CLAT Community

daily AR

SECTIONAL TEST

18

DAYS TO GO FOR

CLAT 2027

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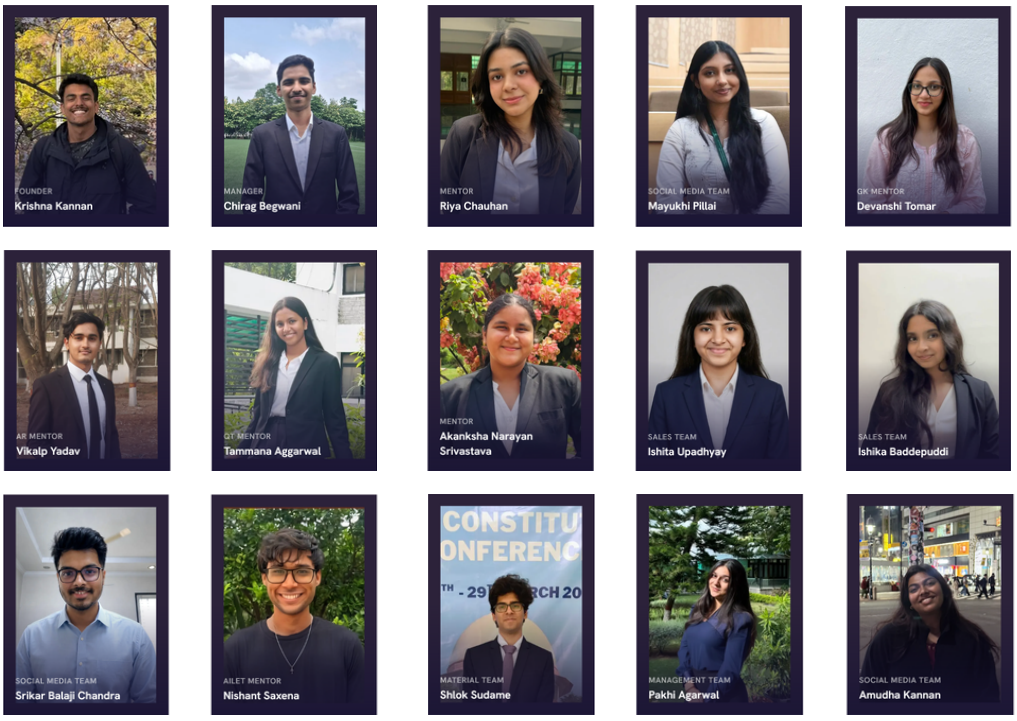








OUR MENTORS



MENTORS' NOTE

Good morning everyone,

If you're reading this, you're already doing something that thousands of CLAT aspirants never do—you've shown up today. That might sound like a small thing, but over the next few months you'll realise that success in CLAT is rarely decided by one brilliant mock or one 12-hour study session. It's decided by the hundreds of ordinary days where you choose to sit down and study even when you don't feel like it.

The entire CLAT Community team is rooting for you. Whenever you're stuck, ask doubts, discuss questions, and make use of the people around you. You don't have to prepare alone. We hope today's material helps you take one more step towards your dream.

Now stop reading this note and get to work. Your future self will thank you for the effort you put in today.

All the best.

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DAILY AR

Passage 1

The safety office of an underground coal mine stencils a three-letter mark on the helmet of every crew member. A mark always uses three different letters, and each letter stands for its place in the alphabet (A = 1, B = 2, …, Z = 26). Two letters are called partners if their places add up to 27, as A and Z, or M and N, do. Each mark is sent to exactly one of four racks: the tests below are applied strictly in the order given, and the mark goes to the rack of the first test it passes.

Rack S: reading from left to right, the places rise by the same amount at each step or fall by the same amount at each step (CFI and TPL are both examples).

Rack P: two of the three letters are partners.

Rack V: the mark contains at least one of the vowels A, E, I, O, U.

Rack N: the mark passes none of the three tests.

On Monday the night-crew register listed twelve marks: CHM, BKY, VEH, RLF, PIW, LOR, KNQ, DMW, LPX, QJC, GKP and UOI. No mark in the register contains the letter Z.

1. How many of the twelve marks in Monday's register are sent to Rack P?

(A) 3

(B) 6

(C) 4

(D) 5

2. Which of the following marks would be sent to a different rack from the other three?

(A) FKP

(B) WSO

(C) NJF

(D) DHM

3. How many different marks that begin with the letter E would be sent to Rack S?

(A) 12

(B) 10

(C) 24

(D) 32

4. Consider every possible mark (three different letters from A to Z). How many of them pass BOTH the Rack S test and the Rack P test?

