CAT Quantitative Aptitude
Sample Paper – 1

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. The population of a town rises by 10% in the first year and then falls by 10% in the second year. If the population at the end of the two years is $29{,}700$, the population at the start was:

(A) $29{,}000$

(B) $30{,}000$

(C) $33{,}000$

(D) $27{,}000$

Q2. A shopkeeper marks his goods 50% above the cost price and then allows a discount of 20% on the marked price. His profit percent is:

(A) 20%

(B) 25%

(C) 30%

(D) 22%

Q3. Three friends A, B and C divide Rs. $6{,}300$ among themselves in the ratio $3 : 5 : 7$. The amount (in Rs.) received by C is:

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

Q4. A certain sum amounts to Rs. $9{,}261$ in 3 years at 5% per annum compounded annually. The sum (principal) is:

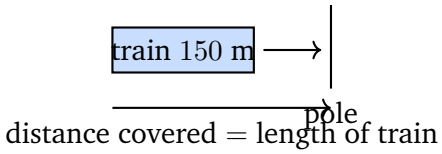
(A) Rs. $8{,}500$

(B) Rs. $8{,}400$

(C) Rs. $7{,}500$

(D) Rs. $8{,}000$

Q5. A train 150 m long passes a vertical pole in 9 seconds. The speed of the train (in km/h) is:



(A) 60

(B) 54

(C) 50

(D) 72

Q6. A can finish a piece of work in 20 days and B in 30 days. They work together for 6 days, after which A leaves. The number of additional days B needs to complete the remaining work is:

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

Q7. In what ratio must water be mixed with milk costing Rs. 32 per litre so that the mixture is worth Rs. 28 per litre? (Take water as free.)

(A) $1 : 6$

(B) $1 : 8$

(C) $1 : 7$

(D) $2 : 7$

Q8. The average of 11 numbers is 50. The average of the first 6 of them is 49 and the average of the last 6 is 52. The value of the 6th number is:

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

Q9. A and B invest Rs. $16{,}000$ and Rs. $12{,}000$ respectively in a business. After 3 months A withdraws Rs. $4{,}000$. At the end of the year, the annual profit should be divided between A and B in the ratio:

(A) $4 : 3$

(B) $13 : 12$

(C) $11 : 10$

(D) $3 : 2$

Q10. The sum of the digits of a two-digit number is 12. When the digits are reversed, the number increases by 18. The original number is:

(A) 57

(B) 75

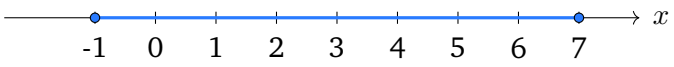
(C) 48

(D) 39

Q11. In the equation $x^2 - 12x + k = 0$, one root is three times the other. The value of k is:

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

Q12. The number of integers x satisfying both $|x-3| \le 4$ and $x > 0$ is (the shaded region shows $|x-3| \le 4$):



(A) 5

(B) 6

(C) 7

(D) 8

Q13. If $f(x) = \dfrac{x-1}{x+1}$ for $x \neq -1$, then $f\big(f(x)\big)$ equals:

(A) x

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

(C) $-x$

(D) $-\dfrac{1}{x}$

Q14. If $\log_2 x + \log_2(x-2) = 3$, then the value of x is:

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

Q15. In a geometric progression the 4th term is 24 and the 7th term is 192. The first term of the progression is:

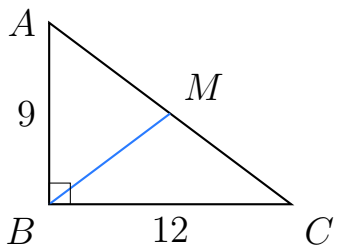
(A) 2

(B) 3

(C) 4

(D) 6

Q16. In the right-angled triangle below, the two sides containing the right angle are 9 cm and 12 cm. The length of the median drawn from the right angle to the hypotenuse is:



