## TIME AND WORK

Work is defined as the amount of job assigned or the amount of job actually done in a period of time.

## 1. Work from Days:

If A can do a piece of work in n days, then $\mathrm{A}^{\prime}$ s 1 day's work $=\frac{1}{\mathrm{~N}}$.

Ex. If a person finishes a work in 10 days then in 1 day he does only one tenth of the work.
We can also consider complete work as 1 unit. If A takes 10 days to finish a work, it means he can finish $\frac{1}{10}$ th of the work in 1 day.

## 2. Days from Work:

If A's 1 day's work $=\frac{1}{N}$, then $A$ can finish the work in ' $n$ ' days.
Ex. Ravi can finish a work in 10 days and Ramesh can do the same work in 15 days. If Ravi and Ramesh both work together then how many days taken by both to do the same work?
Sol: Ravi's 1 day work $=\frac{1}{10}$
Ramesh's 1 day work $=\frac{1}{15}$
Time taken by both $=\frac{1}{10}+\frac{1}{15}=\frac{5}{30}$
$\Rightarrow \frac{5}{30}=6$ days
3. Ratio:

If $A$ is twice as good a workman as $B$, then:
Ratio of work done by $A$ and $B=2: 1$
Ratio of times taken by $A$ and $B$ to finish a work $=1: 2$

Ex. If Ram is thrice as good workman as Sham and takes 20 days less than him. Then find the time taken by Sham?
Sol: Ram: Sham
Ratio of efficiency $=3 x: x$
Ratio of Days $=x: 3 x$
$3 x-x=20$ days
$X=10$
Time taken by Sham $=3 x$
$3 x=30$ days

Note: When the amount of work done is constant, then efficiency is inversely proportional to the time taken.
Efficiency $\propto \frac{1}{\text { time taken }}$

## 4. Alternate days

If $A, B$ and $C$ have to do a piece of work and one of them do the work separately on alternate day.

Ex. Ravi, Ram and Sham can do a work in 10 days, 15 days and 20 days respectively. If they work on alternate basis, then find the time taken by them to finish the whole work.
Sol: Ravi = 10 days
Ram = 15 days
Sham = 20 days
Total units $=60$ units (LCM of 10, 15, 20)
Ravi $=6$ Units
Ram = 4 Units
Sham = 3 Units
Total = 13 Units
3 days = 13 Units
12 days $=52$ Units
13 day $=52+6=58$ Units
Remaining $=60-58=2$ Units
$\Rightarrow \frac{2}{4}=\frac{1}{2}$ days
Total time $=13 \frac{1}{2}$ days

## Important Questions for Practice

1. Hemant is $40 \%$ faster than Ishant. If they will do it together, then they can finish the whole work in 35 days. How much time will Ishant takes to complete the work alone?
(A) 72 days
(B) 75 days
(C) 80 days
(D) 84 days
(E) None of these
2. $A, B$ and $C$ together earn Rs. 2400 in 15 days, $A$ and $B$ together earn Rs. 1840 in 16 days. $B$ and $C$ together earn Rs. 1530 in 18 days. What is the daily earning of $B$ ?
(A) 30
(B) 40
(C) 50
(D) 60
(E) None of these
3. $\mathrm{X}, \mathrm{Y}$ and Y can do a work in 30,60 and 45 days respectively. How many days will be taken by X to finish the work, if $Y$ and $Z$ help him on alternate day?
(A) 10 days
(B) 15 days
(C) 18 days
(D) 19 days
(E) None of these
4. Efficiency of Vineet is two-third that of Sumit and that's why Vineet takes 20 days more than Sumit. How much time taken by both of them to complete the work?
(A) 18 Days
(B) 20 Days
(C) 24 Days
(D) 28 Days
(E) None of these
5. Rohit started a work and completed the $60 \%$ works in 12 days. Then he invited Manish and together they finished the remaining work in 5 days. How many days Manish would take to do it alone?
(A) 40 Days
(B) 48 Days
(C) 60 Days
(D) 64 Days
(E) None of these
6. Ajay can do a piece of work in 10 days, Vijay in 12 days and Ansh in 15 days. They all start the work together, but Ajay leaves after 2 days and Vijay leaves 3 days before the work is completed. In how many days is the work completed?
(A) 4 days
(B) 5 days
(C) 6 days
(D) 7 days
(E) 8 days
7. Gagan takes thrice as much time as Rajat and twice as much as Deepak to finish a piece of work. They all together can finish the work in 5 days. What is the time taken by Deepak to finish the work?
(A) 8 days
(B) 10 days
(C) 12 days
(D) 15 days
(E) 18 days
8. Amit takes 9 days more than Vishal to do a certain job and 5 days more than Anil to do the same job. Amit and Anil together can do the job in the same time as Vishal. How many days Anil would take to finish the work?
(A) 8 days
(B) 10 days
(C) 12 days
(D) 15 days
(E) 20 days
9. Mohit can do as much work in 3 days as Abhay can do in 4 days and Abhay can do as much in 2 days as Vinod can do in 3 days. A piece of work takes 18 days if all work together. How long would Vinod take to do all the work alone?
(A) 32 days
(B) 35 days
(C) 39 days
(D) 42 days
(E) Can't be determined
10. Rohit and Mohit completed a work together in 24 days. Had Rohit worked at twice of his speed and Mohit took thrice the time as before, it would have taken them 18 days to complete the job together. How much time taken by Rohit alone to do the work?
(A) 30 days
(B) 36 days
(C) 40 days
(D) 48 days
(E) 50 days

