Stats 4860 Homework 1

Problem 1: Volume and Surface Area of Sphere

```
sphere_radius <- 4
sphere_volume <- 4/3*pi*sphere_radius^3
sphere_surface_area <- 4*pi*sphere_radius^2

cat("1. The volume of a sphere with radius 4 is ", sphere_volume,
    "\n2. The surface area is ", sphere_surface_area)
```

```
## 1. The volume of a sphere with radius 4 is  268.0826
## 2. The surface area is  201.0619
```

Problem 2: Binomial

Y ~ Binom(10, .3), P(Y=4)

```
n <- 10
p <- .3

q2_y4_binom <- dbinom(4,n,p) #P(Y=4)

cat('P(Y=4) = ', q2_y4_binom)
```

```
## P(Y=4) =  0.2001209
```

Y ~ Binom(10, .3), P(Y<=5)

```
q2_y_leq_5_binom <- pbinom(5,n,p) #P(Y<=5)

cat('P(Y<=5) = ', q2_y_leq_5_binom)
```

```
## P(Y<=5) =  0.952651
```

Y ~ Binom(52, .5), P(Y=26)

```
deck_n <- 52
deck_p <- .5

deck_dbinom <- dbinom(26,deck_n, deck_p)

cat('3. P(Y=26) = ', deck_dbinom)
```

```
## 3. P(Y=26) =  0.110116
```

Y ~ Binom(52, .5), P(23 < Y < 28)

```
deck_pbinom <- pbinom(27, deck_n, deck_p) - pbinom(23, deck_n, deck_p)

cat('4. P(23 < Y < 28) = ', deck_pbinom)
```

```
## 4. P(23 < Y < 28) =  0.4168678
```

Problem 3: Normal

X ~ N(2,3^2)

```
mu <- 2
sigma <- 3

q3.1_normal_cdf <- pnorm(4,mean = mu, sd = sigma) #P(X<4)

cat('P(X<4) = ', q3.1_normal_cdf)
```

```
## P(X<4) =  0.7475075
```

Salaries for Statistics Majors

```
stats_mu <- 68000
stats_sd <- 15000

stats_salary_50000 <- pnorm(50000,stats_mu, sd = stats_sd)
cat('5. The probability the starting salary of a Statistics being below 50000 is', stats_salary_50000)
```

```
## 5. The probability the starting salary of a Statistics being below 50000 is 0.1150697
```

```
stats_salary_range <- pnorm(70000,stats_mu, sd = stats_sd) - pnorm(60000,stats_mu, sd = stats_sd)
cat('6. The probability the starting salary of a Statistics being between 60-70k is', stats_salary_rang
```

```
## 6. The probability the starting salary of a Statistics being between 60-70k is 0.2561337
```

Critical Value for 70% Confidence Interval

```
alpha <- 0.3
cv70 <- -qnorm(alpha/2)
cat("7. The critical value for a 70% confidence interval is", cv70)
```

```
## 7. The critical value for a 70% confidence interval is 1.036433
```

Problem 4: Data

Identify the data type:

- Categorical
  - Binary
  - Nominal
  - Ordinal
- Quantitative
  - Continuous
  - Discrete
    - Binary
    - Count with known maximum
    - Count with no known maximum

8. Political party for particular candidate: Either Categorical Binary or Nominal depending on if there are 2 or more political parties.
9. Cost of supreme gas tomorrow at West Hy-vee Pump: Continuous, because it can be any number on the real number line.
10. Whether or not you will win the next board game you play: Categorical Binary, because the outcomes are either win or lose.
11. Distance I will drive my car in 2023: Continuous, because it can be any number on the real number line, including decimal values.
12. Number of days in June Over 90 degrees Fahrenheit: Count with known max, because it can be any whole number 1-30.
13. How many class periods you will attend STAT 4860/5860 this semester: Count with known max, because it can be any whole number between 0 and the total number of classes this semester.
14. Number of a-particles hitting a detector in 1 min: Count with no known maximum, because it has to be a whole number, but it could be any whole number
15. Responses to a question that asks "How much do you agree with this statement?" when the possible responses are Strongly Disagree, Disagree, Neither agree nor disagree, Agree, and Strongly Agree: Ordinal because they are categorical values with an order.