

KERALA HIGH COURT
OFFICE ATTENDANT EXAM

Numerical Ability

Pipes and Cisterns

Key Concepts • Shortcuts • 25 Practice Questions • Answer Key with Solutions

1. Key Concepts

- **Inlet pipe:** a pipe that fills the tank (positive work). **Outlet pipe / leak:** a pipe that empties the tank (negative work).
- A pipe that fills a tank in **x hours** fills **$1/x$** of the tank in 1 hour.
- A pipe that empties a full tank in **y hours** empties **$1/y$** of the tank in 1 hour.
- **Net part filled in 1 hour** = (sum of inlet rates) - (sum of outlet rates).
- **Time to fill** = $1 / (\text{net rate in 1 hour})$.
- If the net rate is negative, the tank empties instead of filling.

2. Important Formulas

- Two inlet pipes (x and y hours): together they fill in **$xy / (x + y)$** hours.
- One inlet (x hours) and one outlet (y hours), where y is more than x: tank fills in **$xy / (y - x)$** hours.
- Inlet fills in x hours; with a leak it takes (x + t) hours. Leak empties the full tank in **$x(x + t) / t$** hours.
- If rates are in litres per minute: **Capacity = Rate x Time**.
- Part filled in t hours = $t \times (\text{net rate})$. Remaining part = $1 - \text{part filled}$.

3. Useful Shortcuts

- **LCM method:** take the capacity as the LCM of the times (in litres). Each pipe's rate = Capacity / its time.
- **Closing a pipe midway:** compute work done till then, then find the time needed by the remaining pipes for the left-over part.
- A pipe that is k times as fast as another takes $1/k$ of the time.

Quick tip: Count inlets as + and outlets as -, then add all the 1-hour fractions.

4. Practice Questions (25)

Q1. A pipe can fill a tank in 8 hours. The part of the tank filled in 3 hours is:

- (a) $\frac{1}{4}$
- (b) $\frac{3}{8}$
- (c) $\frac{1}{2}$
- (d) $\frac{5}{8}$

Q2. Pipes A and B can fill a tank in 10 hours and 15 hours respectively. Together they fill it in:

- (a) 5 h
- (b) 8 h
- (c) 6 h
- (d) 10 h

Q3. Pipe A fills a tank in 12 hours and pipe B in 6 hours. Together they will fill it in:

- (a) 4 h
- (b) 3 h
- (c) 6 h
- (d) 8 h

Q4. An inlet pipe fills a tank in 6 hours and an outlet pipe empties it in 12 hours. If both are opened together, the tank fills in:

- (a) 6 h
- (b) 8 h
- (c) 10 h
- (d) 12 h

Q5. An inlet pipe fills a tank in 12 hours and an outlet pipe empties it in 18 hours. If both are opened, the tank is filled in:

- (a) 24 h
- (b) 36 h
- (c) 48 h
- (d) 30 h

Q6. Pipes A and B fill a tank in 10 and 15 hours and pipe C empties it in 30 hours. If all three are opened, the tank is filled in:

- (a) 6 h
- (b) 7 h
- (c) 7.5 h
- (d) 9 h

Q7. A pipe fills a tank in 4 hours. Due to a leak it takes 5 hours. The leak alone will empty the full tank in:

- (a) 20 h
- (b) 9 h
- (c) 25 h
- (d) 15 h

Q8. A pipe fills a tank in 6 hours. Due to a leak it takes 2 hours more. The leak alone will empty the full tank in:

- (a) 12 h
- (b) 18 h
- (c) 16 h
- (d) 24 h

Q9. Pipes A and B fill a tank in 20 and 30 minutes. Both are opened and after 6 minutes A is closed. B alone will take further:

- (a) 10 min
- (b) 15 min
- (c) 20 min
- (d) 25 min

Q10. A pipe fills a tank of 600 litres at 20 litres per minute. The time taken is:

- (a) 20 min
- (b) 25 min
- (c) 30 min
- (d) 40 min

Q11. A tank of 1200 litres has an inlet filling 40 L/min and an outlet emptying 20 L/min. With both open, the tank fills in:

- (a) 60 min
- (b) 40 min
- (c) 50 min
- (d) 90 min

Q12. Pipes A and B fill a tank in 20 hours and 30 hours and pipe C empties it in 60 hours. With all three open, the tank fills in:

- (a) 10 h
- (b) 12 h
- (c) 20 h
- (d) 15 h

Q13. Pipes A and B fill a tank in 8 and 12 hours. Both are opened, and after 4 hours B is closed. A takes further:

- (a) 1 h
- (b) 1 h 20 min
- (c) 1 h 30 min
- (d) 2 h

Q14. A tap fills a tank in 4 hours and a drain empties it in 12 hours. If both are open on an empty tank, it fills in:

- (a) 4 h
- (b) 5 h
- (c) 6 h
- (d) 8 h

Q15. A pipe fills a tank in 3 hours. Due to a leak it takes 3.5 hours. The leak alone will empty the full tank in:

- (a) 21 h
- (b) 18 h
- (c) 24 h
- (d) 28 h

Q16. A pipe fills 15 L/min and a leak drains 5 L/min. With both, the tank is filled in 60 minutes. The capacity of the tank is:

- (a) 400 L
- (b) 500 L
- (c) 550 L
- (d) 600 L

Q17. Three pipes A, B and C fill a tank in 20, 30 and 60 hours respectively. If all are opened together, the tank fills in:

- (a) 8 h
- (b) 10 h
- (c) 12 h
- (d) 15 h

Q18. Pipe A fills a tank in 30 minutes and pipe B empties it in 40 minutes. Both are opened, and after 10 minutes B is closed. A takes further:

- (a) 25 min
- (b) 26 min
- (c) 27.5 min
- (d) 30 min

Q19. One pipe is 3 times as fast as another. Together they fill a tank in 12 hours. The faster pipe alone takes:

- (a) 16 h
- (b) 12 h
- (c) 18 h
- (d) 24 h

Q20. Pipes A and B fill a tank in 15 and 10 minutes. Both are opened and B is closed after 3 minutes. A takes further:

- (a) 5 min
- (b) 6 min
- (c) 8 min
- (d) 7.5 min

Q21. A full tank of 500 litres has an outlet that empties 25 litres per minute. The time to empty it is:

- (a) 15 min
- (b) 20 min
- (c) 25 min
- (d) 30 min

Q22. A pipe fills a tank in 5 hours and another empties it in 20 hours. Both are opened together. The tank fills in:

- (a) 5 h
- (b) 6 h
- (c) 6 h 40 min
- (d) 7 h

Q23. An inlet fills a tank in 15 minutes and an outlet empties it in 20 minutes. Both are opened for 10 minutes, then the outlet is closed. The inlet alone takes further:

- (a) 12.5 min
- (b) 10 min
- (c) 15 min
- (d) 18 min

Q24. Pipes A and B fill a tank in 4 and 6 hours and pipe C empties it in 12 hours. With all three open, the tank fills in:

- (a) 2 h
- (b) 2.5 h
- (c) 4 h
- (d) 3 h

Q25. A tank is $\frac{1}{4}$ full. A pipe fills a full tank in 8 hours. The time to fill the remaining part is:

- (a) 4 h
- (b) 6 h
- (c) 8 h
- (d) 5 h

5. Answer Key

1-b | 2-c | 3-a | 4-d | 5-b | 6-c | 7-a | 8-d | 9-b | 10-c | 11-a | 12-d | 13-b | 14-c | 15-a | 16-d | 17-b | 18-c | 19-a | 20-d | 21-b | 22-c | 23-a | 24-d | 25-b