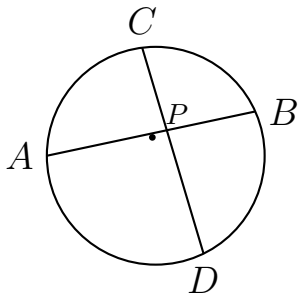
(A) 7.5 cm

(B) 6 cm

(C) 9 cm

(D) 7 cm

Q17. Two chords AB and CD of a circle intersect at a point P inside the circle. If $PA = 4$, $PB = 6$ and $PC = 3$, then the length PD is:



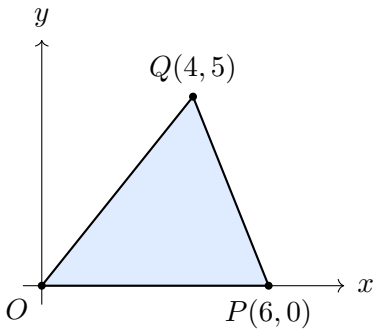
(A) 6

(B) 9

(C) 12

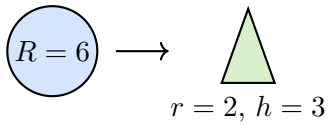
(D) 8

Q18. The area (in square units) of the triangle whose vertices are $O(0,0)$, $P(6,0)$ and $Q(4,5)$ is:



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

Q19. A solid metal sphere of radius 6 cm is melted and recast into small solid cones, each of radius 2 cm and height 3 cm. The number of cones formed is:



(A) 36

(B) 144

(C) 72

(D) 48

Q20. The remainder when 2^{100} is divided by 7 is:

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

Q21. The total number of positive factors (divisors) of 360 is:

(A) 18

(B) 24

(C) 20

(D) 12

Q22. A committee of 3 members is to be formed from 4 men and 3 women so that it contains at least one woman. The number of such committees is:

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

Detailed Solutions

Q1.

Solution

Concept — Successive percentage change: A rise of $a\%$ followed by a fall of $b\%$ multiplies the original quantity by $\left(1+\frac{a}{100}\right)\left(1-\frac{b}{100}\right)$.

Step 1 — Write the multiplying factor: Rise of 10% then fall of 10% gives a factor of 1.10×0.90.

Step 2 — Simplify the factor: $1.10 \times 0.90 = 0.99$.

Step 3 — Relate to the final value: If P is the starting population, then $0.99\,P = 29{,}700$.

Step 4 — Solve for P: $P = \dfrac{29{,}700}{0.99} = 30{,}000$.

Why other options are wrong:

- $29{,}000$ and $27{,}000$: do not satisfy $0.99\,P = 29{,}700$.
- $33{,}000$: gives $0.99 \times 33{,}000 = 32{,}670$, not $29{,}700$.

Final Answer: $30{,}000 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 1

Q2.

Solution

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

Step 1 — Take the cost price as 100: Marked price $= 100 \times 1.50 = 150$.

Step 2 — Apply the 20% discount: Selling price $= 150 \times (1-0.20) = 150 \times 0.80 = 120$.

Step 3 — Compute profit percent: Profit $= 120 - 100 = 20$ on a cost of 100, so profit $= 20\%$.

Why other options are wrong:

- $25\%, 30\%$: result from forgetting to apply the discount fully.
- 22%: arithmetic slip in the multiplication.

Final Answer: 20% profit $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) 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: $3 + 5 + 7 = 15$ parts.

Step 2 — Value of one part: $\dfrac{6300}{15} = 420$.

Step 3 — C's share: C has 7 parts, so $C = 7 \times 420 = 2940$.

Common errors: Using C's ratio number 7 directly as rupees, or dividing by 3 instead of 15.

Final Answer: Rs. $2940 \Rightarrow \boxed{2940}$

Answer: (2940) Go Back to Q 3

Q4.

