$.

$\Rightarrow$ (A + B + C)'s 1 day's work $= \frac{1}{16}$.

Work done by A, B and C in 10 days $= \frac{10}{16} = \frac{5}{8}$. Remaining work $= \left(1-\frac{5}{8}\right) = \frac{3}{8}$.

A's 1 day's work $= \left(\frac{1}{16}-\frac{1}{24}\right) = \frac{1}{48}$.

Now, $\frac{1}{48}$ work is done by A in 1 day.

So, $\frac{3}{8}$ work will be done by A in $\left(48\times\frac{3}{8}\right) = 18$ days.

35. Work done by X in 4 days $= \left(\frac{1}{20}\times 4\right) = \frac{1}{5}$. Remaining work $= \left(1-\frac{1}{5}\right) = \frac{4}{5}$.

(X + Y)'s 1 day's work $= \left(\frac{1}{20}+\frac{1}{12}\right) = \frac{8}{60} = \frac{2}{15}$.

Now, $\frac{2}{15}$ work is done by X and Y in 1 day.

So, $\frac{4}{5}$ work will be done by X and Y in $\left(\frac{15}{2}\times\frac{4}{5}\right) = 6$ days.

Hence, total time taken = (6 + 4) days = 10 days.

36. (A + B)'s 20 days' work $= \left(\frac{1}{30}\times 20\right) = \frac{2}{3}$. Remaining work $= \left(1-\frac{2}{3}\right) = \frac{1}{3}$.

Now, $\frac{1}{3}$ work is done by A in 20 days.

Whole work will be done by A in $(20 \times 3) = 60$ days.

37. Work done by X in 8 days $= \left(\frac{1}{40}\times 8\right) = \frac{1}{5}$. Remaining work $= \left(1-\frac{1}{5}\right) = \frac{4}{5}$.

Now, $\frac{4}{5}$ work is done by Y in 16 days.

Whole work will be done by Y in $\left(16\times\frac{5}{4}\right) = 20$ days.

$\therefore$ X's 1 day's work $= \frac{1}{40}$, Y's 1 day's work $= \frac{1}{20}$.

(X + Y)'s 1 day's work $= \left(\frac{1}{40}+\frac{1}{20}\right) = \frac{3}{40}$.

Hence, X and Y will together complete the work in $\frac{40}{3} = 13\frac{1}{3}$ days.

38. Work done by A, B and C in 4 days $= \left(\frac{1}{10}\times 4\right) = \frac{2}{5}$. Remaining work $= \left(1-\frac{2}{5}\right) = \frac{3}{5}$.

Now, $\frac{3}{5}$ work is done by B and C in 10 days.

Whole work will be done by B and C in $\left(10\times\frac{5}{3}\right) = \frac{50}{3}$ days.

(A + B + C)'s 1 day's work = $\frac{1}{10}$, (B + C)'s 1 day's work = $\frac{3}{50}$.

A's 1 day's work = $\left(\frac{1}{10}-\frac{3}{50}\right)=\frac{2}{50}=\frac{1}{25}$.

∴ A alone could complete the work in 25 days.

39. Whole work is done by A in $\left(20\times\frac{5}{4}\right)$ = 25 days.

Now, $\left(1-\frac{4}{5}\right)$ *i.e.*, $\frac{1}{5}$ work is done by A and B in 3 days.

Whole work will be done by A and B in (3 × 5) = 15 days.

A's 1 day's work = $\frac{1}{25}$, (A + B)'s 1 day's work = $\frac{1}{15}$.

∴ B's 1 day's work = $\left(\frac{1}{15}-\frac{1}{25}\right)=\frac{4}{150}=\frac{2}{75}$.

So, B alone would do the work in $\frac{75}{2}=37\frac{1}{2}$ days.

40. Let A's 1 day's work = x and B's 1 day's work = y.

Then, $x+y=\frac{1}{30}$ and $16x+44y=1$.

Solving these two equations, we get : $x=\frac{1}{60}$ and $y=\frac{1}{60}$.

∴ B's 1 day's work = $\frac{1}{60}$.

Hence, B alone shall finish the whole work in 60 days.

41. A's 5 days' work + B's 7 days' work + C's 13 days' work = 1

⇒ (A + B)'s 5 days' work + (B + C)'s 2 days' work + C's 11 days' work = 1

⇒ $\frac{5}{12}+\frac{2}{16}$ + C's 11 days' work = 1

⇒ C's 11 days' work = $1-\left(\frac{5}{12}+\frac{2}{16}\right)=\frac{11}{24}$.

