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Probability & Combinatorics for CAT

11 Oct 2017





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Question 1:

How many integers, greater than 999 but not greater than 4000, can be formed with the digits 0, 1, 2, 3 and 4, if repetition of digits is allowed?

- A. 499
- B. 500
- C. 375
- D. 376

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Question 2:

What is the number of distinct terms in the expansion of $(a + b + c)^{20}$?

- A. 231
- B. 253
- C. 242
- D. 210
- E. 228

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Question 3:

There are 6 boxes numbered 1,2,... 6. Each box is to be filled up either with a red or a green ball in such a way that at least 1 box contains a green ball and the boxes containing green balls are consecutively numbered. The total number of ways in which this can be done is

- A. 5
- B. 21
- C. 33
- D. 60

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Question 4:

A graph may be defined as a set of points connected by lines called edges. Every edge connects a pair of points. Thus, a triangle is a graph with 3 edges and 3 points. The degree of a point is the number of edges connected to it. For example, a triangle is a graph with three points of degree 2 each. Consider a graph with 12 points. It is possible to reach any point from any point through a sequence of edges. The number of edges, e , in the graph must satisfy the condition

- A. $11 \leq e \leq 66$
- B. $10 \leq e \leq 66$
- C. $11 \leq e \leq 65$
- D. $0 \leq e \leq 11$

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Question 5:

A new flag is to be designed with six vertical stripes using some or all of the colours yellow, green, blue and red. Then, the number of ways this can be done such that no two adjacent stripes have the same colour is

- A. 12×81
- B. 16×192
- C. 20×125
- D. 24×216

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Solutions:

1) Answer (D)

We have to essentially look at numbers between 1000 and 4000 (including both).

The first digit can be either 1 or 2 or 3.

The second digit can be any of the five numbers.

The third digit can be any of the five numbers.

The fourth digit can also be any of the five numbers.

So, total is $3 \times 5 \times 5 \times 5 = 375$.

However, we have ignored the number 4000 in this calculation and hence the total is $375 + 1 = 376$

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2) Answer (A)

The power is 20.

20 has to be divided among a, b and c. This can be done in

$$20+3-1 C_{3-1} = {}^{22}C_2 = 231$$

Option a) is the correct answer.

3) Answer (B)

Solution: If there is only 1 green ball, it can be done in 6 ways

If there are 2 green balls, it can be done in 5 ways.

If there are 6 green balls, it can be done in 1 way.

So, the total number of possibilities is $6 \times 7 / 2 = 21$

Wilson's Theorem for CAT [Download PDF]

4) Answer (A)

Take any 12 points.

The maximum number of edges which can be drawn through

these 12 points are ${}^{12}C_2 = 66$

The minimum number of edges which can be drawn through these 12 points are $12-1 = 11$ as the resulting figure need not be closed. It might be open.

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5) Answer (A)

The number of ways of selecting a colour for the first stripe is 4. The number of ways of selecting a colour for the second stripe is 3. Similarly, the number of ways of selecting colours for the third, fourth, fifth and sixth stripes are 3, 3, 3 and 3 respectively.

The total number of ways of selecting the colours is, therefore, $4 \times 3 \times 3 \times 3 \times 3 \times 3 = 12 \times 81$.

Remainder Theorem for CAT [Download PDF]

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