CAT Quantitative Aptitude

Sample Paper – 6

Duration: 40 Minutes **Maximum Marks: 66**

Instructions

- This paper contains **22 MCQ questions (single-correct)**, modelled on the Quantitative Aptitude section of **CAT**.
- Each correct answer carries **+3 marks**. There is a penalty of -1 **mark per wrong MCQ**; **0** marks for unattempted questions.
- Only **one** option is correct per question. Choose carefully.
- **No personal calculators** are permitted; a basic on-screen calculator is provided in the actual CAT exam.
- **Rough sheets** are provided at the test centre; use them freely for calculations.
- Syllabus level: **Arithmetic, Algebra, Geometry & Mensuration, and Modern Mathematics** at the level of the CAT Quantitative Aptitude section.

Questions (Q1 – Q22)

Q1. Find the unit digit of $7^{95} \times 3^{58}$.

(A) 3

(B) 9

(C) 7

(D) 1

Q2. Three bells ring at intervals of 12, 15, and 20 minutes respectively. They all ring together at 8:00 AM. When will they next ring together?

(A) 9:00 AM

(B) 8:30 AM

(C) 9:30 AM

(D) 8:45 AM

Q3. Simplify $\frac{\sqrt{12}+\sqrt{75}}{\sqrt{3}}$.

(A) 5

(B) 6

(C) 8

(D) 7

Q4. Rs. 8,000 is invested at 15% per annum, compounded annually. Find the compound interest earned in 2 years.

(A) Rs. 2,400

(B) Rs. 2,580

(C) Rs. 2,640

(D) Rs. 2,480

Q5. An article is marked at Rs. 1,500. A discount of 20% is given, and the item is sold. What additional percentage discount on the new selling price would reduce the final price to Rs. 960?

(A) 15%

(B) 18%

(C) 20%

(D) 25%

Q6. A sum of money doubles itself in 10 years at simple interest. In how many years will the same sum triple itself at the same rate?

(A) 20 years

(B) 15 years

(C) 25 years

(D) 30 years

Q7. Tap A fills a tank in 6 hours, Tap B fills it in 4 hours, and a drain pipe C empties it in 12 hours. If all three are opened simultaneously when the tank is empty, how long will it take to fill the tank completely?

(A) 2 hours

(B) 2.5 hours

(C) 4 hours

(D) 3 hours

Q8. Train A (length 200 m) travels at 72 km/h in the same direction as Train B (length 150 m) travelling at 54 km/h. How long does Train A take to completely overtake Train B?

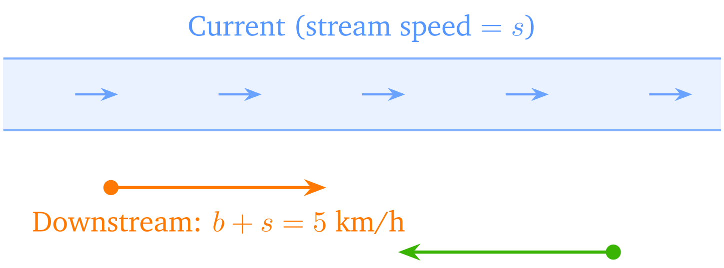
(A) 60 s

(B) 70 s

(C) 75 s

(D) 80 s

Q9. A man rows 15 km downstream in 3 hours and 9 km upstream in 3 hours. Find the speed of the stream (in km/h).



$$b + s = 5 \quad b - s = 3 \quad \Rightarrow \quad s = \frac{(b+s) - (b-s)}{2} = 1 \text{ km/h}$$

(A) 2 km/h

(B) 3 km/h

(C) 1 km/h

(D) 1.5 km/h

Q10. 12 workers can build a wall in 20 days. How many workers are needed to build the same wall in 15 days, assuming the same work rate?

(A) 16

(B) 18

(C) 14

(D) 20

Q11. If α and β are roots of $2x^2 - 5x + 3 = 0$, find the value of $\alpha^2\beta + \alpha\beta^2$.

(A) $\frac{5}{2}$

(B) $\frac{3}{2}$

(C) $\frac{7}{4}$

(D) $\frac{15}{4}$

Q12. The sum of a two-digit number and the number obtained by reversing its digits is 132. The positive difference of the digits is 4. Find the larger of the two possible original numbers.