⇒ C's 1 day's work = $\left(\frac{11}{24}\times\frac{1}{11}\right)=\frac{1}{24}$.

∴ C alone can finish the work in 24 days.

42. (A + B)'s 1 day's work = $\left(\frac{1}{45}+\frac{1}{40}\right)=\frac{17}{360}$.

Work done by B in 23 days = $\left(\frac{1}{40}\times 23\right)=\frac{23}{40}$. Remaining work = $\left(1-\frac{23}{40}\right)=\frac{17}{40}$.

Now, $\frac{17}{360}$ work was done by (A + B) in 1 day.

$\frac{17}{40}$ work was done by (A + B) in $\left(1\times\frac{360}{17}\times\frac{17}{40}\right)$ = 9 days.

∴ A left after 9 days.

43. B's 3 days' work $= \left(\frac{1}{21} \times 3\right) = \frac{1}{7}$. Remaining work $= \left(1 - \frac{1}{7}\right) = \frac{6}{7}$.

(A + B)'s 1 day's work $= \left(\frac{1}{14} + \frac{1}{21}\right) = \frac{5}{42}$.

Now, $\frac{5}{42}$ work is done by A and B in 1 day.

$\therefore$ $\frac{6}{7}$ work is done by A and B in $\left(\frac{42}{5} \times \frac{6}{7}\right) = \frac{36}{5}$ days.

Hence, total time taken $= \left(3 + \frac{36}{5}\right)$ days $= 10\frac{1}{5}$ days.

44. (A + B + C)'s 1 day's work $= \left(\frac{1}{24} + \frac{1}{36} + \frac{1}{48}\right) = \frac{13}{144}$.

Work done by (A + B + C) in 4 days $= \left(\frac{13}{144} \times 4\right) = \frac{13}{36}$.

Work done by B in 3 days $= \left(\frac{1}{36} \times 3\right) = \frac{1}{12}$. Remaining work $= \left[1 - \left(\frac{13}{36} + \frac{1}{12}\right)\right] = \frac{5}{9}$.

(A + B)'s 1 day's work $= \left(\frac{1}{24} + \frac{1}{36}\right) = \frac{5}{72}$.

Now, $\frac{5}{72}$ work is done by A and B in $\left(\frac{72}{5} \times \frac{5}{9}\right) = 8$ days.

Hence, total time taken = (4 + 3 + 8) days = 15 days.

45. B's daily earning = Rs. (300 − 188) = Rs. 112.

A's daily earning = Rs. (300 − 152) = Rs. 148.

C's daily earning = Rs. [300 − (112 + 148)] = Rs. 40.

46. Work done by A $= \left(1 - \frac{8}{23}\right) = \frac{15}{23}$.

$\therefore$ A : (B + C) $= \frac{15}{23} : \frac{8}{23} = 15 : 8$.

So, A's share $=$ Rs. $\left(\frac{15}{23} \times 529\right)$ = Rs. 345.

47. Kim's wages : David's wages = Kim's 1 day's work : David's 1 day's work

$= \frac{1}{3} : \frac{1}{2} = 2 : 3$.

$\therefore$ Kim's share $=$ Rs. $\left(\frac{2}{5} \times 150\right)$ = Rs. 60.

48. Whole work is done by A in (3 × 4) = 12 days.

Whole work is done by B in (4 × 6) = 24 days.

A's wages : B's wages = A's 1 day's work : B's 1 day's work $= \frac{1}{12} : \frac{1}{24} = 2 : 1$.

$\therefore$ A's share $=$ Rs. $\left(\frac{2}{3} \times 180\right)$ = Rs. 120.

49. C's 1 day's work $= \frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8}\right) = \frac{1}{3} - \frac{7}{24} = \frac{1}{24}$.

A's wages : B's wages : C's wages $= \frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1$.

$\therefore$ C's share $= \text{Rs.}\left(\frac{1}{8} \times 3200\right) = \text{Rs. } 400$.

50. Let total money be Rs. x.

A's 1 day's wages $= \text{Rs.}\ \frac{x}{21}$, B's 1 day's wages $= \text{Rs.}\ \frac{x}{28}$.

$\therefore$ (A + B)'s 1 day's wages $= \text{Rs.}\left(\frac{x}{21} + \frac{x}{28}\right) = \text{Rs.}\ \frac{x}{12}$.

$\therefore$ Money is sufficient to pay the wages of both for 12 days.

51. Part of the work done by A $= \left(\frac{1}{10} \times 5\right) = \frac{1}{2}$.

Part of the work done by B $= \left(\frac{1}{15} \times 5\right) = \frac{1}{3}$.

