

Time and Work

Time and Work is an important chapter for Campus Placements and MBA entrance exams. If a person can do a piece of work in x days, he will do $\frac{1}{x}$ work per day.

Illustrative Example:

A can do a piece of work in 10 days, B can do it in 15 days. In how many days both of these can together complete the job?

Traditional method:

$$\begin{aligned} \text{A's per day work} &= \frac{1}{10}; \text{ B's per day work} = \frac{1}{15} \\ \text{So per day work of these people together} &= \frac{1}{10} + \frac{1}{15} \Rightarrow \frac{3+2}{30} = \frac{5}{30} \Rightarrow \frac{1}{6} \end{aligned}$$

So A and B together $\frac{1}{6}$ th of the total work per day. So total work can be completed in 6 days.

Alternate Method:

Ask yourself that why the same work done by A in 10 days will be done by B in 15 days?

The answer is due to their efficiencies. We know that number of days are inversely proportional to their efficiencies.

So we can solve this problem by converting days into efficiencies.

Step 1: Estimate the total work. This can be done by taking LCM of the days given. LCM (10,15) = 30. Assume there is 30 meters length of wall to be constructed.

Step 2: Calculate the efficiencies of A and B: This can be done by dividing total work by their days Efficiency =

$$\frac{\text{Total work}}{\text{days}}$$

$$\text{So we get A's per day efficiency} = \frac{30 \text{ meters}}{10 \text{ days}} = 3 \text{ mts}$$

$$\text{We get B's per day efficiency} = \frac{30 \text{ meters}}{15 \text{ days}} = 2 \text{ mts}$$

So total work done by A and B together = $3 + 2 = 5$ meters

Total work of 30 meters can be done in $30/5 = 6$ Days

Solved Examples:

1. A, B and C can complete a piece of work in 15, 12, 10 days respectively. A and B started the work together and left after 4 days. If the remaining work can be done by C, then in how many days the total work get completed?

Assume total work = LCM (15,12,10) = 60

The efficiencies of A, B, C are 4, 5, 6 respectively. (Efficiency = Total work/ Days)

A and B per day work = 4 + 5 = 9. Then in 4 days they complete $4 \times 9 = 36$.

Remaining work = $60 - 36 = 24$.

This work has to be done by C alone. we know that C's efficiency is 6 units per day. So he can complete the remaining work in $\frac{24}{6}$ days = 4 days.

Total work can be completed in $4 + 4 = 8$ days.

2. A project has been started by a man on the first day. Each subsequent day a new person joined the work force and it is known that the total work got completed on the 11th day. If from the starting day 6 men working on the project and no new men added later, in how many days the work got completed?

Assume 1 day work of a man is 1 unit. If a new person joined the work on second day, 2 units of work get completed. Similarly 3 units on 3rd day, 4 units on 4th day so on...

Then for all the eleven days the total work = $1 + 2 + 3 + \dots + 11 = 66$ units (Use formula $\frac{n(n+1)}{2}$)

Now 6 men per day work = 6 units per day.

They can complete 66 units of work in = $\frac{66}{6} = 11$ days

MCQ's:

1. A can do piece of work in 30 days while B can do it in 40 days. In how many days can A and B working together do it ?

a. 70 days

b. $42\frac{3}{4}$ days

c. $27\frac{1}{7}$ days

d. $17\frac{1}{7}$ days

Correct Option: D

Explanation:

$$(A+B)'S \text{ 1 day's work} = \left[\frac{1}{30} + \frac{1}{40} \right] = \frac{7}{120}$$

Time taken by both to finish the work

$$= \frac{120}{7} \text{ days} = 17\frac{1}{7} \text{ days.}$$

2. A and B can do a piece of work in 12 days; B and C in 15 days; C and A in 20 days. A alone can do the work in :

- a. $15\frac{2}{3}$ days
- b. 24 days
- c. 30 days
- d. 40 days

Correct Option: C

Explanation:

$$[(A + B) + (B + C) + (C + A)]\text{'s 1 day work} = \left[\frac{1}{12} + \frac{1}{15} + \frac{1}{20}\right] = \frac{1}{5}$$

$$2(A + B + C)\text{'s 1 day's work} = \frac{1}{10}$$

$$A\text{'s 1 day's work} = \left[\frac{1}{10} - \frac{1}{15}\right] = \frac{1}{30}$$

A alone can finish it in 30 days.

3. A can do $\left(\frac{1}{3}\right)$ of a work in 5 days and B can do $\left(\frac{2}{5}\right)$ of the work in 10 days. In how many days both A and B together can do the work ?

