TIME & WORK

- KOUSTAV

CONCEPT

TSD ⇒ $S=\frac{D}{T}$ $T=\frac{D}{S}$ $D=ST$

TBW ⇒ $E=\frac{W}{T}$ $T=\frac{W}{E}$ $W=ET$

A → 10 days B → 20 days

$E_A \rightarrow \frac{1}{10}$ $E_B=\frac{1}{20}$

$E_A+E_B=\frac{1}{10}+\frac{1}{20}=\frac{2+1}{20}=\frac{3}{20}$

$T=\frac{1}{3/20}=\frac{20}{3}=6.66$ days

$\frac{M_1T_1}{W_1}=\frac{M_2T_2}{W_2}$

1. A can do a piece of work in 20 days and B can do it in 15 days. How long will they take if both work together?

A) 62/7 days
B) 60/7 days
C) 66/7 days
D) 67/7 days

$E_A = \frac{1}{20}$ $E_B = \frac{1}{15}$

$E_A + E_B = \frac{1}{20} + \frac{1}{15} = \frac{3+4}{60} = \frac{7}{60}$

2. Jai can do a piece of work in 10 days and Veeru can do the same work in 20 days. With the help of Basanti, they finish the work in 5 days. How long will it take for Basanti alone to finish the work?

A) 20 days
B) 10 days
C) 35 days
D) 15 days

$E_J = \frac{1}{10}$ $E_V = \frac{1}{20}$

$E_J + E_V + E_B = \frac{1}{5}$

$E_B = \frac{1}{5} - \frac{1}{10} - \frac{1}{20} = \frac{4-2-1}{20} = \frac{1}{20}$

3. Frodo can do 1/2 of the work in 8 days while Bilbo can do 1/3 of the work in 6 days. How long will it take for both of them to finish the work?

A) 88/17 days
B) 144/17 days
C) 72/17 days
D) 8 days

$E_F = \frac{1/2}{8} = \frac{1}{16}$ $E_B = \frac{1/3}{6} = \frac{1}{18}$

$\frac{1}{16} + \frac{1}{18} = \frac{9+8}{144} = \frac{17}{144}$

4. Gangadhar can do 25% of a piece of work in 5 days. How many days will he take to complete the work 10 times?

A) 150 days
B) 250 days
C) 200 days
D) 180 days

25% → 5

100% → 5 × 4 = 20

10x → 20 × 10 = 200 days

5. 6 men can do a piece of work in 12 days. How many men are needed to do the work in 18 days?

A) 3 men B) 6 men

C) 4 men D) 2 men

$\frac{M_1T_1}{W_1} = \frac{M_2T_2}{W_2}$

$\frac{6 \times 12^{4}}{1} = \frac{M_2 \times 18^{3}}{1}$

6. X number of men can finish a piece of work in 30 days. If there were 6 men more, the work could be finished in 10 days less. The original number of men is

A) 10 B) 11

C) 12 D) 15

$\frac{x \times 30}{1} = \frac{(x+6)\,20}{1}$

$3x = 2x + 12$

$x = 12$

7. Chandler can do a piece of work in 10 days. Joey can do it in 15 days. If the total wages for the work is Rs. 50. How much should Chandler be paid if they work together for the entire duration of the work?

A) Rs 30 B) Rs 20 C) Rs 50 D) Rs 40

$E_C = \frac{1}{10}$ $E_J = \frac{1}{15}$

$E_C + E_J = \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

$W_C = \frac{1}{10} \times 6 = \frac{3}{5}$

$M_C = \frac{3}{5} \times 50 = 30$

C	J
$\frac{1}{10}$	$\frac{1}{15}$
15	10
3	2

$\frac{3}{5} \times 50 = 30$

8. A and B undertake a piece of work for Rs. 100. A can do it in 5 days and B can do it in 10 days. With the help of C, they finish it in 2 days. How much should C be paid for his contribution?