Part of the work done by C $= 1 - \left(\frac{1}{2} + \frac{1}{3}\right) = \frac{1}{6}$.

So, (A's share) : (B's share) : (C's share) $= \frac{1}{2} : \frac{1}{3} : \frac{1}{6} = 3 : 2 : 1$.

$\therefore$ A's share $= \text{Rs.}\left(\frac{3}{6} \times 1500\right) = \text{Rs. } 750$, B's share $= \text{Rs.}\left(\frac{2}{6} \times 1500\right) = \text{Rs. } 500$,

C's share $= \text{Rs.}\left(\frac{1}{6} \times 1500\right) = \text{Rs. } 250$.

A's daily wages $= \text{Rs.}\left(\frac{750}{5}\right) = \text{Rs. } 150$; B's daily wages $= \text{Rs.}\left(\frac{500}{5}\right) = \text{Rs. } 100$;

C's daily wages $= \text{Rs.}\left(\frac{250}{2}\right) = \text{Rs. } 125$.

$\therefore$ Daily wages of B and C = Rs. (100 + 125) = Rs. 225.

52. B's 1 day's work $= \left(\frac{1}{12} - \frac{1}{20}\right) = \frac{2}{60} = \frac{1}{30}$.

Now, (A + B)'s 1 day's work $= \left(\frac{1}{20} + \frac{1}{60}\right) = \frac{4}{60} = \frac{1}{15}$. [$\because$ B works for half day only]

So, A and B together will complete the work in 15 days.

53. (A + B)'s 2 days' work $= \left(\frac{1}{16} + \frac{1}{12}\right) = \frac{7}{48}$.

Work done in 6 pairs of days $= \left(\frac{7}{48} \times 6\right) = \frac{7}{8}$. Remaining work $= \left(1 - \frac{7}{8}\right) = \frac{1}{8}$.

Work done by A on 13th day $= \frac{1}{16}$. Remaining work $= \left(\frac{1}{8} - \frac{1}{16}\right) = \frac{1}{16}$.

On 14th day, it is B's turn.

$\frac{1}{12}$ work is done by B in 1 day. $\frac{1}{16}$ work is done by B in $\left(12 \times \frac{1}{16}\right) = \frac{3}{4}$ day.

$\therefore$ Total time taken $= 13\frac{3}{4}$ days.

54. (A + B)'s 1 day's work $= \left(\frac{1}{11} + \frac{1}{20}\right) = \frac{31}{220}$. (A + C)'s 1 day's work $= \left(\frac{1}{11} + \frac{1}{55}\right) = \frac{6}{55}$.

Work done in 2 days $= \left(\frac{31}{220} + \frac{6}{55}\right) = \frac{55}{220} = \frac{1}{4}$.

Now, $\frac{1}{4}$ work is done by A in 2 days.

$\therefore$ Whole work will be done in $(2 \times 4) = 8$ days.

55. A's 2 days' work $= \left(\frac{1}{20} \times 2\right) = \frac{1}{10}$.

(A + B + C)'s 1 day's work $= \left(\frac{1}{20} + \frac{1}{30} + \frac{1}{60}\right) = \frac{6}{60} = \frac{1}{10}$.

Work done in 3 days $= \left(\frac{1}{10} + \frac{1}{10}\right) = \frac{1}{5}$.

Now, $\frac{1}{5}$ work is done in 3 days.

$\therefore$ Whole work will be done in $(3 \times 5) = 15$ days.

56. (A + B)'s 6 days' work $= 6\left(\frac{1}{20} + \frac{1}{15}\right) = \frac{7}{10}$; (A + C)'s 4 days' work $= \frac{3}{10}$;

(A + C)'s 1 day's work $= \frac{3}{40}$. A's 1 day's work $= \frac{1}{20}$.

$\therefore$ C's 1 day's work $= \left(\frac{3}{40} - \frac{1}{20}\right) = \frac{1}{40}$.

Hence, C alone can finish the work in 40 days.

57. Suppose the work was finished in x days.

Then, A's $(x - 8)$ days' work + B's $(x - 12)$ days' work + C's x days' work = 1

$$\Rightarrow \frac{(x-8)}{36} + \frac{(x-12)}{54} + \frac{x}{72} = 1 \Leftrightarrow 6(x-8) + 4(x-12) + 3x = 216$$

$\therefore$ $13x = 312$ or $x = 24$.

58. (20 × 16) women can complete the work in 1 day.

$\therefore$ 1 woman's 1 day's work $= \frac{1}{320}$.

