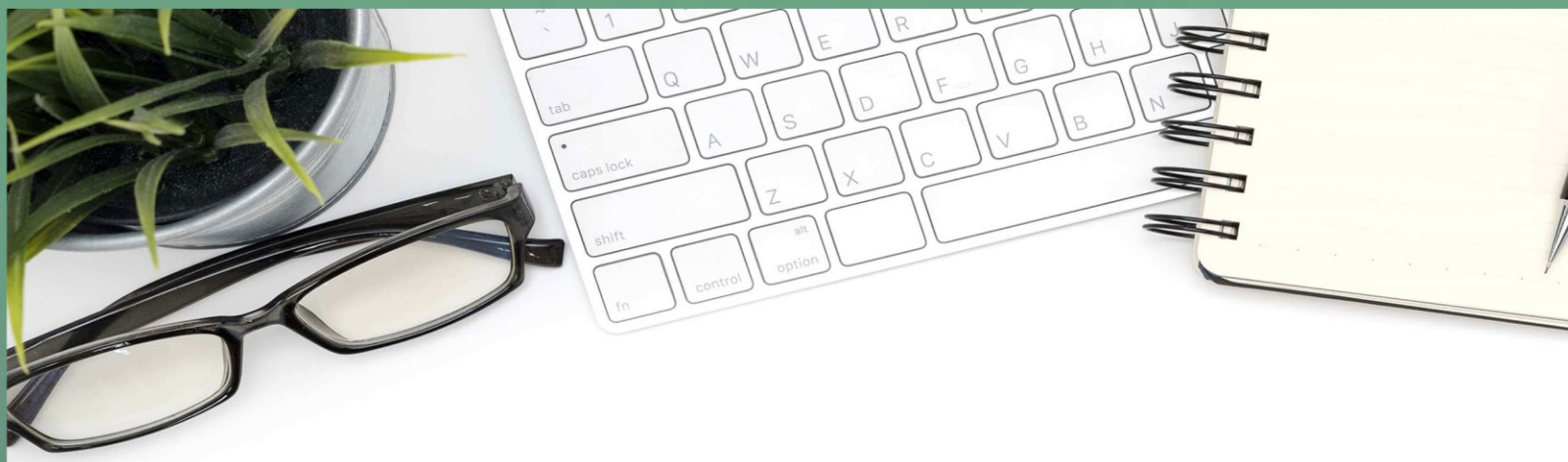

TIME & WORK

(Shortcut Approach) Maths PDF

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Time and Work is an important topic of the arithmetic section for Railways and SSC exams. We are sharing with you some important questions asked under Time and work topic along with various approaches that you can follow to solve these questions.

Example 1

A takes 8 day to finish a piece of work. B takes 10 days to finish the same work. How long will it take to finish the work when both of them are working together?

Solution

Basic Approach:

Now for such questions, A's 1-day work = 1/8
B's 1-day work = 1/10

Work done by both A and B together in one day = 1/8 + 1/10 = 9/40

Hence, A and B together will finish the work in 40/9 days.

Tricky Approach:

How to approach:

STEP 1 : Calculate Total unit of Work.

Take LCM of both 8 (no. of days taken by A) and 10 (no. of days taken by B) i.e. = 40

STEP 2: Calculate efficiency of both A and B individually.

Efficiency = No. of unit work done per unit time

$$\textbf{Efficiency} = \frac{\textit{total units of work}}{\textit{total time taken to complete the work}}$$

Eff. Of A = 40/8 = 5 unit work per day

Eff. Of B = 40/10 = 4 unit work per day

STEP 3: Calculate total efficiency of A and B

Eff. Of A and B = Eff. Of A + Eff. Of B

= 5+4

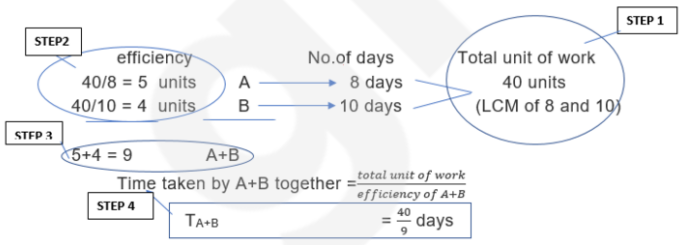
= 9

STEP 4: Calculate time taken to complete total unit of work by A and B together.

$$\textbf{No. of Days taken by (A + B)} = \frac{\textit{Total unit of work}}{\textit{Total efficiency of A and B}}$$

$$T_{A+B} = \frac{40}{9} \text{ days}$$

While taking exam, you can express the information provided in the undermentioned form so that it consumes less time and space.