(A) 93

(B) 84

(C) 75

(D) 66

Q13. How many integers x satisfy $|2x - 3| \leq 5$?

(A) 4

(B) 5

(C) 6

(D) 7

Q14. Find the coefficient of x^2 in the expansion of $(1+x)^6$.

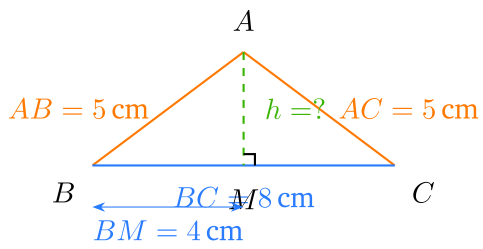
(A) 15

(B) 12

(C) 20

(D) 10

Q15. Triangle ABC is isosceles with $AB = AC = 5$ cm and base $BC = 8$ cm. Find the length of the altitude from A to BC.



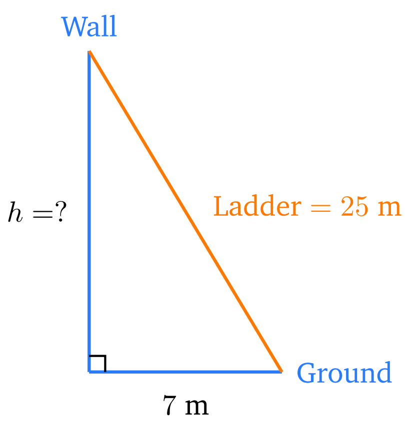
(A) 4 cm

(B) 4.5 cm

(C) 2.5 cm

(D) 3 cm

Q16. A ladder 25 m long leans against a vertical wall. The foot of the ladder is 7 m from the base of the wall. How high does the ladder reach on the wall?



(A) 20 m

(B) 24 m

(C) 23 m

(D) 26 m

Q17. Find the distance between points $P(-3, 4)$ and $Q(5, -2)$.

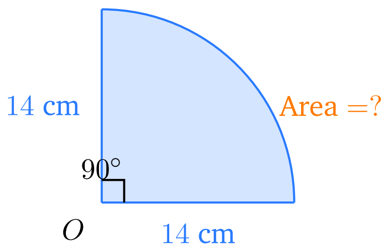
(A) 8

(B) 6

(C) 10

(D) 12

Q18. A sector of a circle has radius 14 cm and a central angle of $90°$. Find the area of the sector. (Use $\pi = 22/7$.)



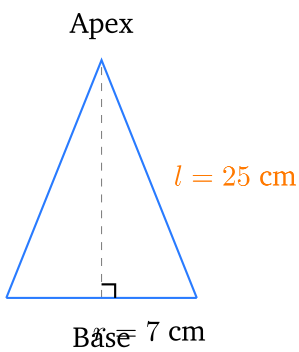
(A) 154 cm^2

(B) 196 cm^2

(C) 308 cm^2

(D) 77 cm^2

Q19. A cone has base radius 7 cm and slant height 25 cm. Find its total surface area. (Use $\pi = 22/7$.)



(A) 616 cm^2

(B) 880 cm^2

(C) 528 cm^2

(D) 704 cm^2

Q20. In how many ways can a cricket team of 11 players be selected from a squad of 15 players?

(A) 1,260

(B) 1,365

(C) 1,470

(D) 1,540

Q21. Evaluate $\log_4 32$.

(A) 2

(B) 3

(C) $\frac{5}{2}$

(D) 4

Q22. One card is drawn at random from a standard deck of 52 playing cards. What is the probability of drawing a face card (Jack, Queen, or King)?

(A) $\dfrac{3}{13}$

(B) $\dfrac{1}{4}$

(C) $\dfrac{4}{13}$

(D) $\dfrac{1}{13}$

Detailed Solutions

Q1.

Solution

Concept — Cyclicity of unit digits: The unit digit of powers of any integer repeats in a fixed cycle. We find the cycles for 7 and 3 separately, then multiply the resulting unit digits.

