CAT Quantitative Aptitude

Sample Paper – 5

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 remainder when $2^{50} + 3^{50}$ is divided by 5.

(A) 0

(B) 3

(C) 1

(D) 4

Q2. The product of three consecutive positive integers is 504. Find their sum.

(A) 18

(B) 21

(C) 24

(D) 27

Q3. How many positive divisors does 360 have?

(A) 24

(B) 18

(C) 20

(D) 30

Q4. A city has a population of $50{,}000$. Its population increases by 10% in the first year and then decreases by 10% in the second year. What is the population at the end of 2 years?

(A) $50{,}500$

(B) $49{,}000$

(C) $50{,}000$

(D) $49{,}500$

Q5. A vessel contains 40 litres of milk. 8 litres are withdrawn and replaced with water. This process is repeated 3 times. What fraction of the mixture is milk after the third replacement?

(A) $\frac{56}{125}$

(B) $\frac{64}{125}$

(C) $\frac{48}{125}$

(D) $\frac{72}{125}$

Q6. Worker A can complete a task in 20 days and Worker B in 30 days. They work together, but B leaves 5 days before the task is completed. In how many days total is the task finished?

(A) 14

(B) 15

(C) 12

(D) 16

Q7. A motorist travels from city X to city Y at 40 km/h and returns at 60 km/h. What is the average speed for the entire round trip?

(A) 50 km/h

(B) 45 km/h

(C) 48 km/h

(D) 52 km/h

Q8. The ratio of the current ages of A and B is $3 : 5$. After 8 years, the ratio of their ages will be $5 : 7$. Find B's current age (in years).

(A) 15

(B) 16

(C) 18

(D) 20

Q9. A invests Rs. $12{,}000$ for 8 months and B invests Rs. $10{,}000$ for the full 12 months in a business. In what ratio should the annual profit be shared between A and B?

(A) $3 : 4$

(B) $4 : 5$

(C) $5 : 6$

(D) $6 : 7$

Q10. The sum of the ages of a father and his son is 50 years. Five years ago, the father was 4 times as old as the son. Find the son's current age.

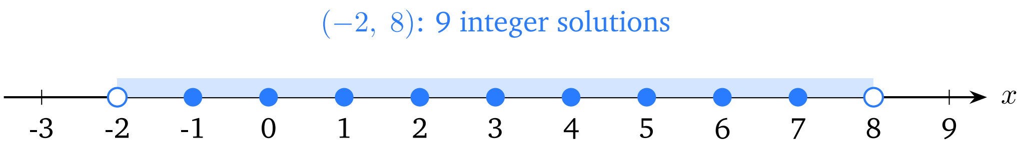
(A) 10

(B) 12

(C) 13

(D) 15

Q11. How many integers x satisfy the inequality $|x - 3| < 5$?



(A) 9

(B) 10

(C) 8

(D) 11

Q12. If $f(x) = 2x^2 - 3x + 1$, find the value of $f(f(1))$.

(A) 2

(B) 0

(C) 3

(D) 1

Q13. When the polynomial $p(x) = x^3 - 4x^2 + x + 6$ is divided by $(x - 3)$, find the remainder.

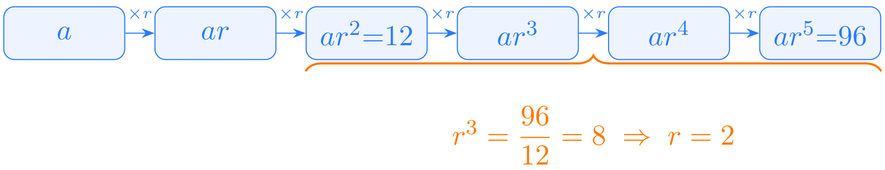
(A) 6

(B) 0

(C) 3

(D) -3

Q14. The 3rd term of a geometric progression is 12 and the 6th term is 96. Find the 1st term of the GP.



