CECS 228 Name:

Lab 10.1 ID: Date:  
Objective:

* Be able to use Basic Counting Principle

Exercise 1: Six different airlines fly from New York to Denver and seven fly from Denver to San Francisco. How many different pairs of airlines can you choose on which to book a trip from New York to San Francisco via Denver, when you pick an airline for the flight to Denver and an airline

for the continuation flight to San Francisco?

6∙7 = 42  
  
Exercise 2: How many strings of eight English letters are there

a) that contain no vowels, if letters can be repeated?

218

b) that start with a vowel, if letters can be repeated?

5∙267

c) that contain at least one vowel, if letters can be repeated?

String with at least 1 vowel = All strings – strings contain no vowel = 268 - 218

d) that start with X and contain at least one vowel, if letters can be repeated?

String start w/ X w/ at least 1 vowel = All strings start w/ X– strings start with X contain no vowel   
= 267 - 217

Exercise 3: How many positive integers between 100 and 999 inclusive

a) are divisible by 7?

(994 – 105)/7 + 1 = 128

b) are odd?

(999 – 101)/2 + 1 = 450

c) have the same three decimal digits?

9 (111, 222, 333, 444, 555, 666, 777, 888, 999)

d) are not divisible by 4?

Numbers not divisibly by 4 = All numbers from 100 to 999 (inclusive) – numbers divisible by 4   
 = 900 – [(996-100)/4 + 1] = 675

e) are divisible by 3 or 4?

Numbers divisible by 3 or 4 = Num div. by 3 + Num div. by 4 – Num div. by 3 and 4  
 = [(999-102)/3 + 1] + [(996-100)/4 + 1] - [(996-108)/12 + 1]  
 = 450

Exercise 4: The name of a variable in the JAVA programming language is a string of between 1 and 65,535 characters, inclusive, where each character can be an uppercase or a lowercase letter, a dollar sign, an underscore, or a digit, except that the first character must not be a digit. Determine the number of different variable names in JAVA.

# of strings with length 1 = 54  
# of strings with length 2 = 54∙64  
# of strings with length 3 = 54∙642  
…  
# of strings with length 65535 = 54∙6465534  
Total = 54(1 + 64 + 642 + … + 6465534) = 54(6465535 – 1) / 63

Exercise 5: Use the principle of inclusion–exclusion to find the number of positive integers less than 1,000,000 that are not divisible by either 4 or by 6.

A = # of numbers not divisible by 4  
 = # of all numbers from 1 to 999999 (inclusive) - # of numbers divisible by 4  
 = 999999 - [(999996 - 4)/4 + 1] = 750000  
B = # of numbers not divisible by 6  
 = # of all numbers from 1 to 999999 (inclusive) - # of numbers divisible by 6  
 = 999999 - [(999996 - 6)/6 + 1] = 833333  
C = # of numbers not divisible by 4 and 6  
 = # of all numbers from 1 to 999999 (inclusive) - # of numbers divisible by 12  
 = 999999 - [(999996 - 12)/12 + 1] = 916666  
# of numbers not divisible by either 4 or 6 = A + B – C = 666667

Exercise 6: How many one-to-one functions are there from a set with five elements to sets with the following number of elements?

a) 4

0

b) 5

5∙4∙3∙2∙1 = 120

c) 6

6∙5∙4∙3∙2 = 720

Exercise 7: In how many ways can a photographer at a wedding arrange six people in a row, including the bride and groom, if

a) the bride must be next to the groom?

2∙(5∙4∙3∙2∙1) = 240

b) the bride is not next to the groom?  
# of bride not next to groom = # of all possible arrangements - # of bride next to groom  
 = 6! - 2∙(5∙4∙3∙2∙1) = 480