A) Rs. 40 B) Rs. 20 C) Rs. 60 D) Rs. 30

$WD_A = \frac{1}{5} \times 2 = \frac{2}{5}$ $M_A = \frac{2}{5} \times 100 = 40$

$WD_B = \frac{1}{10} \times 2 = \frac{1}{5}$ $M_B = \frac{1}{5} \times 100 = 20$

$M_C = 100 - 40 - 20$

$= 40$

9. 4 men and 3 women finish a job in 6 days, and 5 men and 7 women can do the same job in 4 days. How long will one man and one woman take to do the work?

A) 156/7 days B) 51/2 days C) 58/7 days D) 271/22 days

$$\frac{M_1 T_1}{W_1} = \frac{M_2 T_2}{W_2} = \frac{M_3 T_3}{W_3}$$

$$\frac{(4M+3W)\,6}{1} = \frac{(5M+7W)\,4}{1} = \frac{(M+W)\,x}{1}$$

$(4M+3W)6^3 = (5M+7W)4^2$

$12M+9W = 10M+14W$

$2M = 5W$

$M = \frac{5W}{2}$

$(5M+7W)4 = (M+W)x$

$\left(5\times\frac{5}{2}W+7W\right)4 = \left(\frac{5}{2}W+W\right)x$

$\frac{25W+14W}{2} \times 4 = \frac{7}{2} W \times x$

$39W \times 4 = 7W \times x$

$x = 156/7$

10. 5 men and 3 boys can together cultivate a 23-acre field in 4 days and 3 men and 2 boys together can cultivate a 7-acre field in 2 days. How many boys will be needed together with 7 men, if they have to cultivate a 45-acre field in 6 days?

A) 2 B) 3 C) 4 D) 6

$$\frac{(5M+3B)4^2}{23} = \frac{(3M+2B)2}{7} = \frac{(7M+xB)6}{45_{15}}$$

$(5M+3B)\times 2\times 7 = (3M+2B)\times 23$

$70M+42B = 69M+46B$

$M = 4B$

$(3M+2B)15 = (7M+xB)7$

$(3\times 4B+2B)15 = (7\times 4B+xB)7$

$2\cancel{+4B}\times 15 = (28+x)B\times 7$

$30 = 28+x$

$x = 2$

11. A building is under construction and the task of paving the blocks is given to a group of men. 40 men can finish the given task in 96 days, working 9 hours/day. If 48 men take up the assignment and commit to finish it in 45 days, how many hours will they need to work per day?

A) 24 B) 27 C) 16 D) 18

$$\frac{40 \times 96 \times 9}{1} = \frac{48 \times 45 \times x}{1}$$

$$x = 16$$

12. If A & B can do a job in 8 days and B & C can do the same job in 12 days. If A, B & C work together they can finish the job in 6 days. In how many days can A & C finish the job?

A) 8 days B) 10 days C) 12 days D) 14 days

$E_A + E_B = \frac{1}{8}$ — ①

$E_B + E_C = \frac{1}{12}$ — ②

$E_A + E_B + E_C = \frac{1}{6}$ — ③

③ − ①

$E_C = \frac{1}{6} - \frac{1}{8} = \frac{1}{24}$

③ − ②

$E_A = \frac{1}{6} - \frac{1}{12} = \frac{1}{12}$

$E_A + E_C = \frac{1}{12} + \frac{1}{24}$

$= \frac{2+1}{24} = \frac{3}{24} = \frac{1}{8}$

13. A can do a piece of work in 20 days. He works at it for 5 days and then B finishes it in 10 more days. In how many days will A and B together finish the work?