(A) 8

(B) 16

(C) 17

(D) 34

5. Next month every mark in the register is re-stencilled one letter later in the alphabet (A becomes B, B becomes C, …, Y becomes Z), and the new marks are filed afresh. How many of the twelve crew members change racks?

(A) 0

(B) 4

(C) 5

(D) 7

6. How many different marks that begin with the letter A would be sent to Rack P?

(A) 72

(B) 48

(C) 96

(D) 24

7. Suppose the office changes the order of the tests to Rack V first, then Rack S, then Rack P (Rack N last). How many of the twelve register marks would change racks?

(A) 1

(B) 2

(C) 4

(D) 3

8. Consider the following statements:

(i) No Rack S mark can have its first and last letters as partners.

(ii) Every mark containing both M and N is sent to Rack P.

(iii) Exactly as many Rack S marks begin with V as begin with E.

(iv) Some mark beginning with A passes both the Rack S test and the Rack P test.

Which of the statements are true?

(A) (i), (ii) and (iii) only

(B) (i) and (iii) only

(C) (iii) only

(D) (i), (iii) and (iv) only

Passage 2

The clock tower over the old vegetable market of a district town has a single dial carrying the numerals 1 to 12. During a storm the hour hand worked loose on its spindle, and the repairman who refitted it set it at a wrong angle. Nothing else was disturbed. The minute hand still keeps perfect time, and the hour hand still turns at its proper rate, so the error in the position of the hour hand is exactly the same at every moment. Neither hand has been touched since.

On the day of the repair, at exactly 3:10 PM by the accurate clock in the municipal office, a shopkeeper noticed that the two hands of the tower lay exactly one on top of the other.

The shopkeepers read the tower the way anyone reads a clock: the minutes are taken from the minute hand, and the hour is the numeral that the hour hand has most recently reached or passed. In the questions below, every time stated is the true time, unless it is described as a shopkeeper's reading.

9. At 8:00 PM, what is the smaller angle between the two hands of the tower?

(A) 120°

(B) 85°

(C) 137.5°

(D) 155°

10. At what time after 12:00 noon do the two hands of the tower first lie one on top of the other?

(A) 12:06 4/11 PM

(B) 12:59 1/11 PM

(C) 1:05 5/11 PM

(D) 1:10 PM

11. At 4:06 PM, what time would a shopkeeper read on the tower?

(A) 2:06

(B) 3:06

(C) 4:06

(D) 3:31

12. Over the 12 hours from 12:00 noon to 12:00 midnight, for how long in total is a shopkeeper's reading exactly one hour behind the true time?

(A) 2 hours

(B) 7 hours

(C) 10 hours

(D) 12 hours

13. A shopkeeper's reading of the tower is 7:05. What is the true time?

(A) 8:05

(B) 6:05

(C) 7:40

(D) 9:05

14. At what time between 5:00 PM and 6:00 PM do the two hands of the tower point in exactly opposite directions?

(A) 5:47 3/11 PM

(B) 5:53 7/11 PM

(C) 6:06 4/11 PM

(D) There is no such time between 5:00 PM and 6:00 PM

15. How many times from 2:00 PM to 4:00 PM, both included, are the two hands of the tower exactly at right angles?

(A) 4

(B) 3

(C) 5

(D) 2

16. Consider the following statements:

(i) From 12:00 noon to 12:00 midnight, both included, the tower's hands lie on top of each other exactly 11 times.

(ii) At no exact hour (such as 1:00, 2:00, …) is the angle between the tower's hands a multiple of 30°.

(iii) At some time between 12:00 noon and 12:00 midnight a shopkeeper's reading is the correct time.

(iv) At 9:10 PM the tower's hands point in exactly opposite directions.

Which of the statements are true?

(A) (i) and (iv) only

(B) (ii) and (iv) only

(C) (i), (ii) and (iv) only

(D) (i), (ii), (iii) and (iv)

Passage 3

A bus depot has an accurate wall clock with only an hour hand and a minute hand. A camera photographs the clock at every exact minute, that is, whenever the true time is a whole number of minutes past the hour with zero seconds, and measures θ, the smaller angle between the two hands, so that $0° \le \theta \le 180°$. Each photographed minute is filed under the first of the following labels that fits it, the labels being tested strictly in this order:

Line: θ is 0° or 180°.

Quarter: θ is a multiple of 45°.

Whole: θ is a whole number of degrees.