(16 × 15) men can complete the work in 1 day.

$\therefore$ 1 man's 1 day's work $= \frac{1}{240}$.

So, required ratio $= \frac{1}{240} : \frac{1}{320} = 4 : 3$.

59. 10 men's 1 day's work $= \frac{1}{15}$; 15 women's 1 day's work $= \frac{1}{12}$.

(10 men + 15 women)'s 1 day's work $= \left(\frac{1}{15} + \frac{1}{12}\right) = \frac{9}{60} = \frac{3}{20}$.

$\therefore$ 10 men and 15 women will complete the work in $\frac{3}{20} = 6\frac{2}{3}$ days.

60. (7×12) men can complete the work in 1 day.

$\therefore$ 1 man's 1 day's work $= \frac{1}{84}$.

7 men's 5 days' work $= \left(\frac{1}{12} \times 5\right) = \frac{5}{12}$. Remaining work $= \left(1 - \frac{5}{12}\right) = \frac{7}{12}$.

5 men's 1 day's work $= \left(\frac{1}{84} \times 5\right) = \frac{5}{84}$.

$\frac{5}{84}$ work is done by them in 1 day

$\frac{7}{12}$ work is done by them in $\left(\frac{84}{5} \times \frac{7}{12}\right) = \frac{49}{5}$ days $= 9\frac{4}{5}$ days.

61. 1 man's 1 day's work $= \frac{1}{108}$.

12 men's 6 days' work $= \left(\frac{1}{9} \times 6\right) = \frac{2}{3}$. Remaining work $= \left(1 - \frac{2}{3}\right) = \frac{1}{3}$.

18 men's 1 day's work $= \left(\frac{1}{108} \times 18\right) = \frac{1}{6}$.

$\frac{1}{6}$ work is done by them in 1 day.

$\therefore$ $\frac{1}{3}$ work is done by them in $\left(6 \times \frac{1}{3}\right) = 2$ days.

62. Let 1 woman's 1 day's work $= x$.

Then, 1 man's 1 day's work $= \frac{x}{2}$ and 1 child's 1 day's work $= \frac{x}{4}$.

So, $\left(\frac{3x}{2} + 4x + \frac{6x}{4}\right) = \frac{1}{7} \Rightarrow \frac{28x}{4} = \frac{1}{7} \Rightarrow x = \left(\frac{1}{7} \times \frac{4}{28}\right) = \frac{1}{49}$.

$\therefore$ 1 woman alone can complete the work in 49 days.

So, to complete the work in 7 days, number of women required $= \left(\frac{49}{7}\right) = 7$.

63. (1 man + 1 woman)'s 1 day's work $= \left(\frac{1}{3} + \frac{1}{4}\right) = \frac{7}{12}$.

Work done by 1 man and 1 woman in $\frac{1}{4}$ day $= \left(\frac{7}{12} \times \frac{1}{4}\right) = \frac{7}{48}$.

Remaining work $= \left(1 - \frac{7}{48}\right) = \frac{41}{48}$.

Work done by 1 boy in $\frac{1}{4}$ day $= \left(\frac{1}{12} \times \frac{1}{4}\right) = \frac{1}{48}$.

$\therefore$ Number of boys required $= \left(\frac{41}{48} \times 48\right) = 41$.

64. 1 man's 1 day's work $= \frac{1}{100}$. (10 men + 15 women)'s 1 day's work $= \frac{1}{6}$.

15 women's 1 day's work $= \left(\frac{1}{6} - \frac{10}{100}\right) = \left(\frac{1}{6} - \frac{1}{10}\right) = \frac{1}{15}$.

1 woman's 1 day's work $= \frac{1}{225}$.

$\therefore$ 1 woman alone can complete the work in 225 days.

65. 1 man's 1 day's work $= \frac{1}{48}$; 1 woman's 1 day's work $= \frac{1}{60}$.

6 men's 2 days' work $= \left(\frac{6}{48} \times 2\right) = \frac{1}{4}$. Remaining work $= \left(1 - \frac{1}{4}\right) = \frac{3}{4}$.

Now, $\frac{1}{60}$ work is done in 1 day by 1 woman.

So, $\frac{3}{4}$ work will be done in 3 days by $\left(60 \times \frac{3}{4} \times \frac{1}{3}\right) = 15$ women.

66. 1 child's 1 day's work $= \frac{1}{192}$; 1 adult's 1 day's work $= \frac{1}{96}$.

Work done in 3 days $= \left(\frac{1}{96} \times 16 \times 3\right) = \frac{1}{2}$. Remaining work $= \left(1 - \frac{1}{2}\right) = \frac{1}{2}$.