Step 1 — Cycle of unit digits of powers of 7: $7^1 \to 7$, $7^2 \to 9$, $7^3 \to 3$, $7^4 \to 1$, $7^5 \to 7, \ldots$ The cycle length is 4: $\{7, 9, 3, 1\}$. Since $95 = 4 \times 23 + 3$, the remainder is 3, so the unit digit of 7^{95} equals the unit digit of $7^3 = 3$.

Step 2 — Cycle of unit digits of powers of 3: $3^1 \to 3$, $3^2 \to 9$, $3^3 \to 7$, $3^4 \to 1$, $3^5 \to 3, \ldots$ The cycle length is 4: $\{3, 9, 7, 1\}$. Since $58 = 4 \times 14 + 2$, the remainder is 2, so the unit digit of 3^{58} equals the unit digit of $3^2 = 9$.

Step 3 — Multiply unit digits: Unit digit of $7^{95} \times 3^{58}$ = unit digit of $3 \times 9 = 27$, which is **7**.

Why other options are wrong:

- Option A (3): This is only the unit digit of 7^{95} before multiplying by the unit digit of 3^{58}.
- Option B (9): This is only the unit digit of 3^{58}; the product is not computed.
- Option D (1): Would require unit digit $3 \times 7 = 21$ (i.e., using 3^{57} instead of 3^{58}); wrong cycle position.

Final Answer: Unit digit of $7^{95} \times 3^{58} = 7 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 1

Q2.

Solution

Concept — LCM for coincidence of periodic events: When multiple events occur at fixed time intervals, the next time they all coincide is after a time equal to the LCM of their individual intervals.

Step 1 — Find LCM(12, 15, 20): Prime factorise each interval.

$$12 = 2^2 \times 3, \quad 15 = 3 \times 5, \quad 20 = 2^2 \times 5.$$

LCM $= 2^2 \times 3 \times 5 = 60$ minutes.

Step 2 — Add to starting time: They next all ring together at $8{:}00$ AM $+\,60$ min $=$ $9{:}00$ AM.

Why other options are wrong:

- Option B (8:30 AM): Corresponds to 30 minutes, which is not a common multiple of all three intervals (30 is not divisible by 20).
- Option C (9:30 AM): Corresponds to 90 minutes; 90 is not divisible by 20 ($90 \div 20 = 4.5$).
- Option D (8:45 AM): Corresponds to 45 minutes; 45 is not divisible by 12 or 20.

Final Answer: Next simultaneous ring at $9{:}00$ AM $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 2

Q3.

Solution

Concept — Simplifying surds (expressing as multiples of a common radical): Reduce each surd to a multiple of $\sqrt{3}$, add the numerator, and divide by $\sqrt{3}$.

Step 1 — Simplify each surd:

$$\sqrt{12} = \sqrt{4 \times 3} = 2\sqrt{3}, \qquad \sqrt{75} = \sqrt{25 \times 3} = 5\sqrt{3}.$$

Step 2 — Add and divide:

$$\frac{\sqrt{12} + \sqrt{75}}{\sqrt{3}} = \frac{2\sqrt{3} + 5\sqrt{3}}{\sqrt{3}} = \frac{7\sqrt{3}}{\sqrt{3}} = 7.$$

Why other options are wrong:

- Option A (5): Only $\sqrt{75}/\sqrt{3} = 5$; the $\sqrt{12}$ term is omitted.
- Option B (6): $2 + 4 = 6$; misreads $\sqrt{75}$ as $4\sqrt{3}$ instead of $5\sqrt{3}$.
- Option C (8): Over-counts; uses $3\sqrt{3}$ for $\sqrt{12}$ instead of $2\sqrt{3}$.

Final Answer: $\dfrac{\sqrt{12} + \sqrt{75}}{\sqrt{3}} = 7 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 3

Q4.

Solution

Concept — Compound Interest formula: For principal P, rate $r\%$ p.a., and n years compounded annually:

$$A = P\left(1 + \frac{r}{100}\right)^n, \qquad \text{CI} = A - P.$$

Step 1 — Compute the amount after 2 years:

$$A = 8000 \times \left(1 + \frac{15}{100}\right)^2 = 8000 \times (1.15)^2 = 8000 \times 1.3225 = 10{,}580.$$

Step 2 — Find CI:

$$\text{CI} = 10{,}580 - 8{,}000 = \text{Rs.}\, 2{,}580.$$

Why other options are wrong:

- Option A (Rs. 2,400): This is simple interest for 2 years at 15%: $8000 \times 0.15 \times 2 = 2400$; does not account for compounding.
- Option C (Rs. 2,640): Uses $(1.15)^2 = 1.33$ (rounding error) giving $A = 10{,}640$.
- Option D (Rs. 2,480): Arithmetic error; possibly computes $8000 \times 1.31 = 10{,}480$.

