Class Test on Lecture Sheet 8

Time: 10 minutes **Obtained Mark:** **Total Marks: 10**

1. A farmer employed 36 loborer to dig a pond in 15 days, but after 10 days of work he discovered that only 50% of the work was done. How many additional labors are to be employed for completing the job in time?

   A. 25 B. 30 C. 32 D. 36 E. None of these

   সমাধান: In 10 days $\frac{1}{2}$ days part of the work is done by 36 people

   $\therefore$ In 1 day 1 part of the work is done by $(36\times10\times2)$ people

   $\therefore$ In 5 day $\frac{1}{2}$ part of the work can be done by $\left(\frac{36\times10\times2}{5\times2}\right) = 72$ people

   So, additional required = $72 - 36 = 36$

2. A mat weaver can weave 4 mats in 4 days. At the same rate, how many mats would be woven by 8 mat wavers in 8 days?

   A. 8 B. 12 C. 16 D. 20 E. None of these

   সমাধান: In 4 days, 1 mat waver can weave 4 mats

   So, In 1 day, 1 mat waver can weave $\frac{4}{4}$ mats

   $\Rightarrow$ In 8 days, 1 mat waver can weave $\frac{4\times8}{4}$ mats

   $\Rightarrow$ In 8 days, 8 mat wavers can weave $\frac{4\times8\times8}{4} = 64$ mats

   Answer: E. None of these

3. Fifteen men take 21 days of 8 hours each to do a piece of work. How many days of 6 hours each would 21 women take, if 3 women do as much work as 2 men do? [IBA MBA June 2015]

   A. 25 B. 28 C. 30 D. 36 E. None of these

   সমাধান: Work of 3 women = work of 2 men

   So, work of 21 women = work of 14 men

   Now, 15 men take (21×8) or, 168 hours to do a piece of work.

   Let, 21 women take 'P' days.

   Then, total working hour = $(P \times 6)$ hours

   So, 15 men take 168 hours

   $\Rightarrow$ 1 man takes (168×15) hours

   $\Rightarrow$ 14 men takes $\left(\frac{168\times15}{14}\right)$ hours = 180 hours

   Thus, $P \times 6 = 180$

   $\Rightarrow P = \frac{180}{6} = 30$

4. Minhaz and Alam can complete a work in 18 days. After working together for 12 days Minhaz stops and Alam completes the remaining work in 8 days. In how many days can Minhaz complete the work if he works alone? [IBA MBA June 2016]

   A. 32 B. 48 C. 56 D. 72 E. None of these

   সমাধান: Work done in 12 days by Minhaz and Alam = $\frac{12}{18} = \frac{2}{3}$ part

   So, work left = $\frac{1}{3}$ part

   Now, Alam Completes $\frac{1}{3}$ part in 8 days

   So, Alam completes 1 part in 24 days

   Let, Minhaz can alone complete the work in 'x' days

   Then, $\frac{1}{x} + \frac{1}{24} = \frac{1}{18}$

   $\Rightarrow \frac{1}{x} = \frac{1}{18} - \frac{1}{24} = \frac{24-18}{24\times18} = \frac{6}{24\times18} = \frac{1}{72}$

   $\therefore x = 72$

   Answer: D. 72

5. A is 30% more efficient than B. How much time will they, working together, take to complete a job which A alone could have done in 23 days?
A. 13 B. 11 C. 21 D. 12 E. None of these
সমাধান: Here, A takes 23 days to complete a job
So, B takes (23×1.3) = 29.9 days to complete job [As A is 30% more efficient]
So, working together,
In 1 day A & B can complete $\left(\frac{1}{23}+\frac{1}{29.9}\right)$ part of the work
So, $\left(\frac{1}{23}+\frac{1}{29.9}\right)$ part of the work is done in 1 day
So, 1/complete work is done in $\frac{1}{\frac{1}{23}+\frac{1}{29.9}}=\frac{1}{\frac{1}{23}+\frac{10}{299}}=\frac{1}{\frac{13+10}{299}}=\frac{299}{23}$ = 13 days
Answer: A. 13

6. Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B & C are open for one hour each alternately, the tank will be full in approximately-
A. 6 hrs B. 5 hrs C. 7 hrs D. 7.5 hrs E. None of these
সমাধান: As A is open all the time and B & C are open for one hour each alternately,
So, part of the tank filled in 2 hrs = $\left(\frac{1}{12}+\frac{1}{15}\right)+\left(\frac{1}{12}+\frac{1}{20}\right)=\frac{3}{20}+\frac{2}{15}=\frac{17}{60}$
Now, in the 7th hour, A & B tap will be in operation.
So, part of the tank filled in 7th your = $\frac{1}{12}+\frac{1}{15}=\frac{3}{20}$
So, total part of the tank filled in 7 hours = $\frac{17}{20}+\frac{3}{20}=1$
Answer: C. 7 hrs

7. A takes 5 days more than B to do a certain job and 9 days more than C; A and B together can do the job in the same time as C. How many days A would take to do it?
A. 15 B. 10 C. 5 D. 20 E. None of these
সমাধান: Let, C takes 'x' days
So, A takes (x+9) days & B takes (x+4) days to do a certain job.
Then, according to the given condition,
$\frac{1}{x}=\frac{1}{x+9}+\frac{1}{x+4}$
$\Rightarrow \frac{1}{x}-\frac{1}{x+9}=\frac{1}{x+4}$
$\Rightarrow x^2+9x=9x+36$
$\Rightarrow x^2=36$
$\Rightarrow x=6$
So, A takes (x+9) or, 6+9 = 15 days.
Answer: A. 15

8. A and B together can do a piece of work in 40 days. A having worked for 20 days, B finishes the remaining work alone in 60 days, in how many days shall B finish the whole work alone?
A. 60 days B. 70 days C. 80 days D. 90 days E. None of these
সমাধান: Let, A takes 'x' days to complete the whole work.
Then, part of the work done in 20 days = $\frac{20}{x}$
So, work left = $1-\frac{20}{x}=\frac{x-20}{x}$
Now, $\frac{x-20}{x}$ work is done by B in 60 days
So, 1 or, whole work is done in $\frac{60x}{x-20}$ days
Now, together they can do the work in 40 days
So, $\frac{1}{x}+\frac{x-20}{60x}=\frac{1}{40}$
$\Rightarrow \frac{60+x-20}{60x}=\frac{1}{40}$
$\Rightarrow 1600+40x=60x$
$\Rightarrow 20x=1600$

$\Rightarrow x = 80$

So, B takes $= \frac{60x}{x-20} = \frac{60\times80}{60} = 80$ days

Answer: C. 80 days

9. An air conditioner can cool the hall in 40 minutes while another takes 45 minutes to cool under similar conditions. If both air conditioners are switched on at same instance then how long will it take to cool the room approximately?

A. 18 minutes B. 19 minutes C. 22 minutes D. 24 minutes

Solution: Let the conditioners be A and B

'A' cools at 40 min

'B' at 45 min

Together $= \frac{a\times b}{a+b} = \frac{45\times40}{45+40} = 45 \times \frac{40}{85} = 21.1764 = 22$ min (approx)

Answer: C. 22 minutes

10. A car manufacturer has 2,992 forklifts, which is approximately one forklift for every 48.9 employees. Which of the following is the closest approximation in thousands, of the number employees employed by the manufacturer?

A. 60 B. 100 C. 150 D. 172

সমাধান: কর্মচারী আছে $= 299 \times 48.9$

$= 146308.8$

≈ 150000 (প্রায়)

Practice Math

1. A boat has a crack in its hull which is leaking water into the boat and could sink the boat in 6 hours. The boat has a pump which can pump the water out in 8 hours. If the boat is 168 km away from the shore and the pump is running, what is the minimum speed the boat should run at so that it can reach the shore before sinking? [Titas Gas (AM)-21; GTCL (AM)-21]

A. 5 km/hr B. 6 km/hr C. 7 km/hr D. 8 km/hr

সমাধান: 1 ঘণ্টায় পানিপূর্ণ হয় $\frac{1}{6}$ অংশ

1 ঘণ্টায় পানি খালি হয় $\frac{1}{8}$ অংশ

$\therefore$ 1 ঘণ্টায় পূর্ণ হয় $= \frac{1}{6} - \frac{1}{8} = \frac{4-3}{24} = \frac{1}{24}$ অংশ

অর্থাৎ নৌকাটির 24 ঘণ্টা সময় লাগবে ছিদ্রটি দিয়ে পানিপূর্ণ হতে।

$\therefore$ বেগ = দূরত্ব $\div$ সময় $= \frac{168}{24} = 7$ কি.মি./ঘণ্টা

2. A boat sails M miles upstream at rate of r miles per hours. If the rate of the stream is S miles per hours, how long will it take the boat to return to its starting point?

A. $\frac{m}{r+2s}$ B. $\frac{m}{r+s}$ C. $\frac{m+r}{s}$ D. $mr - s$

সমাধান: Let, the speed of the boat in still water be 'x' miles/hr.

The speed of the stream is given as 's' miles/hr

Therefore, speed of the boat upstream = $(x - S)$ miles/hr ... ... (i)

Speed of the boat downstream = $(x + S)$ miles/hr ... ... (ii)

The distance covered by the boat while sailing upstream is given as 'M' miles.