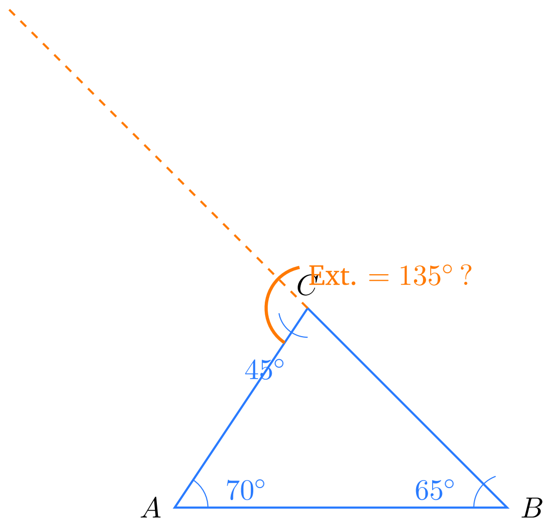
(A) 6

(B) 4

(C) 3

(D) 2

Q15. In a triangle, two interior angles measure 70° and 65°. Find the measure of the exterior angle at the third vertex.



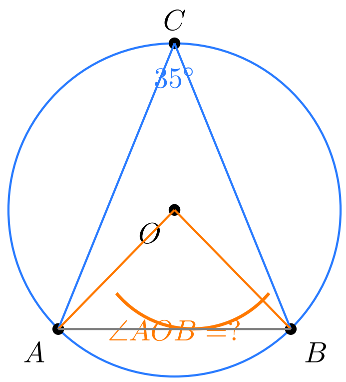
(A) 135°

(B) 45°

(C) 115°

(D) 130°

Q16. In the figure, O is the centre of a circle. Chord AB subtends an inscribed angle $\angle ACB = 35^\circ$ at point C on the major arc. Find the central angle $\angle AOB$.



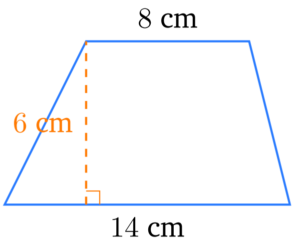
(A) 35°

(B) 55°

(C) 105°

(D) 70°

Q17. A trapezoid has parallel sides of 8 cm and 14 cm, and a perpendicular height of 6 cm. Find its area.



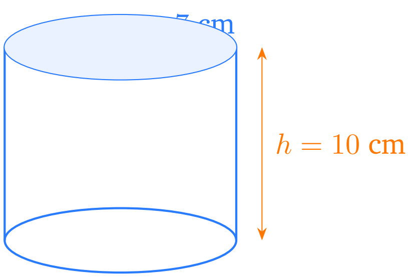
(A) 72 cm^2

(B) 66 cm^2

(C) 84 cm^2

(D) 48 cm^2

Q18. A cylinder has a base radius of 7 cm and a height of 10 cm. Find its total surface area. (Use $\pi = 22/7$.)



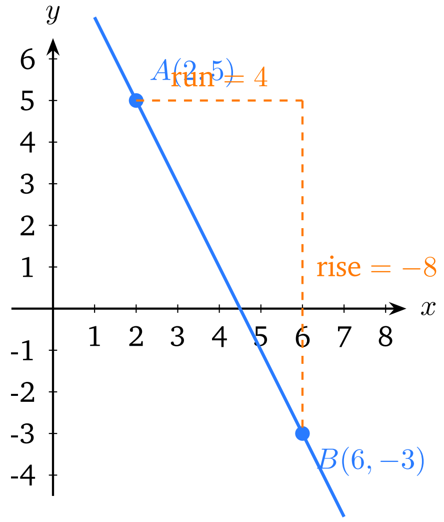
(A) 616 cm^2

(B) 880 cm^2

(C) 748 cm^2

(D) 594 cm^2

Q19. Find the slope of the line passing through the points $A(2, 5)$ and $B(6, -3)$.