Final Answer: CI = Rs. 2,580 $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 4

Q5.

Solution

Concept — Successive discounts and finding an unknown discount: Apply the first discount to get a new price, then compute what percentage reduction of that new price gives the target final price.

Step 1 — Apply first discount of 20% on Rs. 1,500:

$$\text{SP}_1 = 1500 \times (1 - 0.20) = 1500 \times 0.80 = \text{Rs.}\, 1{,}200.$$

Step 2 — Find the additional discount needed to reach Rs. 960:

$$\text{Reduction needed} = 1200 - 960 = \text{Rs. } 240.$$

$$\text{Additional discount\%} = \frac{240}{1200} \times 100 = 20\%.$$

Why other options are wrong:

- Option A (15%): $1200 \times 0.85 = 1020 \neq 960$; discount is insufficient.
- Option B (18%): $1200 \times 0.82 = 984 \neq 960$; still too small.
- Option D (25%): $1200 \times 0.75 = 900 \neq 960$; over-discounts.

Final Answer: Additional discount required $= 20\% \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 5

Q6.

Solution

Concept — Simple Interest and growth multiples: In SI, interest is always earned on the original principal. If a sum doubles, the SI earned equals P. The rate can be found from the doubling time, then used to find the tripling time.

Step 1 — Find the rate of interest: The sum doubles in 10 years, so SI $= P$ in 10 years.

$$P = \frac{P \times r \times 10}{100} \implies r = 10\% \text{ per annum.}$$

Step 2 — Find the time to triple: To triple, SI must equal $2P$.

$$2P = \frac{P \times 10 \times t}{100} \implies t = \frac{2 \times 100}{10} = 20 \text{ years.}$$

Why other options are wrong:

- Option B (15 years): SI in 15 years $= P \times 10 \times 15/100 = 1.5P$; total $= 2.5P$ (not tripled).
- Option C (25 years): SI $= 2.5P$; total $= 3.5P$ (exceeds triple).
- Option D (30 years): SI $= 3P$; total $= 4P$ (quadruples the sum, not triples).

Final Answer: The sum triples in 20 years $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 6

Q7.

Solution

Concept — Pipes and Cisterns (net work-rate method): Filling taps contribute positive rates; drain pipes contribute negative rates. Net rate is the algebraic sum, and time to fill is the reciprocal of the net rate.

Step 1 — Assign rates (fraction of tank per hour):

$$\text{Rate of A} = \frac{1}{6}, \quad \text{Rate of B} = \frac{1}{4}, \quad \text{Rate of C (drain)} = -\frac{1}{12}.$$

Step 2 — Compute net rate using LCM $= 12$**:**

$$\text{Net rate} = \frac{2}{12} + \frac{3}{12} - \frac{1}{12} = \frac{4}{12} = \frac{1}{3}.$$

Step 3 — Time to fill:

$$\text{Time} = \frac{1}{1/3} = 3 \text{ hours}.$$

Why other options are wrong:

- Option A (2 hours): Ignores drain pipe C; net rate $= 1/6 + 1/4 = 5/12$, giving $12/5 \approx 2.4$ h.
- Option B (2.5 hours): Arithmetic error combining the three rates.
- Option C (4 hours): Uses only tap A's rate $(1/6)$ ignoring B; time $= 6$ h; or other miscount.

Final Answer: Tank fills in 3 hours $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 7

Q8.

Solution

Concept — Trains moving in the same direction (overtaking): When two trains travel in the same direction, the relative speed is the *difference* of their speeds. Train A has completely overtaken Train B once it has covered a distance equal to the sum of both lengths relative to B.