Speed of the boat upstream is given as 'R' miles/hr ... ... (iii)

From (i) and (iii), we get

$x - S = R$

$\Rightarrow x = R + S$ ... ... (iv)

Substituting the value of x in equation (iii), we get

Speed of the boat downstream = $(R + S + S)$ miles/hr = $(R + 2S)$ miles/hr ... ... (v)

Time $= \frac{Distance}{Speed} = \left[\frac{M}{R+2S}\right]$ (Answer)

3. A boat takes 8 hours to cover a distance while travelling upstream, whereas while travelling downstream it takes 6 hours. If the speed of the current is 4 kmph, what is the speed of the boat in still water?
A. 12 kmph B. 116 kmph C. 28 kmph D. None of these
সমাধান: Let, the speed of the boat in still water = B km/h
Now, while travelling downstream, s = (B+4)×6 ... ...(i)
and while travelling upstream, s = (B−4)×8 ... ...(ii)
from (i) & (ii) we get,
6B + 24 = 8B − 32
⇒ 2B = 56
⇒ B = 28 km/h
উত্তর: C. 28 kmph

4. The speed of a boat in still water is 10 km/hr. If it can travel 26 km downstream and 14 km upstream in the same time, the speed of the stream is:
A. 2 km/hr B. 2.5 km/hr C. 3 km/hr D. 4 km/hr
সমাধান: Let, the speed of the stream = s km/h
Then, while travelling downstream,
$D = (10+S)t_1$
$\Rightarrow 26 = (10+S)t_1$
& while travelling upstream,
$D = (10-S)t_2$
$\Rightarrow 14 = (10-S)t_2$
Here, $t_1 = t_2$
So, $\frac{26}{10+S} = \frac{14}{10-S}$
$\Rightarrow \frac{13}{10+S} = \frac{7}{10-S}$
$\Rightarrow 130 - 13S = 70 + 7S$
$\Rightarrow 20S = 60$
$\Rightarrow S = 3$ km/h
উত্তর: C. 3 km/hr

5. A boat can travel 20 km downstream in 24 min. The ratio of the speed of the boat in still water to the speed of the stream is 4:1. How much time will the boat take to cover 15 km upstream?
A. 20 min B. 22 min C. 25 min D. 30 min
সমাধান: Let, the speed of the stream = w
Then, speed of the boat in still water = 4w
Now, while travelling downstream,
$D = (4w+w)t_1$
$\Rightarrow 20 = 5w \times t_1$
$\Rightarrow 20 = 5w \times 24$
$\Rightarrow w = \frac{20}{120} = \frac{1}{6}$
Again while travelling upstream,
$D = (4w-w)t_2$
$\Rightarrow 15 = 3w \times t_2$
$\Rightarrow t_2 = \frac{5}{w} = \frac{5}{\frac{1}{6}} = 30$ min
উত্তর: D. 30 min

6. The speed of the boat in still water is 5 times that of the current, it takes 1.1 hours to row to point B from point A downstream. The distance between point A and point B is 13.2 km. How much distance will it cover in 312 minutes upstream?
A. 41.6 km B. 48 km C. 44.8 km D. 43.2 km
সমাধান: Let, speed of the current = S km/h & speed of the boat = B km/h
Now, while travelling downstream,

$13.2 = (B + S) \times 1.1$
$\Rightarrow B + S = 12$
$\Rightarrow 5S + S = 12$ [B = 5S]
$\Rightarrow 6S = 12$
$\Rightarrow S = 2$
$\therefore$ B = 5S = 10
Again, while travelling upstream,
D = $(B - S) \times \frac{312}{60}$
$\Rightarrow D = (10 - 2) \times \frac{312}{60}$
$\Rightarrow$ D = $8 \times \frac{312}{60} = 41.6$ km
উত্তর: A. 41.6 km

7. A man rowed 3 miles upstream in 90 minutes if the river flowed with a current of 2 miles per hour, how long did the man's return trip take?
A. 20 B. 30 C. 40 D. 50 E. 35
সমাধান: Let, the speed of the boat = B
Then, while travelling upstream
3 = $(B - 2) \times \frac{90}{60}$ [Speed of current = 2 miles per hour]
$\Rightarrow 3 = (B - 2) \times \frac{3}{2}$
$\Rightarrow 6 = 3B - 6$
$\Rightarrow 3B = 12$
$\therefore$ B = 4
Now, for the return trip, i.e; while travelling downstream,
$3 = (B + 2) \times t$
$\Rightarrow t = \frac{3}{B+2} = \frac{3}{4+2} = \frac{1}{2}$ hrs = 30 min
উত্তর: B. 30

8. A certain river has a current of 4 miles per hour. A boat takes twice as long as to travel upstream between two points as it down stream between the same two points. What is the speed of the boat in still water?
A. 6 mph B. 8 mph C. 12 mph D. 1.2 mph E. 10 mph
সমাধান: Let, the distance between the two points = S
Then, for the upstream,
S = $(B - 4) \times t_1$ ... ... (i) [Speed of the boat = B]
& for the downstream,
S = $(B + 4) \times t_2$ ... ... (ii)
Given that, $t_1 = 2t_2$,
Form (i) & (ii), we get,
$(B - 4) \times 2t_2 = (B+4) \times t_2$
$\Rightarrow (B - 4) \times 2 = (B + 4)$
$\Rightarrow 2B - 8 = B + 4$
$\Rightarrow B = 12$ mph
উত্তর: C. 12 mph

9. A pipe can fill up an empty tank in 14 minutes. Another pipe flows out 12 liter of water per minute. If the two pipes are opened together and the empty tank is filled up in 98 minutes, how much water does the tank contain? [UCB (PO) 2021]
A. 178 liter B. 184 liter C. 192 liter D. 196 liter E. None of these
Solution: In 1 minute, first pipe can fill $\frac{1}{12}$ part of tank.
Let, second pipe can empty the tank in x minutes.
$\therefore$ In 1 minute, it can empty $\frac{1}{x}$ part of tank.

That means, the tank is filled in 1 minutes $\left(\frac{1}{12}-\frac{1}{x}\right)$ part

According to question, $\frac{1}{12}-\frac{1}{x}=\frac{1}{98}$

$\Rightarrow \frac{1}{x}=\frac{1}{12}-\frac{1}{98}=\frac{8-1}{98}=\frac{7}{98}$

$\therefore x=\frac{98}{7}$ minutes.

$\therefore$ The tank contains $= 14\times\frac{98}{7}=196$ liter

Answer: D. 196 liter

10. Two pipes A and B can fill an empty cistern in 32 and 48 hours, respectively. Pipe C can drain the entire cistern in 64 hours when no other pipe is in operation. Initially, when the cistern was empty pipe A and pipe C were turned on. After a few hours. Pipe A was turned off and pipe B was tuned on instantly. In all it took 112 hours to fill the cistern. For how many hours was pipe B turned on?

A. 84 B. 77 C. 70 D. 72

Solution: Let the total amount of work be 192 units [L.C.M of 32, 48 and 64]

Amount of work done by pipe A in one hour $=\frac{192}{32}=6$ units

Amount of work done by pipe B in one hour $=\frac{192}{48}=4$ units

Amount of work done by pipe C in one hour $=\frac{-192}{64}=-3$ units

Let pipe A and pipe C operate for x hours. After x hours, pipe A is turned off and pipe B is turned on.

Now pipe B and pipe C will operate for remaining $112-x$ hours

Work done by pipe pipe A and C in x hours $=(6-3)\times x$ units

Work done by pipe pipe B and C in $112-x$ hours $=(4-3)\times(112-x)$ units

Total work done should be 192 units

$\Rightarrow (6-3)\times x+(4-3)\times(112-x)=192$

$\Rightarrow 3x+112-x=192$

$\Rightarrow 2x=80$

$\Rightarrow x=40$

$\therefore$ Pipe B was turned on for $112-40=72$ hours

Answer: D. 72

11. Two pipes A and B can fill a tank in 6 hours and 4 hours respectively. If they are opened on alternative hours and if pipe A is opened first, in how many hours the tank shall be full? [Janata Bank (AO) 15]

A. 4 B. 4.5 C. 5 D. 5.5

সমাধান: In 2 hours, the portion of the tank is filled $=\frac{1}{6}+\frac{1}{4}=\frac{10}{24}=\frac{5}{12}$

So, in 4 hours, the portion of the tank is filled $=2\times\frac{5}{12}=\frac{5}{6}$

So, left $=1-\frac{5}{6}=\frac{1}{6}$

Now, pipe A will be in action and it needs 1 hour to fill $\frac{1}{6}$ part of the tank.

So, total required time $=4+1=5$ hours

উত্তর: C. 5

12. Pipes A and C can fill an empty cistern in 7 and 10.5 hours, respectively while pipe B can drain the filled cistern in 5.25 hours. If the three pipes are turned on together when the cistern is empty, how many hours will it take for the cistern to be $\frac{2}{3}$ full?

A. 121 B. 12 C. 14 D. 15.75

সমাধান: In 1 hr, the portion of the cistern filled $=\frac{1}{7}+\frac{1}{10.5}-\frac{1}{5.25}=\frac{1}{7}+\frac{10}{105}-\frac{100}{525}=\frac{75+50-100}{525}=\frac{25}{525}=\frac{5}{105}=\frac{1}{21}$

Now, $\frac{1}{21}$ portion is filled in 1 hr

So, 1 or, complete cistern will be filled in = 21 hrs

Hence, $\frac{2}{3}$ portion will be filled in $=21\times\frac{2}{3}$ hrs = 14 hrs

উত্তর: C. 14

13. One fill pipe A is 3 times faster than second fill pipe B and takes 32 minutes less than the fill pipe B. When will the cistern be full if both pipes are opened together?
A. 6 min B. 8 min C. 12 min D. 10 min
Solution: Let pipe A takes p min to fill
Then, pipe B takes 3p min to fill
$\Rightarrow 3p - p = 32$
$\Rightarrow p = 16$
$\Rightarrow 3p = 48$ min
Required, both pipes to fill $= \frac{48\times16}{48+16} = 12$ min
Answer: C. 12 min

14. A cistern is normally filled with water in 10 hours but takes 5 hours longer to fill because of a leak in its bottom. If the cistern is full, the leak will empty the cistern in- [Janata and Rupali Bank (Officer) 2019]
A. 22.5 hours B. 25 hours C. 27.5 hours D. 30 hours
সমাধান: Let, the leak will empty the cistern in 'x' hours.
Now, A cistern is normally filled in, 10 hours.
Due to the leak's presence, it needs $= 10 + 5 = 15$ hrs
So, according to the question, $\frac{1}{10} - \frac{1}{x} = \frac{1}{15}$
$\Rightarrow \frac{1}{x} = \frac{1}{10} - \frac{1}{15} = \frac{5}{150} = \frac{1}{30}$
$\Rightarrow x = 30$ hrs
উত্তর: D. 30 hours

15. Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P, Q and R respectively. What is the proportion of the solution R in the liquid in the tank after 3 minutes? [IBA BBA 13-14]
A. $\frac{5}{11}$ B. $\frac{6}{11}$ C. $\frac{7}{11}$ D. $\frac{8}{11}$ E. $\frac{9}{11}$
সমাধান: In 1 minute the portion of the tank is filled $= \frac{1}{30} + \frac{1}{20} + \frac{1}{10} = \frac{11}{60}$
So, in 3 minutes, the portion of the tank is filled $= 3 \times \frac{11}{60} = \frac{11}{20}$
Now, the pipe C which can fill the empty tank in 10 minutes discharges solution R.
So, the proportion of solution R after 3 minutes $= \left(\frac{3}{10} : \frac{11}{20}\right) = \frac{3}{10} \times \frac{20}{11} = \frac{6}{11}$
উত্তর: B. $\frac{6}{11}$

