Statistics 147 Assignment #2

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0996

R

1. (Use **R** for this problem!) **(13 pts total)** A production process that creates specialized dog collars operates with 7% nonconforming (defective) output. A sample of 12 collars is selected at random and the number of nonconforming collars counted.

   Let Y = number of nonconforming collars. Then $Y \sim Bin(n = 12, p = 0.07)$. Use this information to complete the following.

   (i) **(1 pt)** Generate the sequence 0 through 12 and store the sequence in a variable named **y**. (Be sure to print the values of y.)

```
> ## Subpart i
>
>   # generate sequence 0 through 12 and store sequence in a variable named y
>   y <- seq(0,12)
>   y
 [1]  0  1  2  3  4  5  6  7  8  9 10 11 12
>
```

   (ii) **(1 pt)** Generate the *probability distribution function* of Y and store the values the variable **pdf1**. (Be sure to print the values of pdf1.)

```
> ## Subpart ii
>
>   # generate the pdf of y and store in var pdf1
>   # Y~Bin(n=12,p=0.07)
>   pdf1 <- dbinom(y,size=12,prob=0.07)
>   pdf1
 [1] 4.185963e-01 3.780870e-01 1.565199e-01 3.927022e-02 6.650602e-03 8.009327e-04 7.033280e-05
 [8] 4.537600e-06 2.134624e-07 7.140915e-09 1.612465e-10 2.206697e-12 1.384129e-14
```

   (iii) **(1 pt)** Generate the *cumulative distribution function* of Y and store the values in the variable **cdf1**. (Be sure to print the values of cdf1.)

```
> ## Subpart iii
>
>   # generate cdf of y and store in var cdf1
>   # y~bin(n=12,p=0.07)
>   cdf1 <- pbinom(y,size=12,prob=0.07)
>   cdf1
 [1] 0.4185963 0.7966833 0.9532032 0.9924734 0.9991240 0.9999249 0.9999952 0.9999998 1.0000000
[10] 1.0000000 1.0000000 1.0000000 1.0000000
>
```

   (iv) **(1 pt)** Generate the values of $P(Y > y)$ and store the values in the variable **sdf1**. (Be sure to print the values of sdf1.)

```
> ## Subpart iv
>
>   # Generate values of P(Y > y) and store in var sdf1
>   # Y~Bin(n=12,p=0.07)
>   sdf1 <- pbinom(y, size=12,prob=0.07, lower=FALSE)
>   sdf1
 [1] 5.814037e-01 2.033167e-01 4.679685e-02 7.526626e-03 8.760239e-04 7.509117e-05 4.758367e-06
 [8] 2.207667e-07 7.304382e-09 1.634670e-10 2.220538e-12 1.384129e-14 0.000000e+00
```

(v) **(1 pt)** Use the **cbind** function to generate a data frame with y1, pdf1, cdf1 and sdf1 as the columns. (Be sure to print the data set.)

```
>
> ## Subpart v
>
>   # use cbind function to generate a data frame with y1, pdf1, cdf1, and sdf1
>   all_together <- cbind(y,pdf1,cdf1,sdf1)
>   all_together
      y         pdf1      cdf1         sdf1
 [1,]  0 4.185963e-01 0.4185963 5.814037e-01
 [2,]  1 3.780870e-01 0.7966833 2.033167e-01
 [3,]  2 1.565199e-01 0.9532032 4.679685e-02
 [4,]  3 3.927022e-02 0.9924734 7.526626e-03
 [5,]  4 6.650602e-03 0.9991240 8.760239e-04
 [6,]  5 8.009327e-04 0.9999249 7.509117e-05
 [7,]  6 7.033280e-05 0.9999952 4.758367e-06
 [8,]  7 4.537600e-06 0.9999998 2.207667e-07
 [9,]  8 2.134624e-07 1.0000000 7.304382e-09
[10,]  9 7.140915e-09 1.0000000 1.634670e-10
[11,] 10 1.612465e-10 1.0000000 2.220538e-12
[12,] 11 2.206697e-12 1.0000000 1.384129e-14
[13,] 12 1.384129e-14 1.0000000 0.000000e+00
>
```

(vi) **(1 pt)** Find the probability that *exactly 3* of the 12 collars are nonconforming (defective)

```
> ## Subpart vi
>
>   # P(X = 3)
>   p6 <- dbinom(3,size=12,prob=0.07)
>   p6
[1] 0.03927022
```