Half: any other minute.

The depot supervisor uses the file to schedule platform announcements. In the questions below, 'a 12-hour period' means the 720 exact minutes from 12:00 noon up to and including 11:59 PM. Times are read on the 12-hour dial; 12:00 noon and 12:00 midnight look the same to the camera.

17. In a 12-hour period, how many minutes are filed as Quarter?

(A) 2

(B) 4

(C) 22

(D) 6

18. In a 12-hour period, how many minutes are filed as Whole?

(A) 352

(B) 360

(C) 358

(D) 354

19. How many minutes from 4:00 PM to 5:00 PM, both included, are filed as Whole?

(A) 28

(B) 29

(C) 30

(D) 31

20. What is the greatest number of consecutive minutes in a 12-hour period, none of which is filed as Whole?

(A) 1

(B) 3

(C) 2

(D) 5

21. Suppose the depot instead tests the labels in the order Whole, Line, Quarter, Half. In a 12-hour period, how many minutes would be filed under a different label from the original order?

(A) 0

(B) 2

(C) 6

(D) 8

22. A second depot has a clock that runs at the correct rate but is exactly 30 seconds slow. Its camera photographs it at every exact true minute and applies the same labels in the same order. In a 12-hour period, how many minutes would that camera file as Whole?

(A) 352

(B) 0

(C) 360

(D) 720

23. Buses leave the first depot only at minutes filed as Line or Quarter, between 5:00 AM and 11:00 PM (both included) on a single day. How many buses leave?

(A) 9

(B) 11

(C) 12

(D) 16

24. Consider the following statements about the first depot:

(i) At every minute filed as Quarter, the minute hand points at 12 or at 6.

(ii) Between any two consecutive Whole minutes there is exactly one Half minute.

(iii) In a 12-hour period, Half minutes outnumber Whole minutes by exactly 6.

(iv) Every exact minute at which the hands are at right angles is filed as Quarter.

Which of the statements are true?

(A) (i) and (iv) only

(B) (i), (ii) and (iv) only

(C) (i), (iii) and (iv) only

(D) (iv) only

ANSWER KEY

1. Answer: (C) 4

Explanation: Test each mark in the stated order. Rack S takes CHM (3, 8, 13), RLF (18, 12, 6), LOR (12, 15, 18), KNQ (11, 14, 17), QJC (17, 10, 3) and UOI (21, 15, 9) — note that RLF, QJC and UOI fall rather than rise, and the rule allows both. LOR (L + O = 27) and QJC (J + Q = 27) contain partners, but they have already been taken by Rack S. Of the remaining six marks, BKY (B + Y), VEH (V + E), DMW (D + W) and GKP (K + P) contain partners, so Rack P receives 4. PIW goes to Rack V and LPX to Rack N.

Why the other options are wrong:

(A) 3 — tests vowels before partners, so VEH is wrongly sent to Rack V (order of tests reversed).

(B) 6 — counts every mark containing a pair of partners, ignoring that LOR and QJC were already taken by Rack S (precedence ignored).

(D) 5 — recognises only rising steps, so QJC (a falling step) is wrongly passed on to Rack P (falling steps overlooked).

Topic / sub-skill: Classification — CL4 ordered multi-rule filing; CL2 shared property vs precedence

Difficulty: Hard — two marks carry the Rack P feature but are captured earlier, one of them by a falling step.

2. Answer: (D) DHM

Explanation: FKP = 6, 11, 16 rises by 5 each time, so it is Rack S even though K and P are partners. WSO = 23, 19, 15 falls by 4 each time, so it is Rack S even though it contains a vowel. NJF = 14, 10, 6 falls by 4, so it is Rack S. DHM = 4, 8, 13 rises by 4 and then by 5 — not a step; its sums 12, 17 and 21 contain no partners; it has no vowel. So DHM goes to Rack N while the other three go to Rack S.

Why the other options are wrong:

(A) FKP — the student sees the partners K and P and files it in Rack P before testing for a step (partner test applied first).

(B) WSO — the student sees the vowel O and files it in Rack V (vowel feature taken at face value).

(C) NJF — the student treats only rising steps as steps and sends NJF to Rack N (falling steps overlooked).

Topic / sub-skill: Classification — CL1 odd one out under an ordered scheme

Difficulty: Hard — each wrong option is a decoy carrying a later rack's surface feature.