(A) -2

(B) 2

(C) $-\frac{1}{2}$

(D) $\frac{1}{2}$

Q20. In a class of 80 students, 45 play cricket, 30 play football, and 20 play both. How many students play neither cricket nor football?

(A) 15

(B) 20

(C) 30

(D) 25

Q21. In how many ways can 4 boys and 3 girls be seated in a row such that all 3 girls sit together?

(A) 360

(B) 720

(C) $1{,}440$

(D) 240

Q22. Two fair dice are rolled simultaneously. What is the probability that the sum of the numbers on the top faces equals 7?

(A) $\frac{1}{4}$

(B) $\frac{1}{9}$

(C) $\frac{1}{6}$

(D) $\frac{5}{36}$

Detailed Solutions

Q1.

Solution

Concept — Cyclicity of remainders (modular arithmetic): Powers of integers repeat in cycles when divided by a fixed modulus. We find the cycle of remainders for $2^n \pmod 5$ and $3^n \pmod 5$, then add.

Step 1 — Cycle for $2^n \pmod 5$:

$$2^1 \equiv 2, \quad 2^2 \equiv 4, \quad 2^3 \equiv 3, \quad 2^4 \equiv 1 \pmod 5.$$

The cycle length is 4. Since $50 = 4 \times 12 + 2$, we have $2^{50} \equiv 2^2 = 4 \pmod 5$.

Step 2 — Cycle for $3^n \pmod 5$:

$$3^1 \equiv 3, \quad 3^2 \equiv 4, \quad 3^3 \equiv 2, \quad 3^4 \equiv 1 \pmod 5.$$

The cycle length is 4. Since $50 = 4 \times 12 + 2$, we have $3^{50} \equiv 3^2 = 9 \equiv 4 \pmod 5$.

Step 3 — Sum the remainders:

$$2^{50} + 3^{50} \equiv 4 + 4 = 8 \equiv 3 \pmod 5.$$

Why other options are wrong:

- Option A (0): Would require $2^{50} + 3^{50}$ divisible by 5; neither term is.
- Option C (1): Results from using $50 \bmod 4 = 0$ (wrong; $50 = 4 \times 12 + 2$, remainder is 2).
- Option D (4): Only one term's remainder, not the sum.

Final Answer: Remainder $= 3 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 1

Q2.

Solution

Concept — Product of consecutive integers: Three consecutive positive integers $n, n+1, n+2$ satisfy $n(n+1)(n+2) = 504$. We find n by estimation or factorisation.

Step 1 — Estimate n: Since $7^3 = 343$ and $8^3 = 512$, try $n = 7$: $7 \times 8 \times 9 = 504$. Confirmed!

Step 2 — Find the sum:

$$7 + 8 + 9 = 24.$$

Why other options are wrong:

- Option A (18): Corresponds to $5+6+7 = 18$; product $5 \times 6 \times 7 = 210 \neq 504$.
- Option B (21): Corresponds to $6+7+8 = 21$; product $6 \times 7 \times 8 = 336 \neq 504$.
- Option D (27): Corresponds to $8+9+10 = 27$; product $8 \times 9 \times 10 = 720 \neq 504$.

Final Answer: Sum $= 24 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 2

Q3.

Solution

Concept — Counting divisors using prime factorisation: If $n = p_1^{a_1} \cdot p_2^{a_2} \cdots p_k^{a_k}$, the total number of positive divisors is $(a_1 + 1)(a_2 + 1) \cdots (a_k + 1)$.

Step 1 — Factorise 360:

$$360 = 8 \times 45 = 2^3 \times 3^2 \times 5^1.$$

Step 2 — Count divisors:

$$(3 + 1)(2 + 1)(1 + 1) = 4 \times 3 \times 2 = 24.$$

Why other options are wrong:

- Option B (18): Uses exponents directly as $(3)(2)(1)\times$ some wrong factor.
- Option C (20): Arithmetic error; possibly uses $(4)(2)(2) = 16$ then adds.
- Option D (30): Overcounts; might add exponents instead of multiplying $(a_i + 1)$.