(vii) **(1 pt)** Find the probability that *at most 3* of the 12 collars are nonconforming (defective).

```
> ## Subpart vii
>
>   # P(X <= 3)
>   p7 <- pbinom(3,size=12,prob=0.07, lower=TRUE)
>   p7
[1] 0.9924734
```

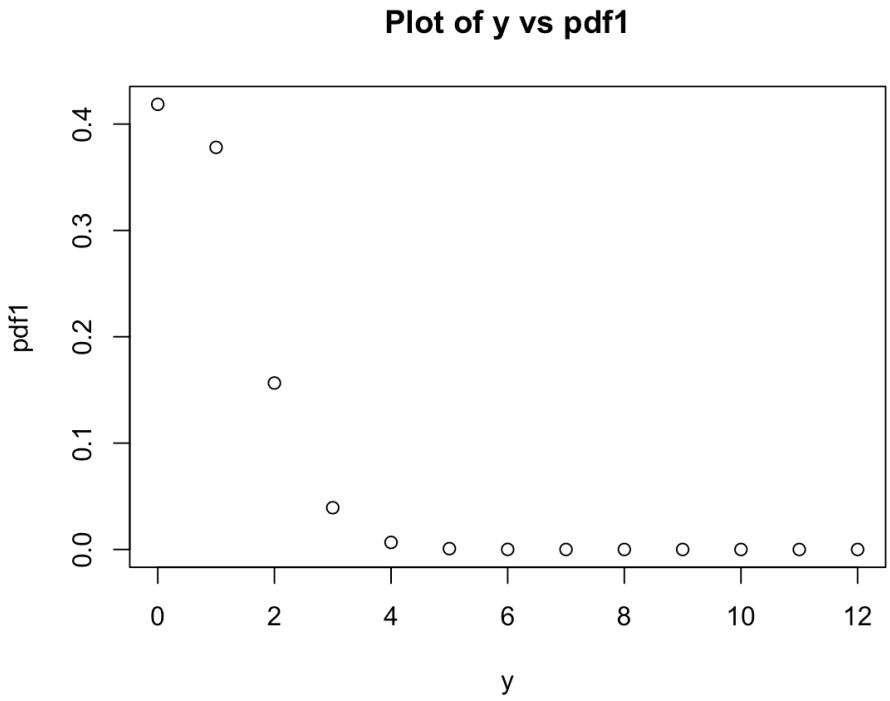
(viii) **2 pts)** Find the probability that *between, and including,* 2 and 4 of the 12 collars are nonconforming (defective).

```
> ## Subpart viii
>
>   # P( 2 <= X <= 4) = P( X <= 4) - P(X <= 2)
>   p8 <- pbinom(4,size=12,prob=0.07, lower=TRUE) - pbinom(2,size=12,prob=0.07, lower=TRUE)
>   p8
[1] 0.04592082
```

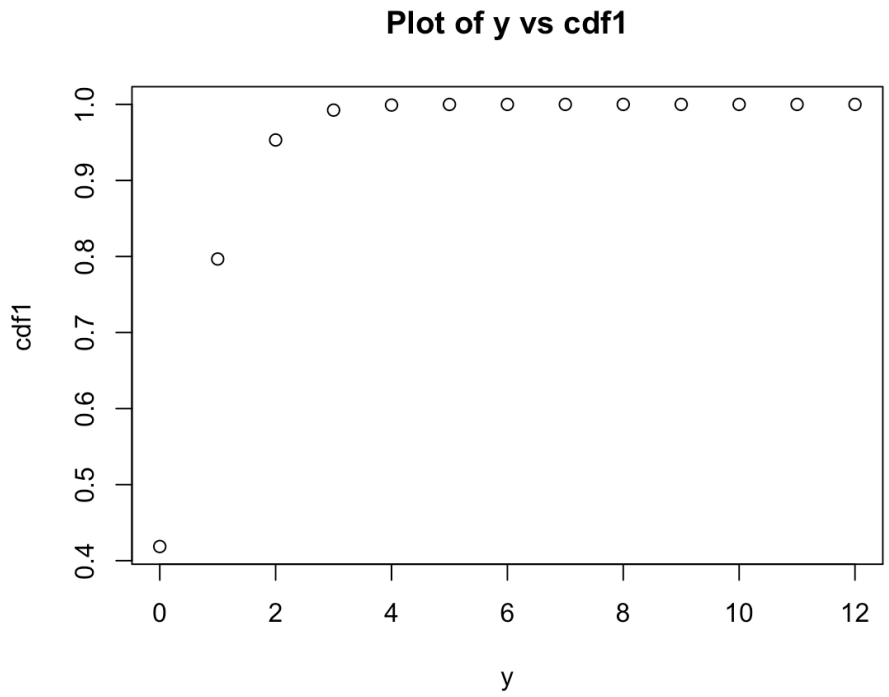
(ix) **(2 pts)** Generate a plot of y vs pdf1. Be sure to give your plot an appropriate title.

```
## Subpart ix

  plot(y, pdf1,
       xlab = "y",
       ylab = "pdf1",
       main = "Plot of y vs pdf1"
       )
```