Step 1 — Convert speeds to m/s:

$$72 \text{ km/h} = 72 \times \frac{5}{18} = 20 \text{ m/s}, \qquad 54 \text{ km/h} = 54 \times \frac{5}{18} = 15 \text{ m/s}.$$

Step 2 — Relative speed and total distance:

$$\text{Relative speed} = 20 - 15 = 5 \text{ m/s.}$$

$$\text{Total distance} = 200 + 150 = 350 \text{ m.}$$

Step 3 — Time to overtake:

$$\text{Time} = \frac{350}{5} = 70 \text{ seconds.}$$

Why other options are wrong:

- Option A (60 s): Uses total distance $= 300$ m (forgets Train B's length) or uses relative speed of 5 m/s with only 300 m.
- Option C (75 s): Uses relative speed of $350/75 \approx 4.67$ m/s; arithmetic error.
- Option D (80 s): Uses relative speed of $350/80 \approx 4.375$ m/s; incorrect.

Final Answer: Time to overtake $= 70$ seconds $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 8

Q9.

Solution

Concept — Boats and Streams: Let b = speed of boat in still water (km/h) and s = speed of stream (km/h). Then: downstream speed $= b + s$ and upstream speed $= b - s$. The stream speed is $s = \dfrac{(\text{downstream speed}) - (\text{upstream speed})}{2}$.

Step 1 — Find effective speeds:

$$\text{Downstream speed} = \frac{15 \text{ km}}{3 \text{ h}} = 5 \text{ km/h.}$$

$$\text{Upstream speed} = \frac{9 \text{ km}}{3 \text{ h}} = 3 \text{ km/h.}$$

Step 2 — Find stream speed:

$$s = \frac{(b+s)-(b-s)}{2} = \frac{5-3}{2} = \frac{2}{2} = 1 \text{ km/h.}$$

Why other options are wrong:

- Option A (2 km/h): This is the difference of speeds $(5 - 3 = 2)$ without dividing by 2.

- Option B (3 km/h): This is the upstream speed, not the stream speed.
- Option D (1.5 km/h): Likely averages the two speeds $(5+3)/2/2 = 2$; arithmetic misapplication.

Final Answer: Speed of stream $= 1$ km/h $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 9

Q10.

Solution

Concept — Work and Manpower (inverse proportion): Total work $=$ (number of workers) $\times$ (number of days). This product is constant for the same task. Hence workers and days are inversely proportional.

Step 1 — Calculate total work:

$$\text{Total work} = 12 \text{ workers} \times 20 \text{ days} = 240 \text{ worker-days}.$$

Step 2 — Find number of workers for 15 days:

$$n = \frac{240 \text{ worker-days}}{15 \text{ days}} = 16 \text{ workers}.$$

Why other options are wrong:

- Option B (18): Would complete in $240/18 \approx 13.3$ days, which is less than 15; more workers than necessary.
- Option C (14): Would complete in $240/14 \approx 17.1$ days, exceeding the 15-day target.
- Option D (20): Would complete in $240/20 = 12$ days; also exceeds the target in excess capacity.

Final Answer: 16 workers are needed $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 10

Q11.

Solution

Concept — Vieta's formulas and symmetric expressions: For $2x^2 - 5x + 3 = 0$, divide by the leading coefficient to read off Vieta's relations: $\alpha+\beta = \frac{5}{2}$ and $\alpha\beta = \frac{3}{2}$. The expression $\alpha^2\beta + \alpha\beta^2$ factors as $\alpha\beta(\alpha + \beta)$.

Step 1 — Apply Vieta's formulas:

$$\alpha + \beta = \frac{5}{2}, \qquad \alpha\beta = \frac{3}{2}.$$

Step 2 — Evaluate the expression:

$$\alpha^2\beta + \alpha\beta^2 = \alpha\beta(\alpha + \beta) = \frac{3}{2} \times \frac{5}{2} = \frac{15}{4}.$$

Why other options are wrong:

- Option A $\left(\frac{5}{2}\right)$: This equals $\alpha + \beta$ alone, without multiplying by $\alpha\beta$.
- Option B $\left(\frac{3}{2}\right)$: This equals $\alpha\beta$ alone, without multiplying by $(\alpha + \beta)$.
- Option C $\left(\frac{7}{4}\right)$: This is $\alpha\beta + (\alpha + \beta)/2$; an incorrect recombination.