Example 2

A takes 8 day to finish a piece of work. B takes 10 days to finish the same work. C takes 20 days to finish the work. How long will it take to finish the work when all are working together?

Solution

Efficiency		No.of Days	Total unit of work
40/8=5	A	8 days	40 units
40/10=4	B	10 days	(LCM of 8,10 and 20)
40/20=2	C	20 days	
5+4+2=11	A+B+C		

Time taken by A+B+C = $\frac{\textit{total unit of work}}{\textit{efficiency of A+B+C}}$

$T_{A+B+C} = \frac{40}{11}$ days

Example 3

A takes 8 day to finish a piece of work. B takes 10 days to finish the same work. C takes 20 days to finish the work. D takes 40 days to finish the work. How long will it take to finish the work when all of them are working together?

Solution

Efficiency		No.of Days	Total unit of work
40/8=5	A	8 days	40 units
40/10=4	B	10 days	(LCM of 8,10 and 20) and 40
40/20=2	C	20 days	
40/40=1	D	40 days	
5+4+2+1=12	A+B+C+D		

Time taken by A+B+C+D = $\frac{\textit{total unit of work}}{\textit{efficiency of A+B+C+D}}$

$= \frac{40}{12}$ days

$= \frac{10}{3}$ days

$= 3\frac{1}{3}$ days

Example 4

B and C together can complete the work in 8 days. A and B together can complete the same work in 12 days while A and C together can complete it in 16 days.

Solution

Efficiency		No.of days	Total units of work
48/8=6	B+C	8 days	48 units
48/12=4	A+B	12 days	(LCM of 8,12 and 16)
48/16=3	A+C	16 days	
6+4+3=13	2(A+B+C)		

$\frac{13}{2}$ = (A+B+C)

efficiency of A+B+C = $\frac{13}{2}$ =6.5 days

efficiency of A = (effi of A+B+C) – (effi of B+C)

$= \frac{13}{2} - 6$

$= \frac{1}{2}$

Similarly,

efficiency of B $= \frac{13}{2} - 3$

$= \frac{7}{2}$

efficiency of C $= \frac{13}{2} - 4$

$= \frac{5}{2}$

(a) In how many days A, B and C together can complete the same work?

$$\text{Time taken by A+B+C} = \frac{\text{total unit of work}}{\text{efficiency of A+B+C}}$$
$$= \frac{48}{13/2}$$
$$= \frac{48}{13} \times 2$$
$$= \frac{96}{13} \text{ days}$$

(b) In how many days A alone can complete the work?

$$\text{Time taken by A} = \frac{\text{total unit of work}}{\text{efficiency of A}}$$
$$= \frac{48}{1/2}$$
$$= 48 \times 2$$
$$= 96 \text{ days}$$

(c) In how many days B alone can complete the work?

$$\text{Time taken by B} = \frac{\text{total unit of work}}{\text{efficiency of B}}$$
$$= \frac{48}{7/2}$$
$$= \frac{48}{7} \times 2$$
$$= \frac{96}{7}$$

(d) In how many days C alone can complete the work?

$$\text{Time taken by C} = \frac{\text{total unit of work}}{\text{efficiency of C}}$$
$$= \frac{48}{5/2}$$
$$= \frac{48}{5} \times 2$$
$$= \frac{96}{5}$$

Example 5

If A+B can do a work in 10 days and A alone can complete the same work in 15 days. Find the no. of days taken by B to complete the work alone?

Solution

Efficiency		No. of Days	Total unit work
30/10=3	A+B →	10	30
30/15=2	A →	15	(LCM of 10 and 15)
3-2=1	(A+B)-A=B		

Efficiency of B = Eff.of (A+B) - Eff.of A
= 3-2 =1

$$\text{Time taken by B} = \frac{\text{total unit of work}}{\text{eff.of B}}$$
$$= \frac{30}{1}$$
$$= 30 \text{ days}$$

Example 6

If A+B+C can do a work in 6 days, A+B can do a work in 8 days and and A+C can do a work in 10 days.

