1. The number of ways in which 13 gold coins can be distributed among three persons such that each one gets at least two gold coins is [EAMCET-2000] 

1) 36 2) 24 3) 12 4) 6
Ans: 1

Sol: Required number of ways 
= coefficient. x^{13} in (x^2 + x^3 + \ldots)^3 
= coefficient. x^7 in (1 + x + x^2 + \ldots)^3 
= coefficient. x^7 in (1 + x)^3 
= \binom{9}{7} = \binom{9}{2} = 36

2. If C (2n, 3) : C (n, 2) = 12 : 1, then n = [EAMCET-2000] 

1) 4 2) 5 3) 6 4) 8
Ans: 2

Sol: 
\binom{2n}{3} : \binom{n}{2} = 12 : 1 
\binom{2n}{3} = 12 \binom{n}{2} 
\Rightarrow \frac{2n(2n-1)(2n-2)}{6} = 12 \cdot \frac{n(n-1)}{2} 
\Rightarrow 2n-1 = 9 \Rightarrow n = 5

3. The number of quadratic expressions with the coefficients drawn from the set\{0, 1, 2, 3\} is [EAMCET-2000] 

1) 27 2) 36 3) 48 4) 64
Ans : 3

Sol: 
ax^2 + bx + c = 0 
a can be filled in 3 ways 
b can be filled in 4 ways 
c can be filled in 4 ways 
Required no. of ways = 3 x 4 x 4 = 48

4. The number of ways in which 5 boys are 4 girls sit around a circular table so that no two girls sit together is [EAMCET-2001] 

Ans : 1 
1) 5! 4! 2) 5! 3! 3) 5! 4) 4!

Sol: First we arrange 5 boys around a circle in (5-1)! = 4! Ways then we have 5 gaps between them then arrange 4 girls in 5 gaps arrangement of 4 girls in 5 gaps
Arrangement of 4 girls in 5 gaps = \binom{5}{4}P_4 = 5! 
\therefore \text{Required no. of ways} = 5! 4!
5. Using the digits 0, 2, 4, 6, 8 not more than once in any number, the number of 5 digited numbers that can be formed is

\[\text{[EAMCET-2001]}\]

1) 16 2) 24 3) 120 4) 96

\text{Ans:} 4

\text{Sol:} \ \text{Required no. of ways} = 5! - 4! = 120-24 = 96

6. If n and r are integers such that \(1 < r < n\) then \(n . C (n-1, r-1) = \)

\[\text{[EAMCET-2002]}\]

1) \(C (n, r)\) 2) \(n . C (n, r)\) 3) \(r . C (n, r)\) 4) \((n - 1) . C (n, r)\)

\text{Ans:} 3

\text{Sol:} \ nC(n-1, r-1) = n.(n-1)c_{r-1}

\[= n. \frac{(n-1)!}{(r-1)!(n-r)!} \times r\]

\[= \frac{n!r}{r!(n-r)!} = r . c_r = r . C(n, r)\]

7. The least value of the natural number 'n' satisfying \(c(n,5) + c(n,6) > c(n+1,5)\)

\[\text{[EAMCET-2002]}\]

1) 10 2) 12 3) 13 4) 11

\text{Ans:} 1

\text{Sol:} \ \text{Given} \ c_5 + c_6 > c_{(n+1)} \ c_5

\[
\begin{align*}
\binom{n+1}{6} &> \binom{n+1}{5} \\
\frac{(n+1)!}{6!(n-5)!} &> \frac{(n+1)!}{5!(n-4)!} \\
\Rightarrow n &> 10
\end{align*}
\]

\therefore \text{The least value of 'n' is 10}

8. The no. of ways such that 8 beads of different colour be strung in a neckles is...

\[\text{[EAMCET-2002]}\]

1) 2520 2) 2880 3) 4320 4) 5040

\text{Ans:} 1

\text{Sol:} \ \text{Required number of ways} = \frac{(8-1)!}{2} = 2520

9. The number of 5 digited numbers which are not divisible by 5 and which contains of 5 odd digits is

\[\text{[EAMCET-2002]}\]

1) 96 2) 120 3) 24 4) 32

\text{Ans:} 1

\text{Sol:} \ \text{The 5 odd digits be} 1,3,5,7,9

\text{Required} = 5! - 4!

\[= 120 - 124\]

\[= 96\]
10. Let \( l_1 \) and \( l_2 \) be two lines intersecting at \( P \). If \( A_1, B_1, C_1 \) are points on \( l_1 \), and \( A_2, B_2, C_2, D_2, E_2 \) are points on \( l_2 \) and if none of those coincides with \( P \), then the number of triangles formed by these eight points.

\[ \text{[EAMCET-2003]} \]

\[
\begin{align*}
1) & \ 56 \\
2) & \ 55 \\
3) & \ 46 \\
4) & \ 45 \\
\end{align*}
\]

Ans: 4

Sol: If triangle is including point \( P \) the other points must be one from \( l_1 \) and other point from \( l_2 \),

Number of triangles formed with \( P \).

\[
\begin{align*}
n(E_1) & = c_1 \times c_1 = 15 \\
\end{align*}
\]

When \( p \) is not included

Number of triangles formed

\[
\begin{align*}
n(E_2) & = c_2 \times c_1 + c_1 \times c_2 \\
& = 15 + 15 \\
& = 30 \\
\end{align*}
\]

\[∴ \text{ Total number of triangles} = n(E_1) + n(E_2) \]

\[= 15 + 30 = 45 \]

11. The number of positive odd divisors of 216 is

\[ \text{[EAMCET-2004]} \]

\[
\begin{align*}
1) & \ 4 \\
2) & \ 6 \\
3) & \ 8 \\
4) & \ 12 \\
\end{align*}
\]