3. Answer: (A) 12

Explanation: A Rack S mark beginning with E has places 5, 5 + g, 5 + 2g, where g is the common step and may be negative but not zero. Rising: $5 + 2g \leq 26$ gives g = 1 to 10, that is 10 marks. Falling: $5 - 2g \geq 1$ gives g = 1 or 2, that is 2 marks (ECA and EDC). Every such mark has three different letters, and a step mark can never fail Rack S, so the total is 10 + 2 = 12.

Why the other options are wrong:

(B) 10 — counts only rising steps (falling steps overlooked).

(C) 24 — doubles the 12 by also counting each mark written backwards, though the reversed mark no longer begins with E (reversal counted as a new mark).

(D) 32 — counts step marks with E in any position (first 12, middle 8, last 12) instead of only those beginning with E (position condition dropped).

Topic / sub-skill: Classification — CL3 class counting over the full set of marks

Difficulty: Very Hard — the bound on the last letter and the falling direction must both be handled.

4. Answer: (B) 16

Explanation: Write a rising step as a, a + g, a + 2g. Which two letters could be partners? First and last: a + (a + 2g) = 2(a + g), which is even and so can never be 27 — this pair is impossible. First and middle: 2a + g = 27, so g is odd; the last letter $a + 2g \leq 26$ forces $g \leq 8$, so g = 1, 3, 5, 7 (MNO, LOR, KPU, JQX): 4 marks. Middle and last: 2a + 3g = 27, so g is odd and $a \geq 1$ forces $g \leq 8$, so g = 1, 3, 5, 7 (LMN, ILO, FKP, CJQ): 4 marks. No mark satisfies both equations.

That gives 8 rising marks, and each one written backwards is a falling step with the same partners, so the total is 16.

Why the other options are wrong:

(A) 8 — counts only rising steps (falling direction overlooked).

(C) 17 — counts rising steps only and forgets to check that the last letter stays within Z, so 2a + g = 27 seems to allow g = 1, 3, …, 25 (13 values) plus 4 (alphabet bound ignored).

(D) 34 — doubles 17 for the falling direction but still ignores the alphabet bound (alphabet bound ignored).

Topic / sub-skill: Classification — CL2/CL4 overlap of two class properties; parity argument

Difficulty: Elite — a parity step kills one case and an unstated bound on the last letter trims the others.

5. Answer: (C) 5

Explanation: Moving every letter one place later keeps the gaps, so every Rack S mark stays in Rack S. Partners, however, are not kept: an old pair adding to 27 now adds to 29, and an old pair adding to 25 now adds to 27. BKY → CLZ: no partners, no vowel, Rack N (changes). VEH → WFI: no partners, vowel I, Rack V (changes). DMW → ENX: no partners, vowel E, Rack V (changes). GKP → HLQ: no partners, no vowel, Rack N (changes). PIW → QJX: J + Q = 27, so it gains partners and moves to Rack P (changes). LPX → MQY: no step, sums 30, 38, 42, no vowel, stays in Rack N. Total: 5.

Why the other options are wrong:

(A) 0 — assumes a uniform shift preserves every rack, as it does for steps (property of one rack generalised to all).

(B) 4 — notices that the four Rack P marks lose their partners but misses PIW gaining a pair (sum 25 becoming 27) (gain of a property overlooked).

(D) 7 — also counts LOR and QJC because they lose their partners, though they stay in Rack S (precedence forgotten).

Topic / sub-skill: Classification — CL4 re-classification under a transformation

Difficulty: Very Hard — the shift destroys some partner pairs and quietly creates another.

6. Answer: (A) 72

Explanation: First, no mark beginning with A can be in Rack S with partners (from 2a + g = 27 or 2a + 3g = 27 with a = 1, g would be 25 or 25/3, both impossible), and a mark beginning with A that has partners therefore goes to Rack P. Partners can arise in two ways. A with Z: Z in the second or third place, and any of the other 24 letters in the remaining place: 2 × 24 = 48 marks. Second and third letters partners of each other: of the 13 partner pairs, A–Z is excluded (A is already used), leaving 12 pairs, each in 2 orders: 24 marks. The two groups cannot overlap (that would need A twice). Total 48 + 24 = 72.

Why the other options are wrong:

(B) 48 — counts only marks in which A has its own partner Z (second route overlooked).

(C) 96 — counts each partner pair of the second route four times instead of twice (ordered pairs double-counted).

(D) 24 — counts only the second route and forgets that A's own partner Z may appear (first route overlooked).

Topic / sub-skill: Classification — CL3 counting with a precedence check

Difficulty: Very Hard — the precedence check must be done before counting, and there are two disjoint routes.

