Time and Work-Key Notes

Time & Work

(M1D1HI)/ W1 = (M2D2H2)/W2

Where M1 & M2 represents no of labourers; D1 & D2 represents no of days; H1 & H2 represents no of hours; W1&W2 represents work done.

If there are **2 persons** A & B such that A can do work in 'a' days and B can do work in 'b'days. Such that 'a' is a multiple of 'b', then, time taken by them to complete the work together = Bigger no/Sum of ratios

Eg: A can do work in 9 days, B can do work in 18 days. In how many days they will complete the work together.

Bigger no=18, Ratio=9:18=1:2

No of days = 18/(1 + 2)
          = 6 days

If 'a' is not a multiple of 'b', then time taken by A&B to complete the work together

=   (LCM)/(Sum of ratios)

Eg: A can do a piece of work 30 days. B can do work in 45 days. In how many days they will complete the work together?

LCM = 90, Ratio= 30:45=2:3
No of days= 90/(2 + 3) = 90/5 = 18

If there are **3 persons** A, B & C whose time taken a,b,c days respectively, to complete a certain work. Time taken by them to complete the work =   LCM of (a, b, c)/(LCM/a + LCM/b + LCM/c)

Note: For 3 persons the common format is

Step1: Find the LCM

Step2: Find the individual share of work i.e. LCM/a, LCM/b, LCM/c.

Step3: Rest methods depend on the question i.e. follow the question patterns.

Eg: A, B and C can do a work in 15,20,45 days respectively. In how many days they can complete the work together.

LCM=180

No of days= [180/ (180/15 + 180/20 + 180/45)

    = [180/ (12+9+4)]
    = [180/25]

    = 7.2 days

Pipes & Cisterns

If there are **2 pipes** A & B such that A (inlet pipe) & B (outlet pipe). Such that A can fill tank in 'a' minutes and B can empty the tank in 'b' minutes , then time taken to fill the tank if both are operated together = Bigger no/Difference of ratios

Eg: A can fill tank in 9 minutes, B can empty the tank in 18 minutes.. In what time the tank be filled, if both pipes work simultaneously?

Bigger no=18, Ratio=9:18=1:2

Time taken to fill the tank = 18/(2 - 1)

    = 18 minutes

If 'a' is not a multiple of 'b', then time taken by A&B to fill the tank.

=   (LCM)/(Difference of ratios)

Eg.: An inlet pipe can fill the tank in 30 minutes. B an outlet pipe can empty the tank in 45 minutes. In what time the tank be filled if both pipes work simultaneously?

Time taken to fill the tank= LCM = 90
= Ratio= 30:45=2:3
= 90/(3 - 2) = 90/1 = 90 minutes

If there are **3 pipes** A, B & C, in which A, B are inlet pipes which takes a,b,minutes respectively to fill the tank and C an outlet pipe which takes c minutes to empty the tank

Time taken by them to fill the tank, if all of them are operated together.

= LCM of abc/ (LCM/a + LCM/b - LCM/c)

Eg: A, B two inlet pipes takes 15,18 minutes to fill the tank and C an oulet pipe takes 45 minutes to empty the tank respectively. In what time the tank be filled if all of them are operated together?

LCM=90
No of days= [90/(90/15 + 90/18 - 90/45)
      = [90/(6+5-2)]
      = [90/9]
      = 10 minutes

Note: In case of division of money with respect to share of each person's work then share of A = bc/ab+bc+ac

In case of division of money with respect to share of each person's work then share of B = ac/ab+bc+ac
In case of division of money with respect to share of each person's work then share of C = ab/ab+bc+ac

Same as Share of A:(LCM/a)/ (LCM/a + LCM/b + LCM/c)
       Share of B:(LCM/b)/ (LCM/a + LCM/b + LCM/c)
       Share of C:(LCM/c)/ (LCM/a + LCM/b + LCM/c)

Eg: A,B,C can do a work in 15,20,45 days respectively. They get Rs 500 for their work. What is the share of A?