(6 adults + 4 children)'s 1 day's work $= \left(\frac{6}{96} + \frac{4}{192}\right) = \frac{1}{12}$.

$\frac{1}{12}$ work is done by them in 1 day.

$\frac{1}{2}$ work is done by them $\left(12 \times \frac{1}{2}\right) = 6$ days.

67. 1 woman's 1 day's work $= \frac{1}{70}$; 1 child's 1 day's work $= \frac{1}{140}$.

(5 women + 10 children)'s 1 day's work $= \left(\frac{5}{70} + \frac{10}{140}\right) = \left(\frac{1}{14} + \frac{1}{14}\right) = \frac{1}{7}$.

$\therefore$ 5 women and 10 children will complete the work in 7 days.

68. 1 man's 1 day's work $= \frac{1}{192}$; 1 child's 1 day's work $= \frac{1}{432}$.

Work done in 8 days $= 8\left(\frac{12}{192} + \frac{8}{432}\right) = 8\left(\frac{1}{16} + \frac{1}{54}\right) = \frac{35}{54}$.

Remaining work $= \left(1 - \frac{35}{54}\right) = \frac{19}{54}$.

(12 men + 11 children)'s 1 day's work $= \left(\frac{12}{192} + \frac{11}{432}\right) = \frac{19}{216}$.

Now, $\frac{19}{216}$ work is done by them in 1 day.

$\therefore$ $\frac{19}{54}$ work will be done by them in $\left(\frac{216}{19} \times \frac{19}{54}\right) = 4$ days.

69. 1 man's 1 day's work $= \frac{1}{384}$; 1 woman's 1 day's work $= \frac{1}{768}$.

Work done in 12 days $= 12\left(\frac{16}{384} + \frac{16}{768}\right) = \left(12 \times \frac{3}{48}\right) = \frac{3}{4}$.

Remaining work $= \left(1 - \frac{3}{4}\right) = \frac{1}{4}$.

(16 men + 16 women)'s 2 days' work $= 2\left(\frac{16}{384}+\frac{16}{768}\right) = \left(2\times\frac{1}{16}\right) = \frac{1}{8}$.

Remaining work $= \left(\frac{1}{4}-\frac{1}{8}\right) = \frac{1}{8}$.

$\frac{1}{384}$ work is done in 1 day by 1 man.

$\therefore$ $\frac{1}{8}$ work will be done in 2 days by $\left(384\times\frac{1}{8}\times\frac{1}{2}\right) = 24$ men.

70. Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y.

Then, $5x + 2y = 4(x + y) \Rightarrow x = 2y \Rightarrow \frac{x}{y} = \frac{2}{1}$.

71. Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y.

Then, $12x + 16y = \frac{1}{5}$ and $13x + 24y = \frac{1}{4}$.

Solving these two equations, we get : $x = \frac{1}{100}$ and $y = \frac{1}{200}$.

$\therefore$ Required ratio $= x : y = \frac{1}{100} : \frac{1}{200} = 2 : 1$.

72. Let 1 man's 1 day's work = x and 1 woman's 1 day's work = y.

Then, $4x + 6y = \frac{1}{8}$ and $3x + 7y = \frac{1}{10}$.

Solving these two equations, we get : $x = \frac{11}{400}$, $y = \frac{1}{400}$.

$\therefore$ 1 woman's 1 day's work $= \frac{1}{400}$.

$\Rightarrow$ 10 women's 1 day's work $= \left(\frac{1}{400}\times 10\right) = \frac{1}{40}$.

Hence, 10 women will complete the work in 40 days.

73. Let 1 man's 1 hour's work = x, 1 woman's 1 hour's work = y and 1 boy's 1 hour's work = z. Then,

$x + 3y + 4z = \frac{1}{96}$ ...(*i*) $2x + 8z = \frac{1}{80}$ ...(*ii*) $2x + 3y = \frac{1}{120}$ ...(*iii*)

Adding (*ii*) and (*iii*) and subtracting (*i*) from it, we get : $3x + 4z = \frac{1}{96}$ ...(*iv*)

From (*ii*) and (*iv*), we get $x = \frac{1}{480}$. Substituting, we get : $y = \frac{1}{720}$, $z = \frac{1}{960}$.

(5 men + 12 boys)'s 1 hour's work $= \left(\frac{5}{480}+\frac{12}{960}\right) = \left(\frac{1}{96}+\frac{1}{80}\right) = \frac{11}{480}$.