Solution

Efficiency		No.of Days	
120/6=20	A+B+C →	6 days	
120/8=15	A+B →	8 days	120
120/10=12	A+C →	10 days	(LCM of 6,8 and 10)

Eff. Of C = eff.of (A+B+C) – eff.of (A+B)
= 20-15
= 5

Eff. of B = eff.of (A+B+C) – eff.of (A+C)
= 20-12
= 8

Eff. of A = eff. of (A+B+C) – eff. of (B+C)
= 20 – (8+5)
= 20-13
= 7

(a) Days taken by A to complete the same work alone?

$$\text{Time taken by A} = \frac{\text{total unit of work}}{\text{eff.of A}}$$
$$T_A = \frac{120}{7}$$

(b) Days taken by B to complete the same work alone?

$$\text{Time taken by B} = \frac{\text{total unit of work}}{\text{eff.of B}}$$
$$T_B = \frac{120}{8}$$
$$T_B = 15 \text{ days}$$

(c) Days taken by C to complete the same work alone?

$$\text{Time taken by C} = \frac{\text{total unit of work}}{\text{efficiency of C}}$$
$$T_c = \frac{120}{5}$$
$$T_c = 24 \text{ days}$$

(d) Days taken by B+C to complete the same work alone?

$$\text{Time taken by B+C} = \frac{\text{total unit of work}}{\text{eff.of B+C}}$$
$$T_{(B+C)} = \frac{120}{8+5}$$
$$T_{(B+C)} = \frac{120}{13} \text{ days}$$

Example 7

Rohit can do a piece of work in 10 days, but with the help of Amit, he can do the same work in 6 days. In what time Amit can do the same work alone?

Solution

Efficiency		No.of Days	Total unit of work
3	Rohit (R) →	10	30
5	Rohit+Amit (R+A) →	6	(LCM of 10 and 6)

Efficiency of Amit = Eff. of (R+A) – (Eff. of R)
= 5 – 3
= 2

$$\text{Time taken by Amit} = \frac{\text{total unit of work}}{\text{efficiency of Amit}}$$
$$T_{Amit} = \frac{30}{2}$$
$$T_{Amit} = 15 \text{ days}$$

Example 8:

There are two gardeners A and B. Both plant some no. of trees in a garden in 10 days and 16 days respectively. In how many days both can complete the work together?

Solution:

Efficiency			No. of days	Total Work
80/10=8	← A	→	10	80
80/16=5	← B	→	16	(LCM of 10 and 16)
8+5=13	A+B			

$$\text{No. of Days taken by (A + B)} = \frac{\text{Total unit of work}}{\text{Total efficiency of A and B}}$$

$$T_{(A+B)} = \frac{80}{13} \text{ days}$$

Now let's discuss this same question by a different approach.

By Approach 2

Efficiency is no. of units work done per unit time.

$$\text{Efficiency} = \frac{\text{total units of work}}{\text{total time taken to complete the work}}$$

Eff. × time taken = Work

We can say that

$\text{Eff.}_A \times T_A$ = total work .....(1)

$\text{Eff.}_B \times T_B$ = total work .....(2)

$\text{Eff.}_{(A+B)} \times T_{(A+B)}$ = total work.....(3)

From eqn (1), (2) and (3), we can say that

$\text{Eff.}_A \times T_A = \text{Eff.}_B \times T_B = \text{Eff.}_{(A+B)} \times T_{(A+B)}$ = total work = constant....(4)

$\text{Eff.}_A \times T_A$ = total work = constant

Remember : In this approach Total Work will always be constant.

We can see that efficiency is inversely proportional to time taken.

$$\text{Eff.} \propto \frac{1}{time}$$

When time taken by A and B respectively is given, we can find the ratio of efficiency of A and B by taking inverse of their time.

	A : B
Ratio of time	10 : 16
Ratio of effi.	$\frac{1}{10} : \frac{1}{16}$
	16 : 10
	8 : 5

This ratio of A and B efficiency means if A plant 8 trees per day then B plant 5 trees per day.

So, A + B together will plant 13 trees per day. $\text{Eff.}_{(A+B)} = 13$

Using eqn (4)

$\text{Eff.}_A \times T_A = \text{Eff.}_B \times T_B = \text{Eff.}_{(A+B)} \times T_{(A+B)}$ = total work

$8 \times 10 = 5 \times 16 = 13 \times T_{(A+B)}$

$T_{(A+B)} = \frac{80}{13}$ days

Let's do some examples to calculate efficiency.

Example 9:

If A and B alone do the same work in 14 and 18 days respectively, then ratio of efficiency of A and B.