Final Answer: Number of divisors $= 24 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 3

Q4.

Solution

Concept — Successive percentage change: A $p\%$ increase followed by a $p\%$ decrease does NOT return to the original value. The net multiplier is $(1+p/100)(1-p/100) = 1-(p/100)^2$.

Step 1 — Apply the multiplier:

$$\text{Final population} = 50{,}000 \times \left(1+\frac{10}{100}\right) \times \left(1-\frac{10}{100}\right) = 50{,}000 \times 1.1 \times 0.9.$$

Step 2 — Compute:

$$50{,}000 \times 0.99 = 49{,}500.$$

Why other options are wrong:

- Option A $(50{,}500)$: Adds 10% twice instead of multiplying net factor.
- Option B $(49{,}000)$: Uses a net decrease of 2% instead of the correct 1%.
- Option C $(50{,}000)$: Assumes a 10% increase then 10% decrease cancels out; it does not.

Final Answer: Population after 2 years $= 49{,}500 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 4

Q5.

Solution

Concept — Repeated replacement (dilution formula): After k replacements of volume v from a vessel of volume V, the fraction of the original liquid remaining is:

$$\left(1-\frac{v}{V}\right)^k.$$

Step 1 — Identify values: $V = 40$ litres, $v = 8$ litres, $k = 3$.

Step 2 — Apply the formula:

$$\text{Fraction of milk} = \left(1-\frac{8}{40}\right)^3 = \left(\frac{32}{40}\right)^3 = \left(\frac{4}{5}\right)^3 = \frac{64}{125}.$$

Why other options are wrong:

- Option A $(56/125)$: Uses $\left(\frac{4}{5}\right)^3$ but subtracts $\frac{8}{125}$ without reason.
- Option C $(48/125)$: Uses an incorrect base; possibly $\left(\frac{3}{4}\right)^3 \times$ scaling.
- Option D $(72/125)$: Applies only 2 replacements: $\left(\frac{4}{5}\right)^2 \times \frac{9}{10}$.

Final Answer: Fraction of milk $= \dfrac{64}{125} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 5

Q6.

Solution

Concept — Time and Work with early departure: Combined rate of A and B together $= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{5}{60} = \frac{1}{12}$ (task/day). B leaves 5 days early, so for the last 5 days only A works.

Step 1 — Set up the equation: Let total days $= T$. Work done by A and B together for $(T-5)$ days, plus A alone for the last 5 days, equals 1 full task:

$$(T-5)\cdot\frac{1}{12} + 5\cdot\frac{1}{20} = 1.$$

Step 2 — Solve for T:

$$\frac{T-5}{12} + \frac{1}{4} = 1 \implies \frac{T-5}{12} = \frac{3}{4} \implies T-5 = 9 \implies T = 14.$$

Why other options are wrong:

- Option B (15): Sets up the equation with B leaving 6 days early, not 5.
- Option C (12): Ignores B's early departure; computes total time if both work the entire duration.
- Option D (16): Arithmetic error; uses combined rate $\frac{1}{15}$ instead of $\frac{1}{12}$.

Final Answer: Total days $= 14 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 6

Q7.

Solution

Concept — Average speed for equal distances (Harmonic mean): When the same distance is covered at two different speeds u and v, the average speed for the round trip is the harmonic mean:

$$v_{\text{avg}} = \frac{2uv}{u+v}.$$

This is always less than the arithmetic mean.

Step 1 — Substitute $u = 40$ km/h, $v = 60$ km/h:

$$v_{\text{avg}} = \frac{2 \times 40 \times 60}{40 + 60} = \frac{4800}{100} = 48 \text{ km/h}.$$

Step 2 — Verify with actual time: Let distance $X \to Y = d$ km.

$$\text{Total time} = \frac{d}{40} + \frac{d}{60} = \frac{3d + 2d}{120} = \frac{5d}{120} = \frac{d}{24}. \quad \text{Avg speed} = \frac{2d}{d/24} = 48 \text{ km/h}.$$

Why other options are wrong:

- Option A (50 km/h): The arithmetic mean $\frac{40+60}{2} = 50$; incorrect for equal distances.
- Option B (45 km/h): Uses an incorrect formula, possibly $\frac{uv}{u+v} \times 2$ with arithmetic error.
- Option D (52 km/h): No standard formula yields this; likely a guess above the arithmetic mean.

