LF LearnFrenzy

QUANTITATIVE APTITUDE · FREE STUDY MATERIAL

Races and Games

Formulas & Shortcut Tricks

Every important formula, shortcut and exam trick for Races and Games in one place – with solved examples, common mistakes and a one-page revision sheet.

WHAT'S INSIDE

1. Topic introduction
2. Important formulas
3. Shortcut tricks & smart techniques
4. Solved examples
5. Important exam tips
6. Quick revision sheet
7. A message from LearnFrenzy

USEFUL FOR

- SSC CGL / CHSL
- Bank PO & Clerk (IBPS, SBI, RBI)
- Railways (RRB NTPC)
- Campus placements (TCS, Infosys, Wipro, Accenture)
- UPSC CSAT & state PSC exams

Practise Races and Games free on LearnFrenzy – questions with instant explanations →

© 2026 LearnFrenzy · Free for personal study

1 Topic introduction

What it is, why it matters and how it is asked

Races and Games applies speed, time and distance to contests. “A beats B by 50 m” means that when A crosses the finishing line, B is still 50 m behind. “A beats B by 10 s” means B finishes 10 seconds after A. A “start” lets the slower runner begin ahead.

The whole topic rests on one idea: in the same time, distances are in the ratio of speeds. Exams add chains of results, games of points and circular tracks where runners meet again and again.

Why it matters in exams

- SSC and placement papers ask one question regularly.
- It reuses speed ratios – easy once the wording is clear.
- Circular-track questions also appear in Time and Distance.

Where it is used

- Athletics, cycling and swimming events.
- Handicaps in sport.
- Laps and meeting points on tracks.

Common question patterns

Beats by metres
Speed ratio L : (L − x).

Beats by seconds
Loser’s speed = metres ÷ seconds.

Giving a start
Head start in metres or seconds.

Dead heat
Both finish together.

Chains
A beats B, B beats C → A beats C.

Games of points
“A can give B 20 points in 100”.

Circular tracks
First meeting, same or opposite way.

Meeting points
At the start; distinct meeting points.

© 2026 LearnFrenzy · Free for personal study

2 Important formulas

Cards marked MOST USED are the ones to revise first

Race basics

Beats by x metres

MOST USED

In a race of L m: speed of A : speed of B = L : (L – x)

While A runs L, B runs only L – x.

EXAMPLE 1 km race, A beats B by 50 m → 1,000 : 950 = **20 : 19**.

Beats by x m or t seconds

MOST USED

B covers x m in t s → speed of B = x/t; B's time = L/(x/t); A's time = B's time – t

The two margins describe the same gap.

EXAMPLE 400 m race, A beats B by 40 m or 8 s → B at 5 m/s takes 80 s → A takes **72 s**.

Giving a start

MOST USED

A gives B a start of s m → B runs L – s while A runs L

For a dead heat, (L – s) : L = speed of B : speed of A.

EXAMPLE Speeds 5 : 4, 500 m race, dead heat → B must run 400 → start **100 m**.

Chains and games of points

Chain of results

MOST USED

When A runs L, B runs L – x; when B runs L, C runs L – y → when A runs L, C runs (L – x)(L – y)/L

Multiply the ratios; never subtract the margins.

EXAMPLE 100 m: A beats B by 10, B beats C by 10 → C runs 81 → A beats C by **19 m**.

Games of points

"A can give B x points in L" → when A scores L, B scores L – x

Exactly like a race of length L.

EXAMPLE A gives B 20 and C 28 in 100 → B : C = 80 : 72 → B gives C **10** in 100.

© 2026 LearnFrenzy · Free for personal study

Circular tracks

First meeting

MOST USED

Same direction: L/(a – b). Opposite directions: L/(a + b)

Same way the faster gains one full lap; opposite ways they close the lap together.

L – track length **a, b** – speeds

EXAMPLE 400 m track, 6 m/s and 4 m/s → same way **200 s**, opposite 40 s.

Meeting at the starting point

Time = LCM of the lap times

Each must complete a whole number of laps.

EXAMPLE Lap times 40 s and 60 s → LCM = **120 s**.

Distinct meeting points

Speeds a : b in lowest terms → opposite: a + b points; same direction: a – b points

Reduce the ratio first.

EXAMPLE Speeds 5 : 3 → opposite **8** points, same way 2.

© 2026 LearnFrenzy · Free for personal study

3 Shortcut tricks & smart techniques

Each trick says when to use it – that matters as much as the trick

Margin to speed ratio

MOST USED

USE WHEN A result is given in metres.