7. Answer: (D) 3

Explanation: Only a mark with a vowel can be affected, because the new first test catches exactly the marks containing a vowel. The register's marks with vowels are VEH, PIW, LOR and UOI. PIW is already in Rack V, so it does not change. LOR and UOI were in Rack S, and VEH was in Rack P; all three now move to Rack V. Every other mark has no vowel and meets the remaining tests in the same relative order, so it stays. Total: 3.

Why the other options are wrong:

(A) 1 — notices only the all-vowel mark UOI (other vowel marks overlooked).

(B) 2 — moves the Rack S marks LOR and UOI but forgets the Rack P mark VEH (one earlier rack overlooked).

(C) 4 — counts every mark containing a vowel, including PIW, which was already in Rack V (no-change case counted).

Topic / sub-skill: Classification — CL2 hierarchy of rules, precedence swap

Difficulty: Hard — must separate 'has a vowel' from 'changes rack'.

8. Answer: (B) (i) and (iii) only

Explanation: (i) True: in a step a, a + g, a + 2g, the first and last add to 2(a + g), which is even and cannot be 27. (ii) False: MNO and LMN contain M and N but are steps, so they go to Rack S. (iii) True: V = 22; rising $22 + 2g \leq 26$ gives g = 1, 2 (2 marks); falling $22 - 2g \geq 1$ gives g = 1 to 10 (10 marks); total 12, the same as for E (Q3). (iv) False: with a = 1, 2a + g = 27 needs g = 25 (last letter beyond Z) and 2a + 3g = 27 needs g = 25/3; neither works, and a falling step from A is impossible.

Why the other options are wrong:

(A) Accepts (ii), forgetting that M and N can appear inside a step mark (precedence forgotten).

(C) Rejects (i), not seeing the parity argument and assuming some step must have first and last partners (parity step missed).

(D) Accepts (iv), solving 2a + g = 27 with a = 1 without checking that the last letter stays within Z (alphabet bound ignored).

Topic / sub-skill: Classification — capstone statement verification

Difficulty: Very Hard — four independent derivations, two of them parity/bound arguments.

9. Answer: (D) 155°

Explanation: First find the error. At 3:10 the minute hand is at 60° (measured clockwise from 12) and a correct hour hand would be at 90° + 5° = 95°. The tower's hour hand lay on the minute hand, at 60°, so it is 35° behind where it should be — at every moment. At 8:00 a correct hour hand would be at 240°; the tower's is at 205°. The minute hand is at 0°. The angle is 205°, so the smaller angle is 360° − 205° = 155°.

Why the other options are wrong:

(A) 120° — the angle on an accurate clock at 8:00 (error ignored).

(B) 85° — puts the hour hand 35° ahead instead of behind, at 275°, giving 85° (direction of the error reversed).

(C) 137.5° — treats the error as 35 minutes of the hour hand's travel (17.5°) instead of 35° (minutes confused with degrees).

Topic / sub-skill: Clock — angle between hands with a displaced hour hand

Difficulty: Hard — the displacement must be derived from the 3:10 observation before any angle is found.

10. Answer: (B) 12:59 1/11 PM

Explanation: The tower's hour hand is 35° behind. t minutes after 12:00 the minute hand is at 6t and the tower's hour hand is at 0.5t − 35 (that is, 325° + 0.5t). They coincide when 6t − 0.5t = 325, so 5.5t = 325 and t = 650/11 = 59 1/11 minutes. The first such moment is 12:59 1/11 PM. (Check: 3:10 PM is 190 minutes after noon, and 650/11 + 2 × 720/11 = 2090/11 = 190. ✓)

Why the other options are wrong:

(A) 12:06 4/11 PM — solves 5.5t = 35, taking the hour hand to be ahead (direction of the error reversed).

(C) 1:05 5/11 PM — the first coincidence on an accurate clock (error ignored).

(D) 1:10 PM — assumes that because the hands met at 3:10 they meet at ten past every hour (one observation generalised).

Topic / sub-skill: Clock — coincidence time with an offset hand

Difficulty: Very Hard — the coincidence equation must carry the 325° offset; the 3:10 check confirms it.

11. Answer: (A) 2:06

Explanation: At 4:06 a correct hour hand would be at 120° + 3° = 123°. The tower's hour hand is 35° behind, at 88°. The numeral 3 is at 90°, so the hand has not yet reached 3; the last numeral it has reached or passed is 2 (at 60°). The minute hand is correct and shows 06. The reading is 2:06.

Why the other options are wrong:

(B) 3:06 — assumes a 35° lag can only ever cost one hour (the extra numeral crossed is missed).

