

IE-231 In-Class Activity - Week 2

Oct 3, 2017 (Due date 12:50)

This is a graded in-class assignment with peer review. **One submission per group on paper.** Do a clean work, your style will be evaluated too. Take a snapshot of your work after peer review. Check the details of peer review guidelines on Bilgi Learn or course webpage.

Question 1

Suppose we draw three cards from a deck and roll two dice. Answer the following questions.

- a) What is the experiment?

The experiment is “drawing three cards from a deck and rolling two dice”.

- b) What is “getting two-sixes and three-kings or five-one (in any order) one queen one king one ace”? Pick one (Event / Outcome / Sample Space)

Event.

- c) Give an example of two mutually exclusive events.

Event A: Queen of Hearts / Queen of Spades / Queen of Diamonds / 6 / 5 Event B: Ace of Clubs / King of Clubs / Queen of Clubs / 4 / 4

- d) What is the probability of getting four-three (in any order) in dice roll and three queens in card draw?

```
#First roll can either be 3 or 4 and second roll should be the other  
# 2/6 * 1/6  
#Getting the first Queen has probability of 4/52  
#Getting the second Queen has probability of 3/51  
#Getting the third Queen has probability of 2/50  
2/6*1/6*4/52*3/51*2/50
```

```
## [1] 1.00553e-05
```

- e) How many different outcomes can there be? This time assume ordering is important (e.g. 6-1 and 1-6 are different outcomes).

```
#Six outcomes per die  
#52 outcomes for the first card draw  
#51 outcomes for the second card draw  
#50 outcomes for the second card draw  
#Multiplication rule  
#You can also use permutation rule for cards  
6*6*52*51*50
```

```
## [1] 4773600
```

Question 2

In how many ways can you arrange the letters of “HOUSEPARTY”?

- a) Any order.

```

the_phrase<-"HOUSEPARTY"
#No repetitive letters
#Permutation rule
factorial(nchar(the_phrase))

```

```
## [1] 3628800
```

b) Vowels together?

```

#4 vowels, 6 consonants
#Assume all vowels are a single "letter". So 8 characters.
#But vowels permuate within the single "letter".
#Multiplication rule
factorial(6+1)*factorial(4)

```

```
## [1] 120960
```

c) Vowels in alphabetical order?

```

#We start with all the permutations 10!
#For any permutation there can be only one ordering of vowels.
#For instance HOUSEPARTY is not valid but HAESOPURTY is valid
#So remove invalid permutations with division
factorial(10)/factorial(4)

```

```
## [1] 151200
```

d) There should be no consecutive vowels?

```

#There are 6 consonants, 4 vowels.
# Assume Xs are consonants and .s are potent vowel places.
# .X.X.X.X.X.X.
#Consonants can permuate in any order so 6! there
#7 places for vowels but only 4 vowels.
# So it is a permutation of 4 out of 8 places.
factorial(6)*(factorial(7)/factorial(7-4))

```

```
## [1] 604800
```

Question 3

In how many ways can you arrange the letters of "CAMARADERIE"?

```

# 11 characters.
# 6 vowels, 5 consonants
# 3 As, 2 Es, 2 Rs

```

a) Any order.

```

#By the formula of permutation with repetitive letters
#Assign the value to all_perms object
all_perms<-factorial(11)/(factorial(3)*factorial(2)*factorial(2))
all_perms

```

```
## [1] 1663200
```

b) Vowels together?

```

#Assume all vowels are single "character" again. So 6 characters
(factorial(5+1)/(factorial(2)))*(factorial(6)/(factorial(3)*factorial(2)))

```

```
## [1] 21600
```

c) Vowels in alphabetical order?

```
#Same as the last question. But be careful about identical vowels.  
all_perms/(factorial(6)/(factorial(3)*factorial(2)))
```

```
## [1] 27720
```

d) There should be no consecutive vowels?

```
#Same as the last question. But be careful about identical vowels.  
(factorial(5)/factorial(2))*(factorial(6)/factorial(6-6))/(factorial(3)*factorial(2))
```

```
## [1] 3600
```

Question 4

Suppose you are putting the top 12 basketball teams in 4 groups evenly (each group should consist of 3 teams). In how many different ways can you arrange the teams?

```
#It is either a chain of combinations or just grouping combination  
choose(12,3)*choose(9,3)*choose(6,3)
```

```
## [1] 369600
```

Question 5

There are 18 people; 10 from Izmir, 8 from Mugla.

a) Suppose you want to form a group of 5 people with at least 1 person from Izmir and Mugla. In how many ways can you form such a group?

```
#Calculate as if no rules. It is the combination of 18 to 5.  
#Then remove the combinations of all Izmir or all Mugla people  
choose(18,5) - choose(10,5) - choose(8,5)
```

```
## [1] 8260
```

b) In how many ways can you form a group of 3 people from Izmir and 4 people from Mugla?

```
#Simply separate combinations with multiplication rule.  
choose(10,3)*choose(8,4)
```

```
## [1] 8400
```