Race and margin	Speed ratio A : B
100 m, by 10 m	10 : 9
100 m, by 20 m	5 : 4
100 m, by 25 m	4 : 3
1 km, by 40 m	25 : 24
1 km, by 50 m	20 : 19

EXAMPLE 100 m race, A beats B by 25 m → **4 : 3**.

Multiply the chain

MOST USED

USE WHEN A beats B and B beats C; find A against C.

1. Write how far C runs while A runs L.
2. C's distance = L × (B's fraction) × (C's fraction).

EXAMPLE 100 m: A beats B by 20, B beats C by 25 → C runs 80 × ¾ = 60 → A beats C by **40 m**.

Metres and seconds together

USE WHEN "A beats B by x m or t s".

1. Loser's speed = x/t.
2. Loser's time = L ÷ speed; winner's time = loser's time – t.

EXAMPLE 1 km: by 50 m or 10 s → B 5 m/s, 200 s → A takes **190 s**.

© 2026 LearnFrenzy · Free for personal study

4 Solved examples

The full method on the left, the exam shortcut on the right

1 START

In a 500 m race the speeds of A and B are in the ratio 3 : 4. A has a start of 140 m. Who wins, and by how many metres?

STEP BY STEP

1. A has to run 500 − 140 = 360 m.
2. While A runs 360 m, B runs 360 × 4/3 = 480 m.
3. B is 20 m short → A wins by 20 m.

SHORTCUT

500 − 360 × 4/3 = 20.

Why it works: Compare distances covered in the same time.

Answer: A, by 20 m

2 CHAIN

In a 1 km race A beats B by 60 m, and B beats C by 50 m. By how much does A beat C?

STEP BY STEP

1. When A runs 1,000, B runs 940.
2. When B runs 1,000, C runs 950 → when B runs 940, C runs 940 × 0.95 = 893.
3. A beats C by 1,000 − 893 = 107 m.

SHORTCUT

1,000 × 0.94 × 0.95 = 893.

Why it works: Trap: 110 m – adding the margins.

Answer: 107 m

3 TIMES TO METRES

A runs 1 km in 3 min 20 s and B in 4 min 10 s. By how many metres does A beat B?

STEP BY STEP

1. A: 200 s; B: 250 s.
2. In 200 s B runs 1,000 × 200/250 = 800 m.
3. A beats B by 200 m.

SHORTCUT

B is 50 s behind at 4 m/s → 200 m.

Why it works: Distance gap = time gap × loser's speed.

Answer: 200 m

4 METRES AND SECONDS

In a 200 m race A beats B by 20 m or 4 seconds. Find A's time.

STEP BY STEP

1. B runs 20 m in 4 s → 5 m/s.
2. B's time = 200 ÷ 5 = 40 s.
3. A's time = 40 − 4 = 36 s.

SHORTCUT

L/(x/t) − t.

Why it works: Trap: 40 s – that is B's time.

Answer: 36 s

© 2026 LearnFrenzy · Free for personal study

5 DEAD HEAT

A runs 1 km in 4 minutes and B in 4 min 10 s. How many metres' start can A give B so that they finish together?

STEP BY STEP

1. A: 240 s; B: 250 s.
2. In 240 s B runs 1,000 × 240/250 = 960 m.
3. Start = 1,000 − 960 = 40 m.

SHORTCUT

10 s × B's speed 4 m/s = 40 m.

Why it works: For a dead heat the start equals the gap.

Answer: 40 m

6 LENGTH OF RACE

A is 25% faster than B. A gives B a start of 60 m. How long must the race be for a dead heat?

STEP BY STEP

1. Speeds A : B = 5 : 4.
2. L : (L − 60) = 5 : 4.
3. 4L = 5L − 300 → L = 300 m.

SHORTCUT

Start = L/5 → L = 5 × 60.

Why it works: B covers 4/5 of the race in A's time.

Answer: 300 m

7 GAMES OF POINTS

In a game of 100 points, A can give B 20 points and C 32 points. How many points can B give C?

STEP BY STEP

1. When A scores 100: B 80, C 68.
2. When B scores 100, C scores 68 × 100/80 = 85.
3. B can give C 15 points.

SHORTCUT

100 − 100 × 68/80.

Why it works: Trap: 12 – subtracting 32 – 20.

Answer: 15

8 SAME DIRECTION

Two runners start together on a 600 m circular track at 8 m/s and 5 m/s in the same direction. When do they first meet?

STEP BY STEP

1. Relative speed = 8 − 5 = 3 m/s.
2. The faster gains one lap of 600 m.
3. Time = 600 ÷ 3 = 200 s.

SHORTCUT

L/(a − b).

Why it works: Trap: 600/13 s – adding speeds for the same direction.