- a. $7\frac{3}{4}$
- b. $8\frac{4}{5}$
- c. $9\frac{3}{8}$
- d. 10

Correct Option: C

Explanation:

$$\frac{1}{3} \text{ work is done by A in 5 days.}$$

Whole work will be done by A in 15 days.

$$\frac{2}{5} \text{ of work is done by B in 10 days.}$$

$$\text{Whole work will be done by B in } \left[10 \times \frac{5}{2}\right] \text{ i.e. 25 days}$$

$$(A+B)\text{'s 1 day's work} = \left[\frac{1}{15} + \frac{1}{25}\right] = \frac{8}{75}$$

$$\text{So, both together can finish it in } \frac{75}{8} \text{ days i.e. } 9\frac{3}{8} \text{ days.}$$

4. A and B can together do a piece of work in 15 days. B alone can do it in 20 days. In how many days can A alone do it ?

- a. 30 days
- b. 40 days
- c. 45 days
- d. 60 days

Correct Option: D

Explanation:

$$(A+B)'S \text{ 1 day's work} = \left[\frac{1}{15} - \frac{1}{20} \right] = \frac{1}{60}$$

A alone can finish it in 60 days

5. 8 men can dig a pit in 20 days. If a man works half as much again as a boy, then 4 men and 9 boys can dig a similar pit in :

- a. 10 days
- b. 12 days
- c. 15 days
- d. 16 days

Correct Option: D

Explanation:

1 man = $\frac{3}{2}$ boys, So (4 men + 9 boys)=15 boys

Also, 8 men = $\frac{3}{2} \times 8$ i.e. 12 boys

Now, 12 boys can dig the pit in 20 days.

15 boys can dig it in $\left(\frac{20 \times 12}{15} \right) = 16$ days.

6. 8 children and 12 men complete a certain piece of work in 9 days. If each child takes twice the time taken by a man to finish the work, in how many days will 12 men finish the same work ?

- a. 8
- b. 15
- c. 9
- d. 12

Correct Option: D

Explanation:

2 children = 1 man

(8 children + 12 men) = 16 men

Now, less men, more days

12 : 16 : 9 : x

$$x = \frac{16 \times 9}{12} = 12 \text{ days}$$

7. 10 men can finish a piece of work in 10 days, where as it take 12 women to finish it in 10 days. If 15 men and 6 women undertake to complete the work, how many days will they take to complete it ?

- a. 2
- b. 4
- c. 5
- d. 11

Correct Option: C

Explanation:

10 men = 12 women or 1 man = $\frac{6}{5}$ women.

15 men + 6 women = $[15 \times \frac{6}{5} + 6]$ women i.e., 24 women.

Now, 12 women can do the work in 10 days.

24 women can do it in $[\frac{10 \times 12}{24}] = 5$ days

8. If 3 men or 4 women can construct a wall in 43 days, then the number of days that 7 men and 5 women take to construct it is :

a. 12

b. 18

c. 24

d. 30

Correct Option: A

Explanation:

3 men = 4 women or 1 man = $\frac{4}{3}$ women.

7 men + 5 women = $[7 \times \frac{4}{3} + 5]$ women i.e., $\frac{43}{3}$ women

Now, 4 women can construct the wall in 43 days.

$\frac{43}{3}$ women can construct it in $[\frac{43 \times 4 \times 3}{43}] = 12$ days

9. 12 men or 18 women can reap a field in 14 days. The number of days that 8 men and 16 women will take to reap it is :

a. 5

b. 7

c. 8

d. 9

Correct Option: D

Explanation:

12 men = 18 women or 1 man = $\frac{3}{2}$ women.

8 men + 16 women = $[8 \times \frac{3}{2} + 16]$ women i.e. 28 women. Now, 18 women can reap the field in 14 days.

28 women can reap it in $[\frac{14 \times 18}{28}] = 9$ days.

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

a. 30 days

b. 35 days

c. 40 days

d. None of these

Correct Option: A

Explanation:

Suppose B takes x days to do the work.

A takes $[2 \times \frac{3}{4}x]$ i.e., $\frac{3x}{2}$ days to do it.

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

$$\frac{1}{x} + \frac{2}{3x} = \frac{1}{18} \quad \text{or } x=30$$

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

- a. $10\frac{1}{2}$ days
- b. $10\frac{1}{4}$ days
- c. $10\frac{2}{3}$ days
- d. $10\frac{1}{3}$ days

Correct Option: B

Explanation:

$$(A + B)'s \text{ 2 day's work} = \left[\frac{1}{9} + \frac{1}{12}\right] = \frac{7}{36}$$

$$\text{Evidently, the work done by A and B during 5 pairs of days} = \left[5 \times \frac{7}{36}\right] = \frac{35}{36}$$

$$\text{Remaining work} = \left[1 - \frac{35}{36}\right] = \frac{1}{36}$$

Now, on 11th day it is A's turn.