(C) 4:06 — ignores the error because the minute hand is correct (error ignored).

(D) 3:31 — converts 35° into 35 minutes and subtracts it from the time (degrees confused with minutes).

Topic / sub-skill: Clock — reading a displaced hour hand; numeral-crossing

Difficulty: Very Hard — 35° exceeds one 30° hour-space, so early in the hour the lag spans two numerals.

12. Answer: (C) 10 hours

Explanation: At H hours M minutes, a correct hour hand is at $30H + M/2$ degrees; the tower's is at $30H + M/2 - 35 = 30(H - 1) + (M/2 - 5)$. If $M \geq 10$, then $M/2 - 5$ lies between 0° and 25°, so the hand has reached the numeral $H - 1$ but not H: the reading is one hour behind. If $M < 10$, then $M/2 - 5$ is negative and the hand has not even reached $H - 1$: the reading is two hours behind. So in every hour the reading is one hour behind for 50 minutes; over 12 hours that is 600 minutes = 10 hours.

Why the other options are wrong:

(A) 2 hours — gives the total time the reading is two hours behind (the two bands confused).

(B) 7 hours — treats the 35° lag as 35 minutes of wrong reading per hour ($35 \times 12 = 420$ minutes) (degrees confused with minutes).

(D) 12 hours — assumes the reading is always exactly one hour behind (two-hour band overlooked).

Topic / sub-skill: Clock — duration of a reading error band

Difficulty: Elite — the reading must be modelled across the hour, splitting at M = 10.

13. Answer: (D) 9:05

Explanation: The minute hand is correct, so the true minute is 05. From the previous analysis, whenever the true minute is below 10, the reading is two hours behind (the hour hand, 35° behind, has not yet reached the numeral one below the true hour). So the true hour is 7 + 2 = 9

and the true time is 9:05. Check: at 9:05 a correct hour hand is at 272.5°; the tower's is at 237.5°, which has passed 7 (210°) but not 8 (240°). ✓

Why the other options are wrong:

(A) 8:05 — assumes the reading is always exactly one hour behind (two-hour band overlooked).

(B) 6:05 — subtracts instead of adding to reverse the lag (direction of correction reversed).

(C) 7:40 — adds 35 minutes to the reading (degrees confused with minutes).

Topic / sub-skill: Clock — inverse reading of a displaced hand

Difficulty: Very Hard — inversion requires knowing which error band minute 05 falls in.

14. Answer: (B) 5:53 7/11 PM

Explanation: t minutes after 5:00, the minute hand is at 6t and the tower's hour hand at 150 + 0.5t − 35 = 115 + 0.5t. Opposite means the minute hand is 180° ahead: 6t − (115 + 0.5t) = 180, so 5.5t = 295 and t = 590/11 = 53 7/11. (The other case, 180° behind, gives a negative t.) The time is 5:53 7/11 PM.

Why the other options are wrong:

(A) 5:47 3/11 PM — subtracts the 35° a second time in the equation (5.5t = 260) (error applied twice).

(C) 6:06 4/11 PM — takes the hour hand 35° ahead (5.5t = 365), which leaves the hour (direction of the error reversed).

(D) No such time — on an accurate clock the hands are opposite at exactly 6:00, not strictly between 5 and 6 (error ignored).

Topic / sub-skill: Clock — opposition time with an offset hand

Difficulty: Hard — the familiar 'no opposition between 5 and 6' fact is a trap here.

15. Answer: (A) 4

Explanation: t minutes after 2:00 ($0 \le t \le 120$), the minute hand is at 6t and the tower's hour hand at 60 + 0.5t − 35 = 25 + 0.5t. The minute hand is ahead by 5.5t − 25, which runs from −25° to 635°. Right angles occur when this equals 90°, 270°, 450° or 630° (−90° lies below the

range): t = 20 10/11, 53 7/11, 86 4/11 and 119 1/11. All four lie in the window, so the answer is 4 (2:20 10/11, 2:53 7/11, 3:26 4/11, 3:59 1/11).

Why the other options are wrong:

(B) 3 — the count for an accurate clock (2:27 3/11, 3:00, 3:32 8/11) (error ignored).

(C) 5 — adds the endpoint 4:00 as a right angle out of habit with 3:00/9:00 (endpoint assumed).

(D) 2 — assumes one right angle per hour (rate halved).

Topic / sub-skill: Clock — counting right-angle instants in a closed window

Difficulty: Very Hard — the offset shifts a fourth instant inside the window.

