CAT Quantitative Aptitude
Sample Paper – 4

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

Instructions

- This paper contains **22** questions modelled on the Quantitative Aptitude section of **CAT**, mixing single-correct **MCQs** and **TITA** (Type-In-The-Answer) questions.
- Each correct answer carries **+3 marks**. For **MCQs** there is a penalty of -1 **mark** for a wrong answer; **TITA** questions carry **no negative marking**. Unattempted questions score 0.
- For an MCQ, exactly **one** option is correct. For a TITA question, work out the numeric value and type it in (no options are given).
- A simple **on-screen calculator** is provided in the actual test interface; personal calculators, log tables and mobile phones are strictly prohibited.
- Recommended time is **40 minutes**, matching the real CAT sectional limit.

Section: Quantitative Aptitude

Q1. In a family budget, savings are exactly 25% of the income and the rest is spent. In a year the income rises by 24% while the total expenditure rises by 20%. The percentage change in the savings is:

(A) 36% increase

(B) 32% increase

(C) 9% increase

(D) 24% increase

Q2. A trader marks his goods 40% above the cost price and then allows a discount of 15% on the marked price. His net profit percent is:

(A) 15%

(B) 21%

(C) 19%

(D) 25%

Q3. A profit of Rs. 10,800 from a joint venture is divided among partners A, B and C in the ratio $2:3:4$. The amount (in Rs.) received by C is:

(TITA — type in the answer; no negative marking)

Q4. A sum of Rs. 4,000 amounts to Rs. 5,200 in 4 years under simple interest. The rate of interest per annum is:

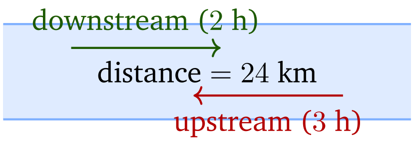
(A) 6%

(B) 7.5%

(C) 8%

(D) 5%

Q5. A boat covers a fixed distance of 24 km downstream in 2 hours and the same distance upstream in 3 hours. The speed of the stream (in km/h) is:



(A) 2

(B) 4

(C) 10

(D) 5

Q6. A can do a piece of work in 10 days, B in 15 days and C in 30 days. Working all together, the number of days they take to finish the work is:

(TITA — type in the answer; no negative marking)

Q7. Alloy X costing Rs. 200 per kg is mixed with alloy Y costing Rs. 320 per kg in the ratio $3:2$. The cost (in Rs. per kg) of the resulting mixture is:

(A) 248

(B) 260

(C) 250

(D) 240

Q8. A class has two groups of students. The first group of 20 students has an average score of 60, and the second group of 30 students has an average score of 70. The combined average score of all 50 students is:

(TITA — type in the answer; no negative marking)

Q9. In a 100 m race, A beats B by 20 m and B beats C by 25 m (each runner running at a steady speed). In the same 100 m race, A beats C by:

(A) 45 m

(B) 35 m

(C) 50 m

(D) 40 m

Q10. A fraction becomes $\frac{1}{2}$ when 1 is added to its numerator, and becomes $\frac{1}{3}$ when 1 is added to its denominator. The original fraction is:

(A) $\frac{2}{7}$

(B) $\frac{3}{8}$

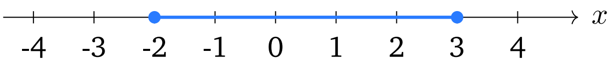
(C) $\frac{4}{9}$

(D) $\frac{3}{7}$

Q11. The equation $9x^2 - kx + 4 = 0$ has two equal (real and coincident) roots. The positive value of k is:

(TITA — type in the answer; no negative marking)

Q12. The number of integer values of x satisfying $|2x-1|<5$ is (the marked segment shows the solution set):



(A) 4

(B) 5

(C) 6

(D) 3

Q13. If $f(x) = x^2 - 3x$ and $f(a) = 4$, then the positive value of a is:

(A) 5

(B) 2

(C) 4

(D) 3

Q14. If $\log_x 343 = 3$, then the value of x is:

(TITA — type in the answer; no negative marking)

Q15. In the arithmetic progression $7, 11, 15, 19, \ldots$, the term whose value is 79 is the:

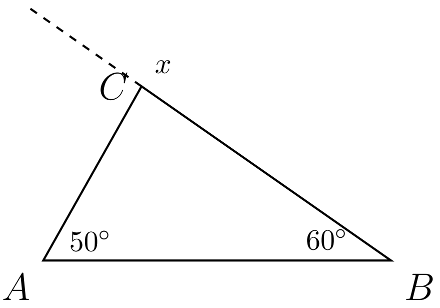
(A) 18th term

(B) 20th term

(C) 21st term

(D) 19th term

Q16. In triangle ABC below, $\angle A = 50°$ and $\angle B = 60°$. Side BC is produced beyond C. The exterior angle x at vertex C is:



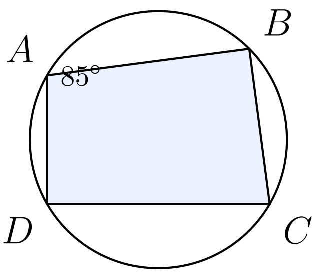
(A) 120°

(B) 110°

(C) 100°

(D) 130°

Q17. $ABCD$ is a cyclic quadrilateral inscribed in the circle shown. If $\angle A = 85^\circ$, then the opposite angle $\angle C$ is:



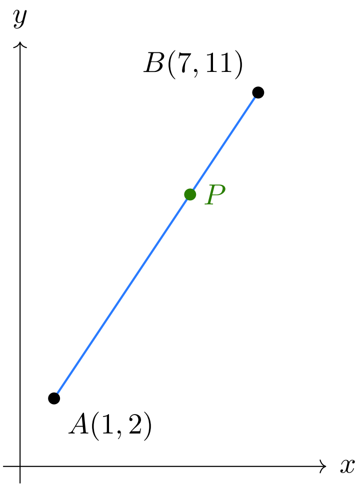
(A) 105°

(B) 85°

(C) 95°

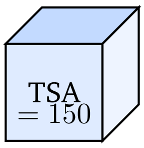
(D) 115°

Q18. The point P divides the segment joining $A(1, 2)$ and $B(7, 11)$ internally in the ratio $2 : 1$ (measured from A). The x-coordinate of P is:



(TITA — type in the answer; no negative marking)

Q19. A cube has a total surface area of 150 cm^2. Its volume (in cm^3) is:



(A) 100

(B) 125

(C) 150

(D) 216

Q20. The unit digit (last digit) of 2^{54} is:

(TITA — type in the answer; no negative marking)

Q21. Two numbers are in the ratio $2 : 3$ and their HCF is 6. Their LCM is:

(A) 30

(B) 72

(C) 108

(D) 36

Q22. The number of distinct arrangements of all the letters of the word **BANANA** is:

(TITA — type in the answer; no negative marking)

Detailed Solutions

Q1.

Solution

Concept — Savings = income − expenditure: Fix a convenient income, split it into savings and expenditure, grow each part by its own rate, then compare the new savings with the old.

Step 1 — Take the income as 100: Savings $= 25\%$ of $100 = 25$, so expenditure $= 100 - 25 = 75$.

Step 2 — New income: A rise of 24% gives $100 \times 1.24 = 124$.

Step 3 — New expenditure: A rise of 20% gives $75 \times 1.20 = 90$.

Step 4 — New savings: New savings $= 124 - 90 = 34$.

Step 5 — Percentage change: Change $= 34 - 25 = 9$ on an original 25, so $\frac{9}{25} \times 100 = 36\%$ increase.

Why other options are wrong:

- 9%: takes the absolute rise of 9 as a percentage directly, forgetting to divide by 25.
- $32\%, 24\%$: mix up the income and expenditure growth rates.

Final Answer: 36% increase $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q 1

Q2.

Solution

Concept — Mark-up then discount: Selling price = marked price $\times (1 - \text{discount})$, and profit percent is measured on the cost price.

Step 1 — Take the cost price as 100: Marked price $= 100 \times 1.40 = 140$.

Step 2 — Apply the 15% discount: Selling price $= 140 \times (1 - 0.15) = 140 \times 0.85 = 119$.

Step 3 — Compute profit percent: Profit $= 119 - 100 = 19$ on a cost of 100, so profit $= 19\%$.