Solution:

	A : B
Ratio of time	14 : 18
Ratio of eff.	$\frac{1}{14} : \frac{1}{18}$
	18 : 14
	9 : 7

Example 10 :

If A and B together complete the work in 10 days and B alone complete the same work in 15 days. In how many days can A alone complete the same work?

Solution:

	A+B : B
Ratio of time	10 : 15
Ratio of eff.	$\frac{1}{10} : \frac{1}{15}$
	15 : 10
	3 : 2

$\text{Eff.}_A = \text{Eff.}_{(A+B)} - \text{Eff.}_B$

$= 3 - 2$

$= 1$

We Know that

$\text{Eff.}_A \times T_A = \text{Eff.}_B \times T_B = \text{Eff.}_{(A+B)} \times T_{(A+B)}$

.....Eqn 1

..... Eqn 2

We can use any eqn 1 or eqn 2

By using eqn (1)

$\text{Eff.}_A \times T_A = \text{Eff.}_B \times T_B$

$1 \times T_A = 2 \times 15$

T_A = 30 days

Or By using eqn (2)

$\text{Eff.}_A \times T_A = \text{Eff.}_{(A+B)} \times T_{(A+B)}$

$1 \times T_A = 3 \times 10$

T_A = 30 days

Example: 11

A is thrice as good as workman as B. Together they can finish a work in 12 days. In how many days will A finish the same work alone?

Solution:

Given A is thrice as good as workman as B. $T_{(A+B)} = 12$

i.e. Eff._A is three times of Eff._B .

$\text{Eff.}_A : \text{Eff.}_B$

3 : 1

$\text{Eff.}_{(A+B)} = 3+1 = 4$

$\text{Eff.}_A \times T_A = \text{Eff.}_{(A+B)} \times T_{(A+B)}$

$3 \times T_A = 4 \times 12$

$T_A = \frac{48}{3}$

T_A = 16 days

How to approach and express data while taking the exam?

If there are two persons A and B. If A begins and both work alternate days. It means

1st day	2nd day	3rd day	4th day	5thday	6thday	7thday	8thday	9thday	10thday	…..
A	B	A	B	A	B	A	B	A	B	…..

Before going forward, we will discuss **some basics of Ratios to make calculation easy** for this topic and these basics will also help you in other topics like Partnership, time and distance, average, allegation etc.

Example 1: If A:B = 2:3 and B:C = 4:5 then A:B:C =?

A : B : C A : B : C **A : B : C**

2 : 3 X 4 8 : 12 **8 : 12 : 15**

3 X 4 : 5 12 : 15

Shortest Approach:

A:B 2 : 3

B:C 4 : 5

A:B:C 8:12:15

Example 2: If 4A=3B=5C then find A:B:C.

A : B : C

BxC : AxC : AxB

3X5 : 4x5 : 4x3

15 : 20 : 12

Example3: If $\frac{A}{4}=\frac{B}{5}=\frac{C}{3}$ then find A:B:C.

Let $\frac{A}{4}=\frac{B}{5}=\frac{C}{3}=K$

Then, A=4K, B=5K and C= 3K

A : B : C

4K:5K:3K **Here we can say that in this type of questions, we can directly find ratio, just by**

4:5:3 **writing down denominator.**

Example4: If total salary of A and B is 4500Rs and ratio of their salary is 7:3. Find the salary of A and B individually.

Solution: A's part $\frac{7}{10}$ and B's part $\frac{3}{10}$

A= $\frac{7}{10}$ x 4500 B=$\frac{3}{10}$x4500

A= 3150Rs. B= 1350Rs

Easy approach:

Ratio of Salary of A and B = 7:3. So salary of A+B = 10

We can say 10 = 4500Rs

1 = 450Rs

A = 450x7=3150

B = 450x3= 1350

TIME AND WORK EXAMPLES

Example 5: A and B can do a work in 8 days and 12 days respectively.

	A	B
Time (T)	8 days	12 days
Efficiency (η)	12	8
η	3	2

total work $= T_A \times \eta_A = T_B \times \eta_B$

total work = $8 \times 3 = 12 \times 2$

total work = 24 units

(a). If both A and B work alternatively and A begins, then in how many days work will be completed?

According to question A begins and both and b work alternately.

Days	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	8th day	9th day	10th /2 day	Total Work
Person	A	B	A	B	A	B	A	B	A	B	
Work Unit	3	2	3	2	3	2	3	2	3	1	24

Hence work will be completed in 9 (1/2) days.

But this type of approach is not helpful in exams. We will go by basic but in a smarter way.

