MThambeliyagodage\_Data605\_W6\_Assign6

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### Problem 1

A box contains 54 red marbles, 9 white marbles, and 75 blue marbles. If a marble is randomly selected from the box, what is the probability that it is red or blue? Express your answer as a fraction or a decimal number rounded to four decimal places.

#### ANSWER 1

### Problem 2

You are going to play mini golf. A ball machine that contains 19 green golf balls, 20 red golf balls, 24 blue golf balls, and 17 yellow golf balls, randomly gives you your ball. What is the probability that you end up with a red golf ball? Express your answer as a simplified fraction or a decimal rounded to four decimal places.

#### Ans 2

### Problem 3

A pizza delivery company classifies its customers by gender and location of residence. The research department has gathered data from a random sample of 1,399 customers. The data is summarized in the table below.

prob3 <- data.frame(male=c(81,116,215,130,129),  
 female=c(228,79,252,97,72),   
 row.names = c("apartment","dorm","with parents","greek house","other"))  
prob3

## male female  
## apartment 81 228  
## dorm 116 79  
## with parents 215 252  
## greek house 130 97  
## other 129 72

What is the probability that a customer is not male or does not live with parents? Write your answer as a fraction or a decimal number rounded to four decimal places.

#### Ans 3-a

Number of customers:

cust\_total <- sum(prob3)  
cust\_total

## [1] 1399

The complement of customers who are not male or do not live with parents is customers who are male and live with parents, which is 215 customers.

#### Ans 3-b

### Problem 4

Determine if the following events are independent. Going to the gym. Losing weight.

#### Ans 4A

Two events are independent if probability of one event is not affected by another event. In other words, if and are two events, then they are independent if .

#### Ans 4B

It is a realistic assumption that will not be the same as , so events are likely **DEPENDENT**. Of course, without additional information we cannot be sure.

### Problem 5

A veggie wrap at City Subs is composed of 3 different vegetables and 3 different condiments wrapped up in a tortilla. If there are 8 vegetables, 7 condiments, and 3 types of tortilla available, how many different veggie wraps can be made?

#### Ans 5

# Number of ways you can choose 3 vegetables from 8 vegetable options  
v <- choose(8, 3)  
# Number of ways you can choose 3 condiments from 7 condiment options  
c <- choose(7, 3)  
# number of ways you can choose a tortilla from 3 tortilla options  
t <- choose(3, 1)  
# Number of total possible combinations  
v \* c \* t

## [1] 5880

### Problem 6

Determine if the following events are independent. Jeff runs out of gas on the way to work. Liz watches the evening news.

#### Ans 6

Similarly to problem 4, it is a realistic assumption that Jeff running out of gas has no influence on Liz watching the news. , so events are likely **INDEPENDENT**. Of course, without additional information we cannot be sure (for instance, Liz and Jeff can be related and Jeff’s morning commute may influence Liz’s evening schedule).

### Problem 7

The newly elected president needs to decide the remaining 8 spots available in the cabinet he/she is appointing. If there are 14 eligible candidates for these positions (where rank matters), how many different ways can the members of the cabinet be appointed?

#### Ans 7

Since rank (order) matters, then number of ways equals .

### Problem 8

A bag contains 9 red, 4 orange, and 9 green jellybeans. What is the probability of reaching into the bag and randomly withdrawing 4 jellybeans such that the number of red ones is 0, the number of orange ones is 1, and the number of green ones is 3? Write your answer as a fraction or a decimal number rounded to four decimal places.

#### Ans 8-1

# Combinations of 0 red out of 9  
r <- choose(9, 0)  
# Combinations of 1 orange out of 4  
o <- choose(4, 1)  
# Combinations of 3 green out of 9  
g <- choose(9, 3)  
# Multiply combinations together and divide by all possible combinations  
dc <- r \* o \* g  
all <- choose((9 + 4 + 9), 4)  
# Probability of 1 orange and 3 green when seleting 4 from 22  
round(dc/all, 4)

## [1] 0.0459

#### Ans 8-2

### Problem 9

Evaluate the following expression.

#### Ans 9

factorial(11)/factorial(7)

## [1] 7920

### Problem 10

Describe the complement of the given event. 67% of subscribers to a fitness magazine are over the age of 34.

#### Ans 10

The complement is **33% of subscribers to a fitness magazine are 34 years old or younger**.

### Problem 11

If you throw exactly three heads in four tosses of a coin you win $97. If not, you pay me $30. *Step 1.* Find the expected value of the proposition. Round your answer to two decimal places. *Step 2.* If you played this game 559 times how much would you expect to win or lose? (Losses must be entered as negative.)

#### Ans 11

A win is 3 heads in 4 tosses of a coin.

.

.

The return on a win is $97. The return on a loss is -$30.

#### Ans 11

*Step 1.* Expected value is .

*Step 2.* After 559 times, the expectation will be . I would expect to win $978.25.

### Problem 12

Flip a coin 9 times. If you get 4 tails or less, I will pay you $23. Otherwise you pay me $26. *Step 1.* Find the expected value of the proposition. Round your answer to two decimal places. *Step 2.* If you played this game 994 times how much would you expect to win or lose? (Losses must be entered as negative.)

#### Ans 12-1

A win is 4 or less tails out of 9 tosses of a coin.

Number of no tails is . Number of 1 tail is . Number of 2 tails is . Number of 3 tails is . Number of 4 tails is

.

.

The return on a win is $23. The return on a loss is -$26.

#### Ans 12-2

*Step 1.* Expected value is .

*Step 2.* After 994 times, the expectation will be . I would expect to loose $1,491.00.

### Problem 13

The sensitivity and specificity of the polygraph has been a subject of study and debate for years. A 2001 study of the use of polygraph for screening purposes suggested that the probability of detecting a liar was .59 (sensitivity) and that the probability of detecting a “truth teller” was .90 (specificity). We estimate that about 20% of individuals selected for the screening polygraph will lie.

1. What is the probability that an individual is actually a liar given that the polygraph detected him/her as such? (Show me the table or the formulaic solution or both.)
2. What is the probability that an individual is actually a truth-teller given that the polygraph detected him/her as such? (Show me the table or the formulaic solution or both.)
3. What is the probability that a randomly selected individual is either a liar or was identified as a liar by the polygraph? Be sure to write the probability statement.

#### Ans 13

and

, so

, so

#### Ans 13(a)

Per Bayes’ Theorem,

#### Ans 13(b)

Per Bayes’ Theorem,

#### Ans 13(c)