Final Answer: Average speed $= 48$ km/h $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 7

Q8.

Solution

Concept — Age problems with ratio conditions: Let the current ages be $A = 3k$ and $B = 5k$ for some positive constant k.

Step 1 — Write the future ratio condition:

$$\frac{3k+8}{5k+8} = \frac{5}{7}.$$

Step 2 — Cross-multiply and solve:

$$7(3k+8)=5(5k+8) \implies 21k+56=25k+40 \implies 4k=16 \implies k=4.$$

$$B=5k=5\times 4=20 \text{ years}.$$

Why other options are wrong:

- Option A (15): Uses $k=3$; check $\frac{9+8}{15+8}=\frac{17}{23}\neq\frac{5}{7}$.
- Option B (16): Uses $k=3.2$ (non-integer); incorrect setup.
- Option C (18): Uses $k=3.6$; check $\frac{10.8+8}{18+8}=\frac{18.8}{26}\neq\frac{5}{7}$.

Final Answer: B's current age $=20$ years $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 8

Q9.

Solution

Concept — Partnership profit sharing (investment $\times$ time): Profit is shared in proportion to each partner's capital-time product (weighted investment).

Step 1 — Compute weighted investments:

$$A\text{'s share}=12{,}000\times 8=96{,}000.$$

$$B\text{'s share}=10{,}000\times 12=1{,}20{,}000.$$

Step 2 — Find the ratio:

$$A:B=96{,}000:1{,}20{,}000=96:120=4:5.$$

(Divide both by the HCF $=24{,}000$.)

Why other options are wrong:

- Option A $(3:4)$: Uses capital alone $(12000:10000=6:5)$ without accounting for time.
- Option C $(5:6)$: Swaps numerator and denominator or uses incorrect time periods.
- Option D $(6:7)$: Arithmetic error; possibly uses $12\times 7=84$ instead of $12\times 8=96$.

Final Answer: Ratio of profit $=4:5\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 9

Q10.

Solution

Concept — Age problems (sum and ratio condition): Let the son's current age be s and the father's current age be f.

Step 1 — Set up equations:

$$f + s = 50 \quad \cdots (1)$$

$$(f - 5) = 4(s - 5) \quad \cdots (2)$$

Step 2 — Substitute (1) into (2):

$$(50 - s) - 5 = 4(s - 5) \implies 45 - s = 4s - 20 \implies 5s = 65 \implies s = 13.$$

Verify: Son now $= 13$, Father now $= 37$. Five years ago: Son $= 8$, Father $= 32 = 4 \times 8$. ✓

Why other options are wrong:

- Option A (10): Father $= 40$. Five years ago: Son $= 5$, Father $= 35 \neq 4 \times 5 = 20$.
- Option B (12): Father $= 38$. Five years ago: Son $= 7$, Father $= 33 \neq 4 \times 7 = 28$.
- Option D (15): Father $= 35$. Five years ago: Son $= 10$, Father $= 30 \neq 4 \times 10 = 40$.

Final Answer: Son's current age $= 13$ years $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 10

Q11.

Solution

Concept — Absolute value inequalities: $|x-a|<d$ is equivalent to $a-d<x<a+d$.

Step 1 — Solve the inequality:

$$|x-3|<5 \implies -5<x-3<5 \implies -2<x<8.$$

Step 2 — List integers in $(-2, 8)$ (strict inequalities, so -2 and 8 are excluded):

$$x \in \{-1,\ 0,\ 1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7\}.$$

Count $=$ **9**.

