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- 21) Let $A = \{1, 2, 3, 4\}$ and be a relation on the set $A \times A$ defined by $R = \{(a, b), (c, d) : 2a + 3b = 4c + 5d\}$. Then the number of elements in R
- 22) The number of elements in the set $\{n \in N : 10 \leq n \leq 100 \text{ and } 3^n - 3 \text{ is a multiple of } 7\}$ is
- 23) Let an ellipse with centre $(1, 0)$ and latus rectum of length $\frac{1}{2}$ have its major axis along x-axis. If its minor axis subtends an angle 60° at the foci, then the square of the sum of the lengths of its minor and major axes is equal
- 24) If the area bounded by the curve $2y^2 = 3x$, lines $x+y=3, y=0$ and outside the circle $(x-3)^2 + y^2 = 2$ is A then $4(\pi + 4A)$
- 25) Consider the triangles with vertices $\mathbf{A}(2, 1), \mathbf{B}(0, 0)$ and $\mathbf{C}(t, 4)$, $t \in [0, 4]$. If the maximum and the minimum perimeters of such triangles are obtained at $t = \alpha$ and $t = \beta$ respectively. Then $6\alpha + 2\beta$ is equal to
- 26) Let the plane P contain the line $2x+y-z-3 = 0 = 5x-3y+4z+9$ and be parallel to the line $\frac{x+2}{2} = \frac{3-y}{4} = \frac{z-7}{5}$. Then the distance of the point $\mathbf{A}(8, -1, -19)$ from the plane P measured parallel to the line $\frac{x}{-3} = \frac{y-5}{4} = \frac{2-z}{-12}$ is equal to
- 27) If the sum of series $\left(\frac{1}{2} - \frac{1}{3}\right) + \left(\frac{1}{2^2} - \frac{1}{2 \cdot 3} + \frac{1}{3^2}\right) + \left(\frac{1}{2^3} - \frac{1}{2^2 \cdot 3} + \frac{1}{2 \cdot 3^2} - \frac{1}{3^3}\right) + \dots = \frac{\alpha}{\beta}$. where α, β are co-prime then the value of $\alpha + 3\beta$
- 28) A person forgets his 4-digit ATM pin code. But he remembers that in the code all the digits are different, the greatest digit is 7 and the sum of the first two digits is equal to the sum of the last two digits. Then the maximum number of trials necessary to obtain the correct code is
- 29) If the line $x = y = z$ intersects the line $x \sin A + y \sin B + z \sin C - 18 = 0 = x \sin 2A + y \sin 2B + z \sin 2C - 9$, where A, B, C are the angles of a triangle ABC, then $80 \left(\sin \frac{A}{2} \right) \sin \frac{B}{2} \sin \frac{C}{2}$
- 30) $f(x) = \int \frac{dx}{(3+4x^2)\sqrt{4-3x^2}}$, $|x| < \frac{2}{\sqrt{3}}$. If $f(0) = 0$ and $f(1) = \frac{1}{\alpha\beta} \tan^{-1} \frac{\alpha}{\beta}$ then $\alpha^2 + \beta^2$ is equal to