Now $\frac{1}{9}$ work is done by A in 1 day.

$$\frac{1}{36} \text{ work will be done by A in } \left[9 \times \frac{1}{36}\right] = \frac{1}{4} \text{ day}$$

So, total time taken = $10\frac{1}{4}$ days.

12. A alone can finish a work in 10 days and B alone can do it in 15 days. If they work together and finish, then out of a total wages of Rs.75. A will get :

- a. Rs.30
- b. Rs.37.50
- c. Rs.45
- d. Rs.50

Correct Option: C

Explanation:

Ratio of time taken by A and B = 10 : 15 = 2 : 3

Ratio of work done in the same time = 3:2, So, the money is to be divided among A and B in the ratio 3 : 2

$$\text{A's share} = \text{Rs. } \left[75 \times \frac{3}{5}\right] = \text{Rs.45.}$$

13. A can do a certain job in 12 days. B is 60% more efficient than A. The number of days it takes for B to do the

same piece of work, is :

- a. 6
- b. $6\frac{1}{4}$
- c. $7\frac{1}{2}$
- d. 8

Correct Option: C

Explanation:

Ratio of time, taken by A and B = 160 : 100 = 8 : 5

If A takes 8 days, B takes 5 days.

If A takes 12 days, B takes = $[\frac{5}{8} \times 12] = 7\frac{1}{2}$ days

14. A is thrice as good a work man as B and takes 10 days less to do a piece of work than B takes. B can do the work in :

- a. 12 days
- b. 15 days
- c. 20 days
- d. 30 days

Correct Option: B

Explanation:

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

If the difference of time is 2 days, B takes 3 days. If the difference of time is 10 days.

B takes $[\frac{3}{2} \times 10] = 15$ days

15. A, B and C together earn Rs.150 per day while A and C together earn Rs.94 and B and C together earn Rs.76.

The daily earning of C is :

- a. Rs.75
- b. Rs.56
- c. Rs.34
- d. Rs.20

Correct Option: D

Explanation:

B's daily earning = Rs.(150-94)= Rs.56

A's daily earning = Rs.(150-76)= Rs.74

C's daily earning = Rs.[(150-(56+74))]=Rs.20

16. A can complete a job in 9 days B in 10 days and C in 15 days. B and C start the work and are forced to leave after 2 days. The time taken to complete the remaining work is :

- a. 6 days

- b. 9 days
- c. 10 days
- d. 13 days

Correct Option: A

Explanation:

$$[B + C] \text{'s 2 days work} = 2\left[\frac{1}{10} + \frac{1}{15}\right] = \frac{1}{3}$$

$$\text{Remaining work} = \left[1 - \frac{1}{3}\right] = \frac{2}{3}$$

$$\frac{1}{9} \text{ work is done by A in 1 day}$$

$$\frac{2}{3} \text{ work is done by A in } \left[9 \times \frac{2}{3}\right] = 6 \text{ days}$$

17. A completes a work in 4 days whereas B completes the work in 6 days. C works $1\frac{1}{2}$ times as fast as A. How many days it will take for the three together to complete the work ?

- a. $\frac{7}{12}$
- b. $1\frac{5}{12}$
- c. $1\frac{5}{7}$
- d. None of these

Correct Option: D

Explanation:

$$\text{Time taken by C alone} = \left[\frac{2}{3} \times 4\right] = \frac{8}{3} \text{ days}$$

$$\text{Their 1 day's work} = \left[\frac{1}{4} + \frac{1}{6} + \frac{3}{8}\right] = \frac{19}{24}$$

$$\text{So, together they can finish the work in } \frac{24}{19} \text{ days i.e. } 1\frac{5}{19} \text{ days.}$$

18. Twelve men can complete a work in 8 days. Three days after they started the work, 3 more men joined them. In how many days will all of them together complete the remaining work ?

- a. 2
- b. 4
- c. 5
- d. 6

Correct Option: B

Explanation:

$$1 \text{ man's one day's work} = \frac{1}{96}$$

$$12 \text{ men's 3 day's work} = \left[3 \times \frac{1}{8}\right] = \frac{3}{8}$$

$$\text{Remaining work} = \left[1 - \frac{3}{8}\right] = \frac{5}{8}$$

$$15 \text{ men's 1 day's work} = \frac{15}{96} \text{ Now, } \frac{15}{96} \text{ work is done by them in 1 day,}$$

$$\frac{5}{8} \text{ work will be done by them in } \left[\frac{96}{15} \times \frac{5}{8}\right] \text{ i.e. 4 days}$$

19. A and B can complete a work in 10 days and 15 days respectively. B starts the work and after 5 days A also joins him. In all, the work would be completed in :

- a. 7 days
- b. 9 days
- c. 11days
- d. None of these

Correct Option: B

Explanation:

$$\text{B's 5 day's work} = 5 \times \frac{1}{15} = \frac{1}{3}$$

$$\text{Remaining work} = \left[1 - \frac{1}{3}\right] = \frac{2}{3}$$

$$\left[\frac{1}{10} + \frac{1}{15}\right] \text{ work is done by both in 1 day.}$$

$$\frac{2}{3} \text{ work is done by both in } \left[6 \times \frac{2}{3}\right] = 4 \text{ days}$$

Hence the work was completed in 9 days.