Final Answer: $\alpha^2\beta + \alpha\beta^2 = \dfrac{15}{4} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 11

Q12.

Solution

Concept — Two-digit number with digit constraints: Let the tens digit be t and the units digit be u. The original number is $10t + u$ and its reverse is $10u + t$.

Step 1 — Set up equations using both conditions:

$$(10t + u) + (10u + t) = 132 \implies 11(t + u) = 132 \implies t + u = 12.$$
$$|t - u| = 4.$$

Step 2 — Solve the system: From $t + u = 12$ and $t - u = 4$: adding gives $2t = 16 \Rightarrow t = 8$, $u = 4$. Number $= 84$. From $t + u = 12$ and $u - t = 4$: $t = 4$, $u = 8$. Number $= 48$. The larger of the two original numbers is **84**.

Why other options are wrong:

- Option A (93): Digit sum $9 + 3 = 12$ is correct, but $|9 - 3| = 6 \neq 4$.
- Option C (75): Digit sum $7 + 5 = 12$ is correct, but $|7 - 5| = 2 \neq 4$.
- Option D (66): Digit sum $6 + 6 = 12$ is correct, but $|6 - 6| = 0 \neq 4$.

Final Answer: Larger original number $= 84 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 12

Q13.

Solution

Concept — Absolute value inequality: $|2x-3| \leq 5$ is equivalent to $-5 \leq 2x-3 \leq 5$. Solve the compound inequality and count the integers in the resulting closed interval.

Step 1 — Solve the compound inequality:

$$-5 \leq 2x - 3 \leq 5 \implies -5 + 3 \leq 2x \leq 5 + 3 \implies -2 \leq 2x \leq 8 \implies -1 \leq x \leq 4.$$

Step 2 — Count integer solutions in $[-1, 4]$: The integers are $-1,\ 0,\ 1,\ 2,\ 3,\ 4$ — a total of **6** integers.

Why other options are wrong:

- Option A (4): Counts only $0, 1, 2, 3$ (ignores -1 and 4).
- Option B (5): Misses one endpoint; counts either $\{-1, 0, 1, 2, 3\}$ or $\{0, 1, 2, 3, 4\}$.
- Option D (7): Includes -2 or 5, which are outside the closed interval.

Final Answer: 6 integers satisfy the inequality $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 13

Q14.

Solution

Concept — Binomial Theorem: The coefficient of x^r in the expansion of $(1+x)^n$ is $\binom{n}{r} = \dfrac{n!}{r!\,(n-r)!}$.

Step 1 — Identify n and r: Here $n = 6$ and $r = 2$.

Step 2 — Compute the coefficient:

$$\binom{6}{2} = \frac{6!}{2!\,4!} = \frac{6 \times 5}{2 \times 1} = \frac{30}{2} = 15.$$

Why other options are wrong:

- Option B (12): Uses $\binom{6}{2} - 3 = 12$; incorrect subtraction.
- Option C (20): This is $\binom{6}{3}$, the coefficient of x^3, not x^2.
- Option D (10): This is $\binom{5}{2}$; uses $n = 5$ instead of $n = 6$.

Final Answer: Coefficient of $x^2 = 15 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 14

Q15.

Solution

Concept — Altitude of an isosceles triangle (Pythagoras): The altitude from the apex of an isosceles triangle bisects the base perpendicularly, creating two congruent right triangles. Apply the Pythagorean theorem to one of these right triangles.

Step 1 — Identify the right triangle: The altitude AM bisects BC at midpoint M, so $BM = \frac{8}{2} = 4$ cm. In right triangle ABM: hypotenuse $AB = 5$ cm, base $BM = 4$ cm, height $AM = h$.

Step 2 — Apply the Pythagorean theorem:

$$h^2 + 4^2 = 5^2 \implies h^2 = 25 - 16 = 9 \implies h = 3 \text{ cm.}$$

Why other options are wrong:

- Option A (4 cm): $4^2 + 4^2 = 32 \neq 25 = 5^2$; uses half-base as hypotenuse.
- Option B (4.5 cm): $4.5^2 + 4^2 = 20.25 + 16 = 36.25 \neq 25$; incorrect arithmetic.
- Option C (2.5 cm): $2.5^2 + 4^2 = 6.25 + 16 = 22.25 \neq 25$; altitude is too small.