LCM=180

Share of A = (LCM/a x Total amount)/LCM/a + LCM/b + LCM/c

    = (180/15)/(180/15 +180/20 + 180/45)

    = (12/25) * 500

    = Rs.240

Exercise questions

1. Two workers A and B manufactured a batch of identical parts. A worked for 2 hours and B worked for 5 hours and they did half the job. Then they worked together for another 3 hours and they had to do (1/20)th of the job. How much time does B take to complete the job, if he worked alone?
A) 24 hours
B) 12 hours
C) 15 hours
D) 30 hours

2. Pipe A can fill a tank in 'a' hours. On account of a leak at the bottom of the tank it takes thrice as long to fill the tank. How long will the leak at the bottom of the tank take to empty a full tank, when pipe A is

kept closed?
A) (3/2)a hours
B) (2/3)a
C) (4/3)a
D) (3/4)a

3. A and B working together can finish a job in T days. If A works alone and completes the job, he will take T + 5 days. If B works alone and completes the same job, he will take T + 45 days. What is T?
A) 25
B) 60
C) 15
D) None of these

4. A man can do a piece of work in 60 hours. If he takes his son with him and both work together then the work is finished in 40 hours. How long will the son take to do the same job, if he worked alone on the job?
A) 0 hours
B) 120 hours
C) 24 hours
D) None of these

5. A, B and C can do a work in 5 days, 10 days and 15 days respectively. They started together to do the work but after 2 days A and B left. C did the remaining work (in days)
A) 1
B) 3
C) 5
D) 4

6. X alone can do a piece of work in 15 days and Y alone can do it in 10 days. X and Y undertook to do it for Rs.720. With the help of Z they finished it in 5 days. How much is paid to Z?
A) Rs.360
B) Rs.120
C) Rs.240
D) Rs.300

7. Ram starts working on a job and works on it for 12 days and completes 40% of the work. To help him complete the work, he employs Ravi and together they work for another 12 days and the work gets completed. How much more efficient is Ram than Ravi?
A)50%
B) 200%
C) 60%
D)100%

8. A red light flashes 3 times per minute and a green light flashes 5 times in two minutes at regular intervals. If both lights start flashing at the same time, how many times do they flash together in each hour?
A) 30
B) 24

C) 20

D) 60

9. A and B can do a piece of work in 21 and 24 days respectively. They started the work together and after some days A leaves the work and B completes the remaining work in 9 days. After how many days did A leave?

A) 5

B) 7

C) 8

D) 6

10. Ram, who is half as efficient as Krish, will take 24 days to complete a work if he worked alone. If Ram and Krish worked together, how long will they take to complete the work?

A) 16 days

B) 12 days

C) 8 days

D) 18 days

Answer Key

1.C; 2.A; 3.C; 4.B;5.D; 6.B; 7.D; 8.A; 9.B; 10.C

Exercise Questions

1. A can do a work in 14 days and working together A and B can do the same work in 10 days. In what time can B alone do the work?

a. 25 days

b. 30 days

c. 23 days

d. 35 days

2. Manu, Manju and Maya can do a work in 90, 30 and 45 days respectively. If they work together, in how many days will they complete work?

a. 15

b. 10

c. 20

d. 25

3. 40 men can catch 200 sharks in 20 days working 6 hours a day. In how many days 25 men can catch 300 sharks working 4 hours a day?

a. 30

b. 34

c. 24

d. 20

4. Amit and Ananthu can do a work in 15 days and 25 days respectively. Amit started the work and left after 3 days. Ananthu took over and completed the work. In how many days was the total work completed?

a. 28 days

b. 20 days

c. 23 days

d. 25 days

5. If A is thrice as fast as B and together can do a work in 21 days. In how many days A alone can do the work?

a. 36

b. 42

c. 28

d. 54

6. 9 men can do a work in 12 days working 4 hours a day. In how many days can 6 men do the same work, working 8 hours a day?

a. 18

b. 9

c. 10

d. 8

7. Rohit and Rohan can complete a work in 12 days and 6 days respectively. How much time will they take when working together?

a. 4

b. 3

c. 5

d. 2

8. Sita and Sinu together can do a work in 50 days. With the help of Smitha, they completed the work in 6 days and earn Rs.250. What is the share of Sinu if Sita alone can do the work in 100 days?

a. Rs.15

b. Rs.18

c. Rs.20

d. Rs.25

9. A and B can do a work in 60 days; B and C can do it in 120 days; A and C can do it in 80 days. In what time A alone can do the work?

a. 100

b. 90

c. 80

d. 70

10. Renu can do a piece of work in 6 days, but with the help of her friend Suma , she can do it in 4 days. In what time Suma can do it alone?