16. Answer: (C) (i), (ii) and (iv) only

Explanation: (i) True: coincidences occur at t = (650 + 720k)/11 minutes after noon; k = 0 to 10 give values up to 7850/11 ≈ 713.6 < 720, and neither noon nor midnight is a coincidence (the hour hand is 35° off 12), so there are 11. (ii) True: at H:00 the minute hand is at 0° and the tower's hour hand at 30H − 35, which always leaves a remainder of 25 on division by 30. (iii) False: the reading is always one or two hours behind (Q12). (iv) True: at 9:10 the minute hand is at 60°; a correct hour hand would be at 275°, the tower's at 240°; the difference is 180°.

Why the other options are wrong:

(A) Rejects (ii), assuming the lag must line up with a numeral at some hour (non-multiple not checked).

(B) Rejects (i), believing the fixed error changes how many coincidences occur (offset confused with rate).

(D) Accepts (iii), assuming a constant lag must somewhere be absorbed (never-correct reading missed).

Topic / sub-skill: Clock — capstone statement verification

Difficulty: Very Hard — each statement needs its own derivation from the 35° offset.

17. Answer: (D) 6

Explanation: At H hours M minutes, θ is the smaller of |30H − 5.5M| and its complement to 360°. For θ to be a whole number, 5.5M must be whole, so M must be even. For θ to be a

multiple of 45°, write 30H − 5.5M = 45k; doubling, 60H − 11M = 90k. Since 60H and 90k are multiples of 30, 11M must be a multiple of 30, so M is 0 or 30. M = 0: θ = 30H must be a multiple of 45, so H = 3 or 9 (90°) — H = 0 and 6 give 0° and 180°, which are Line. M = 30: θ = |30H − 165| must be a multiple of 45, giving H = 1, 4, 7, 10 (135°, 45°, 45°, 135°). Total 2 + 4 = 6.

Why the other options are wrong:

(A) 2 — counts only the right angles at 3:00 and 9:00 (45° and 135° overlooked).

(B) 4 — counts 45° and 90° but forgets 135° (one multiple of 45 overlooked).

(C) 22 — counts every right-angle instant of the hands, most of which are not exact minutes (exact-minute condition ignored).

Topic / sub-skill: Synthesis — Clock (angle at exact minutes) + Classification (ordered labels)

Difficulty: Very Hard — the divisibility argument on 11M replaces enumeration; fusion at the label test.

18. Answer: (A) 352

Explanation: θ is a whole number exactly when M is even, which happens in 30 minutes of every hour: 12 × 30 = 360 minutes. All Line and Quarter minutes also have whole-number θ, but they were taken by the earlier labels: Line takes 2 (12:00 and 6:00) and Quarter takes 6 (Q17). Whole receives 360 − 2 − 6 = 352.

Why the other options are wrong:

(B) 360 — counts every even minute, ignoring that Line and Quarter are tested first (precedence ignored).

(C) 358 — removes the 2 Line minutes but forgets the Quarter minutes (one earlier label overlooked).

(D) 354 — removes the 6 Quarter minutes but forgets the Line minutes (one earlier label overlooked).

Topic / sub-skill: Synthesis — Clock (parity of 5.5M) + Classification (precedence)

Difficulty: Hard — needs the even-minute insight and both earlier labels.

19. Answer: (C) 30

Explanation: In 4:00 to 4:59, the even minutes 4:00, 4:02, …, 4:58 number 30, and each has whole-number θ. One of them, 4:30 (θ = 45°), is Quarter, leaving 29. None is Line. The end minute 5:00 has θ = 150°, a whole number but not a multiple of 45°, so it is Whole. Total 29 + 1 = 30.

Why the other options are wrong:

(A) 28 — treats 'from … to …, both included' as excluding both 4:00 and 5:00 (endpoints dropped).

(B) 29 — counts only the minutes of the hour 4:00–4:59 and forgets 5:00 (closing endpoint dropped).

(D) 31 — forgets that 4:30 is filed as Quarter (precedence ignored).

Topic / sub-skill: Synthesis — Clock (θ at 4:30 and 5:00) + Classification (label precedence) in a closed window

Difficulty: Hard — two boundary checks and one precedence check.

20. Answer: (B) 3

Explanation: Odd minutes always have θ ending in .5, so they are Half; even minutes are Whole unless they are Line or Quarter. Labels therefore alternate Whole/Half, except where an even minute is Line or Quarter. Around such a minute — for example 2:59 (Half), 3:00 (Quarter), 3:01 (Half) — three consecutive minutes are not Whole. No two Line or Quarter minutes are two minutes apart (they are at least 90 minutes apart), and across each hour boundary :59 is odd and :00 even, so no longer run exists. The answer is 3.