Final Answer: Altitude $= 3$ cm $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 15

Q16.

Solution

Concept — Pythagorean theorem (ladder-wall problem): The ladder, wall, and ground form a right triangle. The ladder is the hypotenuse, the wall height is one leg, and the horizontal distance is the other leg.

Step 1 — Set up the equation: Ladder $= 25$ m (hypotenuse), ground distance $= 7$ m, wall height $= h$.

$$h^2 + 7^2 = 25^2 \implies h^2 = 625 - 49 = 576 \implies h = \sqrt{576} = 24 \text{ m}.$$

Step 2 — Verify: $7^2 + 24^2 = 49 + 576 = 625 = 25^2$. ✓ This is the well-known $(7, 24, 25)$ Pythagorean triple.

Why other options are wrong:

- Option A (20 m): $7^2 + 20^2 = 49 + 400 = 449 \neq 625$.
- Option C (23 m): $7^2 + 23^2 = 49 + 529 = 578 \neq 625$.
- Option D (26 m): $7^2 + 26^2 = 49 + 676 = 725 \neq 625$; exceeds the hypotenuse.

Final Answer: Wall height $= 24$ m $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 16

Q17.

Solution

Concept — Distance formula in the coordinate plane: The distance between two points (x_1, y_1) and (x_2, y_2) is:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

Step 1 — Substitute coordinates $P(-3, 4)$ and $Q(5, -2)$:

$$d = \sqrt{(5 - (-3))^2 + (-2 - 4)^2} = \sqrt{8^2 + (-6)^2} = \sqrt{64 + 36} = \sqrt{100} = 10 \text{ units}.$$

Why other options are wrong:

- Option A (8): This is $|x_2 - x_1| = |5 - (-3)| = 8$; uses only the horizontal difference.
- Option B (6): This is $|y_2 - y_1| = |-2 - 4| = 6$; uses only the vertical difference.

- Option D (12): Adds instead of using the square-root-of-sum-of-squares: $8 + 6 = 14$ (or similar arithmetic error).

Final Answer: Distance $PQ = 10$ units $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 17

Q18.

Solution

Concept — Area of a sector of a circle: The area of a sector with radius r and central angle θ (in degrees) is:

$$\text{Area} = \frac{\theta}{360} \times \pi r^2.$$

Step 1 — Substitute $\theta = 90°$, $r = 14$ cm, $\pi = 22/7$:

$$\text{Area} = \frac{90}{360} \times \frac{22}{7} \times 14^2 = \frac{1}{4} \times \frac{22}{7} \times 196.$$

Step 2 — Simplify:

$$\frac{22}{7} \times 196 = 22 \times 28 = 616.$$

$$\text{Area} = \frac{616}{4} = 154\ \text{cm}^2.$$

Why other options are wrong:

- Option B (196 cm^2): This is $r^2 = 196$; omits π and the sector fraction.
- Option C (308 cm^2): Uses $\theta/360 = 1/2$ (i.e., $180°$) instead of $1/4$ (i.e., $90°$).
- Option D (77 cm^2): Divides 308 by 4 instead of 616; arithmetic error in computing πr^2.

Final Answer: Area of sector $= 154\ \text{cm}^2 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 18

Q19.

Solution

Concept — Total Surface Area of a Cone: The TSA of a cone with base radius r and slant height l is:

$$\text{TSA} = \pi r(r + l).$$

This comprises the curved surface area ($\pi r l$) and the base area (πr^2).

Step 1 — Substitute $r = 7$ cm, $l = 25$ cm, $\pi = 22/7$:

$$\text{TSA} = \frac{22}{7} \times 7 \times (7 + 25) = 22 \times 32 = 704 \text{ cm}^2.$$

Why other options are wrong:

- Option A (616 cm^2): This is $\pi r^2 \times (r + l)/r =$ i.e., computes $22 \times 28 = 616$ using $(r + l) = 28$ incorrectly; or is the curved surface area with $l = 28$.
- Option B (880 cm^2): Uses $r + l = 40$ (adds wrong values, e.g., $l = 33$ or wrong r).
- Option C (528 cm^2): Uses $r + l = 24$ or omits the factor πr incorrectly; $22 \times 24 = 528$.