a. 10

b. 12

c. 14

d. 15

11. A can finish a work in 20 days, B in 15 days and C in 12 days. B and C start the work but are forced to leave after 2 days. The remaining work was done by A in :

a. 10

b. 11

c. 13

d. 14

12. Anu can do a work in 6 days and Binu alone in 9 days. Anu and Binu undertook to do it for Rs.4500. With help of Minu, they completed the work in 3 days. How much is to be paid to Minu and Anu?

a. Rs.750, Rs.2250

b. Rs.2000, Rs.750

c. Rs.750, Rs.2000

d. Rs.800, Rs.1250

13. Ram, Krish and Bhim can complete a work in 30 days. If Ram and Krish together can complete the same work in 40 days, then how long will Bhim take to complete it?

a. 60

b. 80

c. 100

d. 120

14. 3 workers transfer a tool weighing 120kg in 12 seconds. How many men are required to transfer it in 9 seconds?

a. 4

b. 5

c. 6

d. 8

15.There is enough provisions for 600 men in an army camp for 25 days. If there were 300 men less, how long will the provision last?

a. 35 days

b. 40 days

c. 45 days

d. 50 days

16.2 men and 4 boys can complete a work in 4 days. 5 men and 6 boys can complete the same work in 3 days. The work done by 2 boys is equal to the work of how many men?

a. 4

b. 5

c. 6

d. 7

17. A is twice as good a workman as B and together they complete a work in 12 days. In how many days A alone can do the work?

a. 32

b. 34

c. 35

d. 36

18. Two pipes can fill a tank in 12 minutes and 20 minutes respectively. Both pipes are opened together and after some time the first pipe is closed and the tank is full in totally 10 minutes. For how many minutes was first pipe open?

a. 8 minutes

b. 6 minutes

c. 7 minutes

d. 10 minutes

19.Two pipes can fill a tank in 15 minutes and 12 minutes. The outlet pipe can empty the tank in 20 minutes. If all the pipes are opened when, the tank is empty, then in how many minutes will it take to fill the tank?

a. 12

b. 13

c. 11

d. 10

20. Pipe A can fill a tank in 12 hours. Due to a leak at the bottom it takes 20 hours to fill the tank. In what time the leak alone can empty the full tank?

a. 18 hours

b. 23 hours

c. 28 hours

d. 30 hours

Answer &Explanations

1. Exp: Work done by B in 1 day = $\frac{1}{10} - \frac{1}{14} = \frac{7-5}{70} = \frac{1}{35}$

   So, B alone can do the work in 35 days.

2. Exp: Manu's one day's work = $\frac{1}{90}$

   Manju's one day's work = $\frac{1}{30}$

   Maya's one day's work = $\frac{1}{45}$

   Manu, Manju and Maya together can do the work = $\frac{1}{90} + \frac{1}{30} + \frac{1}{45} = \frac{1+3+2}{90} = \frac{1}{15}$

   So, They will complete the work in 15 days.

3. Exp: We have, $\frac{M1D1H1}{W1} = \frac{M2D2H2}{W2}$

   $= \frac{40*20*6}{200} = \frac{25*D2*4}{300}$

   D2 $= \frac{40*20*6*300}{}$ = 24

200*25*4

4. Amit's one day's work= $\frac{1}{15}$

Amit's 3 day's work = $\frac{1}{15}$ *3 = $\frac{1}{5}$

Work left= 1-$\frac{1}{5}$ = $\frac{4}{5}$

Ananthu's one day's work= $\frac{1}{25}$

Ananthu can do work in = $\frac{4}{5}$ *$\frac{25}{1}$ = 20 days

So total days = 25+3 = 28 days

5. Exp: A's one day's work= $\frac{1}{X}$

B's one day's work= $\frac{1}{3x}$

A + B's one day's work= $\frac{1}{x}$ + $\frac{1}{3x}$ = $\frac{1}{21}$

= $\frac{3+1}{3x}$ = $\frac{4}{3x}$ = $\frac{1}{21}$

x = $\frac{21*4}{3}$ = 28

6. Exp: We have, M1D1H1 = M2D2H2

So, 9*12*4= 6*D2*8

D2 = $\frac{9*12*4}{6*8}$ = 9

7. Exp: Time taken by Rohit and Rohan = $\frac{xy}{x+y}$

= $\frac{12*6}{12+6}$ = 4 days

8. Exp: Sinu's one day's work = $\frac{1}{50}$ - $\frac{1}{100}$

= $\frac{2-1}{100}$ = $\frac{1}{100}$

Sinu's 6 day's work = 6* $\frac{1}{100}$ = $\frac{3}{50}$

Sinu completed $\frac{3}{50}$ th of total work.