$\therefore$ 5 men and 12 boys can do the work in $\frac{480}{11}$ *i.e.*, $43\frac{7}{11}$ hours.

74. Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y.

Then, $6x + 8y = \frac{1}{10}$ and $26x + 48y = \frac{1}{2}$.

Solving these two equations, we get : $x = \frac{1}{100}$ and $y = \frac{1}{200}$.

(15 men + 20 boys)'s 1 day's work $= \left(\frac{15}{100} + \frac{20}{200}\right) = \frac{1}{4}$.

$\therefore$ 15 men and 20 boys can do the work in 4 days.

EXERCISE 15B

(DATA SUFFICIENCY TYPE QUESTIONS)

Directions (*Questions 1 to 4*) : *Each of the questions given below consists of a statement and/or a question followed by two statements labelled I and II. Read both the statements and*

Give answer (a) if the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient to answer the question;

Give answer (b) if the data in Statement II alone are sufficient to answer the question, while the data in Statement I alone are not sufficient to answer the question;

Give answer (c) if the data either in Statement I or in Statement II alone are sufficient to answer the question;

Give answer (d) if the data even in both Statements I and II together are not sufficient to answer the question;

Give answer (e) if the data in both Statements I and II together are necessary to answer the question.

1. How long will Machine Y, working alone, take to produce x candles ? **(M.B.A. 2002)**
   I. Machine X produces x candles in 5 minutes.
   II. Machine X and Machine Y working at the same time produce x candles in 2 minutes.
2. B alone can complete a work in 12 days. How many days will A, B and C together take to complete the work ?
   I. A and B together can complete the work in 3 days.
   II. B and C together can complete the work in 6 days.
3. Is it cheaper to employ X to do a certain job than to employ Y ?
   I. X is paid 20% more per hour than Y, but Y takes 2 hours longer to complete the job.
   II. X is paid Rs. 80 per hour.
4. A and B together can complete a task in 7 days. B alone can do it in 20 days. What part of the work was carried out by A ? **(M.B.A. 1998)**
   I. A completed the job alone after A and B worked together for 5 days.
   II. Part of the work done by A could have been done by B and C together in 6 days.

Directions (*Questions 5 to 9*) : *Each of the following questions consists of a question followed by three statements I, II and III. You have to study the question and the statements and decide which of the statement(s) is/are necessary to answer the question.*

5. In how many days can A and B working together complete a job ?
   I. A alone can complete the job in 30 days.
   II. B alone can complete the job in 40 days.
   III. B takes 10 days more than A to complete the job.
   (*a*) I and II only (*b*) II and III only (*c*) I and III only
   (*d*) Any two of the three (*e*) All I, II and III

6. In how many days can the work be completed by A and B together ?
I. A alone can complete the work in 8 days.
II. If A alone works for 5 days and B alone works for 6 days, the work gets completed.
III. B alone can complete the work in 16 days. (Bank P.O. 2003)
(a) I and II only (b) II and III only (c) Any two of the three
(d) II and either I or III (e) None of these

7. How many workers are required for completing the construction work in 10 days ?
I. 20% of the work can be completed by 8 workers in 8 days.
II. 20 workers can complete the work in 16 days.
III. One-eighth of the work can be completed by 8 workers in 5 days. (Bank P.O. 2003)
(a) I only (b) II and III only (c) III only
(d) I and III only (e) Any one of the three

8. In how many days can the work be done by 9 men and 15 women ?
I. 6 men and 5 women can complete the work in 6 days.
II. 3 men and 4 women can complete the work in 10 days.
III. 18 men and 15 women can complete the work in 2 days.
(a) III only (b) All I, II and III (c) Any two of the three
(d) Any one of the three (e) None of these

9. In how many days can 10 women finish a work ? (R.B.I. 2002)
I. 10 men can complete the work in 6 days.
II. 10 men and 10 women together can complete the work in $3\frac{3}{7}$ days.
III. If 10 men work for 3 days and thereafter 10 women replace them, the remaining work is completed in 4 days.
(a) Any two of the three (b) I and II only (c) II and III only
(d) I and III only (e) None of these

Directions (*Questions 10-11*) : *Each of these questions is followed by three statements. You have to study the question and all the three statements given to decide whether any information provided in the statement(s) is/are redundant and can be dispensed with while answering the given question.*

10. In how many days can the work be completed by A, B and C together ?
I. A and B together can complete the work in 6 days.
II. B and C together can complete the work in $3\frac{3}{4}$ days.
III. A and C together can complete the work in $3\frac{1}{3}$ days. (S.B.I.P.O. 2001)
(a) Any one of the three (b) I only
(c) II only (d) III only
(e) Information in all the three statements is necessary to answer the question.