## Solutions

## 1. Answer is option D

Explanation
Efficiency of Hemant and Ishant
$\frac{\text { Hemant }}{\text { Ishant }}=\frac{140}{100}$
$\frac{\text { Hemant }}{\text { Ishant }}=\frac{7}{5}$
Together = 7+5=12
Work $=$ Time $\times$ Efficient
$=35 \times 12=420$
Time taken by Ishant $=\frac{420}{5}=84$
$=84$ days

## 2. Answer is option B

Explanation
$A+B+C$ Total earning $=2400$
$A+B+C$ Daily earning $=\frac{2400}{15}=160$
$A+B$ Total earning $=1840$
$A+B$ daily earning $=\frac{1840}{16}=115$
C's daily earning $=160-115=45$
$B+C$ total earning $=1530$
$B+C$ daily earning $=\frac{1530}{18}=85$
$B$ 's daily earning $=85-45=40$

## 3. Answer is option D

Explanation
$X=30$ days
$Y=60$ days
$Z=45$ days
LCM = 180 units
Efficiency
$X=6$ units
$Y=3$ units
$Z=4$ units
$X+Y=9$ units
$X+Z=10$ units
19 units in 2 days
171 units in 18 days
Remaining $=180-171=9$
On $19^{\text {th }}$ day $X+Y=\frac{9}{9}=1$
Answer is 19 days

## 4. Answer is option C Explanation

Vineet efficiency $=2$
Sumit efficiency $=3$
Days
Vineet $=3 x$
Sumit $=2 x$
Difference $=3 x-2 x$
$x=20$
Vineet $=3 \times 20=60$ days
Sumit $=2 \times 20=40$ days
LCM $=120$ units
Together $=\frac{120}{5}$
$=24$ days

## 5. Answer is option C <br> Explanation

Work completed by Rohit $=\frac{3}{5}$
Time taken by Rohit $=12 \times \frac{5}{3}=20$
Remaining work $=\frac{2}{5}$
Together $=6 \times \frac{5}{2}=15$ days
Manish $=\frac{1}{15}-\frac{1}{20}$
$=\frac{1}{60}$
Manish = 60 days

## 6. Answer is option D

## Explanation:

Ajay = 10 days
Vijay $=12$ days
Ansh $=15$ days
LCM $=60$ units
Efficiency
Ajay $=6$ units
Vijay $=5$ units
Ansh $=4$ units
Let total days $=x$
Ajay's work $=6 \times 2=12$ units
Vijay's work $=5(x-3)$ units
Ansh's work $=4(x)$ units
Now,
$12+5 x-15+4 x=60$
$9 x=63$
$X=7$ days

## 7. Answer is option D

Explanation:
Let time taken
Gagan $=3 x$
Rajat $=x$ days
Deepak $=1.5 x$ days
Efficiency
Gagan = 1 unit
Rajat $=3$ units
Deepak = 2units
Total units = 6
Total work is done in 5 days by all of them
together.
Total work $=5 \times 6=30$
(Work = Efficiency $\times$ Time)
Time taken by Deepak $=\frac{30}{2}$
$=15$ days

## 8. Answer is option B

## Explanation:

Let time taken by Vishal $=\mathrm{V}$
Time taken by Amit $=\mathrm{V}+9$
Time taken by Anil $=\mathrm{V}+4$
Amit and Anil can do the job in same time as
Vishal.
Now, $\frac{1}{V}=\frac{1}{V+9}+\frac{1}{V+4}$
$\frac{1}{V}=\frac{V+4+V+9}{V^{2}+13 V+36}$
$\frac{1}{V}=\frac{2 V+13}{V^{2}+13 V+36}$
$V^{2}+13 V+36=2 V^{2}+13 V$
$V^{2}=36$
$\mathrm{V}=6$
Anil $=\mathrm{V}+4$
$=6+4=10$ days

## 9. Answer is option C

Explanation:
As per questions,
$\frac{3}{\text { Mohit }}=\frac{4}{\text { Abhay }}$
$\frac{\text { Abhay }}{\text { Mohit }}=\frac{4}{3}$
(Efficiency is inversely proportional to time)
Efficiency ratio
Mohit : Abhay
3 : 4

Second condition,
$\frac{2}{\text { Abhay }}=\frac{3}{\text { Vinod }}$
$\frac{\text { Vinod }}{\text { Abhay }}=\frac{3}{2}$
Efficiency ratio
Abhay: Vinod
$2: 3$
Now,
Mohit : Abhay : Vinod
$3: 4$ : 6
Total units $=13$
Time taken together $=18$ days
Work $=$ Time $\times$ Efficiency
$=18 \times 13$
Time taken by Vinod $=\frac{18 \times 13}{6}=39$
$=39$ days
10. Answer is option C

Explanation:
Equation-1
$\frac{1}{R}+\frac{1}{M}=\frac{1}{24}$
Second condition
Equation-2
$\frac{2}{R}+\frac{1}{3 M}=\frac{1}{18}$
By solving Equation 1 and 2.
$\frac{6-1}{R}=\frac{1}{6}-\frac{1}{24}$
$\frac{5}{R}=\frac{4-1}{24}$
$\frac{5}{R}=\frac{1}{8}$
$\mathrm{R}=40$
Rohit take 40 days alone to complete the work.

