Lesson

8

K L E TECHNOLOGICAL UNIVERSITY
DEPARTMENT OF HUMANITIES

PROFESSIONAL APTITUDE AND LOGICAL REASONING

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Time and Work

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Work

Work can be of different types; and it is measured in different units. However, whenever a work is done, the total work itself can be taken as one unit. In solving problems, this is the norm.

However, in a problem when two different works are considered, they need to be appropriately denoted. For example, if one is double than the other, then they can be represented as 'W' and '2W'; or they can be represented as W_1 and W_2.

Time

To do any work, a certain time is required. Hence, work and time are related.

The number of units of work (W) done in a unit of time is the **rate of (doing) work (R) per unit time (T)**.

Hence, W = RT because W is taken as 1, R = 1/T or T = 1/R, which means R and T are inversely proportional.

Basic Concepts

Concept 1

Total amount of a complete job (or assigned job) = 1, always, unless specified otherwise.

Concept 2

If any person 'M' completes a job **alone** in *t* days, then **alone time** for 'M' = *t*

Concept 3

1 Day's work by any person = $\left(\frac{1}{alone\ time}\right)^{th}$ part of total work

Example: Ram can polish the floor of a building in 16 days. Find the work done by Ram in one day.

Here, alone time for Ram = 16 days, so 1 day's work by Ram = $1/16^{th}$ part of total work

Concept 4

The reciprocal of 1 day's work gives the alone time i.e. alone time = $\left(\frac{1}{1\ day's\ work}\right)$

Concept 5

When more than one persons are working on the same piece of work, then their combined 1 day's work = sum of 1 day's work by each person. If A, B and C are three persons working on a job, then

(A+B+C)'s one day of work = A's 1 day work + B's 1 day work + C's 1 day work

Concept 6

The reciprocal of combined 1 day's work gives the time for completion by the persons working together

Time for completion = $\left(\frac{1}{combined\ 1\ day's\ work}\right)$

Concept 7

Part of work done at any time 't' by one or more persons = t x (1 day's work)

Concept 8

If more than one persons are working for different time schedules to complete a piece of work, then

i) Assume the time for completion = T
ii) Number of days worked by each person is found with reference to T, if not mentioned in the problem.
iii) Part of the work done by each person is found out by using concept 7
iv) Sum of the parts of work done by each person = 1
v) Solve to find out the unknowns.

Concept 9

The ratio of the work done by two persons in the same time is the inverse ratio of their alone times.

Concept 10

If a person 'P' is '*n*' times as good a workman as Q, then alone time for P = $\left(\frac{Alone\ time\ for\ Q}{n}\right)$

Exercises

1. A can finish a piece of work in 12 days while B can do it in 15 days. If both work at it together, what time will they take to complete the work?
   a) 6 days b) 8 days c) 6 2/3 days d) 10 1/5 days
2. A can do a piece of work in 10 days. B can do it in 24 days. If C also works with them then it takes only 6 days to complete the whole work. In how many days C alone can complete the whole work?
   a) 25 b) 40 c) 50 d) 75
3. If Ram completes a work in 30 days and Shyam does the same work it in 45 days then what is the time taken by them, to complete the same work, if they work together?
   (a) 2 Days (b) 3 days (c) 37.5 days (d) 18 days
4. If Raj completes a work in 50 days and Jay does it in 12.5 days then what is the time taken by them, to complete the same work, if they work together?
   (a) 5 days (b)10 days (c) 4 days (d)None of these
5. Mohan completes a work in 40 days while Mohan and Ram, together, do it in 2 days then what is the time taken by Ram to complete the same work, if he works alone?
   (a) 3 2/19 days (b)2 2/19 days (c)3 days (d)None of these
6. Pipe P and pipe Q can fill a tank in 36 hours and 63 hours respectively. If both pipes are opened simultaneously how long will it take to fill the tank?
   (a)20 hours (b)4 hours (c)5 hours (d)None of these

7. Two pipes P and Q can fill a tank in 5 hours and 10 hours respectively. If they are opened on alternate hours and if pipe Q is opened first, in how many hours, the tank shall be full?
   (a)17 hours (b)2 hours (c)7 hours (d)10 hours
8. If Pratik completes a work in 25 days and Manoj does it in 20 days then what is the time taken by them, to complete the same work, if they work together?
   (a)4 days (b)5 days (c)9 days (d)11.11 days
9. If P completes a work in 60 days, Q does it in 12 days and R does it in 15 days then what is the time taken by them, to complete the same work, if they work together?
   (a)6 days (b) 10 days (c) 5 days (d) 4 days
10. Bharat is thrice as good a workman as Vineet and together they finish a piece of work in 18 days. In how many days will Bharat alone finish the work?
    (a)72 days (b)24 days (c)18 days (d) 54 days
11. A pipe can fill a cistern in12 minutes, but due to a leak in the bottom; it's filled in 16 minutes. If the cistern is full, how much time will the leak take to empty it?
    (a)24 minutes (b)52 minutes (c)4 minutes (d)48 minutes
12. Two pipes P and Q can fill a tank in 6 minutes and 4 minutes respectively. If they are opened on alternate hours and if pipe P is opened first, in how many minutes, the tank shall be full?
    (a)5 minutes (b) 15 minutes (c) 24 minutes (d) 25 minutes
13. P and Q separately do a piece of work in 20 and 15 days respectively. They worked together for 6 days, after which Q was replaced by R. If the work was finished in next 4 days, then how long will it take for R alone to complete the work?
    (a)30 days (b)60 days (c)40 days (d)35 days
14. A can do a work in 20 days, while B can do the same work in 30 days. If B works at $\frac{1}{2}$ his usual rate, how many days will A and B together take to complete 1/3 of the work?
    a) 2 b) 3 c) 4 d) 5
15. Four friends P, Q, R and S are working on an assignment together. They contribute to the work in the ratio 1:2:3:4, respectively. They can complete the entire assignment individually in 1, 2, 3 and 4 days, respectively. If they work one after the other, how many days will it take to complete the assignment?
    a) 3 $\frac{1}{4}$ days b) 3 days c) 4 $\frac{1}{2}$ days d) 4 days
16. Working together A and B can complete a piece of work in 't' days. When A works alone he takes 12 days more than 't' and B takes 3 days more than 't'. A and B work individually on alternate days and complete the work. If they are paid an amount of Rs. 1000 for the entire work and are to be paid in proportion to the amount of work done by each of them, then what amount does A receive?
    a) Rs. 300 b) Rs. 333.33 c) Rs. 400 d) Rs. 433.33
17. Ratio of the respective earnings of a man, a woman and a boy is 4:3:2. If they are paid in proportion to their rates of work, how many days would a boy alone take to complete the work, given that all the three together complete the work in 16 days?
    a) 144 days b) 72 days c) 36 days d) None of these