16. A water tank has two taps (tap-1 and tap-2). Tap-1 can fill a tank in 8 hrs and tap-2 can empty the tank in 16 hrs. How long will they take to fill the tank if both taps are opened simultaneously but tap-2 is closed after 8 hrs?
A. 10 B. 12 C. 14 D. 16 E. 20
সমাধান: In 8 hrs,
The part of the tank is filled $= 8\left(\frac{1}{8} - \frac{1}{16}\right) = \frac{1}{2}$
So, remaining part $= \frac{1}{2}$
Now, Tap-1 can fill 1 or complete part in 8 hrs
So, $\frac{1}{2}$ part can be filled in 4 hrs.
So, total time required $= 8 + 4 = 12$ hrs
উত্তর: B. 12

17. In how many ways 4 books can be selected out of 10 books if two books is always left out? [BTRC AD '21]
A. 210 B. 70 C. 45 D. 28
সমাধান: দু'টি বই বাদ দিলে বই থাকে 8টি।
∴ বাছাই করা যাবে $= {}^8C_2 = \frac{8\times7}{1\times2} = 28$ উপায়ে

18. How many triangle can be formed with the apen points of 12 side polynomial?
[বেসামরিক বিমান চলাচল কর্তৃপক্ষ (সিনিয়র অফিসার) ২০২১]

A. 220 B. 120 C. 210 D. 180

সমাধান: ত্রিভুজ গঠন করা যাবে = ${}^{12}C_3 = \frac{12\times11\times10}{1\times2\times3} = 220$

19. In how many ways a team of 11 members can be formed from a group of 15 students if a student who is the owner of the ball is always considered a member of the team? [Agrani Bank Ltd. Off (Cash) 2017]

A. 14 B. 201 C. 210 D. 1001

সমাধান: Here, total students = 15

Owner of the ball has to be considered always.

So, total ways of team formation = $15 - {}^{1}C_{(11-1)} = {}^{14}C_{10} = {}^{14}C_4$ [${}^{n}C_r = {}^{n}C_{n-r}$] = $\frac{14\times13\times12\times11}{4\times3\times2\times1} = 1001$

উত্তর: D. 1001

20. From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways it can be done? [BB (AD) 2011]

A. 564 B. 645 C. 735 D. 756

সমাধান:

	Men (7)	Women (6)
i.	5	0
ii.	4	1
iii.	3	2

i. নং ক্ষেত্রে, বাছাইয়ের সংখ্যা = ${}^{7}C_5 \times {}^{6}C_0 = {}^{7}C_2 \times {}^{6}C_0 = 21$

ii. নং ক্ষেত্রে, বাছাইয়ের সংখ্যা = ${}^{7}C_4 \times {}^{6}C_1 = 210$

iii. নং ক্ষেত্রে, বাছাইয়ের সংখ্যা = ${}^{7}C_3 \times {}^{6}C_2 = 525$

∴ মোট উপায় = $21 + 210 + 525 = 756$

উত্তর: D. 756

21. At a party, everyone shook hands with everybody else. If there were 66 handshakes, how many people were at the party?

A. 9 B. 15 C. 10 D. 12 E. 13

সমাধান: Let, total people in the party = n

As shaking hands require two people,

So, ${}^{n}C_2 = 66$

$\Rightarrow \frac{n!}{2!(n-2)!} = 66$

$\Rightarrow \frac{n(n-1)(n-2)!}{2!(n-2)!} = 66$

$\Rightarrow n^2 - n = 132$

$\Rightarrow n^2 - n = 132$

$\Rightarrow n^2 - n - 132 = 0$

$\Rightarrow n^2 - 12n + 11n - 132 = 0$

$\Rightarrow n(n-12) + 11(n-12) = 0$

$\Rightarrow (n-12)(n+11) = 0$

$\therefore n = 12$

Answer: D. 12

22. A team of 8 students goes on an excursion, in two cars, of which one can seat 5 and the other only 4. In how many ways can they travel?

A. 120 B. 126 C. 146 D. 156 E. 166

সমাধান: Here, total 8 students can be grouped/ divided in two cars in 2 ways; either 5+3 or 4+4

Now, 5 seats can be occupied by 8 students in ${}^{8}C_5$ ways and the total ways here = ${}^{8}C_5 \times {}^{3}C_3 = {}^{8}C_5 = 56$

Again, 4 seats can be occupied by 8 students in ${}^{8}C_4$ ways and the total ways here = ${}^{8}C_4 \times {}^{4}C_4 = {}^{8}C_4 = 70$

So, total ways to travel = $56 + 70 = 126$

Answer: B. 126

23. In how many ways 5 different chocolates be distributed to 4 children such that any child can get any number of chocolate?
A. 20 B. 24 C. 120 D. 625 E. 1024
সমাধান: Here, total vaieties of chocolates, r = 5
and total children, n = 4
So, total ways to distribute chocolate such that any child can get any member of chocolate = $n^r = 4^5 = 1024$
Answer: E. 1024

24. A committee of 3 people is to be chosen from the president and vice president of four different companies. What is the number of different committees that can be chosen if two people who work for the same company cannot both serve on the committee?
A. 16 B. 24 C. 28 D. 32 E. 40
সমাধান: Here, 3 companies can be selected from companies in ${}^4C_3$ ways
Now, for each chosen/ selected company, there are 2 ways of selection (either president or vice president)
So, total number of ways = ${}^4C_3 \times 2 \times 2 \times 2 = 4 \times 2 \times 2 \times 2 = 32$
Answer: D. 32

25. Five members were present at a board meeting. Each member shook hands with all of the other members before the meeting. How many handshakes took place? [MTBL (Officer) 2013]
A. 10 B. 11 C. 15 D. 20
সমাধান: এখানে, বোর্ড মিটিংয়ে ছিল 5 জন এবং করমর্দনের জন্য 2 জন লোক লাগে।
তাহলে, 5 জন সদস্য উপস্থিত থাকায়,
মোট করমর্দনের সংখ্যা = ${}^5C_2 = \frac{5\times4}{1\times2} = 10$ (উত্তর: A. 10)

Home Task Math

26. If a boat goes 7 km upstream in 42 minutes and the speed of the stream is 3kmph, then the speed of the baot in still water is- [Pallikarma Sohayak Foundation (AM) 2014]
A. 4.2 km/hr B. 9 km/hr C. 13 km/hr D. 21 km/hr
সমাধান: ধরি, speed of the boat in still water = B km/hr
তাহলে, upstream এর ক্ষেত্রে, $7 = (B-3) \times \frac{42}{60}$ [42 min = $\frac{42}{60}$ hrs & $s = (u-v)t$ সূত্র হতে]
$\Rightarrow B - 3 = \frac{7\times60}{42} = 10$
$\therefore B = 13$ km/hr (উত্তর: C)

27. A man can row at the rate of 4 km/hr in still water. If the time taken to row a certain distance upstream is 3 times as much as to row the same distance downstream, find the speed of the current.
A. 1 B. 2 C. 3 D. 4
সমাধান: স্রোতের অনুকূলে, $s = (4+x)t_1$ [x = স্রোতের বেগ]
এবং, স্রোতের প্রতিকূলে, $s = (4-x)t_2$
এখন, $(4+x)t_1 = (4-x)t_2$
$\Rightarrow (4+x)t_1 = (4-x)3t_1$ [$\because$ upstream time, t_2 = 3 × downstream time = $3t_1$]
$\Rightarrow 4 + x = 12 - 3x$
$\Rightarrow 4x = 8$
$\therefore x = 2$
$\therefore$ Speed of the current = 2 km/hr (উত্তর: B)

28. A certain river has a current of 3 miles per hour. A boat takes twice as long travel upstream between two points as it does to travel downstream between the same two points. What is the speed of the boat in still water?
A. 3 mph B. 6 mph C. 8 mph D. 9 mph E. 12 mph
সমাধান: ধরি, নৌকার বেগ = x

প্রশ্নমতে,
$x + 3 = 2(x - 3)$
$\Rightarrow x + 3 = 2x - 6$
$\Rightarrow x - 2x = -6 - 3$
$\Rightarrow -x = -9$
$\therefore x = 9$ mph (উত্তর)

29. A boat is moving 2 km against the current of the stream in 1 hour and moves 1 km in the direction of the current in 10 minutes. How long will it take the boat to go 5 km in stationary water?
A. 1 hr 20 minutes B. 1 hr 30 minutes C. 1 hr 15 minutes D. 30 minutes E. 45 minutes
সমাধান: Downstream = $\left(\frac{1}{10} \times 60\right) = 6$ km/hr
Upstram = 2 km/hr
Speed in still water = $\frac{1}{2}(6 + 2) = 4$ km/hr
So, the time is taken by the boat to go 5 km in stationary water = $\frac{5}{4}$ hr = $1\frac{1}{4}$ hr = 1 hr 15 minutes (Answer: C)

30. If a man goes 18 km downstream in 4 hours and return against the stream in 12 hours, then the speed of the stream in km/hr is:
A. 3 B. 1.5 C. 1.75 D. 2 E. 1
সমাধান: Let the speed of the boat in still water = x km/hr and the speed of the stream y km/hr
Then, speed downstream = $x + y = \frac{18}{4} = \frac{9}{2} \dots \dots \dots \dots \dots (i)$
and speed upstream = $x - y = \frac{18}{12} = \frac{3}{2} \dots \dots \dots \dots \dots (ii)$
Subtracting equation (ii) from equation (i), we get,
$2y = \frac{6}{2} = 3$
$\Rightarrow y = 1.5$ km/hr (Answer: B)

31. A boat traveled a total of 600 miles in two days. If the distance it traveled on the first day was 150 miles less than twice the distance it traveled on the second day, what was the distance, in miles that it traveled on the second day?
A. 250 B. 275 C. 350 D. 375 E. 450
সমাধান: Let F = number of miles traveled on first day
Let S = number of miles traveled on second day
A boat traveled a total of 600 miles in two days.
So, we can write: $F + S = 600$
The distance it traveled on the first day was 150 miles less than twice the distance it traveled on the second day.
So, we can write, F = $2S - 150$
We now have two equations:
$F + S = 600$
$F = 2S - 150$
Take the top equation and subtract S from both sides to get: F = $600 - S$
Now take, F = $2S - 150$ and replace F with $600 - S$ to get,
$600 - S = 2S - 150$
$\therefore S = 250$ (Answer)