11. 8 men and 14 women are working together in a field. After working for 3 days, 5 men and 8 women leave the work. How many more days will be required to complete the work ? (S.B.I.P.O. 1999)
I. 19 men and 12 women together can complete the work in 18 days.
II. 16 men can complete two-third of the work in 16 days.
III. In a day, the work done by three men is equal to the work done by four women.
(a) I only (b) II only (c) III only
(d) I or II or III (e) II or III only

ANSWERS

1. (e) 2. (e) 3. (d) 4. (a) 5. (d) 6. (c) 7. (e) 8. (c)
9. (a) 10. (e) 11. (d)

SOLUTIONS

1. I gives, Machine X produces $\frac{x}{5}$ candles in 1 min.

II gives, Machines X and Y produce $\frac{x}{2}$ candles in 1 min.

From I and II, Y produces $\left(\frac{x}{2}-\frac{x}{5}\right)=\frac{3x}{10}$ candles in 1 min.

$\frac{3x}{10}$ candles are produced by Y in 1 min.

x candles will be produced by Y in $\left(\frac{10}{3x}\times x\right)$ min $=\frac{10}{3}$ min.

Thus, I and II both are necessary to get the answer.

$\therefore$ Correct answer is (e).

2. Given : B's 1 day's work $=\frac{1}{12}$.

I gives, (A + B)'s 1 day's work $=\frac{1}{3}$.

$\Rightarrow$ A's 1 day's work $=\left(\frac{1}{3}-\frac{1}{12}\right)=\frac{3}{12}=\frac{1}{4}$.

II gives, (B + C)'s 1 day's work $=\frac{1}{6}$ $\Rightarrow$ C's 1 day's work $=\left(\frac{1}{6}-\frac{1}{12}\right)=\frac{1}{12}$.

$\therefore$ (A + B + C)'s 1 day's work $=\left(\frac{1}{4}+\frac{1}{12}+\frac{1}{12}\right)=\frac{5}{12}$.

Hence, they all finish the work in $\frac{12}{5}=2\frac{2}{5}$ days.

Thus, I and II both are necessary to get the answer.

$\therefore$ Correct answer is (e).

3. Suppose X takes x hours and Y takes $(x + 2)$ hours to complete the job.

II. X is paid Rs. 80 per hour.

Total payment to X = Rs. $(80x)$.

I. X = 120% of Y $=\frac{120}{100}Y=\frac{6}{5}Y \Rightarrow Y=\frac{5}{6}X$.

$\therefore$ Y is paid Rs. $\left(\frac{5}{6}\times 80\right)$ per hour $\Rightarrow$ Y is paid Rs. $\left[\frac{200}{3}(x+2)\right]$.

We cannot compare $(80x)$ and $\frac{200}{3}(x+2)$.

$\therefore$ Correct answer is (d).

4. B's 1 day's work $= \frac{1}{20}$. (A + B)'s 1 day's work $= \frac{1}{7}$.

I. (A + B)'s 5 day's work $= \frac{5}{7}$. Remaining work $= \left(1 - \frac{5}{7}\right) = \frac{2}{7}$.

$\therefore$ $\frac{2}{7}$ work was carried by A.

II. is irrelevant.

$\therefore$ Correct answer is (*a*).

5. I. A can complete the job in 30 days.

$\therefore$ A's 1 day's work $= \frac{1}{30}$. Remaining work $= \left(1 - \frac{5}{7}\right) = \frac{2}{7}$.

II. B can complete the job in 40 days.

$\therefore$ B's 1 day's work $= \frac{1}{40}$.

III. B takes 10 days more than A to complete the job.

I and II gives, (A + B)'s 1 day's work $= \left(\frac{1}{30} + \frac{1}{40}\right) = \frac{7}{120}$.

$\therefore$ I and III also give the same answer.

II and III also give the same answer.

$\therefore$ Correct answer is (*d*).

6. I. A can complete the job in 8 days. So, A's 1 day's work $= \frac{1}{8}$.

II. A works for 5 days, B works for 6 days and the work is completed.

III. B can complete the job in 16 days. So, B's 1 day's work $= \frac{1}{16}$.

I and III : (A + B)'s 1 day's work $= \left(\frac{1}{8} + \frac{1}{16}\right) = \frac{3}{16}$.

$\therefore$ Both can finish the work in $\frac{16}{3}$ days.

II and III : Suppose A takes x days to finish the work.