(x) **(2 pts)** Generate a plot of y vs cdf1. Be sure to give your plot an appropriate title.




```
## Subpart x

  plot(y, cdf1,
       xlab = "y",
       ylab = "cdf1",
       main = "Plot of y vs cdf1"
       )
```

2. **(6 pts total)** (Use **R** for this problem!) Suppose the filling process of a particular type of dry dog food bag is normally distributed with a mean of 40 pounds and a standard deviation of 0.50 pounds. The filling process is considered to be functioning at an appropriate level (functioning "in control") if the amount of fill in the dog food bags is between 38.75 pounds and 41.25 pounds. Ruihan selects a dog food bag at random from the assembly line.

(i) **(1 pt)** Find the probability that the bag is under-filled.

```
> ## Subpart i
>
>   # Prob bag is underfilled
>   # P(X<38.75)
>   # pnorm(x,mean,sd)
>   p1 <- pnorm(38.75,mean=40,sd=0.50)
>   p1
[1] 0.006209665
```

(ii) **(1 pt)** Find the probability that the the bag is not under-filled.

```
> ## Subpart ii
>
>   # Prob bag is not underfilled
>   # P(X > 38.75), lower tail is FALSE
>   p2 <- pnorm(38.75,mean=40,sd=0.50, lower=FALSE)
>   p2
[1] 0.9937903
```

(iii) **(1 pt)** Find the probability that the bag is over-filled or under-filled. (1 pt) (iv) **(2 pts)** Find the probability that the bag has a fill amount that meets specifications.

```
> ## Subpart iii
>
>   # Prob bag is overfilled or underfilled
>   # P(X<38.75) + P(X>41.25)
>   p3 <- pnorm(38.75,mean=40,sd=0.50) + pnorm(38.75,mean=40,sd=0.50, lower=FALSE)
>   p3
[1] 1
```

(iv) **(1 pt)** Find the 97^{th} percentile.

```
> ## Subpart iii
>
>   # Prob bag is overfilled or underfilled
>   # P(X<38.75) + P(X>41.25)
>   p3 <- pnorm(38.75,mean=40,sd=0.50) + pnorm(38.75,mean=40,sd=0.50, lower=FALSE)
>   p3
[1] 1
>
```

3. **(3 pts total)** (Use **R** for this problem!) Linda has three dogs (Cody, Dusty and Shadow) that she is training for a national agility championship. Linda records their times to finish the course (in seconds) for 30 runs. Luke does not believe there is a significant difference in mean finishing times between the three dogs. To test this claim, Luke takes three independent random samples of 8 times for each of the three dogs, yielding the following data:

```
File name: agility.dat
Cody Dusty Shadow
75     69     83
85     79     93
70     77     87
79     51     72
73     53     82
81     69     72
84     59     62
70     64     77
```

NOTE:

♠ The data is located in a datafile named **agility.dat**.

♠ The headings are included in the data file. The actual data begins on line 3.

♠ **Assume** the *Cody* is dog 1, *Dusty* is dog 2, and *Shadow* is dog 3.

♠ μ_i = true average finishing time for dog *i* and σ_i^2 = variance of the finishing time for dog *i,* $i = 1,2,3$

(i) **(2 pts)** Write the R code to read the data into a data frame and then print it out.

```
> ## Subpart i
>   # Read from file into p1 with header, skip one line
>   p1 = read.table(file="agility.dat",header=TRUE,skip=1,sep="")
>   p1
  Cody Dusty Shadow
1   75    69     83
2   85    79     93
3   70    77     87
4   79    51     72
5   73    53     82
6   81    69     72
7   84    59     62
8   70    64     77
```

(ii) **(1 pt)** Add the appropriate lines of code to make the columns of the data frame accessible individually and obtain the column headers/names.

```
> ## Subpart ii
>   # add code that allows the columns to be accessible individually
>   attach(p1)
>   # display columns to verify that the code above worked
>   names(p1)
[1] "Cody"   "Dusty"  "Shadow"
```

SAS

1. **(5 pts total)** (Use **SAS** for this problem!) According to a recent survey, 65% of dog owners prefer a male dog. A random sample of 25 dog owners is selected.