32. A boat travelled upstream 90 miles at an average speed of $(v - 3)$ mile per hour and then travelled the same distance downstream at an average speed of $(v + 3)$ mile per hours. If the trip upstream took a half hour longer than the trip downstream, then how many hours did it take the boat travel downstream?
A. 2.5 B. 2.4 C. 2.3 D. 2.2 E. 2.1
সমাধান: We can write: travel upstream = travel downstream + $\frac{1}{2}$
time = $\frac{distance}{rate}$

So, we can replace elements in our word equation to get:

$\frac{90}{(v-3)} = \frac{90}{(v+3)} + \frac{1}{2}$

$\Rightarrow \frac{90}{(v-3)} - \frac{90}{(v+3)} = \frac{1}{2}$

$\Rightarrow \frac{90(v+3)-90(v-3)}{(v+3)(v-3)} = \frac{1}{2}$

$\Rightarrow \frac{90(v+3-v+3)}{v^2-9} = \frac{1}{2}$

$\Rightarrow \frac{540}{v^2-9} = \frac{1}{2}$

$\Rightarrow v^2 - 9 = 1080$

$\Rightarrow v^2 = 1089$

$\therefore v = 33$

So, travel time downstream = $\frac{90}{v+3} = \frac{90}{33+3} = \frac{90}{36} = \frac{5}{2} = 2.5$ hours (Answer)

33. Azam can swim 10 km upstream and 25 km downstream in 12 hours. He can also swim 15 km upstream and 50 km downstream in 20 hours. How many hours will it take for him to cover 17.5 km in downstream if the rate of current increase by 40%? [IBA MBA June 2018]

A. 4.5 hours B. 4 hours C. 3.5 hours D. 3 hours E. None of these

সমাধান: ধরি, speed of boat = x km/hr

speed of current = y km/hr

speed at upstream = $(x - y)$ km/hr

speed of downstream = $(x + y)$ km/hr

$\frac{10}{x-y} + \frac{25}{x+y} = 12$ [time = $\frac{distance}{speed}$]

let, $\frac{1}{x-y} = a, \frac{1}{x+y} = b$

$\therefore 10a + 25b = 12 \ldots\ldots\ldots\ldots\ldots (i)$

অনুরূপভাবে, $15a + 50b = 20 \ldots\ldots\ldots\ldots\ldots (ii)$

$(ii) \times 2 - (i) \times 3$

$25b = 4 \Rightarrow b = \frac{4}{25} \Rightarrow \frac{1}{x+y} = \frac{4}{25}$

$\therefore x + y = \frac{25}{4} = 6.25 \ldots\ldots\ldots\ldots\ldots (iii)$

$(i) \times 2 - (ii)$

$5a = 4 \Rightarrow a = \frac{4}{5} \Rightarrow \frac{1}{x-y} = \frac{4}{5}$

$\therefore x - y = \frac{5}{4} = 1.25 \ldots\ldots\ldots\ldots\ldots (iv)$

$(iii) + (iv)$

$2x = 7.5$

$\therefore$ x = 3.75 এবং $y = 2.5$

with 40% increase in current, $y = 2.5 \times 140\% = 3.5$

Hours take in downstream = $\frac{17.5}{x+y} = \frac{17.5}{3.75+3.5} = 2.4$ hr

উত্তর ঃ E

34. Two pipes A and B can fill a tank together in 12 hours. A can fill the tank 10 hours before B. In what time B can fill the tank? [NSI (Field Officer) 2021]

A. 20 hours B. 25 hours C. 30 hours D. 35 hours

সমাধান: ধরি B ট্যাংকটি পূর্ণ করে x ঘণ্টায়

$\therefore$ A ট্যাংকটি পূর্ণ করে $x - 10$ ঘণ্টায়

প্রশ্নমতে,

$\frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$

$\Rightarrow \frac{x-10+x}{x(x-10)} = \frac{1}{12}$

$\Rightarrow \frac{2x-10}{x(x-10)} = \frac{1}{12}$

$\Rightarrow 12(2x+10) = x(x-10)$
$\Rightarrow 24x - 120 = x^2 - 10x$
$\Rightarrow x^2 - 10x - 24x + 120 = 0$
$\Rightarrow x^2 - 34x + 120 = 0$
$\Rightarrow x^2 - 30x - 4x + 120 = 0$
$\Rightarrow x(x-30) - 4(x-30) = 0$
$\Rightarrow (x-30)(x-4) = 0$
হয় $x - 30 = 0$ অথবা, $x - 4 = 0$
$\Rightarrow x = 30$ $x = 4$ [গ্রহণযোগ্য নয় কারণ তখন A এর সময় $(-)ve$ হয়ে যায়]
$\therefore x = 30$

35. Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are open together but after 4 minutes, pipe A is turned off, What is the total time required to fill the tank? [PKB (SEO Cash) 2021]

A. 10 min 20 sec B. 11 min 45 sec C. 12 min 30 sec D. 14 min 40 sec

সমাধান: Pipe A ও B একত্রে 1 মিনিটে পূর্ণ করে = $\left(\frac{1}{15} + \frac{1}{20}\right) = \frac{6}{60}$ অংশ
Pipe A ও B একত্রে 4 মিনিটে পূর্ণ করে = $4 \times \frac{7}{60} = \frac{7}{15}$ অংশ
ট্যাংক খালি রইল = $\left(1 - \frac{7}{15}\right) = \frac{8}{15}$ অংশ
এখন, Pipe B $\frac{1}{20}$ অংশ পূর্ণ করে = 1 মিনিটে
Pipe B 1 অংশ পূর্ণ করে = (20×1) মিনিটে
Pipe B $\frac{8}{15}$ অংশ পূর্ণ করে = $\frac{20\times8}{15} = 10\frac{2}{3}$ মিনিটে
সুতরাং, পুরো ট্যাংকের পানি দ্বারা পূর্ণ হতে সময় লাগে = $\left(4 + 10\frac{2}{3}\right) = 14\frac{2}{3}$ মিনিট = 14 মিনিট 40 সেকেন্ড
উত্তর: (ঘ) 14 min 40 sec

36. Two pipes A and B can fill a tank in 6 hours and 4 hours respectively; If they are opened on alternative hours and if pipe A is opened first, in how many hours, the tank shall be full? [Janata Bank (Asst. Off.)-15]

A. 4 B. 4.5 C. 5 D. 5.5

সমাধান: পাইপ A 1 ঘণ্টায় পূর্ণ করে ট্যাংকের $\frac{1}{6}$ অংশ
এবং পাইপ B 1 ঘণ্টায় পূর্ণ করে ট্যাংকের $\frac{1}{4}$ অংশ
যেহেতু, পাইপ A এবং পাইপ B পর্যায়ক্রমে চালু হয়।
সুতরাং, এরা একত্রে $(1+1) = 2$ ঘণ্টায় ট্যাংকের $\left(\frac{1}{6} + \frac{1}{4}\right) = \frac{2+3}{12} = \frac{5}{12}$ অংশ পূর্ণ করে
পাইপ দু'টি একত্রে 2 ঘণ্টায় পূর্ণ করে = $\frac{5}{12}$ অংশ
পাইপ দু'টি একত্রে 1 ঘণ্টায় পূর্ণ করে = $\frac{5}{12\times2}$ অংশ
পাইপ দু'টি একত্রে 4 ঘণ্টায় পূর্ণ করে = $\frac{5\times4}{12\times2} = \frac{5}{6}$ অংশ
$\therefore$ খালি রইল = $1 - \frac{5}{6} = \frac{6-5}{6} = \frac{1}{6}$ অংশ; যা পাইপ A এর 1 ঘণ্টার কর্মক্ষমতা।
$\therefore$ মোট সময় লাগবে = $(4+1) = 5$ ঘণ্টা [যেহেতু পাইপ A প্রথমে চালু হয়, তাই পাইপ A এর কর্মক্ষমতা যোগ হবে]
উত্তর: (গ) 5

37. Two pipes can, fill a cistern separately in 24 minutes and 40 minutes respectively and a waste pipe can drain off 30 liters per minute. If all the three pipes open, the cistern fills in one hour. What is the capacity of cistern?

A. 300 liters B. 400 liters C. 500 liters D. 600 liters

সমাধান: ধরি, চৌবাচ্চাটিতে x লিটার পানি ধরে।
প্রথম পাইপটি 1 মিনিটে চৌবাচ্চার $\frac{1}{24}$ অংশ পূর্ণ করে
$\therefore$ প্রথম পাইপটি x মিনিটে চৌবাচ্চার $\frac{x}{24}$ অংশ পূর্ণ করে
আবার, দ্বিতীয় পাইপটি 1 মিনিটে চৌবাচ্চার $\frac{1}{40}$ অংশ পূর্ণ করে

∴ দ্বিতীয় পাইপটি x মিনিটে চৌবাচ্চার $\frac{x}{40}$ অংশ পূর্ণ করে

বলা হয়েছে, তৃতীয় পাইপটি 1 মিনিটে 30 লিটার পানি বের করে দেয়।

এবং তিনটি পাইপ একত্রে চললে 1 ঘণ্টা বা 60 মিনিটে চৌবাচ্চাটি পূর্ণ হয়।

সুতরাং, তিনটি পাইপ একত্রে 1 মিনিটে চৌবাচ্চার $\frac{x}{60}$ অংশ পূর্ণ করে।

শর্তমতে, $\frac{x}{24}+\frac{x}{40}-30=\frac{x}{60}$

$\Rightarrow \frac{x}{24}+\frac{x}{40}-\frac{x}{60}=30$

$\Rightarrow \frac{5x+3x-2x}{120}=30$

$\Rightarrow 6x=30\times 120$

$\Rightarrow x=\frac{30\times 120}{6}$

$\therefore x=600$

∴ চৌবাচ্চাটিতে 600 লিটার পানি ধরে।

উত্তরঃ (ঘ) 600 liters

38. One pipe can fill an empty cistern in 7.8 hours while another can drain the cistern when full in 19.5 hours. Both the pipes were turned on when the cistern was half-empty. How long will it take for the cistern to be full?

