

KING SAUD UNIVERSITY

Practice problems for final

1. What is the co-efficient of $x^3y^4z^3$ when expanding $(x + 2y + 3z)^{10}$.

2. Calculate the value of $\sum_{k=0}^n \prod_{i=0}^k 3$.

3. Prove using Induction that for all positive integer n , then

$$\sum_{k=0}^n k \cdot (k!) = (n+1)! - 1.$$

4. Use Induction to show that, $n! > 2^n$ for all $n \geq 4$.

5. Solve the recurrence relation $a_n = a_{n-1} - 3a_{n-2}$ with initial conditions

$$a_0 = 1, a_1 = 6.$$

6. How many passwords of length 7 can you make using following symbols: a-z, A-Z, @, and 0-9. Each password must have at least one capital letter, and at least one digit.

7. Suppose we have three sets: X , Y , and Z of sizes n, m, ℓ respectively. Let set $W = X \times Y$ (cross-product of two sets), and let $E = P(W)$, that is the power set of W . Count the number of functions $f : Z \mapsto E$.

8. Solve using the Chinese remained theorem the system of equations,

$$x \equiv 2 \pmod{9}$$

$$x \equiv 3 \pmod{50}$$

$$x \equiv 6 \pmod{49}$$

9. How many different words can you make by re-arranging the letters of the name, *MOHAMMAD*. What if we insist that the first letter must be "M", how many different words can you make by re-arranging the other letters.

10. How many ways can you distribute 6 identical toys to 5 children if each child must get at least one toy. What if the toys are different?

11. Express the gcd of the numbers 245 and 363 as a linear combination of both numbers.

12. Calculate $\begin{pmatrix} -1/3 \\ 5 \end{pmatrix}$.