If we make a pair of A and B, we can say that both together will work 5 units but in 2 days.

2 days = 5 unit of work

2 days × 4 = 5 units of work × 4

8 Days = 20 units of work, i.e. we can say that up to 8th day 20 units of work will be done

But on 9th day it's a chance of A and he will do his 3 units of work. So up to 9th day 23 units of work will be done. Now 1 unit of work will remain. On 10th day it's a chance of B.

As above B do 2 unit of work in a day. So, he will do 1 unit of work in (1/2) days.

So total time taken to complete the work is 9 (1/2) days.

(b). If A and B both work for 4 days then A leaves. In how many days total work will be completed.

$(Eff_{A+B} \times t_{A+B}) + (Eff._B \times t_B)$ = total work

$(5 \times 4) + (2 \times t_B) = 24$

$20 + 2 \times t_B = 24$

$2 \times t_B = 4$

t_B = 2 days , hence total time will be (4+2)days i.e. 6 days.

Important: Same question can be framed in many ways.

Way 1 : B works for 2 days and after that A joins B, then in how many days the work will be completed.

Solution: B works only for 2 days and then A joins B, i.e. both will work together after 2 days.

$(t_B \times \eta_B) + (t_{A+B} \times \eta_{A+B})$ = total work

$(2 \times 2) + (t_{A+B} \times 5) = 24$

$(t_{A+B} \times 5) = 20$

t_{A+B} = 4 days hence total time is (2+4) days i.e. 6 days

Way 2 : A and B both work together and A takes leaves for 2 days, then in how many days the work will be completed.

Solution: When both A and B are working together and A takes leaves for two days it means B has to work alone for 2 days.

Let total time to complete the work is t days.

So, $\eta_{A+B} \times (t-2) + \eta_B \times 2$ days = 24

$5 \times (t-2) + 2 \times 2 = 24$

$t-2 = 4$

t = 6 days Hence total time taken to complete the work is 6 days.

Don't confuse between t_{A+B} and T_{A+B} (as mentioned in article1). Both are different.

Example 6: X can do a work in 6 days, Y can do it in 8 days and Z can do it in 12 days.

(a).If X starts the work and X,Y,Z works in alternate days, then in how many days the work will be completed?

Solution: Here X will start work on 1st day, then Y will work on 2nd day and z will work on 3rd day.

	X :	Y :	Z
Time	6 :	8 :	12
Efficiency	12 × 8:	6 × 12 :	8 × 6
η	96 :	72 :	48
η	4 :	3 :	2

total work = $\eta_X \times T_X = \eta_Y \times T_Y = \eta_Z \times T_Z$

total work = 6 × 4 = 8 × 3 = 12 × 2 = 24 units

On 1st day, work done by X = 4 unit

On 2nd day, work done by Y = 3 unit

On 3rd day, work done by Z = 2 unit

Total work in 3 days done by X,Y and Z = 9 unit

Now again X will come then Y,then Z and so on till work is completed.

	In 3 days	= 9 units
	× 2	× 2
	In 6 days	= 18 units
X will work on 7th day		= **4 units**
		= **22 units**

Now we need (24-22) units = 2 units work more but Y can do 3 unit of work in one day. So 2 unit will be done in (2/3) day.

+(2/3) day	+ 2 unit
Total days=7 (2/3) days	24 units

Hence total work will be done in 7 (2/3) days.

(b). If all started together and after completion of $(3/4)^{th}$ work, Y left and remaining work is done by X and Z together. Then in how many days work will be completed?

Solution: Total work is 24 units then $(3/4)^{th}$ work is 18 units.

One day work of (X+Y+Z) = 9 units so in 2 days 18 units of work will be done by (X+Y+Z) together.

After this Y left, X+Z worked together and 6 units of work remained.

One day work of X+Z = (4+2) units = 6 units. So in 3 days total work will be completed.

Man, Hours, Efficiency, Day, Work & Rupees Relation

No. of persons (M) ∝ Work (W)
efficiency (η) ∝ Work (W)
no. of days (D) ∝ Work (W)
no. of hours (H) ∝ Work (W)

So, No. of persons × efficiency × no. of days × no. of hours per day = work

$M_1 \times \eta_1 \times D_1 \times H_1 = W_1$ $M_2 \times \eta_2 \times D_2 \times H_2 = W_2$

$\frac{M_1 \times \eta_1 \times D_1 \times H_1}{W_1}$ = constant $\frac{M_2 \times \eta_2 \times D_2 \times H_2}{W_2}$ = constant

.....(1) .....(2)

From eqn (1) and (2)

$$\frac{M_1 \times \eta_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times \eta_2 \times D_2 \times H_2}{W_2}$$

$$\frac{M_1 \times \eta_1 \times D_1 \times H_1}{W_1/R_1/C_1} = \frac{M_2 \times \eta_2 \times D_2 \times H_2}{W_2/R_2/C_2}$$

where R= rupees or salary and C = consumption.