A. 3.9 hours B. 7.8 hours C. 6.5 hours D. 5.2 hours

সমাধানঃ প্রথম পাইপটি 1 ঘণ্টায় পূর্ণ করে চৌবাচ্চার $=\frac{1}{7.8}=\frac{1}{\frac{78}{10}}=\frac{10}{78}=\frac{5}{39}$ অংশ

অন্য পাইপটি 1 ঘণ্টায় খালি করে চৌবাচ্চার $=\frac{1}{19.5}=\frac{1}{\frac{195}{10}}=\frac{10}{195}=\frac{2}{39}$ অংশ

∴ পাইপ দুটি একত্রে চালু থাকলে চৌবাচ্চাটি পূর্ণ হয় $=\frac{5}{39}-\frac{2}{39}=\frac{5-2}{39}=\frac{3}{39}=\frac{1}{13}$ অংশ

ধরি, পাইপ দু'টি একত্রে x ঘণ্টায় অর্ধ-খালি চৌবাচ্চাটি পরিপূর্ণ করে।

শর্তমতে, x এর $\frac{1}{13}=\frac{1}{2}$

$\Rightarrow \frac{x}{13}=\frac{1}{2}$

$\Rightarrow 2x=13$

$\Rightarrow x=\frac{13}{2}$

$\Rightarrow x=6.5$

অতএব পাইপ দু'টি একসাথে চালু থাকলে 6.5 ঘণ্টায় ট্যাংকটি পূর্ণ হবে।

উত্তরঃ (গ) 6.5 hours

39. 3 pumps, working 8 hours a day, can empty a tank in 2 days. How many hours a day must 4 pumps work to empty the tank in 1 day? [Combined 5 bank (Cash Officer) 2019]

A. 9 B. 10 C. 11 D. 12

সমাধানঃ প্রতিদিন 8 ঘণ্টা কাজ করে তিনটি পাম্প 2 দিনে কাজ করে $=(8\times 2)=16$ ঘণ্টা, অর্থাৎ ট্যাংকটি খালি হতে 16 ঘণ্টা সময় লাগে।

∴ 3টি পাম্পের 1 ঘণ্টার কাজ $=\frac{1}{16}$ অংশ

1টি পাম্পের 1 ঘন্টার কাজ $=\frac{1}{16\times 3}$ অংশ

∴ 4টি পাম্পের 1 ঘণ্টার কাজ $=\frac{4}{16\times 3}=\frac{1}{12}$ অংশ

অতএব, ট্যাংকটির $\frac{1}{12}$ অংশ খালি হয় = 1 ঘণ্টায়

ট্যাংকটির সম্পূর্ণ বা 1 অংশ খালি হয় $=(1\times 12)=12$ ঘণ্টায়

উত্তরঃ D. 12

40. A tank is filled in 5 hours by three pipes A, B and C. The pipe C is twice as fast as B and B is twice as fast as A. How much time will pipe A alone take to fill tank?

A. 20 B. 25 C. 30 D. 35 E. None of these

Solution: ধরি, pipe A 'x' ঘণ্টায় ট্যাংকটি পূর্ণ করে

∴ pipe B $\frac{x}{2}$ ঘণ্টায় ট্যাংকটি পূর্ণ করে

এবং pipe C $\frac{x}{4}$ ঘণ্টায় ট্যাংকটি পূর্ণ করে

অতএব, pipe A, B এবং C 1 ঘণ্টায় যথাক্রমে ট্যাংকটির $\frac{1}{x}, \frac{1}{\frac{x}{2}}$ বা $\frac{2}{x}$ এবং $\frac{1}{\frac{x}{4}}$ বা $\frac{4}{x}$ অংশ পূর্ণ করে

এবং তিনটি pipe একত্রে 1 ঘণ্টায় ট্যাংকটির $\frac{1}{5}$ অংশ পূর্ণ করে

শর্তমতে, $\frac{1}{x}+\frac{2}{x}+\frac{4}{x}=\frac{1}{5}$

$\Rightarrow \frac{1+2+4}{x}=\frac{1}{5}$

$\Rightarrow \frac{7}{x}=\frac{1}{5}$

$\Rightarrow x=35$

$\therefore$ pipe 'A' 35 ঘণ্টায় ট্যাংকটি পূর্ণ করে।

Answer: D. 35

41. Three pipes can individually fill a water tank in 10, 12 and 15 hours. How many hours will it take for all three pipes opened together to fill half of the tank?

A. 6 hr B. 5 hr C. 4 hr D. 2 hr E. None of these

Solution: 1 ঘণ্টায় তিনটি পাইপ একত্রে পূর্ণ করে ট্যাংকটির $\left(\frac{1}{10}+\frac{1}{12}+\frac{1}{15}\right)=\frac{6+5+4}{60}=\frac{15}{60}=\frac{1}{4}$ অংশ

$\therefore \frac{1}{4}$ অংশ পূর্ণ হয় = 1 ঘণ্টায়

$\therefore$ 1 অংশ পূর্ণ হয় = 1 ঘণ্টায়

$\therefore$ 1 অংশ পূর্ণ হয় = (1×4) ঘণ্টায়

$\therefore \frac{1}{2}$ অংশ পূর্ণ হয় = $\frac{4}{2}$ বা, 2 ঘণ্টায়

Answer: D. 2 hr

42. A large fresh water reservoir is fitted with two type of feeder pipes- hot water pipes and cold water pipes. 6 cold water pipes alone can fill the reservoir in 12 hours. 3 cold water pipes and 9 hot water pipes together can fill the reservoir in 8 hours. How long will 5 hot water pipes alone take to fill the reservoir?

A. 18 hr 36 min B. 21 hr 36 min C. 20 hr 45 min D. 20 hr 36 min E. None of these

Solution: ধরি, x = ঠাণ্ডা পানির পাইপ

y = গরম পানির পাইপ

যেহেতু, 6টি ঠাণ্ডা পানির পাইপ একা চললে 12 ঘণ্টায় ট্যাংকটি পূর্ণ হয়। সুতরাং,

$\frac{6}{x}=\frac{1}{12}$

$\Rightarrow x=6\times 12$

$\Rightarrow x=72 \ldots\ldots\ldots\ldots\ldots (i)$

আবার, 3টি ঠাণ্ডা পানির পাইপ এবং 9টি গরম পানির পাইপ একত্রে চললে 8 ঘণ্টায় ট্যাংকটি পূর্ণ হয়।

$\therefore \frac{3}{x}+\frac{9}{y}=\frac{1}{8}$

$\Rightarrow \frac{3}{72}+\frac{9}{y}=\frac{1}{8}$ [(i) নং থেকে x এর মান বসিয়ে]

$\Rightarrow \frac{9}{y}=\frac{1}{8}-\frac{3}{72}$

$\Rightarrow \frac{9}{y}=\frac{9-3}{72}$

$\Rightarrow \frac{9}{y}=\frac{6}{72}$

$\Rightarrow \frac{9}{y}=\frac{1}{12}$

$\Rightarrow y=12\times 9$

$\Rightarrow y=108$

অতএব, 5টি গরম পানির পাইপ 1 ঘণ্টায় পূর্ণ করে ট্যাংকের $\frac{5}{108}$ অংশ

$\therefore \frac{5}{108}$ অংশ পূর্ণ হয় = 1 ঘণ্টায়

1 অংশ পূর্ণ হয় = $\frac{1}{\frac{5}{108}}=\frac{108}{5}=21\frac{3}{5}$ ঘণ্টায়

এখন, $21\frac{3}{5}$ ঘণ্টা = 21 ঘণ্টা 36 মিনিট

Answer: B. 21 hr 36 min

43. A pond can be filled in 15, 20, 30 and 60 hours respectively using four pipes. The first pipe was opened at 8 am, second at 9 am, third at 10 am and fourth at 11 am. When will the pond be full?

A. 12 pm B. 2 pm C. 1 pm D. 3 pm E. 2:30 pm

Solution: ধরি, প্রথম পাইপটি চালু হওয়ার x ঘণ্টা পর পুকুরটি পানি দ্বারা পূর্ণ হয়েছিল।

শর্তমতে,

$\frac{x}{15}+\frac{x-1}{20}+\frac{x-2}{30}+\frac{x-3}{60}=1$

$\Rightarrow \frac{4x+3(x-1)+2)(x-2)+x-3}{60}=1$

$\Rightarrow 10x-10=60$

$\Rightarrow 10x=60+10$

$\Rightarrow 10x=70$

$\Rightarrow x=7$

অতএব, প্রথম পাইপ চালু হওয়ার 7 ঘণ্টা পর অর্থাৎ (8 am +7 hour) = 3 pm এ পুকুরটি পূর্ণ হয়েছিল।

Answer: D. 3 pm

44. One pipe A can fill the tank in 24 minutes but another pipe B can empty the tank in 40 minutes. If the tank was filled ¾ of the capacity of tank and after 9 minutes B is closed, how much time to need fill the tank if A is running from beginning? [IBA MBA, Dec' 2021]

A. 15 min B. 6 min C. 11 min D. 25 min E. Cannot be determined

সমাধান: Tank টি পূর্ণ করতে

A এর সময় লাগে 24 mins

B এর সময় লাগে 40 mins

তাহলে, tank এর ধারণক্ষমতা হবে 24 ও 40 এর L.C.M যা হয় 120.

এখন, A 1min এ পূর্ণ করে tank এর $\frac{120}{24}=5$ unit

B 1 min এ পূর্ণ করে tank এর $\frac{120}{40}=3$ unit

9mins পরে tank পূর্ণ হয় $\frac{3}{4}\times 120=90$ unit

$\therefore$ পূর্ণ হতে বাকি থাকে (120-90)=30 unit

এখন, A এর-5 unit পূর্ণ করতে সময় লাগে 1 min

$\therefore$ 1 unit পূর্ণ করতে সময় লাগে $\frac{1}{5}$ min

$\therefore$ 30 unit পূর্ণ করতে সময় লাগে $\frac{30}{5}$ min=6min

অতএব, A এর সর্বমোট সময় লাগে 9+6=15min

উত্তর: 15min

45. 3 pumps working 8 hour a day can empty a tank in 2 days. How many hours a day must 4 pumps work to empty the same tank in 1 day?

