

MATH 213 – DISCRETE MATH – Spring 2026 – Quiz 3 – Wednesday, Mar. 4  
This quiz contains 3 questions – You have 15 minutes

Name: \_\_\_\_\_

**Problem 1.** State the binomial theorem for the expansion of  $(x + y)^n$ .

*Solution:*

$$(x + y)^n = \sum_{k=0}^n \binom{n}{k} x^k y^{n-k}$$

**Problem 2.** Suppose we have a probability distribution with sample space  $S = \{a, b, c\}$ . What are the relations that  $p(a)$ ,  $p(b)$ , and  $p(c)$  must satisfy so that we have a valid probability distribution?

*Solution:* We must have  $0 \leq p(a) \leq 1$ ,  $0 \leq p(b) \leq 1$ ,  $0 \leq p(c) \leq 1$ , and  $p(a) + p(b) + p(c) = 1$ .

**Problem 3.** Give an arithmetical expression for the following. For this problem, expressions involving factorials like  $5 \cdot 3!$  are fine, but expressions involving quantities like  $\binom{4}{2}$  or  $P(5, 3)$  are not.

*(No work needed)*

(a)  $\binom{8}{3}$

*Solution:*  $\frac{8!}{3! \cdot 5!}$

(b)  $P(8, 3)$

*Solution:*  $8 \cdot 7 \cdot 6$  (or  $\frac{8!}{5!}$ )

(c) The number of distinct permutations of the string AAAABBCCCD (different copies of the same letter are taken to be indistinguishable).

*Solution:*  $\binom{10}{4,2,3,1} = \frac{10!}{4! \cdot 2! \cdot 3! \cdot 1!}$ .