Important: When persons are same their efficiency will be equal. If persons are different their efficiency will be different.

Example 1: 12 persons can complete a work in 5 days, then how many persons are required to complete the same work in 3 days?

Solution: Here $M_1 = 12$ and $D_1 = 5$, $D_2 = 3$ days we have to find M_2

$M_1 \times D_1 = M_2 \times D_2$

$12 \times 5 = M_2 \times 3$

$60 = M_2 \times 3$

$M_2 = 20$

Example 2: 18 persons can make 12 chairs in 6 days working 8 hours per day. In many days 12 persons can make 24 chairs working 6 hours per day?

Solution: Here $M_1 = 18$, $D_1 = 6$, $H_1 = 8$ $W_1 = 12$ and $M_2 = 12$, $H_2 = 6$, $W_2 = 24$ are given we have to find D_2

$$\frac{M_1 \times \eta_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times \eta_2 \times D_2 \times H_2}{W_2}$$

$$\frac{18 \times 6 \times 8}{12} = \frac{12 \times D_2 \times 6}{24}$$

$D_2 = 24$ days

Example 3: The expenditure of fuel is Rs.600 burning 6 stove for 12 days for 4 hours per day. How many stoves are required to burn 6 days for 8 hours making expenditure of Rs.900?

Solution: Here R = Rupess

$$\frac{M_1 \times \eta_1 \times D_1 \times H_1}{R_1} = \frac{M_2 \times \eta_2 \times D_2 \times H_2}{R_2}$$

Here M = no. of stoves

$$\frac{6 \times 12 \times 4}{600} = \frac{M_2 \times 6 \times 8}{900}$$

$M_2 = 9$ Hence, 9 stoves are required.

Example 4: If Q persons can do Q units of work in Q days working Q hours per day then in how many days P persons can do P units of work, working P hours per day.

Solution:

$$\frac{M_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2}$$

$$\frac{Q \times Q \times Q}{Q} = \frac{P \times D_2 \times P}{P}$$

$D_2 = \frac{Q^2}{P}$ days

Example 5: If 5 women can do a work in 6 days working 9 hours per day. How many men are required to complete four times of work in 4 days working 6 hours per day. If 3 women can do the work in 6 hours that work can be done by 4 men in 3 hours.

Solution: In this type, we can see that efficiencies of men and women are different. So first we will calculate efficiency, check the last line of question. work done by 3 women in 6 hours = work done by 4 men in 3 hours

$3\omega \times 6 = 4m \times 3$

$3\omega = 2m$ or if $\omega = 2$ then $m = 3$

$\frac{\omega}{m} = \frac{2}{3}$

where ω = eff. of women and m = effi. of men

using $\frac{M_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2}$

$$\frac{5\omega \times 6 \times 9}{1} = \frac{Xm \times 4 \times 6}{4}$$

$$\frac{5 \times 2 \times 6 \times 9}{1} = \frac{X \times 3 \times 4 \times 6}{4} \quad (\omega = 2 \text{ and } m = 3)$$

$X = 30$ men

Example 6: 4 women and 12 children together take 4 days to complete a piece of work. How many days will 4 children alone take to complete the piece of work if 2 women alone can complete the piece of work in 16 days?

Solution: Let time take by 4 children to complete the work is X days.

work done by 4 women and 12 children in 4 days = work done by 2 women in 16 days = work done by 4 children in X days

$(4\omega+12C) \times 4 = (2\omega) \times 16 = (4C) \times X$
By using
$(4\omega+12C) \times 4 = (2\omega) \times 16$
$16\omega+48C = 32\omega$
$48C = 16\omega$
$3C = \omega$
hence $\omega = 3$ and $C = 1$
By using
$(2\omega) \times 16 = (4C) \times X$ or $(4\omega+12C) \times 4 = (4C) \times X$
$2\times3\times 16 = 4\times 1 \times X$ or $(4\times3+12\times1)\times 4 = (4\times1)\times X$
$X = 24$ days or $(24) \times 4 = 4X$
$X = 24$ days.