6. Solutions

- Q1. (b) $\frac{3}{8}$** - In 1 hour it fills $\frac{1}{8}$. In 3 hours: $\frac{3}{8}$.
- Q2. (c) 6 h** - Together = $(10 \times 15)/(10 + 15) = 150/25 = 6$ hours.
- Q3. (a) 4 h** - $\frac{1}{12} + \frac{1}{6} = \frac{3}{12} = \frac{1}{4}$. So 4 hours.
- Q4. (d) 12 h** - Net = $\frac{1}{6} - \frac{1}{12} = \frac{1}{12}$. So 12 hours.
- Q5. (b) 36 h** - Net = $\frac{1}{12} - \frac{1}{18} = (3 - 2)/36 = \frac{1}{36}$. So 36 hours.
- Q6. (c) 7.5 h** - $\frac{1}{10} + \frac{1}{15} - \frac{1}{30} = (3 + 2 - 1)/30 = \frac{4}{30} = \frac{2}{15}$. Time = $15/2 = 7.5$ hours.
- Q7. (a) 20 h** - Leak rate = $\frac{1}{4} - \frac{1}{5} = \frac{1}{20}$. So 20 hours.
- Q8. (d) 24 h** - Leak rate = $\frac{1}{6} - \frac{1}{8} = \frac{1}{24}$. So 24 hours.
- Q9. (b) 15 min** - In 6 minutes: $6 \times (\frac{1}{20} + \frac{1}{30}) = \frac{1}{2}$. Remaining $\frac{1}{2}$ by B takes 15 minutes.
- Q10. (c) 30 min** - Time = $600/20 = 30$ minutes.
- Q11. (a) 60 min** - Net = 20 L/min. Time = $1200/20 = 60$ minutes.
- Q12. (d) 15 h** - $\frac{1}{20} + \frac{1}{30} - \frac{1}{60} = (3 + 2 - 1)/60 = \frac{4}{60} = \frac{1}{15}$. So 15 hours.
- Q13. (b) 1 h 20 min** - In 4 hours: $4 \times (\frac{1}{8} + \frac{1}{12}) = \frac{5}{6}$. Remaining $\frac{1}{6}$ by A takes $(\frac{1}{6})/(\frac{1}{8}) = \frac{4}{3} \text{ h} = 1 \text{ h } 20 \text{ min}$.
- Q14. (c) 6 h** - Net = $\frac{1}{4} - \frac{1}{12} = \frac{1}{6}$. So 6 hours.
- Q15. (a) 21 h** - Leak rate = $\frac{1}{3} - \frac{2}{7} = \frac{1}{21}$. So 21 hours.
- Q16. (d) 600 L** - Net = 10 L/min. Capacity = $10 \times 60 = 600 \text{ L}$.
- Q17. (b) 10 h** - $\frac{1}{20} + \frac{1}{30} + \frac{1}{60} = (3 + 2 + 1)/60 = \frac{1}{10}$. So 10 hours.
- Q18. (c) 27.5 min** - Net rate = $\frac{1}{120}$ per minute. In 10 min: $\frac{1}{12}$ filled. Remaining $\frac{11}{12}$ by A: $(\frac{11}{12}) \times 30 = 27.5 \text{ min}$.
- Q19. (a) 16 h** - Let slow = x , fast = $3x$. $4x = \frac{1}{12}$, so $x = \frac{1}{48}$. Fast pipe = $\frac{1}{16}$, so 16 hours.
- Q20. (d) 7.5 min** - In 3 min: $3 \times (\frac{1}{15} + \frac{1}{10}) = \frac{1}{2}$. Remaining $\frac{1}{2}$ by A takes 7.5 minutes.
- Q21. (b) 20 min** - Time = $500/25 = 20$ minutes.
- Q22. (c) 6 h 40 min** - Net = $\frac{1}{5} - \frac{1}{20} = \frac{3}{20}$. Time = $20/3 \text{ h} = 6 \text{ h } 40 \text{ min}$.
- Q23. (a) 12.5 min** - Net = $\frac{1}{60}$ per min. In 10 min: $\frac{1}{6}$ filled. Remaining $\frac{5}{6}$ by inlet: $(\frac{5}{6}) \times 15 = 12.5 \text{ min}$.
- Q24. (d) 3 h** - $\frac{1}{4} + \frac{1}{6} - \frac{1}{12} = (3 + 2 - 1)/12 = \frac{4}{12} = \frac{1}{3}$. So 3 hours.
- Q25. (b) 6 h** - Remaining = $\frac{3}{4}$. Time = $\frac{3}{4} \times 8 = 6$ hours.