

COMP S264F Discrete Mathematics
Tutorial 9: Combinatorics

Question 1. Consider the following menu of a restaurant.

<u>CHICKEN DISHES</u>	
Curry Chicken	\$58
Sweet & Sour Chicken	\$58
Grilled Lemongrass Chicken	\$48
<u>SEAFOOD DISHES</u>	
Crispy Catfish Fillet with Ginger	\$48
Clay Hot Pot with Shrimp and Tofu	\$58
Iron Seafood Skillet with Mixed Vegetables & Ginger	\$78
<u>VEGETARIAN DISHES</u>	
Mapo Tofu	\$45
Vegetarian Fried Rice	\$50

Find the number of ways to order

- (a) any 6 distinct dishes from the menu.
- (b) 5 distinct dishes with 2 chicken dishes, 2 seafood dishes and 1 vegetarian dish.
- (c) 4 distinct dishes with at least 1 dish from each of the 3 categories.

Question 2. Find the number of strings that can be formed by ordering the letters in the string “ETHANE”

- (a) with no constrictions.
- (b) if the two E’s must be consecutive.
- (c) using some or all of the letters.
- (d) if the letter N occurs at any position before the letter A.

Question 3. Given an unlimited number of red, blue, green balls, find the number of ways to select 10 balls if

- (a) there is no constrictions.
- (b) at least one red ball must be selected.
- (c) exactly one blue ball must be selected.
- (d) at most one green ball must be selected.
- (e) twice as many red balls as green balls must be selected.

Question 4. Find the number of non-negative integer solutions to the equation $x + y + z = 18$ if

- (a) there are no more restrictions on x, y, z
- (b) $x \geq 3, y \geq 2, z \geq 1$
- (c) $x < 7, y < 8, z < 9$

Question 5. Give a combinatorial proof for the identity

$$\sum_{k=0}^r C(n+k, k) = C(n+r+1, r) .$$