Answer: 200 s

© 2026 LearnFrenzy · Free for personal study

9 OPPOSITE DIRECTIONS

On a 1.2 km circular track, two cyclists start together at 7 m/s and 5 m/s in opposite directions. When do they first meet?

STEP BY STEP

1. Relative speed = 7 + 5 = 12 m/s.
2. Together they cover 1,200 m.
3. Time = 100 s.

SHORTCUT

L/(a + b).

Why it works: Opposite directions → speeds add.

Answer: 100 s

10 AT THE START

Three runners complete a lap in 30 s, 45 s and 60 s. If they start together, when are they next together at the start?

STEP BY STEP

1. Each must finish whole laps.
2. LCM(30, 45, 60) = 180 s.
3. = 3 minutes.

SHORTCUT

LCM of the lap times.

Why it works: The track length is not needed.

Answer: 3 minutes

11 MEETING POINTS

Two runners go round a circular track in opposite directions at 15 km/h and 9 km/h. At how many distinct points do they meet?

STEP BY STEP

1. Speed ratio 15 : 9 = 5 : 3.
2. Opposite directions → 5 + 3 = 8 points.

SHORTCUT

Reduce the ratio, then add.

Why it works: Trap: 24 – not reducing 15 : 9 first.

Answer: 8

© 2026 LearnFrenzy · Free for personal study

5 Important exam tips

Patterns, traps and habits that save marks

Frequently asked question patterns

- Speed ratio from a margin in metres.
- Beats by metres or seconds.
- Start and dead heat.
- Chains of results.
- Games of points.
- Circular tracks: first meeting.
- Meeting at the start; distinct points.

Common mistakes to avoid

- Adding or subtracting margins in a chain.
- Forgetting that a start shortens the loser's run.
- Adding speeds when runners go the same way.
- Giving the loser's time when the winner's is asked.
- Not reducing the speed ratio for meeting points.
- Mixing km/h and m/s.

Points to remember

- A : B = L : (L − x).
- Loser's speed = x/t.
- Chain → multiply.
- Same way: L/(a − b).
- Opposite: L/(a + b).

Speed and accuracy

- Turn every result into "when A runs L, B runs …".
- Use fractions (0.9, 0.95) for chains.
- Use the LCM for meeting at the start.
- Draw the track for circular questions.

Preparation strategy

- Revise Speed, Time and Distance first.
- Practise on LearnFrenzy in order: Easy → Medium → Hard → Exam Pattern Mix → Data Sufficiency.
- Aim for 40–60 seconds per question.
- Keep an error log of chain and start slips.
- Read the Quick Revision Sheet (next page) the night before the exam.

© 2026 LearnFrenzy · Free for personal study

6 Quick revision sheet

Everything on one page for the night before the exam

Formulas

Beats by x m	**A : B = L : (L – x)**	Beats by t s	**B's speed = x/t**
Winner's time	**loser's time – t**	Start s m	**B runs L – s**
Dead heat	**(L – s) : L = B : A**	Chain	**C runs (L – x)(L – y)/L**
Games of points	**like a race of L**	Circle, same way	**L/(a – b)**
Circle, opposite	**L/(a + b)**	At the start	**LCM of lap times**
Distinct points	**a + b (opp.), a – b (same)**		

Shortcut tricks

- 100 m by 20 → 5 : 4.
- 1 km by 50 → 20 : 19.
- Chain → multiply fractions.
- Gap in m = gap in s × loser's speed.
- Reduce ratio for meeting points.
- km/h × 5/18 = m/s.

Must-know numbers

Fractions	`0.95 = 19/20 · 0.9 = 9/10 · 0.8 = 4/5 · 0.75 = 3/4`
Units	`1 km = 1,000 m · 18 km/h = 5 m/s · 36 km/h = 10 m/s`

© 2026 LearnFrenzy · Free for personal study

7 A message from LearnFrenzy

For everyone preparing for placements, competitive and government exams

Keep going – you are closer than you think

Success in examinations is not just about how many hours you study. It is about how effectively you understand concepts, practise questions, and improve yourself every day.

Every formula you learn, every problem you solve, and every mistake you correct brings you one step closer to your goal.

Whether you are preparing for campus placements, competitive examinations, or government jobs, remember that consistency, confidence, and smart preparation make a real difference.

Don’t just memorize formulas. Understand the concepts, practise smart techniques, and develop the confidence to solve problems independently.

Your hard work today can create the opportunities you dream of tomorrow.

— Team LearnFrenzy

Practise **Races and Games** free on LearnFrenzy – questions with instant explanations →

© 2026 LearnFrenzy · Free for personal study