Important: There are so many shortcuts for this type of question, if language of questions change, students will be confused so we suggest you to go by this method. All approaches discussed above are the advanced part of Time and Work article 1 and 2.

Example 7: 4 men can complete a piece of work in 2 days. 4 women can complete the same piece of work in 4 days whereas 5 children can complete the same piece of work in 4 days. If 2 men, 4 women and 10 children work together, in how many days can the work be completed?

(SBI Rural Business officers)

Solution: Let time taken by $(2m+4\omega+10C)$ is X days.
$4m \times 2 = 4\omega \times 4 = 5C \times 4 = (2m+4\omega+10C) \times X$ …… (1)
Firstly, we will calculate efficiency of men, women and children.
$8m = 16\omega = 20C$
$2m = 4\omega = 5C$
$m : \omega : C$ (to know the basics of ratio, check time and work article 2)
20 : 10 : 8
10 : 5 : 4
Now, putting in eqn (1)
$4\times10\times2 = 4\times5\times4 = 5\times4\times4 = (2\times10+4\times5+10\times4)\times X$
$80 = (80) X$
$X = 1$ day.

Example 8: 8 men and 4 women together can complete a piece of work in 6 days. Work done by a man in one day is double the work done by a woman in one day. If 8 men and 4 women started working and after 2 days, 4 men left and 4 new women joined. In how many more days will the work be completed? (IBPS PO)

Solution: Given, work of man in 1 day = 2×work of woman in 1 day
$m \times 1\times 1 = 2 \times \omega \times 1$
$m = 2\omega$ So, $m = 2$ and $\omega = 1$
Now, let total time take to complete the work is p days.
$(8m+4\omega)\times6 = (8m+4\omega)\times2+(4m+8w)\times(p-2)$
$(16+4)\times 6 = (16+4)\times 2 +(8+8)\times (p-2)$
$120 = 40 + 16(p-2)$
$80 = 16 (p-2)$
$5 = p-2$
$p = 7$
hence total time is 7 days but in question time taken by changed persons after 2 days is asked so answer will be 5 days.
Exam approach: As $(8m+4\omega)$ has worked for 2 days after that 4m left and 4ω joined, remaining work of 4 days of $(8m+4\omega)$ will be done by $(4m+8\omega)$ in X days.
so, $(8m+4\omega) \times 4 = (4m+8\omega)\times X$
$(16+4) \times 4 = (8+8)X$
$80 = 16X$
$X = 5$ days

Example 9: If 5 women or 3 men or 12 children can complete a work in 6 days. In how many days 2 men, 3 women and 5 children can complete the same work.?

Solution: In this question, we can see that here **'OR'** is used instead of **'AND'**.

So, we can write directly $5\omega = 3m = 12C$
$\omega : m : C$
$12\times3: 5\times12: 5\times3$
12 : 20 : 5

$5\omega \times 6 = 3m \times 6 = 12C \times 6 = (2m+3\omega+5C) \times X$ days

$5\times 12\times 6 = 3\times20\times6 = 12\times5\times6 = (2\times20+3\times12+5\times5)\times X$
$360 = (40+36+25)X$
$X = 360/101$ days.

Example 10: A contractor wants to complete a project in 120 days and he employed 80 men. After 90 days 1/2 work is completed, then how many more persons he must hire to complete work on time?

Solution: Here given work has to be completed in 120 days and 80 men were employed earlier.

According to contractor,
In 120 days = 1 total work completed

In 90 days = ¾ of work has to be completed but we can see that it didn't happen. In 90 days only 1/2 work is completed and remaining 1/2 work has to be completed in remaining 30 days.

Let more person hire are P.

$\frac{90 \times 80}{½} = \frac{30 \times (P+80)}{½}$

$240 = P+80$

$P = 160$ persons

Example 11: P and Q undertake to do a piece of work in 6000Rs. P can do this in 8 days alone and B alone can do it in 12 days. With the help of R, they complete the work in 4 days. Find the part of P, Q and R individually?

Solution: Effici Days total work

24/8 = 3 P.....8

24/12=2 Q.....12 24

24/4 =6 P+Q+R.....4 (LCM of 8,12and 4)

6 - (3+2)= 1 R

there are two methods :

(1) efficiency method

Share of P = $\frac{\eta_P}{\eta_{(P+Q+R)}} \times$ total Rs.

$= \frac{3}{6} \times 6000$

$= 3000$ Rs.