Solution

Concept — Compound interest amount: $A = P\left(1 + \dfrac{r}{100}\right)^n$. To find the principal, divide the amount by the growth factor.

Step 1 — Write the growth factor: At 5% for 3 years the factor is $(1.05)^3$.

Step 2 — Evaluate the factor: $(1.05)^3 = 1.157625$.

Step 3 — Solve for P: $P = \dfrac{9261}{1.157625} = 8000$.

Step 4 — Quick check: $8000 \times 1.05 = 8400$; $8400 \times 1.05 = 8820$; $8820 \times 1.05 = 9261$. Confirmed.

Why other options are wrong:

- $8500, 8400, 7500$: none grows to exactly 9261 over three years at 5%.

Final Answer: Rs. $8000 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 4

Q5.

Solution

Concept — Crossing a pole: A train crossing a pole travels a distance equal to its own length. Speed $= \dfrac{\text{distance}}{\text{time}}$.

Step 1 — Distance covered: Equal to the train's length $= 150$ m.

Step 2 — Speed in m/s: $\dfrac{150}{9} = \dfrac{50}{3}$ m/s.

Step 3 — Convert to km/h: Multiply by $\dfrac{18}{5}$: $\dfrac{50}{3} \times \dfrac{18}{5} = \dfrac{900}{15} = 60$ km/h.

Why other options are wrong:

- $54, 50$: come from arithmetic or conversion slips.
- 72: would need a speed of 20 m/s, i.e. crossing in 7.5 s, not 9 s.

Final Answer: 60 km/h $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 5

Q6.

Solution

Concept — Combined work then remainder: Rates add when people work together. Compute the fraction done together, then the time the remaining worker needs alone.

Step 1 — Individual rates: $A = \dfrac{1}{20}$ and $B = \dfrac{1}{30}$ of the work per day.

Step 2 — Combined rate: $\dfrac{1}{20} + \dfrac{1}{30} = \dfrac{3}{60} + \dfrac{2}{60} = \dfrac{5}{60} = \dfrac{1}{12}$ per day.

Step 3 — Work done in 6 days together: $6 \times \dfrac{1}{12} = \dfrac{1}{2}$ of the work.

Step 4 — Remaining work: $1 - \dfrac{1}{2} = \dfrac{1}{2}$.

Step 5 — Time for B alone: At rate $\dfrac{1}{30}$, time $= \dfrac{1/2}{1/30} = \dfrac{1}{2} \times 30 = 15$ days.

Common errors: Forgetting that only B continues after A leaves, or using the combined rate for the remaining half.

Final Answer: 15 days $\Rightarrow \boxed{15}$

Answer: (15) Go Back to Q 6

Q7.

Solution

Concept — Alligation with a free ingredient: Water costs 0 per litre. Use the alligation rule on the prices about the mean price.

Step 1 — List the prices: Water $= 0$, milk $= 32$, mixture (mean) $= 28$.

Step 2 — Apply alligation: $\dfrac{\text{water}}{\text{milk}} = \dfrac{\text{milk price} - \text{mean}}{\text{mean} - \text{water price}} = \dfrac{32-28}{28-0} = \dfrac{4}{28}$.

Step 3 — Simplify: $\dfrac{4}{28} = \dfrac{1}{7}$, so water : milk $= 1 : 7$.

Why other options are wrong:

- $1:6, 1:8$: come from misplacing the differences in the alligation cross.
- $2:7$: does not reduce from $4:28$.

Final Answer: $1:7 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 7

Q8.

Solution

Concept — Overlapping group totals: When the first 6 and the last 6 of 11 numbers are taken, the 6th number is counted in both groups, so it equals (sum of the two group totals) minus (total of all 11).

Step 1 — Total of all 11 numbers: $11 \times 50 = 550$.

Step 2 — Total of the first 6: $6 \times 49 = 294$.

Step 3 — Total of the last 6: $6 \times 52 = 312$.

Step 4 — Find the 6th number: $(294 + 312) - 550 = 606 - 550 = 56$.

