DATA605 - Assignment 6

Nick Oliver

Assignment 6

1. A bag contains 5 green and 7 red jellybeans. How many ways can 5 jellybeans be

withdrawn from the bag so that the number of green ones withdrawn will be less than 2?

$$\binom{n}{k} = \frac{n!}{k!(n-k!)}$$

Choosing less than 2 two green jellybeans out of five means we can either choose 0 green jellybeans and 5 red jellybeans or choose 1 green jellybean

```
choose(5,0) * choose(7,5) +
choose(5,1) * choose(7,4)
```

```
## [1] 196
```

Answer: **196**

2. A certain congressional committee consists of 14 senators and 13 representatives. How

many ways can a subcommittee of 5 be formed if at least 4 of the members must be representatives?

Since you the committee only consists of 5 members, and at least 4 must be representives, then there are two options, for the number of senators. 0 senators and 5 representitives or 1 senator and 4 representatives.

```
choose(14,0) * choose(13,5) +
choose(14,1) * choose(13,4)
```

```
## [1] 11297
```

Answer: **11,297**

3. If a coin is tossed 5 times, and then a standard six-sided die is rolled 2 times, and finally

a group of three cards are drawn from a standard deck of 52 cards without replacement, how many different outcomes are possible?

Coin toss -> two possible outcomes, 2 outcomes repeated 5 times is 2^5

Six-sided die -> 6 possible outcomes, 6 outcomes repeated 2 times is 6^2

Card selection -> 52 possible outcomes, 52 outcomes then 51 because one card is removed, then 50 because a second cards is removed

```
2^5 * 6^2 * 52 * 51 * 50
```

```
## [1] 152755200
```

Answer: **152,755,200 possible outcomes**

4. 3 cards are drawn from a standard deck without replacement. What is the probability

that at least one of the cards drawn is a 3? Express your answer as a fraction or a decimal number rounded to four decimal places.

There are 4 total 3 cards in a deck of 52 cards, one for each suit. Computing the probability of choosing at least one 3 is equivilant to 1 - P(choosing no 3)

$48/52 * 47/51 * 46/50 = \frac{4324}{5525}$

$1 - \frac{4324}{5525} = \frac{1201}{5525}$

Answer: $\frac{1201}{5525} \approx 0.2174$

5. Lorenzo is picking out some movies to rent, and he is primarily interested in

documentaries and mysteries. He has narrowed down his selections to 17 documentaries and 14 mysteries.

Step 1. How many different combinations of 5 movies can he rent?

17 docs and 14 mysteries means a total of 31 choices.

$$\binom{31}{5} = \frac{31!}{5!(31 - 5!)}$$

```
factorial(31) / (factorial(5) * factorial(31 -5))
```

```
## [1] 169911
```

```
choose(31,5)
```

```
## [1] 169911
```

Answer: **169,911**

Step 2. How many different combinations of 5 movies can he rent if he wants at least

one mystery?

If he wants at least one mystery you can take the complement by subtracting all possible combinations by the number of choices that contain no mysteries

```
choose(31,5) - choose(17,5)
```

```
## [1] 163723
```

Answer: **163,723**

6. In choosing what music to play at a charity fund raising event, Cory needs to have an

equal number of symphonies from Brahms, Haydn, and Mendelssohn. If he is setting up a schedule of the 9 symphonies to be played, and he has 4 Brahms, 104 Haydn, and 17 Mendelssohn symphonies from which to

choose, how many different schedules are possible? Express your answer in scientific notation rounding to the hundredths place.

If he needs an equal number from each Brahms, Haydn, and Mendelssohn and he is selecting 9 symphonies that means he needs to choose 3 from each.

```
choose(4,3) * choose(104,3) * choose(17,3)
```

```
## [1] 495322880
```

Answer: 4.95×10^8

7. An English teacher needs to pick 13 books to put on his reading list for the next school

year, and he needs to plan the order in which they should be read. He has narrowed down his choices to 6 novels, 6 plays, 7 poetry books, and 5 nonfiction books.

Step 1. If he wants to include no more than 4 nonfiction books, how many different

reading schedules are possible? Express your answer in scientific notation rounding to the hundredths place.

24 total books to choose from

No more than means, number of ways to choose 0,1,2,3,4 nonfiction books

```
choose(19,13) + choose(20, 13) + choose(21,13) + choose(22,13) + choose(23,13)
```

```
## [1] 1949628
```

Answer: 1.95×10^6

Step 2. If he wants to include all 6 plays, how many different reading schedules are

possible? Express your answer in scientific notation rounding to the hundredths place.

6 of your choices are pre-selected to be plays that leaves you with 7 choices left

There are 18 books left to choose from since we already choose all 6 plays

```
choose(18, 7)
```

```
## [1] 31824
```

Answer: 3.18×10^4

8. Zane is planting trees along his driveway, and he has 5 sycamores and 5 cypress trees to

plant in one row. What is the probability that he randomly plants the trees so that all 5 sycamores are next to each other and all 5 cypress trees are next to each other? Express your answer as a fraction or a decimal number rounded to four decimal places.

The probability of picking all sycamores first then all cypress is $(5! * 5!)/10! = \frac{1}{252}$

Since the order doesn't matter you need to consider both sycamores first and cypress first $2 \times \frac{1}{252}$

Answer: $\frac{1}{126}$

9. If you draw a queen or lower from a standard deck of cards, I will pay you $4. If not, you

pay me $16. (Aces are considered the highest card in the deck.)

Step 1. Find the expected value of the proposition. Round your answer to two decimal

places. Losses must be expressed as negative values.

Since Kings and Aces are highest you subtract them from the deck leaving 44 possible ways of winning

```
4 * (44/52) - 16 * (8/52)
```

```
## [1] 0.9230769
```

Answer: **0.9230769**

Step 2. If you played this game 833 times how much would you expect to win or lose?

Round your answer to two decimal places. Losses must be expressed as negative values.

```
0.9230769 * 833
```

```
## [1] 768.9231
```

Answer: **Gain $768.92**