Why other options are wrong:

- 25%: takes the mark-up of 40% minus the discount of 15%, which is not how the two combine.
- $21\%, 15\%$: arithmetic slips in the multiplication 140×0.85.

Final Answer: 19% profit $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 2

Q3.

Solution

Concept — Dividing a sum in a given ratio: Split the total into equal parts equal to the sum of the ratio terms, then give each share its number of parts.

Step 1 — Total number of parts: $2 + 3 + 4 = 9$ parts.

Step 2 — Value of one part: $\dfrac{10800}{9} = 1200$.

Step 3 — C's share: C has 4 parts, so $C = 4 \times 1200 = 4800$.

Common errors: Dividing by 4 instead of 9, or using C's ratio number 4 as rupees directly.

Final Answer: Rs. $4800 \Rightarrow \boxed{4800}$

Answer: (4800) Go Back to Q 3

Q4.

Solution

Concept — Simple interest: SI $= \dfrac{P \times R \times T}{100}$, and Amount $= P +$ SI. Find the interest first, then solve for the rate.

Step 1 — Find the simple interest: SI $=$ Amount $- P = 5200 - 4000 = 1200$.

Step 2 — Write the rate formula: $R = \dfrac{100 \times \text{SI}}{P \times T}$.

Step 3 — Substitute the values: $R = \dfrac{100 \times 1200}{4000 \times 4} = \dfrac{120000}{16000}$.

Step 4 — Simplify: $R = 7.5\%$ per annum.

Why other options are wrong:

- 5%: would give SI $= 4000 \times 0.05 \times 4 = 800$, not 1200.
- $6\%, 8\%$: do not produce an interest of exactly 1200 over 4 years.

Final Answer: 7.5% per annum $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) **Go Back to Q 4**

Q5.

Solution

Concept — Boat and stream: Downstream speed = (boat + stream), upstream speed = (boat − stream). The stream speed is half the difference of the two.

Step 1 — Downstream speed: $\frac{24}{2} = 12$ km/h.

Step 2 — Upstream speed: $\frac{24}{3} = 8$ km/h.

Step 3 — Speed of the stream: $\frac{\text{downstream} - \text{upstream}}{2} = \frac{12-8}{2} = \frac{4}{2} = 2$ km/h.

Why other options are wrong:

- 10: this is the speed of the boat in still water, $\frac{12+8}{2}$, not the stream.
- $4, 5$: take the full difference $12 - 8 = 4$ or a misread time without halving.

Final Answer: Stream speed = 2 km/h $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) **Go Back to Q 5**

Q6.

Solution

Concept — Combined work: When people work together their one-day rates add. The time taken together is the reciprocal of the combined rate.

Step 1 — Individual rates: $A = \frac{1}{10}$, $B = \frac{1}{15}$, $C = \frac{1}{30}$ of the work per day.

Step 2 — Combined rate: $\frac{1}{10} + \frac{1}{15} + \frac{1}{30} = \frac{3}{30} + \frac{2}{30} + \frac{1}{30} = \frac{6}{30} = \frac{1}{5}$ per day.

Step 3 — Time together: Time $= \frac{1}{1/5} = 5$ days.

Common errors: Adding the days $10+15+30$, or using a wrong common denominator when combining the three fractions.

Final Answer: 5 days $\Rightarrow$ $\boxed{5}$

Answer: (5) **Go Back to Q 6**

Q7.

Solution

Concept — Weighted cost of a mixture: When two ingredients are mixed in a ratio, the per-unit cost of the mixture is the weighted average of the two prices using that ratio.

Step 1 — Set the parts: Take 3 kg of X at Rs. 200 and 2 kg of Y at Rs. 320.

Step 2 — Total cost: $3 \times 200 + 2 \times 320 = 600 + 640 = 1240$.

Step 3 — Total weight: $3 + 2 = 5$ kg.

Step 4 — Cost per kg: $\frac{1240}{5} = 248$.

Why other options are wrong:

- 260: the simple average $\frac{200+320}{2}$, which ignores the $3:2$ weighting.
- $250, 240$: arithmetic slips in the total cost or the division.

Final Answer: Rs. 248 per kg $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 7

Q8.