A. 9 B. 10 C. 11 D. 12 E. None of these

Solution: ধরি, h ঘণ্টায় ট্যাংকটি খালি হবে।

আমরা জানি, $M_1\times T_1\times H_1=M_2\times T_2\times H_2$

$\Rightarrow 3\times 8\times 2=4\times 1\times h$ [এখানে, M = পাম্পের সংখ্যা এবং T = দিনের সংখ্যা]

$\Rightarrow 48=4h$

$\Rightarrow h=\frac{48}{4}$

$\therefore h=12$

Answer: D. 12

46. Pump can fill a tank with water in 2 hours. Because of a leak, it took $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water of the tank in:

A. 14 hrs B. 4 hrs C. 7 hrs D. 8 hrs E. None of these

Solution: পাম্পটি 1 ঘণ্টায় ট্যাংকের $\frac{1}{2}$ অংশ পূর্ণ করে।

আবার, Leakage এর কারণে ট্যাংকটি পূর্ণ হতে সময় লাগে $2\frac{1}{3}$ ঘণ্টা বা $\frac{7}{3}$ ঘণ্টা।

$\therefore$ Leakage সহ পাম্পটি 1 ঘণ্টায় ট্যাংকটির $\frac{1}{\frac{7}{3}}$ বা, $\frac{3}{7}$ অংশ পূর্ণ করে।

$\therefore$ ট্যাংকটিতে 1 ঘণ্টায় Leakage হয় $= \left(\frac{1}{2} - \frac{3}{7}\right) = \frac{7-6}{14} = \frac{1}{14}$

$\therefore$ Leakage এর কারণে ট্যাংকটির $\frac{1}{14}$ অংশ খালি হয় $= 1$ ঘণ্টায়

Leakage এর কারণে ট্যাংকটির 1 অংশ খালি হয় $= (1 \times 14) = 14$ ঘণ্টায়।

Answer: A. 14 hrs

47. A water tank with 84 gallons capacity is filled by pipe A and emptied by pipe B. If the rate of water flow through pipe A is 2 gallons per hour, how many gallons per hour should flow through pipe B so that when both pipes are open, the initially empty tank should be full in capacity in 96 hours?

A. $\frac{3}{8}$ B. $\frac{4}{3}$ C. $\frac{9}{8}$ D. $\frac{8}{9}$ E. $\frac{2}{3}$

Solution: ধরি, pipe B দিয়ে 1 ঘণ্টায় x গ্যালন পানি বের হয়

$\therefore$ pipe B দিয়ে 96 ঘণ্টায় 96x গ্যালন পানি বের হয়

আবার, pipe A 1 ঘণ্টায় ট্যাংক পূর্ণ করে $= 2$ গ্যালন

$\therefore$ pipe A 96 ঘণ্টায় ট্যাংক পূর্ণ করে $= (2 \times 96) = 192$ গ্যালন

শর্তমতে, $192 - 96x = 84$

$\Rightarrow -96x = 84 - 192$

$\Rightarrow -96x = -108$

$\Rightarrow x = \frac{-108}{-96}$

$\therefore x = \frac{9}{8}$

Answer: C. $\frac{9}{8}$

48. Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both pipes are opened. In what time the cistern will be filled in just after half an hour, if the B is turned off after?

A. 5 mins B. 9 mins C. 10 mins D. 15 mins E. None of these

Solution: pipe A 1 মিনিটে পূর্ণ করে চৌবাচ্চার $\frac{1}{\frac{75}{2}}$ বা $\frac{2}{75}$ অংশ

pipe B 1 মিনিটে পূর্ণ করে চৌবাচ্চার $\frac{1}{45}$ অংশ

ধরি, pipe B t মিনিট পরে বন্ধ হবে।

যেহেতু pipe A এবং pipe B একত্রে t মিনিট পর্যন্ত চলে এবং বাকি সময় $(30-t)$ pipe A একা চলে চৌবাচ্চাটি পূর্ণ করে।

$\therefore t(A+B) + (30-t)A = 1$ [চৌবাচ্চাকে 1 একক ধরে]

$\Rightarrow t\left(\frac{2}{75} + \frac{1}{45}\right) + (30-t) \times \frac{2}{75} = 1$

$\Rightarrow t\left(\frac{6+5}{225}\right) + \frac{60-2t}{75} = 1$

$\Rightarrow \frac{11t}{225} + \frac{60-2t}{75} = 1$

$\Rightarrow \frac{11t+3(60-2t)}{225} = 1$

$\Rightarrow \frac{11t+180-6t}{225} = 1$

$\Rightarrow 5t + 180 = 225$

$\Rightarrow 5t = 225 - 180$

$\Rightarrow t = \frac{45}{5}$

$\Rightarrow t = 9$

Answer: B. 9 mins

49. Two pipes A and B can fill a tank in 12 minutes and 15 minutes respectively while a third pipe C can empty the full tank in 20 minutes. All the three pipes are opened in the beginning. However, pipe C is closed 6 minutes before the tank is filled. In what time will the tank be full?

A. 7 minutes B. 11 minutes C. 10 minutes D. 60 minutes E. 15 minutes

Solution: ধরি, ট্যাংকটি x মিনিট পূর্ণ হবে

এখানে, পাইপ A 1 মিনিটে পূর্ণ করে ট্যাংকের $\frac{1}{12}$ অংশ

$\therefore$ পাইপ A x মিনিটে পূর্ণ করে ট্যাংকের $\frac{x}{12}$ অংশ

আবার, পাইপ B 1 মিনিটে পূর্ণ করে ট্যাংকের $\frac{1}{15}$ অংশ

$\therefore$ পাইপ x মিনিটে পূর্ণ করে ট্যাংকের $\frac{x}{15}$ অংশ

এবং পাইপ C 1 মিনিটে খালি করে ট্যাংকের $\frac{1}{20}$ অংশ

$\therefore$ পাইপ $(x-6)$ মিনিটে খালি করে ট্যাংকের $\frac{x-6}{20}$ অংশ

শর্তমতে, $\frac{x}{12}+\frac{x}{15}-\frac{x-6}{20}=1$ [ট্যাংককে 1 একক ধরে]

$\Rightarrow \frac{5x+4x-3(x-6)}{60}=1$

$\Rightarrow \frac{9x-3x+18}{60}=1$

$\Rightarrow 6x+18=60$

$\Rightarrow 6x=60-18$

$\Rightarrow x=\frac{42}{6}$

$\Rightarrow x=7$

Answer: A. 7 minutes

50. Eight pipes are fitted to a water tank. Some of these water pipes are to fill the tank and remaining are to empty the tank. Each water pipe can fill the tank in 12 hours and each waste pipe can empty the tank in 36 hours. On opening all the pipes an empty tank is filled in 3 hours. How many waste pipes are there?

A. 2 B. 3 C. 4 D. 5 E. 6

Solution: ধরি, ট্যাংকটি পূর্ণ করার পাইপ আছে x টি

$\therefore$ ট্যাংকটি খালি করার পাইপ আছে $(8-x)$টি

এখন, পূর্ণ করার পাইপ দিয়ে 1 ঘণ্টায় ট্যাংকটির $\frac{1}{12}$ অংশ পূর্ণ হয়

$\therefore$ পূর্ণ করার পাইপ দিয়ে x ঘণ্টায় ট্যাংকটির $\frac{x}{12}$ পূর্ণ হয়

আবার, খালি করার পাইপ দিয়ে 1 ঘণ্টায় ট্যাংকটির $\frac{1}{36}$ অংশ খালি হয়

$\therefore$ খালি করার পাইপ দিয়ে $(8-x)$ ঘণ্টায় $\frac{(8-x)}{36}$ অংশ খালি হয়

এবং পূর্ণ ও খালি উভয় ধরনের পাইপ একসাথে চললে ট্যাংকটি 1 ঘণ্টায় $\frac{1}{3}$ অংশ পূর্ণ হয়

শর্তমতে $\frac{x}{12}-\frac{8-x}{36}=\frac{1}{3}$

$\Rightarrow \frac{3x-8+x}{36}=\frac{1}{3}$

$\Rightarrow \frac{4x-8}{36}=\frac{1}{3}$

$\Rightarrow 3(4x-8)=36$

$\Rightarrow 4x-8=12$

$\Rightarrow 4x=12+8$

$\Rightarrow x=\frac{20}{4}$

$\Rightarrow x=5$

অতএব, খালি করার পাইপ আছে $=(8-5)$টি = 3টি

Answer: B. 3

51. In a function, the guest can hand shake with only 1 other person. If the number of handshakes is 300 then how many guest were there in the function? [43rd BCS]

A. 24 B. 25 C. 30 D. 60

সমাধান: ধরি লোক সংখ্যা = n জন

$\therefore {}^{n}C_{2}=300$ [করমর্দনের জন্য কমপক্ষে 2 জন লোক লাগে এবং n জনের মধ্যে 2 জন নিয়ে করমর্দন সংখ্যা]

$\Rightarrow \frac{n(n-1)}{2}=300$

$\Rightarrow n^2 - n = 600$
$\Rightarrow n^2 - n - 600 = 0$
$\Rightarrow n^2 - 25n + 24n - 600 = 0$
$\Rightarrow n(n - 25) + 24(n - 25) = 0$
হয়, $n = 25$ অথবা $n = -24$ [গ্রহণযোগ্য নয়]
∴ উত্তর 25

52. From a group of 7 men and 6 women, 5 persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?
A. 564 B. 645 C. 735 D. 756
সমাধান:

	Men (7)	Women (6)
i.	3	2
ii.	4	1
iii.	5	0

যেহেতু At least 3 men কমিটিতে থাকতেই হবে,
সেহেতু, (i) নং ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^7C_3 \times {}^6C_2 = 525$
(ii) নং ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^7C_4 \times {}^6C_1 = 210$
(iii) নং ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^7C_5 \times {}^6C_0 = 21$
∴ সর্বমোট বাছাই সংখ্যা = $525 + 210 + 21 = 756$ (উত্তর: D. 756)

53. A select group of 4 is to be formed from 8 men and 6 women in such a way that the group must have at least 1 woman. In how many different ways can it be done?
A. 364 B. 728 C. 931 D. 1001
সমাধান:

	Men (8)	Women (6)
i.	0	4
ii.	1	3
iii.	2	2
iv.	3	1

(i) নং এর ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^8C_0 \times {}^6C_4 = 15$
(ii) নং এর ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^8C_1 \times {}^6C_3 = 160$
(iii) নং এর ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^8C_2 \times {}^6C_2 = 420$
(iv) নং এর ক্ষেত্রে, মোট বাছাই সংখ্যা = ${}^8C_3 \times {}^6C_1 = 336$
∴ মোট বাছাই সংখ্যা = $15 + 160 + 420 + 336 = 931$ (উত্তর: C. 931)

54. 8 directors, the vice chairman and the chairman are to be seated around a circular table. If the chairman should sit between a director and the vice chairman, in how many ways can they be seated?
A. 9! B. 7!*2 C. 9!*2 D. 8!*2 E. 8!
সমাধান: চেয়ারম্যান এবং ভাইস চেয়ারম্যানকে পাশাপাশি বসিয়ে মোট বিন্যাস = $(3 - 1)! = 2!$ $[(n - 1)!$ বৃত্তাকার টেবিল]
তাহলে, বাকি 8 জন ডিরেক্টরকে বসানো যাবে = 8! উপায়ে
∴ মোট বিন্যাস = $2! \times 8! = 8! \times 2$ (উত্তর: D. 8!*2)

55. The jones family is going on vacation. The members of the family will sit on one side of the aisle and three seats on the other. The two oldest children will sit together on one side that has only two seats. The parents and the youngest child will sit together on the other side. How many different seating arrangements are possible?
A. 5 B. 10 C. 12 D. 60 E. 120
সমাধান: 2 oldest children যেহেতু পাশাপাশি বসবে, সেহেতু তাদের ক্ষেত্রে বিন্যাস = 2! [নিজেদের মধ্যে 2! ভাবে বিন্যস্ত হতে পারে]
আবার, Parent's & youngest child যেহেতু একসাথে বসবে, তাদের ক্ষেত্রে বিন্যাস সংখ্যা = 3!
∴ মোট বিন্যাস = $2! \times 3! = 2 \times 6 = 12$ (উত্তর: C. 12)

56. The retirement plan for a company allows employees to invest in 10 different mutual funds. Six of the 10 funds grew by at least 10% over the last year. If Shahadat randomly selected 4 of the 10 funds, what is the probability that 3 of Shahadat's 4 funds grew by least 10% over last year?

