LF LearnFrenzy

QUANTITATIVE APTITUDE · FREE STUDY MATERIAL

Clock

Formulas & Shortcut Tricks

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

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USEFUL FOR

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

Practise Clock free on LearnFrenzy – questions with instant explanations →

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1 Topic introduction

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

A clock face is a circle of 360° divided into 12 hour spaces of 30° each, or 60 minute spaces of 6° each. The minute hand turns 6° every minute and the hour hand 0.5° every minute, so the minute hand gains 5.5° on the hour hand every minute. That single fact solves almost every clock question.

Exams ask for the angle between the hands at a given time, the times when the hands meet, are opposite or at right angles, how often that happens in a day, mirror images of clocks, and clocks that run fast or slow.

Why it matters in exams

- SSC and railway papers ask clock questions in the reasoning and arithmetic sections.
- Placement tests use angle, coincidence and faulty-clock questions.
- They are quick marks once the relative-speed idea is clear.

Where it is used

- Reading analogue clocks and their reflections.
- Synchronising faulty clocks and watches.
- A neat application of relative speed in circular motion.

Common question patterns

Angle at a time
Angle between the hands at, say, 3:40.

Hands together
When do the hands coincide between H and H + 1?

Opposite / right angle
Times when the hands are 180° or 90° apart.

Counts in a day
How many times the hands coincide or are at right angles.

Mirror images
What time does the mirror show?

Faulty clocks
Hands meet every 64 minutes – gain or loss per day.

Fast and slow clocks
When will two clocks show the same time again?

Striking and hand length
Strikes, intervals and distance moved by a hand's tip.

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2 Important formulas

Cards marked MOST USED are the ones to revise first

Speeds of the hands

Hand speeds

MOST USED

Minute hand 6° per minute; hour hand 0.5° per minute; relative speed 5.5° per minute

In 60 minutes the minute hand gains 55 minute-spaces (330°) on the hour hand.

EXAMPLE In 20 minutes the minute hand gains 20 × 5.5 = **110°** on the hour hand.

Angle between the hands

MOST USED

$\theta = |30H - 5.5M|$; if $\theta > 180°$, the smaller angle is $360° - \theta$

H is the hour (1–12) and M the minutes past it.

H – hour **M** – minutes

EXAMPLE 3:40 → |90 − 220| = **130°**.

When do the hands make a given angle?

Time for an angle θ between H and H + 1

MOST USED

$M = (2/11) \times (30H \pm \theta)$ minutes past H

Use − for the time before the minute hand passes the hour hand, + for after; keep answers between 0 and 60.

EXAMPLE Hands together (θ = 0) between 4 and 5 → M = 2/11 × 120 = **21 9/11 min** past 4.

Hands opposite (θ = 180°)

$M = (2/11) \times (30H - 180)$ for $H \geq 7$; $(2/11) \times (30H + 180)$ for $H \leq 5$

Between 5 and 7 the opposite position falls exactly at 6:00.

EXAMPLE Opposite between 7 and 8 → 2/11 × 30 = **5 5/11 min** past 7.

Hands coincide every 65 5/11 minutes

Interval between meetings = $720/11$ minutes

The minute hand needs 360° ÷ 5.5° = 720/11 minutes to lap the hour hand.

EXAMPLE A correct clock's hands meet every **65 5/11 minutes**.

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Counts in 12 and 24 hours

Position of the hands	In 12 hours	In 24 hours
Together (coincide)	11	22
Opposite (180°)	11	22
Right angle (90°)	22	44
In a straight line (0° or 180°)	22	44
Any other angle θ (0° < θ < 180°)	22	44

The hands coincide only 11 times (not 12) in 12 hours because the meeting between 11 and 1 happens at 12:00 once.

Mirrors and faulty clocks

Mirror image

MOST USED

Time shown in a mirror = 11:60 − actual time (use 23:60 for 24-hour reading)

The mirror reflects left and right, so the two times add up to 12:00.

EXAMPLE 4:25 in a mirror → 11:60 − 4:25 = **7:35**.

Clock whose hands meet every m minutes

MOST USED

Gain per day = (720/11 − m)/m × 1,440 minutes (a loss if negative)

Meeting sooner than 65 5/11 minutes means the clock is running fast.

EXAMPLE Hands meet every 64 min → gain = (720/11 − 64)/64 × 1,440 = **32 8/11 min** a day.

Two clocks showing the same time again

Days needed = 720 min/(total gain + loss per day)

Their readings must drift apart by a full 12 hours.

EXAMPLE One gains 2 min a day, the other loses 3 → 720 ÷ 5 = **144 days**.

Striking clocks and hand length

n strikes have (n − 1) intervals; tip of a hand of length r moves 2πr per full turn

Time is spent between strikes, not on the strikes.