Then, $\frac{5}{x} + \frac{6}{16} = 1 \Rightarrow \frac{5}{x} = \left(1 - \frac{3}{8}\right) = \frac{5}{8} \Rightarrow x = 8$.

$\therefore$ (A + B)'s 1 day's work $= \left(\frac{1}{8} + \frac{1}{16}\right) = \frac{3}{16}$.

$\therefore$ Both can finish it in $\frac{16}{3}$ days.

I and II : A's 1 day's work $= \frac{1}{8}$. Suppose B takes x days to finish the work.

Then from II, $\left(5 \times \frac{1}{8} + 6 \times \frac{1}{x} = 1\right) \Rightarrow \frac{6}{x} = \left(1 - \frac{5}{8}\right) = \frac{3}{8} \Rightarrow x = \left(\frac{8 \times 6}{3}\right) = 16$.

$\therefore$ (A + B)'s 1 day's work $= \left(\frac{1}{8} + \frac{1}{16}\right) = \frac{3}{16}$.

$\therefore$ Both can finish it in $\frac{16}{3}$ days.

Hence, the correct answer is (*c*).

7. I. $\frac{20}{100}$ work can be completed by (8×8) workers in 1 day.

$\Rightarrow$ Whole work can be completed by $(8 \times 8 \times 5)$ workers in 1 day

$= \frac{8 \times 8 \times 5}{10}$ workers in 10 days = 32 workers in 10 days.

II. (20×16) workers can finish it in 1 day.

$\Rightarrow \frac{(20 \times 16)}{10}$ workers can finish it in 10 days.

$\Rightarrow$ 32 workers can finish it in 10 days.

III. $\frac{1}{8}$ work can be completed by (8×5) workers in 1 day.

$\Rightarrow$ Whole work can be completed by $(8 \times 5 \times 8)$ workers in 1 day

$= \frac{8 \times 5 \times 8}{10}$ workers in 10 days = 32 workers in 10 days.

$\therefore$ Any one of the three gives the answer.

$\therefore$ Correct answer is (e).

8. Clearly, any two of the three will give two equations in x and y, which can be solved simultaneously.

$\therefore$ Correct answer is (c).

[For example I and II together give $\left(6x + 5y = \frac{1}{6},\ 3x + 4y = \frac{1}{10}\right)$].

9. I. (10×6) men can complete the work in 1 day.

$\Rightarrow$ 1 man's 1 day's work $= \frac{1}{60}$.

II. $\left(10 \times \frac{24}{7}\right)$ men + $\left(10 \times \frac{24}{7}\right)$ women can complete the work in 1 day.

$\Rightarrow \left(\frac{240}{7}\right)$ men's 1 day work + $\left(\frac{240}{7}\right)$ women's 1 day work = 1

$\Rightarrow \left(\frac{240}{7} \times \frac{1}{60}\right) + \left(\frac{240}{7}\right)$ women's 1 day's work = 1.

$\Rightarrow \left(\frac{240}{7}\right)$ women's 1 day's work $= \left(1 - \frac{4}{7}\right) = \frac{3}{7}$

$\Rightarrow$ 10 women's 1 day's work $= \left(\frac{3}{7} \times \frac{7}{240} \times 10\right) = \frac{1}{8}$.

So, 10 women can finish the work in 8 days.

III. (10 men's work for 3 days) + (10 women's work for 4 days) = 1

$\Rightarrow$ (10×3) men's 1 day's work + (10×4) women's 1 day's work = 1

$\Rightarrow$ 30 men's 1 day's work + 40 women's 1 day's work = 1.

Thus, I and III will give us the answer.

And, II and III will give us the answer.

$\therefore$ Correct answer is (a).

10. I. (A + B)'s 1 day's work $= \frac{1}{6}$.

II. (B + C)'s 1 day's work $= \frac{4}{15}$.

III. (A + C)'s 1 day's work $= \frac{3}{10}$.

Adding, we get 2 (A + B + C)'s 1 day's work $= \left(\frac{1}{6} + \frac{4}{15} + \frac{3}{10}\right) = \frac{22}{30}$

$\Rightarrow$ (A + B + C)'s 1 day's work $= \left(\frac{1}{2} \times \frac{22}{30}\right) = \frac{11}{30}$.

Thus, A, B and C together can finish the work in $\frac{30}{11}$ days.

Hence I, II and III are necessary to answer the question.

$\therefore$ Correct answer is (*e*).

11. Clearly, I only gives the answer.

Similarly, II only gives the answer.

And, III only gives the answer.

$\therefore$ Correct answer is (*d*).