

## Quiz 1 - MACM 201 - *Solutions*

Express your answer using only numbers and factorials  
Do Not Simplify!

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[4 pts] Consider the word SUCCESS

- (a) In how many ways can the letters from this word be arranged?
- (b) For the arrangements in part (a), how many have all three S's together?

*Solution:*

- (a) The word success has 3 S's, 2 C's, 1 U, and 1 E for a total of 7 letters. The number of ways to rearrange these letters is

$$\binom{7}{3, 2, 1, 1} = \frac{7!}{3!2!}$$

- (b) If all three S's are together, then we may represent SSS by the letter X. Now have a word with 1 X, 2 C's, 1 U, and 1 E so the total number of words of this type is

$$\binom{5}{1, 2, 1, 1} = \frac{5!}{2!}$$

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[4 pts] Consider integer solutions to  $x_1 + x_2 + x_3 = 13$

- (a) How many satisfy  $x_1, x_2, x_3 \geq 0$ ?
- (b) How many satisfy  $x_1, x_2, x_3 \geq 3$ ?

*Solution:*

- (a) The number of solutions to this equation is the same as the number of binary strings with 13 1's and 2 0's which is

$$\binom{15}{2} = \frac{15!}{2!13!}$$

- (b) Setting  $y_i = x_i - 3$  we can express this as the number of nonnegative solutions to the equation  $y_1 + y_2 + y_3 = 4$ . This is the same as the number of binary strings with 4 1's and 2 0's which is

$$\binom{6}{2} = \frac{6!}{4!2!}$$