EXAMPLE 6 strikes in 5 s (1 s apart) → 12 strikes take **11 s**.

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3 Shortcut tricks & smart techniques

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

Angle in one line

MOST USED

USE WHEN Angle between the hands at a given time.

1. Compute |30H – 5.5M|.
2. If the result is more than 180°, subtract it from 360°.

EXAMPLE 10:15 → |300 – 82.5| = 217.5° → 360 – 217.5 = **142.5°**.

Coincidence time: 60H/11

MOST USED

USE WHEN "When are the hands together between H and H + 1?"

1. M = 60H/11 = 5H × 12/11 minutes past H.

EXAMPLE Between 2 and 3 → 120/11 = **10 10/11 min** past 2.

Mirror-time table

USE WHEN Mirror and reflection questions.

Actual	Mirror	Actual	Mirror
3:15	8:45	8:35	3:25
4:25	7:35	10:10	1:50
6:00	6:00	12:20	11:40

EXAMPLE 8:35 → 11:60 – 8:35 = **3:25**.

Right angle times

USE WHEN "When are the hands at right angles between H and H + 1?"

1. M = (2/11)(30H – 90) and M = (2/11)(30H + 90).
2. Keep the values between 0 and 60.

EXAMPLE Between 3 and 4 → 0 (3:00) and 2/11 × 180 = **32 8/11 min** past 3.

Gain or loss of two clocks combined

USE WHEN One clock gains and another loses; when will they agree again?

1. Add the gain and the loss per day (they drift apart that fast).
2. Divide 720 minutes by it.

EXAMPLE A gains 2 min a day, B loses 4 → 720 ÷ 6 = **120 days**.

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4 Solved examples

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

1 ANGLE

What is the angle between the hands of a clock at 7:20?

STEP BY STEP

1. Hour hand: $7 \times 30 + 20 \times 0.5 = 220°$.
2. Minute hand: $20 \times 6 = 120°$.
3. Angle = 100°.

SHORTCUT

$|30 \times 7 - 5.5 \times 20| = |210 - 110| = 100°$.

Why it works: The hour hand also moves during the 20 minutes.

Answer: 100°

2 REFLEX ANGLE

Find the smaller angle between the hands at 10:15.

STEP BY STEP

1. $|30 \times 10 - 5.5 \times 15| = |300 - 82.5| = 217.5°$.
2. Smaller angle = $360 - 217.5 = 142.5°$.

SHORTCUT

More than 180° → subtract from 360°.

Why it works: Two angles are formed between the hands; the question asks for the smaller.

Answer: 142.5°

3 HANDS TOGETHER

At what time between 2 and 3 o'clock are the hands of a clock together?

STEP BY STEP

1. At 2:00 the minute hand is 60° behind.
2. It gains 5.5° a minute → $60 \div 5.5 = 120/11$ minutes.
3. = 10 10/11 minutes past 2.

SHORTCUT

$60H/11 = 120/11$.

Why it works: The minute hand must make up the 10-minute-space gap.

Answer: 10 10/11 min past 2

4 OPPOSITE

At what time between 8 and 9 o'clock are the hands exactly opposite?

STEP BY STEP

1. At 8:00 the hands are 240° apart (120° the short way).
2. They are opposite when the minute hand is 180° behind the hour hand: $240 - 5.5M = 180$.
3. $M = 60/5.5 = 10\ 10/11$ minutes past 8.

SHORTCUT

$(2/11)(30 \times 8 - 180) = 120/11$.

Why it works: Opposite means a 180° gap.

Answer: 10 10/11 min past 8

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5 RIGHT ANGLE

Apart from 3:00, at what time between 3 and 4 are the hands at right angles?

STEP BY STEP

1. Right angle when |90 − 5.5M| = 90.
2. 90 − 5.5M = −90 → M = 180/5.5 = 360/11.
3. = 32 8/11 minutes past 3.

SHORTCUT

(2/11)(30H + 90) = 360/11.

Why it works: The minute hand passes the hour hand and gets 90° ahead.

Answer: 32 8/11 min past 3

6 MIRROR

A clock shows 8:35. What time does its mirror image show?

STEP BY STEP

1. Mirror time = 11:60 − 8:35.
2. = 3:25.

SHORTCUT

The two times add up to 12:00.

Why it works: A mirror swaps left and right on the dial.

Answer: 3:25

7 COUNTS

How many times in a day are the hands of a clock at right angles?

STEP BY STEP

1. In 12 hours the hands are at right angles 22 times.
2. In 24 hours: 44 times.

SHORTCUT

Twice in every hour except the 3–4 and 9–10 sharing at 3:00 and 9:00 → 22 per 12 hours.

Why it works: Each of the 11 laps of the minute hand gives two right angles.

Answer: 44

8 FAULTY CLOCK

The hands of a faulty clock coincide every 64 minutes of true time. How much does it gain or lose in a day?