Why other options are wrong:

- Option B (10): Incorrectly includes one boundary point (-2 or 8).
- Option C (8): Misses one integer, perhaps starting from 0 instead of -1.
- Option D (11): Includes both boundary points -2 and 8 in the count.

Final Answer: 9 integers $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 11

Q12.

Solution

Concept — Composite functions: To find $f(f(1))$, first evaluate the inner function $f(1)$, then substitute the result back into f.

Step 1 — Evaluate $f(1)$:

$$f(1)=2(1)^2-3(1)+1=2-3+1=0.$$

Step 2 — Evaluate $f(f(1))=f(0)$:

$$f(0)=2(0)^2-3(0)+1=0-0+1=1.$$

Why other options are wrong:

- Option A (2): Evaluates $f(1)=0$ correctly but then computes $f(1)$ again instead of $f(0)$.

- Option B (0): Only finds $f(1) = 0$ and stops; does not apply f a second time.
- Option C (3): Arithmetic error; perhaps uses $f(0) = 0 + 0 + 3$ with a wrong constant term.

Final Answer: $f(f(1)) = 1 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 12

Q13.

Solution

Concept — Remainder Theorem: When a polynomial $p(x)$ is divided by $(x - c)$, the remainder equals $p(c)$.

Step 1 — Apply the theorem with $c = 3$:

$$p(3) = 3^3 - 4(3)^2 + 3 + 6.$$

Step 2 — Evaluate step by step:

$$= 27 - 4(9) + 3 + 6 = 27 - 36 + 3 + 6 = 0.$$

So the remainder is 0. (This also confirms that $(x - 3)$ is a factor of $p(x)$.)

Why other options are wrong:

- Option A (6): The constant term of $p(x)$; corresponds to $p(0)$, not $p(3)$.
- Option C (3): Substitutes $x = 3$ but makes an arithmetic error ($27 - 36 + 3 + 6 \neq 3$).
- Option D (-3): Sign error; possibly computes $27 - 36 + 3 + 3 = -3$ using wrong constant.

Final Answer: Remainder $= 0 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 13

Q14.

Solution

Concept — Geometric Progression (GP) terms: The nth term of a GP with first term a and common ratio r is $T_n = ar^{n-1}$.

Step 1 — Set up equations from given terms:

$$T_3 = ar^2 = 12 \quad \cdots(1)$$

$$T_6 = ar^5 = 96 \quad \cdots(2)$$

Step 2 — Divide (2) by (1) to find r:

$$\frac{ar^5}{ar^2} = \frac{96}{12} \implies r^3 = 8 \implies r = 2.$$

Step 3 — Find a using equation (1):

$$a \times (2)^2 = 12 \implies 4a = 12 \implies a = 3.$$

Why other options are wrong:

- Option A (6): Uses $r^2 = 8$ incorrectly, giving $r = 2\sqrt{2}$ and thus $a = 12/(2\sqrt{2})^2 = 6/4$; not integer.
- Option B (4): Assumes $r = 2$ correctly but uses $T_3 = a \cdot r^3 = 12$, applying wrong power.
- Option D (2): Assumes $a = r = 2$; then $T_3 = 2 \times 4 = 8 \neq 12$.

Final Answer: First term $a = 3 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 14

Q15.

Solution

Concept — Exterior angle of a triangle: The exterior angle at any vertex of a triangle equals the sum of the two non-adjacent interior angles (Remote Interior Angle Theorem). Alternatively, the sum of all interior angles is 180°, and the exterior angle is the supplement of the interior angle at that vertex.

Step 1 — Find the third interior angle:

$$\angle C = 180^\circ - 70^\circ - 65^\circ = 45^\circ.$$

Step 2 — Find the exterior angle at vertex C:

$$\text{Exterior angle} = 180^\circ - \angle C = 180^\circ - 45^\circ = 135^\circ.$$

Check via Remote Interior Angle Theorem: $70^\circ + 65^\circ = 135^\circ$. ✓

Why other options are wrong:

- Option B (45°): This is the interior angle at C, not the exterior angle.
- Option C (115°): Uses only one non-adjacent angle: $180^\circ - 65^\circ = 115^\circ$.
- Option D (130°): Arithmetic error; possibly subtracts $70^\circ - 65^\circ = 5^\circ$ from 135°.