Share of Q = $\frac{2}{6} \times 6000$

$= 2000$ Rs.

Share of R = $\frac{1}{6} \times 6000$

$= 1000$ Rs.

(2) Work Method

Share of P = $\frac{\text{work done by P}}{\text{work done by P+Q+R}} \times$ total Rs

$= \frac{3 \times 4}{24} \times 6000$

$= 3000$ Rs.

Share of Q = $\frac{2 \times 4}{24} \times 6000$

$= 2000$ Rs

Share of R = $\frac{1 \times 4}{24} \times 6000$

$= 1000$ Rs

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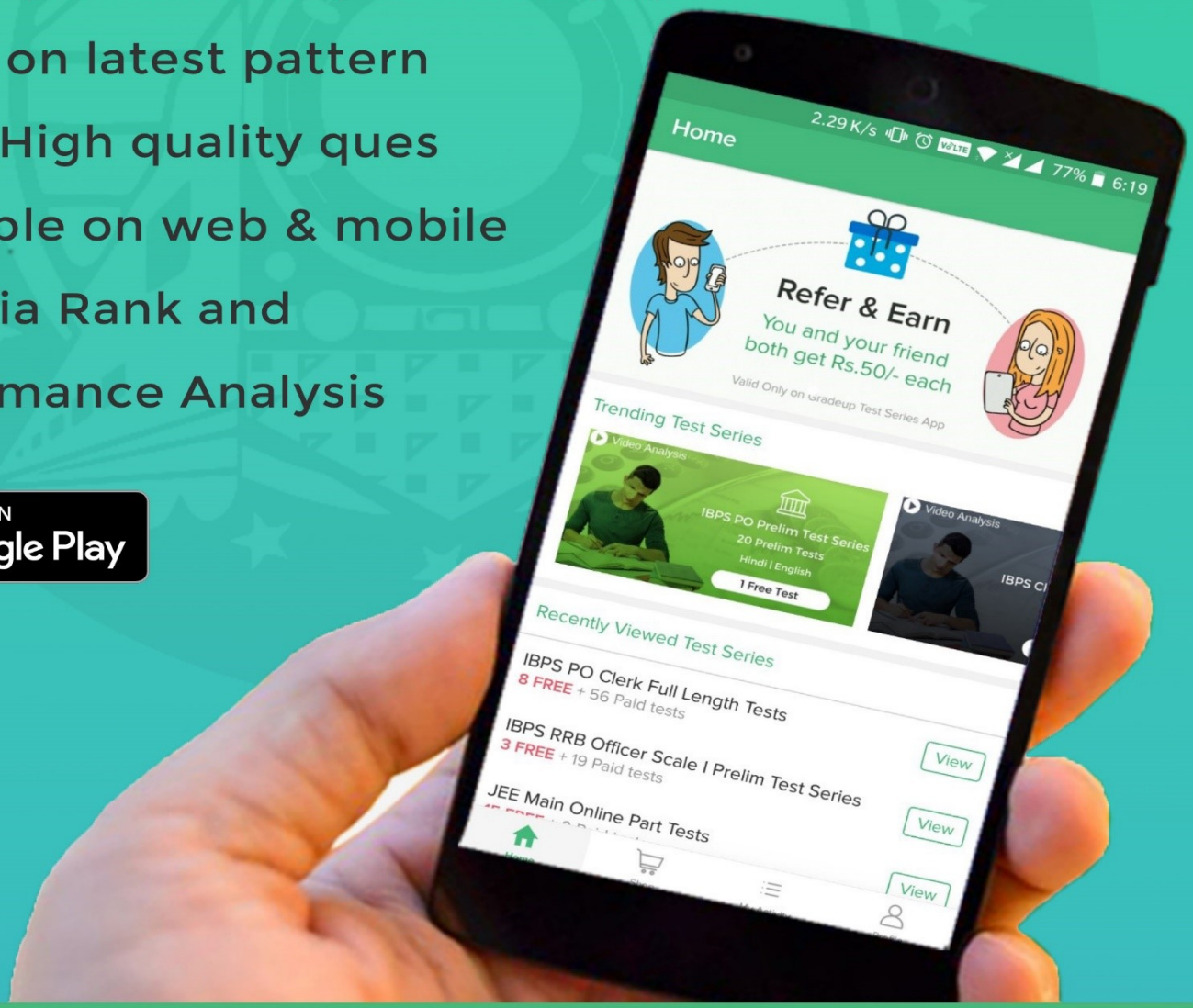

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