

Unit 10 - Week 9: Combinatorics

Course outline

How to access the portal

Week 1: Mathematical Logic

Week 2: Mathematical Logic

Week 3: Mathematical Logic And Set Theory

Week 4: Graph Theory

Week 5: Graph Theory-II

Week 6: Set Theory & Number Theory

Week 7: Set Theory & Number Theory

Week 8: Combinatorics

Week 9: Combinatorics

 Composition of Generating Function

 Principle of Inclusion Exclusion

 Rook placement problem

 Quiz : Assignment 9

 Feedback form

Live Session-1

Week 10: Number Theory

Live Session-2

Week 11: Algebra

Week 12: Algebra-II

Assignment 9

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-10-02, 23:59 IST.

1) Consider a sorted array with 5 elements such that no elements repeat. What is the number of ways of rearranging the array so that no number is in its correct sorted position? **4 points**

- 44
 120
 60
 24

No, the answer is incorrect.
Score: 0

Accepted Answers:
44

2) Consider a sorted array with n elements such that no elements repeat. Let x be the number of ways of rearranging the array so that no number is in its correct sorted position. Which of the following is the best approximation for x when n is large? **4 points**

- $n!/e$
 e^n
 e
 e^{-n}

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $n!/e$

3) Let $D(n)$ denote the number of derangements of an n element set. Which of the following recurrences are satisfied by $D(n)$? **4 points**

- $D(n) = n(D(n-1) + D(n-2))$
 $D(n) = n(D(n-1) - D(n-2))$
 $D(n) = nD(n-1) + D(n-2)$
 $D(n) = D(n-1) + nD(n-2)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $D(n) = n(D(n-1) + D(n-2))$

4) Let $\{a_n\}_{n \geq 0}$ and $\{b_n\}_{n \geq 0}$ be two sequences such that $b_n = \sum_{i=0}^n a_i$ and let $A(x)$ and $B(x)$ be their generating functions. Which of the following is true? **4 points**

- $B(x) = \frac{A(x)}{1-x}$
 $B(x) = \frac{A(x)}{1+x}$
 $A(x) = \frac{B(x)}{1-x}$
 $A(x) = \frac{B(x)}{1+x}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $B(x) = \frac{A(x)}{1-x}$

5) Consider a string (consisting of letters A-Za-z) length n . We need split the string into several contiguous substrings. After that, the case of a few (possibly none) letters are changed (from upper case to lower case and vice versa). What is the number of ways of doing this? **4 points**

- $2 \cdot 3^{n-1}$
 $2 \cdot 3^n$
 $2 \cdot 3^{n+1}$
 $3 \cdot 2^{n-1}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $2 \cdot 3^{n-1}$

6) Consider a string (consisting of letters A-Za-z) length n . We need split the string into several contiguous substrings. After that, the case of a few (possibly none) letters are changed (from upper case to lower case and vice versa). Let a_n be the number of ways of doing this. What is the generating function of $\{a_n\}_{n \geq 0}$ **4 points**

- $\frac{1-x}{1-3x}$
 $\frac{1+x}{1-3x}$
 $\frac{1-3x}{1+x}$
 $\frac{1-x}{1+3x}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\frac{1-x}{1-3x}$

7) The rook polynomial of a 4×4 chess board is **4 points**

- $24x^4 + 96x^3 + 72x^2 + 16x + 1$
 $24x^4 + 96x^3 + 144x^2 + 16x + 1$
 $24x^4 + 96x^3 + 72x^2 + 17x + 1$
 $24x^4 + 144x^3 + 72x^2 + 16x + 1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $24x^4 + 96x^3 + 72x^2 + 16x + 1$

8) Let $a_0 + a_1x + a_2x^2 + a_nx^n$ be a rook polynomial of a board B . Which of the following statements are true? **4 points**

- $a_0 = 1$
 a_1 denotes the total number of allowed positions on B
 $a_n = 1$
 a_i cannot be negative for any i

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $a_0 = 1$

a_1 denotes the total number of allowed positions on B

a_i cannot be negative for any i