   Let X = # of dog owners that prefer a male dog. Use this information to complete the following.

```
data question1;
     /* Create variables using pdf, cdf and sdf functions
         Format:
                 P(X = x) = pdf('Binom',x,p,n)
                 P(X <= x) = cdf('Binom',x,p,n)
                 P(X > x) = sdf('Binom',x,p,n)    */

         /*  Part (i)
             p1 = P(X = 15) */
         p1 = pdf('Binom',15,.65,25);

         /*  Part (ii
             p2 = P(X <= 15) */
         p2 = cdf('Binom',15,.65,25);

         /*  Part (iii)
             p3  = P(16 < X < 19) =
                 = P( X <= 19) - P( X > 16)  */
         p3 = cdf('Binom',19,.65,25) - sdf('Binom',19,.65,25);

         /*Part (iv)
             Find average number of dog owners
             mu = n * p */
         p4 = 25 * 0.65;

run;
```

(i) **(1 pt)** Find the probability that exactly 15 of the dog owners prefer a male dog.

Probability = 0.14085

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 1
Subpart (i) P(X = 15)

p1
0.14085

```
/* Print the results */
proc print noobs data = question1;
/* Revise title4 and title5 */
title5 'Subpart (i) P(X = 15)';
var p1;
run;
```

(ii) **(1 pt)** Find the probability that no more than 15 of the dog owners prefer a male dog.

Probability = 0.36969

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 1
Subpart (ii) P(X <= 15)

p2
0.36969

```
proc print noobs data = question1;
title5 'Subpart (ii) P(X <= 15)';
var p2;
run;
```

(iii) **(2 pts)** Find the probability that between 16 and 19, inclusively, of the dog owners prefer a male dog.

Probability = 0.83475

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 1
Subpart (iii) P(X 16 < X <= 19)

p3
0.83475

```
proc print noobs data = question1;
title5 'Subpart (iii) P(X 16 < X <= 19)';
var p3;
run;
```

(iv) **(1 pt)** Find the average number of dog owners that prefer a male dog.

Average = 16.25

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 1
Subpart (iv) Average number of dog owners that prefer a male dog

p4
16.25

```
proc print noobs data = question1;
/* Modify title5 */
title5 'Subpart (iv) Average number of dog owners that prefer a male dog';
var p4;
run;
```

2. **(6 pts total)** (Use **SAS** for this problem!) Suppose the filling process of a particular type of canned dog food is normally distributed with a mean of 13.25 ounces and a standard deviation of 0.10 ounces. The filling process is considered to be functioning at an appropriate level (functioning "in control") if the amount of fill in the dog food cans is between 13.15 ounces and 13.35 ounces. Ruihan selects a can of dog food at random from the assembly line.

```
data question2;

    /* Subpart (i) find probability that the can is underfilled
        X~N, P( X <= 13.15)*/
    p1 = cdf('Normal',13.15,13.25,.1);

    /*Subpart (ii) find probability that can is not underfilled
        X~N, P( X > 13.15) */
    p2 = 1 - cdf('Normal',13.15,13.25,.1);

    /* Subpart (iii) find probability that can meets specifications
        X~N, P( 13.15 < X < 13.35)
                    = P(X <= 13.35) - P(X <= 13.15) */
    p3 = cdf('Normal',13.35,13.25,.1) - cdf('Normal',13.15,13.25,.1);

    /* Subpart (iv) find probability that can is overfilled or underfilled
        X~N, P(X < 13.15) + P(X > 13.35)
                    = P(X <= 13.15) + 1 - P(X <= 13.35) */
    p4 = cdf('Normal',13.15,13.25,.1) + 1 - cdf('Normal',13.35,13.25,.1);


    /* Subpart (v) find the 97th percential */
    p5 = quantile('Normal',.97,13.25,.1);

run;
```

(i) **(1 pt)** Find the probability that the can is underfilled.

Probability = 0.15866

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 2
Subpart (i)

p1
0.15866

```
proc print noobs data = question2;
     title5 'Subpart (i)';
     var p1;
run;
```

(ii) **(1 pt)** Find the probability that the can is *not* underfilled.