Solution

Concept — Weighted average of two groups: The combined average is the total of all scores divided by the total number of students.

Step 1 — Total of the first group: $20 \times 60 = 1200$.

Step 2 — Total of the second group: $30 \times 70 = 2100$.

Step 3 — Grand total: $1200 + 2100 = 3300$.

Step 4 — Combined average: $\frac{3300}{50} = 66$.

Common errors: Taking the plain average $\frac{60+70}{2} = 65$, which ignores that the groups have different sizes.

Final Answer: $66 \Rightarrow \boxed{66}$

Answer: (66) Go Back to Q 8

Q9.

Solution

Concept — Chained race ratios: Each runner moves at a constant speed, so the distances they cover in the same time are in fixed ratios. Multiply the ratios to link A and C.

Step 1 — A versus B: When A runs 100, B runs $100-20=80$, so $A:B=100:80$.

Step 2 — B versus C: When B runs 100, C runs $100-25=75$, so $B:C=100:75$.

Step 3 — Distance C runs while A runs 100**:** $C=100\times\frac{80}{100}\times\frac{75}{100}=100\times0.8\times0.75=60$ m.

Step 4 — Margin: A beats C by $100-60=40$ m.

Why other options are wrong:

- 45: simply adds the two margins $20+25$, which double counts and ignores the chaining.
- $35, 50$: come from applying the second ratio to the wrong base distance.

Final Answer: 40 m $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q 9

Q10.

Solution

Concept — Two conditions on a fraction: Let the fraction be $\frac{a}{b}$. Translate each "add 1" condition into a linear equation and solve the pair.

Step 1 — Numerator condition: $\frac{a+1}{b}=\frac{1}{2}\Rightarrow 2(a+1)=b\Rightarrow b=2a+2$.

Step 2 — Denominator condition: $\frac{a}{b+1}=\frac{1}{3}\Rightarrow 3a=b+1$.

Step 3 — Substitute $b=2a+2$: $3a=(2a+2)+1=2a+3$.

Step 4 — Solve: $3a-2a=3\Rightarrow a=3$, and $b=2(3)+2=8$.

Step 5 — Check: $\frac{3+1}{8}=\frac{4}{8}=\frac{1}{2}$ and $\frac{3}{8+1}=\frac{3}{9}=\frac{1}{3}$. Both hold.

Why other options are wrong:

- $\frac{2}{7},\frac{4}{9},\frac{3}{7}$: fail at least one of the two "add 1" conditions on substitution.

Final Answer: $\frac{3}{8} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 10

Q11.

Solution

Concept — Equal roots condition: A quadratic $ax^2 + bx + c = 0$ has equal roots exactly when its discriminant $b^2 - 4ac = 0$.

Step 1 — Identify the coefficients: For $9x^2 - kx + 4 = 0$, $a = 9$, $b = -k$, $c = 4$.

Step 2 — Set the discriminant to zero: $(-k)^2 - 4(9)(4) = 0$, i.e. $k^2 - 144 = 0$.

Step 3 — Solve for k: $k^2 = 144 \Rightarrow k = \pm 12$.

Step 4 — Take the positive value: The positive value is $k = 12$.

Common errors: Using $4ac = 4 \times 9 + 4$ instead of $4 \times 9 \times 4$, or forgetting that $(-k)^2 = k^2$.

Final Answer: $k = 12 \Rightarrow \boxed{12}$

Answer: (12) Go Back to Q 11

Q12.

Solution

Concept — Absolute-value inequality: $|2x - 1| < 5$ means $2x - 1$ lies strictly between -5 and 5. Solve the double inequality, then count the integers inside.

Step 1 — Remove the modulus: $-5 < 2x - 1 < 5$.

Step 2 — Add 1 throughout: $-4 < 2x < 6$.

Step 3 — Divide by 2: $-2 < x < 3$.

Step 4 — Count the integers: The integers strictly between -2 and 3 are $-1, 0, 1, 2$, which is 4 values.

Why other options are wrong:

- 6: wrongly includes the endpoints -2 and 3, but the inequality is strict.
- $5, 3$: miscount the integers in the open interval.

Final Answer: 4 integers $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 12

Q13.