Why the other options are wrong:

(A) 1 — assumes Whole and Half simply alternate (Line/Quarter interruptions overlooked).

(C) 2 — notices the Quarter minute but counts only one neighbouring Half minute (neighbour on one side only).

(D) 5 — assumes two Quarter minutes can occur close together, e.g. thinking 4:30 and an adjacent even minute both break the pattern (spacing not checked).

Topic / sub-skill: Synthesis — Clock (parity of minute) + Classification (label runs)

Difficulty: Very Hard — structural reasoning about runs rather than counting.

21. Answer: (D) 8

Explanation: Every Line and Quarter minute has a whole-number θ (0°, 45°, 90°, 135°, 180°), so with Whole tested first all of them become Whole. Half minutes are unaffected, and the original Whole minutes stay Whole. The number of changes is 2 (Line) + 6 (Quarter) = 8.

Why the other options are wrong:

(A) 0 — assumes reordering cannot matter because each minute 'really' has one label (overlap of labels ignored).

(B) 2 — moves the Line minutes only (Quarter minutes overlooked).

(C) 6 — moves the Quarter minutes only (Line minutes overlooked).

Topic / sub-skill: Synthesis — Classification (precedence swap) + Clock (values of θ)

Difficulty: Hard — needs both special classes and the fact that their angles are whole.

22. Answer: (B) 0

Explanation: At an exact true minute this clock shows M − ½ minutes past the hour. Its angle is $|30H - 5.5(M - ½)| = |30H - 5.5M + 2.75|$. If M is even, 5.5M is whole, so the angle ends in .25 or .75; if M is odd, 5.5M ends in .5, so the angle again ends in .25 or .75. Either way it is never a whole number (and never 0°, 180° or a multiple of 45°). So no minute is Whole: the answer is 0 (every minute is Half).

Why the other options are wrong:

(A) 352 — assumes a constant lag simply relabels the minutes, so counts are unchanged (shift assumed harmless).

(C) 360 — believes half the minutes still give whole angles and ignores precedence (parity argument misapplied).

(D) 720 — answers for the Half label instead of Whole (labels swapped).

Topic / sub-skill: Synthesis — Clock (fractional minute positions) + Classification (labels)

Difficulty: Elite — a quarter-degree residue makes three labels empty.

23. Answer: (C) 12

Explanation: On the 12-hour dial, Line minutes are 12:00 and 6:00; Quarter minutes are 1:30, 3:00, 4:30, 7:30, 9:00 and 10:30 — each occurring twice a day. Between 5:00 AM and 11:00 PM: morning — 6:00 (Line), 7:30, 9:00, 10:30; noon — 12:00 (Line); afternoon and evening — 1:30, 3:00, 4:30, 6:00 (Line), 7:30, 9:00, 10:30. That is 4 + 1 + 7 = 12.

Why the other options are wrong:

(A) 9 — counts only Quarter minutes (Line overlooked).

(B) 11 — leaves out 12:00 noon, treating 12:00 as midnight only (noon overlooked).

(D) 16 — counts every Line or Quarter minute of the full day, ignoring the window (window ignored).

Topic / sub-skill: Synthesis — Clock (24-hour day on a 12-hour dial) + Classification (two labels)

Difficulty: Hard — derived label set must be laid on a day window with a noon trap.

24. Answer: (A) (i) and (iv) only

Explanation: (i) True: Quarter minutes occur only at M = 0 or 30 (Q17). (ii) False: 2:58 and 3:02 are consecutive Whole minutes (3:00 is Quarter), and between them lie two Half minutes, 2:59 and 3:01. (iii) False: Half = 360 and Whole = 352, so Half exceeds Whole by 8, not 6. (iv) True: $\theta = 90°$ is a multiple of 45° and is not 0° or 180°, so it passes the Quarter test before the Whole test.

Why the other options are wrong:

(B) Accepts (ii), assuming strict alternation of Whole and Half (Quarter interruptions overlooked).

(C) Accepts (iii), subtracting only the 6 Quarter minutes from 360 (Line minutes overlooked).

(D) Rejects (i), thinking 45° and 135° angles can occur at minutes other than :00 and :30 (divisibility argument missed).

Topic / sub-skill: Synthesis — capstone (Clock + Classification)

Difficulty: Very Hard — each statement re-uses a different derived result.



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