Ans: 1

Sol: The factors of 216 = \( 2^3 \times 3^3 \)

The odd divisors are the multiplied 3.

\[∴ \text{ The number of positive odd divisors} = 3 + 1 = 4 \]

12. A three digit number \( n \) is such that the last two digits of it are equal and different from the first. The number of such \( n \)'s is

\[ \text{[EAMCET 2005]} \]

\[
\begin{align*}
1) & \ 64 \\
2) & \ 72 \\
3) & \ 81 \\
4) & \ 900 \\
\end{align*}
\]

Ans: 3

Sol: If the last two digits are equal to then the first digit may 1 to 9

If the last two digits are equal to 1 to 9 then the first digit may be selected in 8 ways.

\[∴ \text{ The required number} = 9 \times 9 \times 8 \]

\[= 81 \]

13. If \( N \) denotes Set of all positive integers and if and if is defined by the sum of positive divisors of .

then where is a positive integer is

\[ \text{[EAMCET-2005]} \]

\[
\begin{align*}
1) & \ 2^{k+1} - 1 \\
2) & \ 2(2^{k+1} - 1) \\
3) & \ 3(2^{k+1} - 1) \\
4) & \ 4(2^{k+1} - 1) \\
\end{align*}
\]

ns: 3

Sol: Given \( f(x) = \) the sum of positive divisors of \( n \)
Permutation and combination

\[ f(2^k, 3) = 3\left(1 + 2 + 2^2 + 3^3 + \ldots + 2^k\right) \]
\[ = 3\left(\frac{2^{k+1} - 1}{2 - 1}\right) \]
\[ = 3\left(2^{k+1} - 1\right) \]

14. The number of natural numbers less than 1000, in which no two digits are repeated is

[EAMCET 2006]

1) 738  2) 792  3) 837  4) 720

Ans: 1

Sol: The number of 1 digit numbers = 9
The number of 2 digit numbers = 9 \times 9 = 81
The number of 3 digit numbers = 9 \times 9 \times 8 = 648
\[ \therefore \] The number of Required numbers
\[ = 9 + 81 + 648 = 738 \]

15. The number of ways of arranging 8 men and 4 women around a circular table such that no two women can sit together, is

[EAMCET-2007]

Ans:
1) 8!  2) 4!  3) 8! \times 4!  4) 7! \times 8\text{P}_4

Ans: 4

Sol: Number of ways of arranging 8 men around a circle = (8-1)! = 7!
Then we have 8 gaps between them.
Number of ways of arranging 4 women in 8 gaps = 8\text{P}_4
\[ \therefore \] Required number of ways = 7! \times 8\text{P}_4

16. If a polygon of n sides has 275 diagonals, then n =

[EAMCET-2007]

1) 25  2) 35  3) 20  4) 15

Ans: 1

Sol: Number of diagonals of a polygon of n sides = \frac{n(n-3)}{2} = 275
\[ \frac{n(n-3)}{2} = 275 \]
\[ n(n-3) = 550 \]
\[ n(n-3) = 25 \times 22 \]
\[ \therefore \] n = 25

17. 9 balls are to be placed in 9 boxes, and 5 of the balls can not fill into 3 small boxes. The numbers of ways of arranging one ball in each of the boxes is

[EAMCET-2008]
Permutation and combination

1) 18720 2) 18270 3) 17280 4) 12780
Ans: 3

Sol: 5 balls can be placed in 6 boxes (other than the 3 small boxes) in $^6p_5$ ways
The remaining 4 balls can be placed in the remaining 4 boxes in $4!$ ways.
\[ \therefore \text{The required number of arrangements} = ^6p_5 \times 4! \]

18. If $p_r = 30240$ and $c_r = 252$ then the ordered pair $(n,r) =$
1) (12,6) 2) (10,5) 3) (9,4) 4) (16,7)
Ans: 2

Sol: $\frac{^np_r}{^nc_r} = \frac{30240}{252}$
\[ \Rightarrow r! = 120 \]
\[ \Rightarrow r! = 5! \]
\[ \Rightarrow r = 5 \]
\[ ^np_s = 30240 = 10p_5 \Rightarrow n = 10 \]
\[ \therefore (n,r) = (10,5) \]

19. The number of subsets of \{1,2,3,…9\} containing at least one odd number is [EAMCET-2009]
1) 324 2) 396 3) 496 4) 512
Ans: 3

Sol: No of subsets = $2^9 - 2^4$
\[ = 512 - 16 \]
\[ = 496 \]

20. ‘P’ points are chosen each of the three coplanar lines. The maximum number of triangles formed with vertices at these points is [EAMCET-2009]
1) $p^3 + 3p^2$ 2) $\frac{1}{2}(p^3 + p)$ 3) $\frac{p^2}{2}(5p - 3)$ 4) $p^3(4p - 3)$
Ans: 4

Sol: Let the lines be $L_1$, $L_2$, $L_3$
Max no of triangles = $^3c_2 \times ^p c_2 \times c_1 + \left( ^pc_1 \right)^3$
\[ = 6 \times \frac{p(p-1)}{2} \times p + p^3 \]
\[ = p^2(3p^2 - 3p + p) \]
\[ = p^2(4p^2 - 3p) \]

21. A binary sequence is an array of 0’s and 1’s the number of n-digit binary sequences which contain even number of 0’s is [EAMCET-2009]
Permutation and combination

1) $2^{n-1}$  
2) $2^{n-1}$  
3) $2^{n-1} - 1$  
3) $2^n$

Ans: 1

Sol: If n is even, no of n-digit binary sequences = $2^{n-1}$. 