Solution

Concept — Solving $f(a) =$ value: Substitute a into the rule, set it equal to the given value, and solve the resulting quadratic.

Step 1 — Write the equation: $f(a) = a^2 - 3a = 4$.

Step 2 — Bring to standard form: $a^2 - 3a - 4 = 0$.

Step 3 — Factorise: $(a-4)(a+1) = 0$, so $a = 4$ or $a = -1$.

Step 4 — Pick the positive root: The positive value is $a = 4$.

Why other options are wrong:

- 5: gives $f(5) = 25 - 15 = 10$, not 4.
- $2, 3$: give $f(2) = -2$ and $f(3) = 0$, neither equal to 4.

Final Answer: $a = 4 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 13

Q14.

Solution

Concept — Logarithm to exponent: $\log_x N = p$ is equivalent to $x^p = N$. Rewrite and take the root.

Step 1 — Convert to exponential form: $\log_x 343 = 3 \Rightarrow x^3 = 343$.

Step 2 — Recognise the cube: $343 = 7 \times 7 \times 7 = 7^3$.

Step 3 — Take the cube root: $x^3 = 7^3 \Rightarrow x = 7$.

Common errors: Treating $\log_x 343 = 3$ as $3x = 343$, or dividing 343 by 3.

Final Answer: $x = 7 \Rightarrow \boxed{7}$

Answer: (7) Go Back to Q 14

Q15.

Solution

Concept — nth term of an AP: The nth term is $a_n = a + (n-1)d$, where a is the first term and d the common difference. Set it equal to the target value and solve for n.

Step 1 — Identify a and d: $a = 7$ and $d = 11 - 7 = 4$.

Step 2 — Set up the equation: $7 + (n-1) \times 4 = 79$.

Step 3 — Isolate the bracket: $(n-1) \times 4 = 79 - 7 = 72$.

Step 4 — Solve for n: $n - 1 = \frac{72}{4} = 18$, so $n = 19$.

Why other options are wrong:

- 18: forgets to add back the 1 after finding $n - 1 = 18$.
- $20, 21$: give terms 83 and 87, overshooting 79.

Final Answer: 19th term $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 15

Q16.

Solution

Concept — Exterior angle theorem: An exterior angle of a triangle equals the sum of the two remote (non-adjacent) interior angles.

Step 1 — Identify the remote interior angles: For the exterior angle at C, the remote angles are $\angle A = 50^\circ$ and $\angle B = 60^\circ$.

Step 2 — Add them: $x = \angle A + \angle B = 50^\circ + 60^\circ = 110^\circ$.

Step 3 — Cross-check: Interior $\angle C = 180^\circ - 110^\circ = 70^\circ$, and the exterior angle $180^\circ - 70^\circ = 110^\circ$ matches.

Why other options are wrong:

- 130°: adds a wrong pair of angles, e.g. uses $70^\circ + 60^\circ$.
- $100^\circ, 120^\circ$: arithmetic slips in $50 + 60$.

Final Answer: $x = 110^\circ \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 16

Q17.

Solution

Concept — Cyclic quadrilateral: In a quadrilateral inscribed in a circle, opposite angles are supplementary, i.e. they add up to 180°.

Step 1 — Write the supplementary relation: $\angle A + \angle C = 180^\circ$.

Step 2 — Substitute $\angle A = 85^\circ$: $85^\circ + \angle C = 180^\circ$.

Step 3 — Solve for $\angle C$: $\angle C = 180^\circ - 85^\circ = 95^\circ$.

Why other options are wrong:

- 85°: assumes opposite angles are equal, which is true for a parallelogram, not a general cyclic quadrilateral.
- $105^\circ, 115^\circ$: do not satisfy $\angle A + \angle C = 180^\circ$.

Final Answer: $\angle C = 95^\circ \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 17

Q18.

Solution

Concept — Section formula: A point dividing $A(x_1, y_1)$ and $B(x_2, y_2)$ internally in the ratio $m : n$ (from A) has coordinates $\left(\dfrac{mx_2 + nx_1}{m+n}, \dfrac{my_2 + ny_1}{m+n}\right)$.

Step 1 — List the values: $A(1, 2)$, $B(7, 11)$, with $m : n = 2 : 1$.