A. ${}^6C_3 \div {}^{10}C_4$ B. $({}^6C_3 \times {}^4C_1) \div {}^{10}C_4$ C. $({}^6C_3 \times {}^4C_1) \div {}^{10}P_4$
D. $({}^6P_3 \times {}^4P_1) \div {}^{10}C_4$ E. $({}^6P_3 \times {}^4P_1) \div {}^{10}P_4$

সমাধান: 10টি fund থেকে 4টি বাছাই করা যায় = ${}^{10}C_4$ উপায়ে

আবার, at least 10% grow করেছে এমন ফান্ড = 6

সুতরাং, at least 10% grow করেনি এমন ফান্ড = 4

তাহলে, দৈবভাবে 4টি ফান্ড নির্বাচন করলে তার মাঝে 3টি at least 10% অথবা আরো বেশি grow করেছে তার সম্ভাবনা = $\frac{{}^6C_3 \times {}^4C_1}{{}^{10}C_4}$

(উত্তর: B. $({}^6C_3 \times {}^4C_1) \div {}^{10}C_4$)

57. Abir has 4 painting in the basement. He is going to bring up 2 of them and hang 1 in his den and 1 in his bedroom. In how many ways can he choose which paintings go in each room?

A. 4 B. 6 C. 12 D. 16 E. 24

সমাধান: Out of 4 paintings 2 can be selected in ${}^4C_2$ ways or 6 ways.

Now, for each ways, there are two ways to select in which room paintings will go.

So, total ways = $6 \times 2 = 12$ (উত্তর: C. 12)

58. A committee of 6 is chosen from 8 men and 5 women, so as to contain at least 2 men and 3 women. How many different committee could be formed if two of the men refuse to serve together?

A. 3510 B. 2620 C. 1404 D. 700 E. 635

সমাধান:

	Men (8)	Women (5)
i	2	4
ii	3	3

এক্ষেত্রে, সর্বমোট সমাবেশ সংখ্যা = ${}^8C_2 \times {}^5C_4 + {}^8C_3 \times {}^5C_3 = 700$ [(i) ও (ii)]

কিন্তু, শর্তমতে 2 men refuse to serve together

2 men একসাথে serve করলে, 2টি case হতে পারে।

i. 2 men, 4 women or ii. 2 men, 1 additioned man, 3 women

i. এর ক্ষেত্রে নির্ণেয় সমাবেশ = ${}^2C_1 \times {}^5C_1 = 1 \times 5 = 5$

ii. এর ক্ষেত্রে নির্ণেয় সমাবেশ = ${}^2C_2 \times {}^6C_1 \times {}^5C_3 = 60$

∴ 2 men কে একত্রে রেখে সমাবেশ = $5 + 60 = 65$

∴ একত্রে না রেখে সমাবেশ = $700 - 65 = 635$ (উত্তর: E. 635)

59. A box contain 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?

A. 32 B. 48 C. 64 D. 96 E. None of these

সমাধান: নিম্নলিখিত উপায়ে 3টি বল pick করা যাবে। at least one black ball থাকতেই হবে যেখানে সাদা 2টি, কালো = 3টি এবং লাল = 4টি।

i. ${}^2C_1 \times {}^3C_1 \times {}^4C_1 = 24$
ii. ${}^2C_2 \times {}^3C_1 \times {}^4C_0 = 3$
iii. ${}^2C_0 \times {}^3C_1 \times {}^4C_2 = 18$
iv. ${}^2C_0 \times {}^3C_2 \times {}^4C_1 = 12$
v. ${}^2C_0 \times {}^3C_3 \times {}^4C_0 = 1$
vi. ${}^2C_1 \times {}^3C_2 \times {}^4C_0 = 6$

∴ সর্বমোট উপায় = $24 + 3 + 18 + 12 + 1 + 6 = 64$ (উত্তর: C. 64)

60. How many different ways can 2 students be seated in a row of 4 desks, so that there is always at least one empty desk between the students?

A. 2 B. 3 C. 4 D. 6 E. 12

সমাধান: 2 students can be seated in 4 seats = ${}^4P_2$ ways

2 students যদি পাশাপাশি বসে তাহলে, they can be seated in = ${}^3P_2$ ways

∴ Required ways = Total arrangement − Seated together = ${}^4P_2 - {}^3P_2 = 12 - 6 = 6$ (উত্তরঃ D. 6)

Written Math

1. Find the number of possible combination that can be made by taking 4 letters of the word '**COMBINATION**'? [38th BCS

সমাধানঃ The word 'COMBINATION' is 11 letters

Here there are 3 pairs = (O, O); (I, I); (N, N)

So the number of different letters are (C, O, B, M, I, N, A, T) = 8

1. All four letters are distinct = ${}^8C_4 = 70$

2. Two letters alike and other two are distinct;

Numbers of ways to choose two alike letters from 3 pairs is ${}^3C_1$ and number of ways to choose two distinct letters from 7 distinct letters is ${}^7C_2$.

So, total ways: ${}^3C_1 \times {}^7C_2 = 63$

3. Two letters are alike and other two letters are also alike.

Numbers of ways to choose two pairs, ${}^3C_2 = 3$

∴ Total number of ways = $70 + 63 + 3 = 136$ (Answer)

2. A club has 20 members. They are electing a principal and a vice president. How many different outcome of the election are possible? (Assume the president and the vice president must be different members of the club.) [SJIB (TSO) 2011]

সমাধানঃ A president can be elected from 20 members by ${}^{20}C_1 = 20$ ways

A vice president can be elected from 19 members by ${}^{19}C_1 = 19$ ways

Possible outcome of the election = $20 \times 19 = 380$ (Answer)

3. A committee of 5 is to be formed 6 male students and 5 female students. In how many ways can this be done so that the committee contains at least one male and one female sstudent?

[Rupali Bank (Cash Officer) 2018, Sonali Bank (SO) 2018]

সমাধানঃ In the following ways a 5 members committee from 6 male students and 5 female students can be formed.

4 female students and 1 male student = ${}^5C_4 \times {}^6C_1 = 5 \times 6 = 30$

3 female students and 2 male students = ${}^5C_3 \times {}^6C_2 = 10 \times 15 = 150$

2 female students and 3 male students = ${}^5C_2 \times {}^6C_3 = 10 \times 20 = 200$

1female student and 4 male students = ${}^5C_1 \times {}^6C_4 = 5 \times 15 = 75$

∴ Total = $30 + 150 + 200 + 75 = 455$ ways (Answer)

4. A man went downstream for 28 km in a motor boat and immediately returned. It took the man twice as long to make the return trip. If the speed of the river flow were twice as high, the trip downstream and back would take 672 minutes. Find the speed of the boat in still water and the speed of the river flow.

[Combined 2 bank (Officer) 2018 (written), Combined 4 Bank (Officer) 2019 (written)]

সমাধানঃ Let, the speed of boat in still water = x km/hr

and the speed of the stream = y km/hr

According to the first condition,

$2 \times \left(\frac{28}{x+y}\right) = \frac{28}{x-y}$ [দূরত্ব উভয়ক্ষেত্রে 28 কে ভাগ করে 2×অনুকূলে লাগা সময় = প্রতিকূলে লাগা সময়]

$\Rightarrow \frac{2}{x+y} = \frac{1}{x-y}$ [dividing by 28]

$\Rightarrow 2x - 2y = x + y$

$\Rightarrow x = 3y$

According to the second condition,

$\frac{28}{x+2y}+\frac{28}{x-2y}=\frac{672}{60}$ [স্রোতের গতি দ্বিগুণ হওয়ার পর অনুকূলে লাগা সময় + প্রতিকূল সময় = $\frac{672}{60}$ ঘণ্টা]

$\Rightarrow \frac{28}{3y+2y}+\frac{28}{3y-2y}=\frac{56}{5}$ [Since $x=3y$]

$\Rightarrow \frac{1}{5y}+\frac{1}{y}=\frac{2}{5}$

$\Rightarrow \frac{1+5}{5y}=\frac{2}{5}$

$\Rightarrow 10y=30$

$\therefore y=3$

So, the speed of the river, $y=3$ km/hr

Therefore the speed of the boat, $x=3y=3\times 3=9$ km/hr

Answer: 9 km/hr and 3 km/hr

5. A man can row 30 km upstream and 44 km downstream in 10 hrs. It is also known that he can row 40 km upstream and 55 km downstream in 13 hrs. Find the speed of the man in still water.

[Combined 4 banks (Cash Officer) 2018 (written)]

সমাধান: Let, the upstream speed is = x km/hr and downstream speed = y km/hr

Then, $\frac{30}{x}+\frac{44}{y}=10 \dots\dots\dots\dots\dots (i)$ and $\frac{40}{x}+\frac{55}{y}=13 \dots\dots\dots\dots\dots (ii)$

Multiplying (i) by 4 and (ii) by 3 then $(i)-(ii)$ we get,

$\left(\frac{120}{x}+\frac{176}{y}\right)-\left(\frac{120}{x}+\frac{165}{y}\right)=40-39$

$\Rightarrow \frac{176}{y}-\frac{165}{y}=1$

$\Rightarrow \frac{176-165}{y}=1$

$\therefore y=11$

Putting the value of y in (i) we got,

$\frac{30}{x}+\frac{44}{11}=10$

$\Rightarrow \frac{30}{x}+4=10$

$\Rightarrow \frac{30}{x}=6$

$\therefore x=5$

So, downstream speed is = 11 kmph and upstream speed is = 5 kmph

$\therefore$ Speed of the man in still water = $\frac{11+5}{2}=8$ kmph

So, speed of the man in still water is 8 km/hr (Answer)

6. Two boats on opposite banks of a river start moving towards each other. They first pass each other 1400 meters from one bank. They each continue to the opposite bank, immediately turn around and start back to the other bank. When they pass each other a second time, they are 600 meters from the other bank. We assume that each boat travels at a constant speed all along the journey. What's the width of the river?