STEP BY STEP

1. In a correct clock they meet every 720/11 = 65 5/11 min.
2. In 64 min the faulty clock shows 65 5/11 min → gains 16/11 min.
3. Per day: 16/11 × 1,440 ÷ 64 = 32 8/11 min gained.

SHORTCUT

(720/11 − 64)/64 × 1,440 = 360/11.

Why it works: Meeting early means the clock runs fast.

Answer: Gains 32 8/11 min

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9 STRIKING

A clock takes 14 seconds to strike 8. How long does it take to strike 12?

STEP BY STEP

1. 8 strikes → 7 intervals = 14 s → 2 s each.
2. 12 strikes → 11 intervals = 22 s.

SHORTCUT

(12 − 1) × 14 ÷ (8 − 1) = 22.

Why it works: Time is spent in the gaps between strikes.

Answer: 22 seconds

10 TWO CLOCKS

Two clocks are set right together. One gains 2 minutes a day and the other loses 4 minutes a day. After how many days will they again show the same time?

STEP BY STEP

1. They drift apart by 6 minutes a day.
2. They show the same time again when 12 hours (720 min) apart.
3. 720 ÷ 6 = 120 days.

SHORTCUT

720 ÷ (2 + 4) = 120.

Why it works: A 12-hour dial looks the same after a 12-hour difference.

Answer: 120 days

11 HAND TIP

The minute hand of a clock is 10.5 cm long. How far does its tip move in 40 minutes? (π = 22/7)

STEP BY STEP

1. Full turn (60 min) = 2 × 22/7 × 10.5 = 66 cm.
2. In 40 min: 66 × 40/60 = 44 cm.

SHORTCUT

2πr × fraction of a turn = 66 × 2/3.

Why it works: The tip moves along a circle of radius equal to the hand's length.

Answer: 44 cm

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5 Important exam tips

Patterns, traps and habits that save marks

Frequently asked question patterns

- Angle between the hands at a given time (including reflex cases).
- Times between H and H + 1 when the hands coincide, are opposite or at right angles.
- How many times in 12 or 24 hours.
- Mirror images of clocks.
- Faulty clocks whose hands meet every m minutes.
- Two clocks gaining and losing.
- Striking clocks and distance moved by a hand's tip.

Common mistakes to avoid

- Ignoring the movement of the hour hand (it moves 0.5° per minute).
- Giving the reflex angle when the smaller angle is asked.
- Saying the hands coincide 12 or 24 times (it is 11 and 22).
- Counting strikes instead of intervals.
- Using 24 hours instead of 12 hours for clocks to agree again.
- Mixing up gain and loss for faulty clocks.

Points to remember

- Minute hand 6°/min, hour hand 0.5°/min, gain 5.5°/min.
- $\theta = |30H - 5.5M|$.
- Together: $M = 60H/11$; every 65 5/11 min.
- Coincide 22, opposite 22, right angle 44 times a day.
- Mirror time = 11:60 − actual time.

Speed and accuracy

- Use $\theta = |30H - 5.5M|$ rather than drawing.
- Use $M = (2/11)(30H \pm \theta)$ for any angle question.
- Learn the count table by heart.
- Sketch the dial for mirror questions if unsure.

Preparation strategy

- Master relative speed of the hands first; everything else follows.
- Practise on LearnFrenzy in order: Easy → Medium → Hard → Exam Pattern Mix → Data Sufficiency.
- Aim for 30–40 seconds per clock question.
- Keep an error log of reflex-angle and count mistakes.
- Read the Quick Revision Sheet (next page) the night before the exam.

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6 Quick revision sheet

Everything on one page for the night before the exam

Formulas

Minute hand	**6° per min**	Hour hand	**0.5° per min**
Relative	**5.5° per min**	Angle	**|30H − 5.5M|**
Reflex → smaller	**360° − θ**	Angle θ time	**M = (2/11)(30H ± θ)**
Together	**M = 60H⁄11**	Meet every	**720/11 = 65 5/11 min**
Faulty (meet every m)	**(720/11 − m)/m × 1,440**	Mirror	**11:60 − time**
Two clocks agree	**720⁄(gain + loss) days**	Strikes	**n strikes → n − 1 gaps**
Tip distance	**2πr × fraction of turn**		

Shortcut tricks

- Hour hand moves too!
- Over 180° → use 360 − θ.
- Together 11×/12 h.
- Right angle 22×/12 h.
- Mirror: add to 12:00.
- Count gaps, not strikes.

Must-know numbers

Counts per day	together 22 · opposite 22 · right angle 44 · straight line 44
Together times	1:05 5/11 · 2:10 10/11 · 3:16 4/11 · 4:21 9/11 · 5:27 3/11 · 6:32 8/11

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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

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