Probability = 0.84134

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 2
Subpart (ii)

p2
0.84134

```
proc print noobs data = question2;
     title5 'Subpart (ii)';
     var p2;
run;
```

(iii) **(2 pts)** Find the probability that the can has a fill amount that meets specifications.

Probability = 0.68269

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 2
Subpart (iii)

p3
0.68269

```
proc print noobs data = question2;
     title5 'Subpart (iii)';
     var p3;
run;
```

(iv) **(1 pt)** Find the probability that the can is overfilled or underfilled (does not meet specifications).

Probability = 0.31731

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 2
Subpart (iv)

p4
0.31731

```
proc print noobs data = question2;
     title5 'Subpart (iv)';
     var p4;
run;
```

(v) **(1 pt)** Find the 97^{th} percentile.

97^{th} Percentile = 13.4381

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 2
Subpart (v)

p5
13.4381

```
proc print noobs data = question2;
     title5 'Subpart (v)';
     var p5;
run;
```

3. **(5 pts)** (Use **SAS** for this problem!) Let Let$y = 3n + \sqrt{4.5m^{-0.5n}}$ for n = 1,3,5 and m = 2,5,8. Use nested DO loops to calculate the values of y. (Be careful of P.E.M.D.A.S. / order-of-operations when you code!)

Summer 2020
Lab 2 SAS
Wesley Chang
Question 3

n	m	y
1	2	4.7838
1	5	4.4186
1	8	4.2613
3	2	10.2613
3	5	9.6344
3	8	9.4460
5	2	15.8919
5	5	15.2837
5	8	15.1577

```
title4 'Question 3';

/* y = 3n + sqrt(4.5m^-0.5n), for n=1,3,5 and m = 2,5,8 */

data question3;
    /* do loop for n */
    do n = 1 to 5 by 2;
        /* nest m loop */
        do m = 2 to 8 by 3;
            /* calculate equation given n and m and store in y */
            y = 3 * n + sqrt(4.5*m**(-0.5*n));
            output;
        end;
    end;
run;

/* print results */
proc print noobs data = question3;
run;
quit;
```

4. **(13 pts total)** (Use **SAS** for this problem!) Linda has three dogs (Cody, Dusty and Shadow) that she is training for a national agility championship. Linda records their times to finish the course (in seconds) for 30 runs. Ruihan does not believe there is a significant difference in mean finishing times between the three dogs. To test this claim, Ruihan takes three independent random samples of 8 times for each of the three dogs, yielding the following data:

```
File name: agility.dat
Cody Dusty Shadow
75     69     83
85     79     93
70     77     87
79     51     72
73     53     82
81     69     72
84     59     62
70     64     77
```

NOTE:

- ♠ The data is located in a datafile named **agility.dat**.
- ♠ The headings are included in the data file. The actual data begins on line 3.
- ♠ **Assume** the *Cody* is dog 1, *Dusty* is dog 2, and *Shadow* is dog 3.
  - ♠ μ_i = true average finishing time for dog i and σ_i^2 = variance of the finishing time for dog i, $i = 1,2,3$

(i) **(4 pts)** Write the SAS code to read in and print out the data. Use **agility1** as your temporary SAS dataset name. Use nested do loops! **(NOTE: DO NOT COPY AND PASTE THE DATA INTO YOUR SAS PROGRAM. READ THE DATA IN FROM THE EXTERNAL DATA FILE!)** (5 pts)

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 4
Subpart (i)

owner	time
Cody	75
Dust	69
Shad	83
Cody	85
Dust	79
Shad	93
Cody	70
Dust	77
Shad	87
Cody	79
Dust	51
Shad	72
Cody	73
Dust	53
Shad	82

Cody	81
Dust	69
Shad	72
Cody	84
Dust	59
Shad	62
Cody	70
Dust	64
Shad	77

```
title5 'Subpart (i)';
data question4;

    /* read file */
    infile '\\apporto.com\dfs\UCR\Users\wchan061_ucr\Desktop\agility.dat' firstob

    /* do loop for 8 rows of data */
    do rows = 1 to 8;
        /* do loop for 3 columns of data, assigned by owner */
        do column = 1 to 3;
            if      column = 1 then owner = 'Cody';
            else if column = 2 then owner = 'Dusty';
            else                    owner = 'Shadow';
                /* input statement to read observations */
                input time @@;

                /* output */
                output;

        end;
    end;
run;

/* print data */
proc print noobs data = question4;
    var owner time;
run;
quit;
```

(ii) **(2 pts)** Using if-then-else structures, name the dogs as follows:

dog	1	2	3
name	**Cody**	**Dusty**	**Shadow**

```
/* do loop for 8 rows of data */
do rows = 1 to 8;
    /* do loop for 3 columns of data, assigned by owner */
    do column = 1 to 3;
        if      column = 1 then owner = 'Cody';
        else if column = 2 then owner = 'Dusty';
        else                    owner = 'Shadow';
```

(iii) **(1 pt)**Add the appropriate lines of code to sort the data by the **name** of the dog.