Common errors: Forgetting that the 6th number is shared by both groups of six.

Final Answer: $56 \Rightarrow \boxed{56}$

Answer: (56) Go Back to Q 8

Q9.

Solution

Concept — Capital $\times$ time: In a partnership, profit is shared in the ratio of (capital $\times$ months invested) for each partner.

Step 1 — A's contribution: Rs. $16{,}000$ for 3 months, then Rs. $12{,}000$ for 9 months: $16000 \times 3 + 12000 \times 9 = 48000 + 108000 = 156000$.

Step 2 — B's contribution: Rs. $12{,}000$ for the full 12 months: $12000 \times 12 = 144000$.

Step 3 — Form the ratio: $156000 : 144000$.

Step 4 — Simplify: Divide both by 12000: $13 : 12$.

Why other options are wrong:

- $4:3, 3:2, 11:10$: ignore the time-weighting of A's changing capital.

Final Answer: $13 : 12 \Rightarrow$ B

Answer: (B) Go Back to Q 9

Q10.

Solution

Concept — Two-digit number with digit conditions: Write the number as $10a+b$ where a is the tens digit. Reversing gives $10b + a$. Translate the conditions into equations.

Step 1 — Digit-sum condition: $a + b = 12$.

Step 2 — Reversal condition: $(10b+a)-(10a+b) = 18 \Rightarrow 9b-9a = 18 \Rightarrow b-a = 2$.

Step 3 — Solve the two equations: Adding $a+b = 12$ and $b-a = 2$ gives $2b = 14$, so $b = 7$ and $a = 5$.

Step 4 — Form the number: $10a + b = 10(5) + 7 = 57$.

Why other options are wrong:

- 75: is the reversed number, not the original.
- $48, 39$: do not have digit sum 12 with the required reversal gap.

Final Answer: $57 \Rightarrow$ A

Answer: (A) Go Back to Q 10

Q11.

Solution

Concept — Vieta's formulas: For $x^2 - 12x + k = 0$, the sum of the roots is 12 and the product is k.

Step 1 — Name the roots: Let the roots be r and $3r$ (one is three times the other).

Step 2 — Use the sum of roots: $r + 3r = 12 \Rightarrow 4r = 12 \Rightarrow r = 3$.

Step 3 — Use the product of roots: $k = r \times 3r = 3r^2 = 3 \times 9 = 27$.

Common errors: Setting the sum to -12 (the sign rule gives $+12$ here), or computing $r \times r$ instead of $r \times 3r$.

Final Answer: $k = 27 \Rightarrow \boxed{27}$

Answer: (27) Go Back to Q 11

Q12.

Solution

Concept — Absolute-value inequality: $|x - 3| \leq 4$ means x lies within 4 units of 3, i.e. $-1 \leq x \leq 7$. Then apply the extra condition $x > 0$.

Step 1 — Remove the modulus: $-4 \leq x - 3 \leq 4$, so $-1 \leq x \leq 7$.

Step 2 — Apply $x > 0$: Combine with $x > 0$ to get $0 < x \leq 7$.

Step 3 — Count the integers: Integers in $0 < x \leq 7$ are $1, 2, 3, 4, 5, 6, 7$, which is 7 values.

Why other options are wrong:

- 8: wrongly includes $x = 0$, which fails $x > 0$.
- $5, 6$: drop one or two of the valid integers.

Final Answer: 7 integers $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 12

Q13.

Solution

Concept — Composition of a function: Substitute $f(x)$ into f again and simplify the compound fraction.

Step 1 — Write the inner value: Let $u = f(x) = \dfrac{x-1}{x+1}$.

Step 2 — Form $f(u)$: $f(u) = \dfrac{u-1}{u+1} = \dfrac{\frac{x-1}{x+1} - 1}{\frac{x-1}{x+1} + 1}$.