A) 8 days B) 10 days C) 12 days D) 6 days

$E_A = \frac{1}{20}$

$WD_A = \frac{1}{20} \times 5 = \frac{1}{4}$

$W_{Rem} = 1 - \frac{1}{4} = \frac{3}{4}$

$E_B = \frac{3/4}{10} = \frac{3}{40}$

$E_A + E_B = \frac{1}{20} + \frac{3}{40} = \frac{2+3}{40} = \frac{5}{40} = \frac{1}{8}$

14. Louis can do a piece of work in 25 days and Clark can do it in 20 days. They work for 5 days and then Louis goes away. In how many more days will Clark finish the work?

A) 10 days B) 12 days C) 14 days D) 11 days ✓

$E_L = \frac{1}{25}$ $E_C = \frac{1}{20}$

$WD_5 = \frac{1}{25} \times 5 + \frac{1}{20} \times 5 = \frac{1}{5} + \frac{1}{4} = \frac{4+5}{20} = \frac{9}{20}$

$W_{Rem} = 1 - \frac{9}{20} = \frac{11}{20}$

$T_C = \frac{11/20}{1/20} = 11$

15. Twenty workers can finish a piece of work in 30 days. After how many days should 5 workers leave the job so that the work is completed in 35 days?

A) 5 days B) 10 days C) 15 days ✓ D) 20 days

$\frac{30 \times 20}{1} = \frac{20x + 15(35-x)}{1}$

$\frac{30 \times 20}{1} = \frac{15 \times 35 + 5x}{1}$

$120 = 105 + x$

$x = 15$

16. Gabbar and Mogambo together can do a piece of work in 7 days. If Gabbar does twice as much work as Mogambo in a given time, how long will Gabbar alone take to do the work?

A) 6.33 days B) 10.5 days ✓ C) 11 days D) 72 days

$E_G = 2E_M \Rightarrow E_M = \frac{E_G}{2}$

$E_G + E_M = \frac{1}{7}$

$E_G + \frac{E_G}{2} = \frac{1}{7}$

$\frac{3}{2} E_G = \frac{1}{7}$

$E_G = \frac{1}{7} \times \frac{2}{3} = \frac{2}{21}$

$\frac{21}{2} = 10.5$

17. The ratio of efficiencies of P, Q and R is 2 : 3 : 4. While P and R work on alternate days, Q works on all days. The work is completed in 10 days and the total amount they get is Rs. 1200. Find the amount earned by each person (respectively).

A) 200, 600, 400 B) 400, 600, 200 C) 600, 200, 400 D) 400, 200, 600

P Q R

$2\times5 : 3\times10^{2} : 4\times5^{2}$

1 : 3 : 2

18. Bruce can copy 50 pages in 10 hours. Bruce and Robin together can copy 300 pages in 40 hours. In how much time can Robin copy 30 pages?

A) 13 hours B) 12 hours C) 11 hours D) 9 hours

$E_B = \frac{50}{10} = 5$

$E_B + E_R = \frac{300}{40} = \frac{15}{2}$

$E_R = \frac{15}{2} - 5 = \frac{5}{2}$

$T_R = \frac{30}{5/2} = 12$

19. There are 720 boxes. A & B can paint them in 20 days, B & C can paint them in 24 days, A & C in 15 days. If A paints for 4 days, B for 8 days and C for 8 days, how many boxes will be painted?

A) 252 B) 516 C) 348 D) 492

$E_A + E_B = \frac{720}{20} = 36$ — (1)

$E_B + E_C = \frac{720}{24} = 30$ — (2)

$E_C + E_A = \frac{720}{15} = 48$ — (3)

$WD_{BC} = 30\times8 = 240$

(1) + (2) + (3)

$2(E_A + E_B + E_C) = 114$

$E_A + E_B + E_C = 57$ — (4)

(4) − (2)

$E_A = 57 - 30 = 27$

$WD_A = 27\times4 = 108$

$240 + 108 = 348$

20. Sansa can do a piece of work in 10 days, Arya in 12 days and Bran in 15 days. They all start the work together, but Sansa leaves after 2 days and Arya leaves 3 days before the work is completed. In how many days is the work completed?