Directions for Questions (18 – 20): At Wiley Publishers every book goes through 3 phases (or stages) typing, composing and binding. There are 16 typists, 10 composers

and 15 binders. A typist can type 8 books in each hour, a composer can compose 12 books in each hour and a binder can bind 12 books in each hour. All the people at Wiley work for 10 hours a day and each person is trained to do only one job of one category.

18. How many books can be prepared in each day?
    a) 1500 b) 1200 c) 1440 d) 1380
19. If company has hired 12 more people, who can do any of the three jobs, then maximum how many books can be prepared in each day?
    a) 1500 b) 1680 c) 1800 d) more than 2000
20. If the company wanted to reduce the number of employees by 3, then from which category it should reduce the number of employees without reducing the daily production of books?
    a) Reduce 2 binders and 1 typist b) Reduce three binders only
    c) Reduce 1 typist, 1 composer and 1 binder d) both a) and b)
21. A single reservoir supplies the petrol to the whole city, while the reservoir is fed by a single pipeline filling the reservoir with a stream of uniform volume. When the reservoir is full and 40000 litres of petrol is used daily, the supply will fail in 90 days. If 32000 litres of petrol is used daily then the supply will fail in 60 days. How much petrol can be used daily without the supply ever failing?
    a) 64000 lt b) 56000 lt c) 78000 lt d) 60000 lt

Directions for Questions (22 and 23): Four pipes A, B, C, and D can fill a cistern in 20, 25, 40 and 50 hours alone, respectively.

22. The first pipe A was opened at 0600 hrs, B at 0800 hrs, C at 0900 hrs and D at 1000 hrs. At what time will the cistern be full?
    a) 1618 hrs b) 1509 hrs c) 1215 hrs d) 1109 hrs
23. If A and B are opened as inlet pipe into the cistern and C and D are opened as outlet pipes from the cistern and all the four pipes are opened simultaneously, how many hours will it take to fill the cistern completely?
    a) 20 hrs b) 11 and 1/9 hrs c) 22 and 2/9 hrs d) 45 hrs

Directions for Questions (24 and 25): A tank has an inlet and outlet pipe. The inlet pipe fills the tank completely in 2 hrs when the outlet pipe is plugged. The outlet pipe empties the tank completely in 6 hrs when the inlet pipe is plugged.

24. If both pipes are simultaneously at a time when the tank was $1/3^{rd}$ filled, when will the tank fill thereafter?
    a) 1.5 hrs b) 2/3 hrs c) 2 hrs d) 1.67 hrs
25. If there is a leakage also which is capable of draining out the liquid from the tank at half of the rate, then what is the time taken to fill the empty tank when both the pipes are open?
    a) 3 hrs b) 3 and 2/3 hrs c) 4 hrs d) None of these

Directions for Questions (26 & 27): In a public bathroom there are *n* taps 1, 2, 3, … *n*. Tap 1 and 2 take equal time to fill the tank while tap 3 takes half time taken by tap 2 and tap 4 takes half time taken by tap 3 and so on. This means Kth tap takes half time of (K-1)th tap.

26. If the 10^{th} tap takes 2 hours to fill the tank alone then what is the ratio of efficiency of 8^{th} tap and 12^{th} tap, respectively?
    a) 4:1 b) 5:3 c) 16:1 d) 1:16

27. If the 8th tap takes 80 hours to fill the tank then the 10th and 12th taps (working together) take how many hours to fill the tank?
    a) 2 b) 4 c) 6 d) None of these

Directions for Questions (28 to 30): A contractor undertook a project to complete it in 20 days, which required 5 workers to work continuously for all the days estimated. But before the start of the work the client wanted to complete it earlier than the scheduled time, so the contractor calculated that he needed to increase 5 additional men every 2 days to complete the work in the time the client wanted it.

28. How many men were working on the day the project was completed as per due date that the client wanted it finished?
    a) 5 b) 10 c) 20 d) None of these
29. Find the number of days in which the client wanted to complete his work
    a) 15 b) 10 c) 8 d) can't be determined
30. If the work was further increased by 50% but the contractor continues to increase 5 workers every 2 days, then how many more days are required to finish the work?
    a) 1 day b) 2 days c) 5 days d) 10 days