Final Answer: Exterior angle $= 135^\circ \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 15

Q16.

Solution

Concept — Inscribed Angle Theorem: The central angle subtended by a chord at the centre of a circle is exactly *twice* the inscribed angle subtended by the same chord at any point on the major arc.

Step 1 — Apply the theorem:

$$\angle AOB = 2 \times \angle ACB = 2 \times 35^\circ = 70^\circ.$$

Why other options are wrong:

- Option A (35°): Confuses the central angle with the inscribed angle; they are equal only in very specific configurations, not the general case.
- Option B (55°): Uses $90^\circ - 35^\circ = 55^\circ$; a complementary angle with no geometric basis here.
- Option C (105°): Uses $3 \times 35^\circ = 105^\circ$; incorrect multiplier.

Final Answer: $\angle AOB = 70^\circ \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 16

Q17.

Solution

Concept — Area of a trapezoid: The area of a trapezoid with parallel sides a and b and perpendicular height h is:

$$A = \frac{1}{2}(a+b) \times h.$$

Step 1 — Identify values: $a = 8$ cm, $b = 14$ cm, $h = 6$ cm.

Step 2 — Calculate area:

$$A = \frac{1}{2}(8+14) \times 6 = \frac{1}{2} \times 22 \times 6 = \frac{132}{2} = 66 \text{ cm}^2.$$

Why other options are wrong:

- Option A (72 cm^2): Uses $\frac{1}{2}(8+16) \times 6 = 72$; adds 2 to the longer side.
- Option C (84 cm^2): Uses height $h = \frac{84 \times 2}{22} \approx 7.6$; or forgets the $\frac{1}{2}$ factor: $22 \times \frac{6}{\cdots}$.
- Option D (48 cm^2): Uses $\frac{1}{2}(8) \times 12 = 48$; only uses one parallel side.

Final Answer: Area $= 66 \text{ cm}^2 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 17

Q18.

Solution

Concept — Total Surface Area of a cylinder: The total surface area (TSA) of a cylinder with base radius r and height h is:

$$\text{TSA} = 2\pi r(r+h).$$

This includes the curved lateral surface ($2\pi rh$) plus two circular bases ($2\pi r^2$).

Step 1 — Substitute $r = 7$ cm, $h = 10$ cm, $\pi = \frac{22}{7}$:

$$\text{TSA} = 2 \times \frac{22}{7} \times 7 \times (7+10) = 2 \times 22 \times 17 = 44 \times 17 = 748 \text{ cm}^2.$$

Why other options are wrong:

- Option A (616 cm^2): Computes only the curved surface area plus one base:

$2\pi rh + \pi r^2 = 440 + 154+$ error; or $2\pi r^2 \times 2 = 2 \times \frac{22}{7} \times 49 \times 2 = 616$ (two bases only).

- Option B (880 cm^2): Uses $r+h = 10+10 = 20$ by doubling h; $2\times\frac{22}{7}\times 7\times 20 = 880$.
- Option D (594 cm^2): Uses $r + h = 16$ instead of 17; $44 \times 16 = 704$, or $2 \times 22 \times 13.5 = 594$ with wrong sum.

Final Answer: TSA $= 748$ cm^2 $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 18

Q19.

Solution

Concept — Slope of a line through two points: The slope (gradient) of the line joining points (x_1, y_1) and (x_2, y_2) is:

$$m = \frac{y_2 - y_1}{x_2 - x_1}.$$

Step 1 — Identify the coordinates: $A(2, 5)$ and $B(6, -3)$.

Step 2 — Substitute into the formula:

$$m = \frac{-3 - 5}{6 - 2} = \frac{-8}{4} = -2.$$

The negative slope confirms the line falls from left to right, consistent with A being higher than B.