A) 2 days B) 6 days C) 7 days D) 8 days

$E_S = \frac{1}{10}$ $E_A = \frac{1}{12}$ $E_B = \frac{1}{15}$

$WD_S + WD_A + WD_B = 1$

$\frac{1}{10} \times 2 + \frac{1}{12} \times (x-3) + \frac{1}{15} \times x = 1$

$\frac{12 + 5x - 15 + 4x}{60} = 1$

$9x - 3 = 60$

$9x = 63$

$x = 7$

21. Two pipes can fill the cistern in 10 hours and 12 hours respectively, while the third empties it in 20 hours. If all the pipes are opened simultaneously, then the cistern will be filled in

A) 9 hours B) 8.5 hours C) 8 hours D) 7.5 hours

$E_{P_1} = \frac{1}{10}$ $E_{P_2} = \frac{1}{12}$ $E_{P_3} = -\frac{1}{20}$

$\frac{1}{10} + \frac{1}{12} - \frac{1}{20} = \frac{6+5-3}{60} = \frac{8}{60}$

$T = \frac{60}{8} = 7.5$

22. A cistern is normally filled in 5 hours. However, it takes 6 hours when there is a leak in its bottom. If the cistern is full, in what time can the leak empty half of it?

A) 6h B) 5h C) 30h D) 15h

$E_T = \frac{1}{5}$

$E_T + E_L = \frac{1}{6}$

$E_L = \frac{1}{6} - \frac{1}{5} = -\frac{1}{30}$

$\frac{30}{2} = 15$

23. Two taps are running continuously to fill a tank. The first tap could have filled it in 5 hours by itself and the second one by itself could have filled it in 20 hours. But the operator failed to realize that there was a leak in the tank from the beginning which caused a delay of one hour in the filling of the tank. Find the time in which the leak would empty a filled tank?

A) 15 hours B) 20 hours C) 25 hours D) 40 hours

$E_{T_1} = \frac{1}{5}$ $E_{T_2} = \frac{1}{20}$

$\frac{1}{5} + \frac{1}{20} = \frac{1}{4}$

$E_{T_1} + E_{T_2} + E_L = \frac{1}{5}$

$\frac{1}{5} + \frac{1}{20} + E_L = \frac{1}{5}$

$E_L = -\frac{1}{20}$

24. Two pipes can fill a tank in 20 and 24 minutes respectively and a waste pipe can empty 3 gallons per minute. All the three pipes working together can fill the tank in 15 minutes. The capacity of the tank in gallons is

A) 100 B) 110 C) 120 D) 140

$\frac{1}{20} + \frac{1}{24} + E_L = \frac{1}{15}$

$E_L = \frac{1}{15} - \frac{1}{20} - \frac{1}{24}$

$= \frac{8 - 6 - 5}{120} = \frac{-3}{120} = \frac{-1}{40}$

Cap: $3 \times 40 = 120$ gal

25. Three taps P, Q and R can fill a tank in 12 hours, 15 hours and 20 hours respectively. If P is open all the time and Q and R are open for one hour each alternately, starting with Q, then the tank will be full in how many hours?

A) 9 hours B) 7 hours C) 13 hours D) 11 hours

$E_P = \frac{1}{12}$ $E_Q = \frac{1}{15}$ $E_R = \frac{1}{20}$

$WD_{1st} = \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60}$

$WD_{2nd} = \frac{1}{12} + \frac{1}{20} = \frac{5+3}{60} = \frac{8}{60}$

$WD_2 = \frac{9}{60} + \frac{8}{60} = \frac{17}{60}$

$WD_4 = \frac{17}{60} \times 2 = \frac{34}{60}$

$WD_6 = \frac{17}{60} \times 3 = \frac{51}{60} < 1$

$WD_8 = \frac{17}{60} \times 4 = \frac{68}{60} > 1$ ×

$WD_7 = \frac{51}{60} + \frac{9}{60} = \frac{60}{60} = 1$