Step 3 — Simplify the numerator: $\dfrac{x-1}{x+1} - 1 = \dfrac{(x-1)-(x+1)}{x+1} = \dfrac{-2}{x+1}$.

Step 4 — Simplify the denominator: $\dfrac{x-1}{x+1} + 1 = \dfrac{(x-1)+(x+1)}{x+1} = \dfrac{2x}{x+1}$.

Step 5 — Divide: $f(u) = \dfrac{-2/(x+1)}{2x/(x+1)} = \dfrac{-2}{2x} = -\dfrac{1}{x}$.

Why other options are wrong:

- x: would mean f is its own inverse giving identity, which is not the case here.
- $\dfrac{1}{x}, -x$: drop the sign or invert incorrectly.

Final Answer: $-\dfrac{1}{x} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 13

Q14.

Solution

Concept — Combining logarithms: $\log_2 A + \log_2 B = \log_2(AB)$. Convert to an algebraic equation and keep only values in the valid domain.

Step 1 — Combine the logs: $\log_2\big(x(x-2)\big) = 3$.

Step 2 — Remove the log: $x(x-2) = 2^3 = 8$.

Step 3 — Form a quadratic: $x^2 - 2x - 8 = 0$.

Step 4 — Factorise: $(x-4)(x+2) = 0$, so $x = 4$ or $x = -2$.

Step 5 — Apply the domain: Logarithms need $x > 0$ and $x - 2 > 0$, i.e. $x > 2$. Only $x = 4$ qualifies.

Common errors: Keeping $x = -2$, which makes the logarithms undefined.

Final Answer: $x = 4 \Rightarrow \boxed{4}$

Answer: (4) Go Back to Q 14

Q15.

Solution

Concept — Geometric progression terms: The nth term is ar^{n-1}. Dividing two terms eliminates a and gives a power of r.

Step 1 — Write the two terms: $ar^3 = 24$ and $ar^6 = 192$.

Step 2 — Divide to find r: $\dfrac{ar^6}{ar^3} = \dfrac{192}{24} \Rightarrow r^3 = 8 \Rightarrow r = 2$.

Step 3 — Find a: From $ar^3 = 24$: $a \times 8 = 24 \Rightarrow a = 3$.

Why other options are wrong:

- 2: this is the common ratio r, not the first term.
- $4, 6$: do not satisfy $a \times 8 = 24$.

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

Answer: (B) Go Back to Q 15

Q16.

Solution

Concept — Median to the hypotenuse: In a right triangle the median from the right angle to the hypotenuse equals half the hypotenuse (the vertex lies on the circle with the hypotenuse as diameter).

Step 1 — Find the hypotenuse: $AC = \sqrt{9^2 + 12^2} = \sqrt{81 + 144} = \sqrt{225} = 15$ cm.

Step 2 — Apply the median rule: Median $BM = \dfrac{1}{2} \times AC = \dfrac{1}{2} \times 15 = 7.5$ cm.

Why other options are wrong:

- $6, 9$: are not half of the hypotenuse 15.
- 7: a rounding of 7.5, but the exact value is 7.5.

Final Answer: 7.5 cm $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 16

Q17.

Solution

Concept — Intersecting chords theorem: When two chords cross inside a circle, the products of their two segments are equal: $PA \cdot PB = PC \cdot PD$.

Step 1 — Write the theorem: $PA \cdot PB = PC \cdot PD$.

Step 2 — Substitute the values: $4 \times 6 = 3 \times PD$, so $24 = 3\,PD$.

Step 3 — Solve for PD: $PD = \dfrac{24}{3} = 8$.

Why other options are wrong:

- $6, 9, 12$: do not satisfy $3\,PD = 24$.

Final Answer: $PD = 8 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 17

Q18.

Solution

Concept — Area from coordinates: The area of a triangle with vertices $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ is $\dfrac{1}{2}\left|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right|$.

Step 1 — Use the base on the x-axis: OP lies on the x-axis with length 6 (base).