[BSC Combined Exam (SO) 2018]

Solution: $s_1=\frac{1400}{t_1}=\frac{(w-800)}{t_2}$

$s_2=\frac{(w-1400)}{t_1}=\frac{(w+800)}{t_2}$

$s_1 + s_2 = \frac{w}{t_1} = \frac{2w}{t_2}$

So, $t_2 = 2t_1$

$\Rightarrow \frac{1400}{t_1} = \frac{(w-800)}{2t_1}$

So, $1400 = \frac{w-800}{2}$

$2800 = w - 800$

$\Rightarrow w = 3600$ (Answer)

7. A boat can take 8 hour to go 32 km against the current and take 4 hour for same distance with the current, what is the speed of the boat and current?

[IFIC Bank (PO) 2011, Modhumoti Bank (MTO) (Written) 2016, Pubali Bank (SO) (Written) 2000]

সমাধান: Let, speed of the boat is x km/hr & speed of the current is y km/hr

Speed of the boat against the current is (Upstream) = $\frac{32}{8}$ = 4 km/hr

Speed of the boat with the current is (Downstream) = $\frac{32}{4}$ = 8 km/hr

Then, $x + y = 8 \dots\dots\dots\dots\dots (i)$

and $x - y = 4 \dots\dots\dots\dots\dots (ii)$

Now, by $(i) + (ii)$ we get,

$$2x = 12$$

$\therefore x = 6$

Putting the value of x in equation (i), $6 + y = 8 \Rightarrow y = 2$

So, speed of the boat = 6 km/hr & speed of current = 2 km/hr (Answer)

Alternate Approach: Boat's speed against the current = $\frac{32}{8}$ = 4 km/hr

and boat's speed with the current = $\frac{32}{4}$ = 8 km/hr

We know that boat's speed = $\frac{Diwnstream+Upstream}{2}$

Here, boat's speed = $\frac{8+4}{2} = \frac{12}{2}$ = 6 km/hr

Again, we know that, Stream's speed = $\frac{Downstream-Upstream}{2}$

Here, Stream's speed = $\frac{8-4}{2} = \frac{4}{2}$ = 2 km/hr

So, speed of the boat = 6 km/hr and speed of current = 2 km/hr (Answer)

8. A river is flowing at a speed of 5 kilometer per hour in a particular direction. A man, who can swim at a speed of 20 km per hour in still water, starts swimming along the direction of flow of the river from point A and reaches another point B, which is at a distance of 30 km from the starting point A. On reaching point B, the man turns back and starts swimming against the direction of flow of the river and stops after reaching point A. the total time taken by the man to complete his journey is?

[Sonali Bank (Officer) 2019]

সমাধান: Given, Speed of the stream = 5 km/h

And, Speed of the man in still water = 20 km/h

Speed of the man downstream = 20 + 5 = 25 km/h

And, Speed of the man upstream = 20 − 5 = 15 km/h

$\therefore$ Total time taken to complete the journey = $\frac{30}{25} + \frac{30}{15} = 30\left(\frac{3+5}{75}\right) = \frac{30\times8}{75}$ = 3 hr 12 min (Answer)

9. Pipe A can fill a tank in 18 hours, pipe B can empty a tank in 12 hours, pipe C can fill tank in 6 hours. The tank is already filled up to $\frac{1}{6}$ of its capacity. Now pipe A is opened in the first hour alone, pipe B is opened in the second hour alone and pipe C is opened in the third hour alone. This cycle is repeated until the tank gets filled. Then in how many hours does the rest of tank gets filled?

[BSC Combined SO (8 Banks & FI's) 2018]

Solution: Here, the tank is already filled = $\frac{1}{6}$ part

So, remaining part = $1 - \frac{1}{6} = \frac{5}{6}$ part need to be filled

In 18 hours pipe A can fill = 1 part

So, In 1 hours pipe A can fill = $\frac{1}{18}$ part

Similarly, in 1 hour pipe B can empty = $\frac{1}{12}$ part and pipe C an fill = $\frac{1}{6}$ part

So, in first 3 hours 3 pipes can fill the tank separately = $\frac{1}{18} - \frac{1}{12} + \frac{1}{6} = \frac{2-3+6}{36} = \frac{5}{36}$ part

$\frac{5}{36}$ part is filled in = 3 hours

$\therefore$ 1 part is filled in = $3 \times \frac{36}{5}$ hours

$\therefore \frac{5}{6}$ part is filled in = $3 \times \frac{36}{5} \times \frac{5}{6}$ hours = 18 hrs (Answer)

10. Water flows into an empty 64 gallon drum through pipe A and flows out through pipe B. If the rate of flow through A is 2 gallons/hour, how many gallons per hour must flow out through pipe B so that drum is full in exactly 96 hours? [Dhaka Bank MTO 2004, RAKUB (Officer) 2011]

Solution: Let, the required flow rate of pipe B be x gallon per hour.

Together they fill $(2 - x)$ gallons per hour.

ATQ, $\frac{64}{2-x} = 96 \Rightarrow \frac{64}{96} = 2 - x \Rightarrow x = 2 - \frac{64}{96}$

$\therefore x = \frac{4}{3}$ gallons per hour. (Answer)

11. Two pipes can separately fill a tank in 20 hrs. and 30 hrs. respectively. Both the pipes are opened to fill the tank but when the tank is $\frac{1}{3}$ full a leak develops in the tank through which $\frac{1}{3}$ of the water supplied by both the pipes goes out. How much time wills the tank to be full.

Solution: One pipe can fill a tank 1 hour = $\frac{1}{20}$ portions. Another pipe can fill a tank in 1 hour = $\frac{1}{30}$ portion.

In 1 hour both pipe fill a tank = $\frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60} = \frac{1}{12}$ portion.

Since, Both together can fill the tank in 12 hours and $\frac{1}{3}$ is filled by both in = $\frac{1}{3} \times 12 = 4$ hours at taht time a leak empties $\frac{1}{3}$ water.

So, time taken by both to fill the whole tank+ time taken by both to fill the $\frac{1}{3}$ of tank = $12 + 4 = 16$ hours.

Alternate approach: LCM of 20 and 30 = 60

Suppose, the capacity of the tank be 60 units.

So, In 1 hour (A + B) to together fill = $\frac{60}{20} + \frac{60}{30} = 30 + 2 = 5$ hours.

Now, $\frac{1}{3}$ of 60 = 20 units filled by (A + B) together = $\frac{20}{5} = 4$ hours.

Remaining = $(60 - 20) = 40$ units will be filled at $\frac{2^{rd}}{3}$ of its usual rate due to the leak.

Hence, Require time remaining 40 units = $\frac{40}{5} \times \frac{3}{2} = 12$ units.

Hence, Total time required = $12 + 4 = 16$ hours. (Answer)

12. A cistern can be filled by a tap in 4 hours while it can be emptied by another tap in 9 hours. If both the taps are opened simultaneously then after how much time will the cistern get filled? [IBBL (TO) 2021]

সমাধান: Let, tap A fill the cistern and tap B empty the cistern.

Work done by tap A = $\frac{1}{4}$

Work done by tap B = $\frac{1}{9}$

Work done to fill the tap when both are opened = $\frac{1}{4} - \frac{1}{9} = \frac{9-4}{36} = \frac{5}{36}$

Thus, time taken to completely fill the cistern = $\frac{36}{5}$ = 7.2 hours (Answer)

13. There are three pumps P, R and T with a tank. P, R and T simultaneously can fill the tank in 5 hours. Again P and R simultaneously can fill the tank in 7 hours. Then how many hours T need to fill the tank alone? [Dhaka Bank (ATO) 2021]

সমাধান: Pumps P, R and T working together in 5 hours to fill up 1 tank.

Pumps P, R and T working together in one hour can complete $\frac{1}{5}$ of the job.

Pumps P & R, working simultaneously at their respective constant rats, can fill the tank in 7 hrs.

Pumps P and R working together in one can complete $\frac{1}{7}$ of the job.

So, pump T's contribution in one hour = $\frac{1}{5} - \frac{1}{7} = \frac{7-5}{35} = \frac{2}{35}$

So, in one hour, pump T can complete $\frac{2}{35}$ of the job.

It will take pump T to complete the entire job $\frac{35}{2}$ hours or $17\frac{1}{2}$ hours. (Answer)

14. One pump drains one-half of a pond in 3 hours, and then a second pump starts draining the pond. The two pumps working together finish emptying the pond in half an hour. How long would it take the second pump to drain the pond if it had to do the job alone? [NRBC Bank (Trainee Junior Officer) 2021]

সমাধান: In $3\frac{1}{2}$ hours P_1 can drain $\frac{7}{2} \times \frac{1}{6} = \frac{7}{12}$ of pond

So, P_2 can drain = $1 - \frac{7}{12} = \frac{12-7}{12} = \frac{5}{12}$ of pond in one-half hour,

or, a rate of $\frac{10}{12}$ of pond in one hour

$\frac{1\ pond}{\frac{10}{12} rate}$ = 1.2 hours' time for P_2 to drain pond alone (Answer)

15. A basin can be filled tap A in 5 hours and by B in 8 hours, each tap working on its own. When the basin is full and a draining hole is open, the water is drained in 20 hours. If initially basin empty and someone started the taps together but the drainage hole open, how long does it take for the basin to filled? [Rupali Bank (Senior Officer) 2020]

সমাধান: Tap A can fill in 1 hours = $\frac{1}{5}$ parts

Tap B can fill in 1 hours = $\frac{1}{8}$ parts

& the drainage can empty in 1 hours = $\frac{1}{20}$ parts

Tap A, Tap B and drainage can fill in 1 hour = $\frac{1}{5} + \frac{1}{8} - \frac{1}{20}$ parts

= $\frac{8+5-2}{40}$ parts

= $\frac{11}{40}$ parts

Full basin can be filled = $\frac{40}{11}$ hours = $3\frac{7}{11}$ hours (Answer)