Final Answer: $\text{TSA} = 704 \text{ cm}^2 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 19

Q20.

Solution

Concept — Combinations (choosing a subset): The number of ways to choose r items from n distinct items (order not mattering) is $\binom{n}{r}$. Choosing 11 from 15 is equivalent to choosing which 4 are *left out*.

Step 1 — Apply the combination formula:

$$\binom{15}{11} = \binom{15}{4} = \frac{15 \times 14 \times 13 \times 12}{4 \times 3 \times 2 \times 1} = \frac{32{,}760}{24} = 1{,}365.$$

Step 2 — Verify step by step:

$$15 \times 14 = 210, \quad 210 \times 13 = 2{,}730, \quad 2{,}730 \times 12 = 32{,}760, \quad 32{,}760 \div 24 = 1{,}365.$$

Why other options are wrong:

- Option A (1,260): This equals $\binom{14}{4} = 1001$ (incorrect) or $\binom{15}{3} \times$ some factor; does not equal $\binom{15}{4}$.
- Option C (1,470): Arithmetic error in the final division step.
- Option D (1,540): This is $\binom{22}{3}$ or other combination; not $\binom{15}{11}$.

Final Answer: $\binom{15}{11} = 1{,}365 \text{ ways} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 20

Q21.

Solution

Concept — Logarithm change of base and power rule: We use $\log_b(a^k) = k \log_b a$ and $\log_b b = 1$ to simplify $\log_4 32$ by expressing both 32 and 4 as powers of 2.

Step 1 — Express 32 and 4 as powers of 2:

$$32 = 2^5, \qquad 4 = 2^2.$$

Step 2 — Apply change-of-base or power rule:

$$\log_4 32 = \log_4(2^5) = 5 \cdot \log_4 2.$$

Since $4 = 2^2$, we have $2 = 4^{1/2}$, so $\log_4 2 = \frac{1}{2}$.

$$\log_4 32 = 5 \times \frac{1}{2} = \frac{5}{2}.$$

Alternatively, using change-of-base formula:

$$\log_4 32 = \frac{\log_2 32}{\log_2 4} = \frac{5}{2}.$$

Why other options are wrong:

- Option A (2): $4^2 = 16 \neq 32$; under-estimates.
- Option B (3): $4^3 = 64 \neq 32$; over-estimates.
- Option D (4): $4^4 = 256 \neq 32$; far too large.

Final Answer: $\log_4 32 = \frac{5}{2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 21

Q22.

Solution

Concept — Classical probability: $P(\text{event}) = \dfrac{\text{number of favourable outcomes}}{\text{total number of equally likely outcomes}}$.

Step 1 — Count total outcomes: A standard deck has 52 cards, so the sample space has 52 equally likely outcomes.

Step 2 — Count favourable outcomes (face cards): Face cards are Jacks, Queens, and Kings. Each suit has 3 face cards, and there are 4 suits, giving $3 \times 4 = 12$ face cards.

Step 3 — Compute probability:

$$P(\text{face card}) = \frac{12}{52} = \frac{3}{13}.$$

Why other options are wrong:

- Option B $\left(\frac{1}{4}\right)$: This would require 13 favourable cards; perhaps counting Ace as a face card (4 suits $\times$ 4 picture-type cards $= 16$), but even $16/52 = 4/13 \neq 1/4$.
- Option C $\left(\frac{4}{13}\right)$: Counts 16 favourable cards (including Aces as face cards); incorrect definition.
- Option D $\left(\frac{1}{13}\right)$: Counts only 4 favourable cards; perhaps only Kings or only one rank of face card.

Final Answer: $P = \dfrac{3}{13} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 22

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	A	3	D	4	B	5	C
6	A	7	D	8	B	9	C	10	A
11	D	12	B	13	C	14	A	15	D
16	B	17	C	18	A	19	D	20	B
21	C	22	A						

Quick Reference: Correct Answers

Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	7	D	13	C	19	D
2	A	8	B	14	A	20	B
3	D	9	C	15	D	21	C
4	B	10	A	16	B	22	A
5	C	11	D	17	C		
6	A	12	B	18	A		

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