Why other options are wrong:

- Option B $(+2)$: Drops the negative sign; uses $|y_2 - y_1|/|x_2 - x_1|$ ignoring direction.
- Option C $(-\frac{1}{2})$: Inverts the formula: uses $(x_2 - x_1)/(y_2 - y_1) = 4/(-8) = -\frac{1}{2}$.
- Option D $(+\frac{1}{2})$: Inverts and drops the negative sign.

Final Answer: Slope $= -2 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 19

Q20.

Solution

Concept — Set Theory (Inclusion-Exclusion Principle): The number of elements in $A \cup B$ is given by:

$$|A \cup B| = |A| + |B| - |A \cap B|.$$

Students who play *neither* $=$ Total $-|A \cup B|$.

Step 1 — Find $|C \cup F|$ (cricket or football):

$$|C \cup F| = 45 + 30 - 20 = 55.$$

Step 2 — Find students who play neither:

$$\text{Neither} = 80 - 55 = 25.$$

Why other options are wrong:

- Option A (15): Subtracts $|C \cap F|$ twice: $80 - 45 - 30 + 20 - 10 = 15$ (wrong).
- Option B (20): Uses $80 - (45 + 30 - 20) + 20 = 45$; arithmetic confusion.
- Option C (30): Ignores the intersection: $80 - (45 + 30) = 80 - 75 = 5$; or uses $80 - 50 = 30$ with wrong union.

Final Answer: Students playing neither $= 25 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 20

Q21.

Solution

Concept — Permutations with grouping constraint: When a group of objects must stay together, treat the entire group as a single unit, then arrange the resulting units.

Step 1 — Treat all 3 girls as one block: We now have 4 boys $+1$ block $= 5$ units to arrange in a row.

$$\text{Arrangements of 5 units} = 5! = 120.$$

Step 2 — Arrange the 3 girls within the block:

$$\text{Internal arrangements of girls} = 3! = 6.$$

Step 3 — Total arrangements:

$$\text{Total} = 5! \times 3! = 120 \times 6 = 720.$$

Why other options are wrong:

- Option A (360): Uses $5! \times 3!/2 = 360$; incorrectly divides by 2.
- Option C (1,440): Uses $5! \times 4! = 120 \times 12 = 1{,}440$; treats the girls-block as having 4 internal arrangements.
- Option D (240): Uses $4! \times 4!/\text{something}$; likely counts boys-arrangements only: $4! \times \binom{5}{1} = 24 \times 10 = 240$.

Final Answer: Total arrangements $= 720 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 21

Q22.

Solution

Concept — Classical probability with two dice: When two fair dice are rolled, the total number of equally likely outcomes is $6 \times 6 = 36$.

Step 1 — List favourable outcomes (sum $= 7$):

$$(1,6),\ (2,5),\ (3,4),\ (4,3),\ (5,2),\ (6,1) \quad \Rightarrow \quad 6 \text{ outcomes.}$$

Step 2 — Compute probability:

$$P(\text{sum} = 7) = \frac{6}{36} = \frac{1}{6}.$$

Note: A sum of 7 is the *most likely* outcome when rolling two dice.

Why other options are wrong:

- Option A ($\frac{1}{4}$): Uses 9 favourable outcomes instead of 6; overestimates.
- Option B ($\frac{1}{9}$): Uses 4 favourable outcomes: $\frac{4}{36} = \frac{1}{9}$; underestimates.
- Option D ($\frac{5}{36}$): Correct count for sum $= 6$ or sum $= 8$, but not for sum $= 7$.

Final Answer: $P = \frac{1}{6} \Rightarrow \boxed{\text{C}}$

$\boxed{\textbf{Answer: (C)}}$ **Go Back to Q 22**

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	A	4	D	5	B
6	A	7	C	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						

Quick Reference: Correct Answers

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

Practice more CAT Sample Papers at ***collegedunia.com/exams/cat/sample-paper***