So, Sinu's share= $\frac{3}{50}$ *250 = Rs. 15

9. Exp: (A+B)'s one day's work = $\frac{1}{60}$

(B+C)'s one day's work = $\frac{1}{120}$

(A+C)'s one day's work = $\underline{1}$

80

Adding we get, 2(A+B+C)' s one day's work= $\dfrac{1}{60} + \dfrac{1}{120} + \dfrac{1}{80}$ = $\dfrac{28}{720}$ = $\dfrac{14}{365}$

(A+B+C)' s one day's work = $\dfrac{14*1}{365*2}$ = $\dfrac{14}{720}$

So, A's one day's work = $\dfrac{14}{720} - \dfrac{1}{120}$ = $\dfrac{1}{90}$

A alone can do the work in 90 days.

10. Exp: Renu's one day's work = $\dfrac{1}{6}$

Suma's one day's work = $\dfrac{1}{4} - \dfrac{1}{6}$ = $\dfrac{1}{12}$

Suma can do it alone in 12 days.

11. Exp: (B+C)'s one day's work = $\dfrac{1}{15} + \dfrac{1}{12}$ = $\dfrac{3}{20}$

Work done by B and C in 2 days = $\dfrac{3}{20}* 2$ = $\dfrac{3}{10}$

Remaining work = $1- \dfrac{3}{10}$ = $\dfrac{7}{10}$

$\dfrac{1}{20}$ work is done by A in 1 day.

So, $\dfrac{7}{10}$ work is done by A in $20 * \dfrac{7}{10}$ = 14 days

12. Exp: Minu's one day's work = $\frac{1}{3} - \frac{1}{6} + \frac{1}{9}$

$$= \frac{1}{3} - \frac{5}{18} = \frac{1}{18}$$

Anu's wages: Binu's wages: Minu's wages = $\frac{1}{6} : \frac{1}{9} : \frac{1}{18}$ = 6: 4: 2

Minu's share = Rs.4500* $\frac{2}{12}$ = Rs.750

Anu's share = Rs.4500* $\frac{6}{12}$ = Rs.2250

13. Exp: Ram + Krish + Bhim's work = $\frac{1}{30}$

Ram and Krish's work= $\frac{1}{40}$

Bhim's work = $\frac{1}{30} - \frac{1}{40} = \frac{1}{120}$

14. Exp: We have, M1D1H1 = M2D2H2

3*120*12 = M2*120*9

M2 = $\frac{3*120*12}{120*9}$ = 4

15. Exp: We have, M1D1 = M2D2

600*25= 300* D2

D2 = $\frac{600*25}{300}$ = 50 days.

16. Exp: (2m + 4b)'s one day's work = $\frac{1}{4}$

(5m + 6b)'s one day's work = $\frac{1}{3}$

=> (8m + 16b)'s one day's work = (15m + 18b) 's one day's work

=> 7 men's work = 2 boy's work

So, we should be employ 5 more men to be completed the work.

17. Exp: A's one day's work : B's one day's work= 2:1

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

B's one day's work= $\frac{1}{12} * \frac{1}{3} = \frac{1}{36}$

B alone can do the work in 36 days.

18. Exp: Second pipe is opened for 10 minutes. So , part of tank filled by the second pipe = 10/20=1/2.
So, $1 - \frac{1}{2} = \frac{1}{2}$ tank is filled by first pipe. First pipe can fill $\frac{1}{2}$ of tank in $\frac{1}{2} * 12$ = 6minutes.
So, the first pipe is opened for 6minutes.

19. Exp: Part of tank filled by all three pipes in one minute =

$\frac{1}{15} + \frac{1}{12} - \frac{1}{20} = \frac{8+10-6}{120} = \frac{18-6}{120}$

$= \frac{1}{10}$

So, the tank becomes full in 10 minutes.

20. Exp: Let leak can empty the full tank in x hours.

$$\frac{1}{12} - \frac{1}{x} = \frac{1}{20} \Rightarrow \frac{1}{12} - \frac{1}{20} = \frac{1}{x}$$

$$\frac{5-3}{60} = \frac{1}{30}$$

x= 30 hours