Step 2 — Apply the x-coordinate formula: $x_P = \dfrac{2 \times 7 + 1 \times 1}{2+1}$.

Step 3 — Compute the numerator: $2 \times 7 + 1 \times 1 = 14 + 1 = 15$.

Step 4 — Divide: $x_P = \dfrac{15}{3} = 5$.

Common errors: Swapping the weights (m with n) so that 7 is multiplied by 1 instead of 2, or pairing x_2 with n rather than m.

Final Answer: $x_P = 5 \Rightarrow \boxed{5}$

Answer: (5) Go Back to Q 18

Q19.

Solution

Concept — Cube surface area and volume: A cube of edge a has total surface area $6a^2$ and volume a^3. Find a from the area, then cube it.

Step 1 — Set up the surface-area equation: $6a^2 = 150$.

Step 2 — Solve for a^2: $a^2 = \dfrac{150}{6} = 25$.

Step 3 — Find the edge: $a = \sqrt{25} = 5$ cm.

Step 4 — Compute the volume: $a^3 = 5^3 = 125\ \text{cm}^3$.

Why other options are wrong:

- 216: uses edge 6, which would need a surface area of 216, not 150.
- $100, 150$: confuse the surface area with the volume or stop at a^2.

Final Answer: $125\ \text{cm}^3 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 19

Q20.

Solution

Concept — Cyclic unit digits: The unit digit of powers of 2 repeats in the cycle $2, 4, 8, 6$ of length 4. Locate the exponent within this cycle.

Step 1 — Write the cycle: $2^1 = 2$, $2^2 = 4$, $2^3 = 8$, $2^4 = 16$ (digit 6); then it repeats.

Step 2 — Reduce the exponent modulo 4: $54 = 4 \times 13 + 2$, so the remainder is 2.

Step 3 — Read off the digit: A remainder of 2 points to the 2nd entry of the cycle, which is 4.

Common errors: Treating a remainder of 0 as the first entry instead of the last; here the remainder is 2, so this does not arise, but it is the usual trap.

Final Answer: Unit digit $= 4 \Rightarrow \boxed{4}$

Answer: (4) Go Back to Q 20

Q21.

Solution

Concept — Numbers from ratio and HCF: If two numbers are in the ratio $p : q$ with p, q coprime and HCF h, the numbers are ph and qh, and their LCM is pqh.

Step 1 — Form the numbers: With ratio $2 : 3$ and HCF 6, the numbers are $2 \times 6 = 12$ and $3 \times 6 = 18$.

Step 2 — Use HCF × LCM = product: $\text{LCM} = \dfrac{12 \times 18}{\text{HCF}} = \dfrac{216}{6} = 36.$

Step 3 — Cross-check: $2, 3$ are coprime so $\text{LCM} = pqh = 2 \times 3 \times 6 = 36$. Confirmed.

Why other options are wrong:

- 108: is the product 12×9 or an unsimplified value, not the LCM.
- $30, 72$: do not equal $\dfrac{12 \times 18}{6}$.

Final Answer: $\text{LCM} = 36 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 21

Q22.

Solution

Concept — Permutations with repeated letters: The number of distinct arrangements of n letters, where some letters repeat, is $\dfrac{n!}{(\text{product of the factorials of the repeat counts})}$.

Step 1 — Count the letters: BANANA has 6 letters: B, A, N, A, N, A.

Step 2 — Note the repeats: A appears 3 times and N appears 2 times; B is single.

Step 3 — Write the formula: $\text{Arrangements} = \dfrac{6!}{3! \times 2!}$.

Step 4 — Evaluate: $6! = 720$ and $3! \times 2! = 6 \times 2 = 12$, so $\dfrac{720}{12} = 60$.

Common errors: Using $6! = 720$ directly (treating all letters as distinct), or dividing by only one of the repeat factorials.

Final Answer: 60 arrangements $\Rightarrow \boxed{60}$

Answer: (60) Go Back to Q 22

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	C	3	4800	4	B	5	A
6	5	7	A	8	66	9	D	10	B
11	12	12	A	13	C	14	7	15	D
16	B	17	C	18	5	19	B	20	4
21	D	22	60						