20. A, B and C contract a work for Rs.550. Together A and B are to do $\frac{7}{11}$ of the work. The share of C should be :

- a. Rs. $183\frac{1}{3}$
- b. Rs.200
- c. Rs.300
- d. Rs.400

Correct Option: B

Explanation:

$$\text{Work to be done by C} = \left[1 - \frac{7}{11}\right] = \frac{4}{11}$$

$$(A + B) : C = \frac{7}{11} : \frac{4}{11} = 7 : 4$$

$$\text{C's share} = \text{Rs.} \left[550 \times \frac{4}{11}\right] = \text{Rs. 200}$$

21. A can do a piece of work in 80 days. He works at it for 10 days and then B alone finishes the work in 42 days. The two together could complete the work in :

- a. 24 days
- b. 25 days
- c. 30 days
- d. 35 days

Correct Option: C

Explanation:

$$\text{A's 10 day's work} = \left[10 \times \frac{1}{80}\right] = \frac{1}{8}$$

$$\text{Remaining work} = \left[1 - \frac{1}{8}\right] = \frac{7}{8}$$

$\frac{7}{8}$ work is done by A in 42 days

Whole work will be done by A in $[42 \times \frac{8}{7}]$ i.e. 48 days

$$(A + B)'s \text{ 1 day's work} = [\frac{1}{80} + \frac{1}{48}] = \frac{8}{240} = \frac{1}{30}$$

Hence A and B together can finish it in 30 days.

22. If 5 men or 9 women can finish a piece of work in 19 days, 3 men and 6 women will do the same work in :

- a. 10 days
- b. 12 days
- c. 13 days
- d. 15 days

Correct Option: D

Explanation:

5 men = 9 women or 1 men = $\frac{9}{5}$ women.

3 men + 6 women = $[3 \times \frac{9}{5} + 6]$ women i.e., $\frac{57}{5}$ women.

Now 9 women can do the work in 19 days.

$\frac{57}{5}$ women can do it in $(\frac{19 \times 9 \times 5}{57}) = 15$ days

23. Two men undertake to do a piece of work for Rs.400. One alone can do it in 6 days, the other in 8 days. With the help of a boy, they finish it in 3 days. The boy's share is

- a. Rs.40
- b. Rs.50
- c. Rs.60
- d. Rs.80

Correct Option: B

Explanation:

One man's 1 day's work = $\frac{1}{6}$

Another man's 1 day's work = $\frac{1}{8}$

Boy's 1 day's work = $\frac{1}{3} - [\frac{1}{6} + \frac{1}{8}] = \frac{1}{24}$

Ratio of their shares = $\frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4:3:1$

Boy's share = Rs. $[400 \times \frac{1}{8}] = \text{Rs.}50$

24. If a man or 2 women or 3 boys can do a piece of work in 44 days, then the same piece of work will be done by 1 man, 1 woman and 1 boy in :

- a. 21 days
- b. 24 days
- c. 26 days

d. 33 days

Correct Option: B

Explanation:

1 man = 2 women = 3 boys

1 woman = $\frac{1}{2}$ man and 1 boy = $\frac{1}{3}$ man

So, $[1 + \frac{1}{2} + \frac{1}{3}]$ men = $[\frac{11}{6}]$ men

Now, 1 man can do the piece of work in 44 days

$\frac{11}{6}$ men can do it in $[44 \times \frac{6}{11}] = 24$ days

25. 3 men and 4 boys do a piece of work in 8 days, while 4 men and 4 boys finish it in 6 days. 2 men and 4 boys will finish it in:

a. 9 days

b. 10 days

c. 12 days

d. 14 days

Correct Option: 4

Explanation:

(3 men + 4 boys)'s 1 day's work = $(\frac{1}{8})$

(4 men + 4 boys)'s 1 day's work = $(\frac{1}{6})$

Subtracting :

1 man's 1 day's work = $(\frac{1}{6} - \frac{1}{8}) = \frac{1}{24}$

(2 men + 4 boys)'s 1 day, work = $(\frac{1}{8} - \frac{1}{24}) = \frac{1}{12}$

Thus, 2 men and 4 boys will finish it in 12 days.