Step 2 — Find the height: The height is the y-coordinate of Q, which is 5.

Step 3 — Apply area $= \dfrac{1}{2} \times$ base $\times$ height: $\dfrac{1}{2} \times 6 \times 5 = 15$.

Step 4 — Cross-check with the formula: $\dfrac{1}{2}|0(0 - 5) + 6(5 - 0) + 4(0 - 0)| = \dfrac{1}{2} \times 30 = 15$.

Common errors: Using 4 (the x-coordinate of Q) as the height instead of 5.

Final Answer: 15 square units $\Rightarrow \boxed{15}$

Answer: (15) Go Back to Q 18

Q19.

Solution

Concept — Conservation of volume on recasting: The metal volume is unchanged, so (number of cones) $= \dfrac{\text{volume of sphere}}{\text{volume of one cone}}$.

Step 1 — Volume of the sphere: $\frac{4}{3}\pi R^3 = \frac{4}{3}\pi(6)^3 = \frac{4}{3}\pi \times 216 = 288\pi$.

Step 2 — Volume of one cone: $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(2)^2(3) = \frac{1}{3}\pi \times 12 = 4\pi$.

Step 3 — Divide: Number of cones $= \dfrac{288\pi}{4\pi} = 72$.

Why other options are wrong:

- 36: halves the correct count, e.g. by dropping the factor in the sphere volume.
- $144, 48$: arithmetic slips in the cube or in the division.

Final Answer: 72 cones $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 19

Q20.

Solution

Concept — Cyclic remainders (powers): Remainders of 2^n on division by 7 repeat in a short cycle. Find the cycle length, then locate n within it.

Step 1 — List early powers mod 7: $2^1 \equiv 2$, $2^2 \equiv 4$, $2^3 = 8 \equiv 1 \pmod 7$.

Step 2 — Identify the cycle: Since $2^3 \equiv 1$, the remainders repeat every 3 powers.

Step 3 — Reduce the exponent: $100 = 3 \times 33 + 1$, so $2^{100} = (2^3)^{33} \cdot 2^1 \equiv 1^{33} \cdot 2 = 2 \pmod 7$.

Common errors: Forgetting the leftover 2^1 after grouping into blocks of 2^3.

Final Answer: Remainder $= 2 \Rightarrow \boxed{2}$

Answer: (2) Go Back to Q 20

Q21.

Solution

Concept — Counting divisors: If $N = p^a q^b r^c \cdots$, the number of positive divisors is $(a+1)(b+1)(c+1)\cdots$.

Step 1 — Prime factorise 360**:** $360 = 2^3 \times 3^2 \times 5^1$.

Step 2 — Add one to each exponent: Exponents $3, 2, 1$ give $(3{+}1), (2{+}1), (1{+}1) = 4, 3, 2$.

Step 3 — Multiply: $4 \times 3 \times 2 = 24$.

Why other options are wrong:

- $18, 20, 12$: result from a wrong factorisation or from multiplying the exponents without adding one.

Final Answer: 24 factors $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 21

Q22.

Solution

Concept — "At least one" by complement: Count all committees and subtract those with no woman (all men). This is faster than adding the separate cases.

Step 1 — Total committees of 3 **from** 7 **people:** $\binom{7}{3} = \dfrac{7 \times 6 \times 5}{3 \times 2 \times 1} = 35$.

Step 2 — Committees with no woman (all 3 **men):** $\binom{4}{3} = 4$.

Step 3 — Subtract: At least one woman $= 35 - 4 = 31$.

Common errors: Adding the cases incorrectly, or forgetting to subtract the all-men committees from the total.

Final Answer: 31 committees $\Rightarrow \boxed{31}$

Answer: (31) Go Back to Q 22

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	2940	4	D	5	A
6	15	7	C	8	56	9	B	10	A
11	27	12	C	13	D	14	4	15	B
16	A	17	D	18	15	19	C	20	2
21	B	22	31						