Subpart (iii)

Obs	owner	time
1	Cody	75
2	Cody	85
3	Cody	70
4	Cody	79
5	Cody	73
6	Cody	81
7	Cody	84
8	Cody	70
9	Dust	69
10	Dust	79
11	Dust	77
12	Dust	51
13	Dust	53
14	Dust	69
15	Dust	59
16	Dust	64
17	Shad	83
18	Shad	93
19	Shad	87
20	Shad	72
21	Shad	82
22	Shad	72
23	Shad	62
24	Shad	77

\

```
/* Subpart (iii) */
title5 'Subpart (iii)';
proc sort;
     by owner;
run;
proc print;
     var owner time;
quit;
```

(iv) **(2 pts)** Add the appropriate lines of code to your program to generate the mean, standard deviation and median for each of the dogs and complete the following table. You may need to create a table of your own in your writeup.

name	Mean	Standard Deviation	Median
Cody	77.125	5.987	77.000
Dusty	65.125	10.343	66.500
Shadow	78.500	9.813	79.500

Subpart (iv)

The MEANS Procedure

owner=Cody

Analysis Variable : time		
Mean	Std Dev	Median
77.1250000	5.9865922	77.0000000

owner=Dust

Analysis Variable : time		
Mean	Std Dev	Median
65.1250000	10.3432172	66.5000000

owner=Shad

Analysis Variable : time		
Mean	Std Dev	Median
78.5000000	9.8125284	79.5000000

```
/* Subpart (iv) */
title5 'Subpart (iv)';
proc means mean stddev median;
     by owner;
     var time;
```

(v) **(3 pts)** Create a new temporary SAS data set, named **onlyC**, in which the data is restricted to the times of *Cody* only. (Be sure to print the data as a check.)

Statistics 147 Assignment #2
Summer 2020
Wesley Chang
Question 4
Subpart (v)

Obs	rows	column	owner	time
1	1	1	Cody	75
2	2	1	Cody	85
3	3	1	Cody	70
4	4	1	Cody	79
5	5	1	Cody	73
6	6	1	Cody	81
7	7	1	Cody	84
8	8	1	Cody	70

```
/* Subpart (v) */
title5 'Subpart (v)';
data onlyC;
     set question4;

     if owner = 'Cody';
run;

proc print data = onlyC;
run;
```

(vi) **(3 pts)** Create a new temporary SAS data set, named **bothDS**, in which the data is restricted to the times of **Dusty** and **Shadow** only. (Be sure to print the data as a check.)

Subpart (vi)

Obs	rows	column	owner	time
1	1	2	Dust	69
2	2	2	Dust	79
3	3	2	Dust	77
4	4	2	Dust	51
5	5	2	Dust	53
6	6	2	Dust	69
7	7	2	Dust	59
8	8	2	Dust	64
9	1	3	Shad	83
10	2	3	Shad	93
11	3	3	Shad	87
12	4	3	Shad	72
13	5	3	Shad	82
14	6	3	Shad	72
15	7	3	Shad	62
16	8	3	Shad	77

```
/* Subpart (vi) */
title5 'Subpart (vi)';
data bothDS;
    set question4;

    if owner = 'Dust' or owner = 'Shad';
run;
proc print data = bothDS;
run;
quit;
```

R Code:

```
# Statistics 147 Assignment #2
# Summer 2020
# Wesley Chang


# change working directory to assignment folder for easy access
setwd("/Users/wes_chang/Library/Mobile
Documents/com~apple~CloudDocs/Summer   2020   (UCR)/STAT   147   (Session
A)/Assignments/2/")


# R Question 1

## Subpart i

  # generate sequence 0 through 12 and store sequence in a variable named y
  y <- seq(0,12)
  y

## Subpart ii

  # generate the pdf of y and store in var pdf1
  # Y~Bin(n=12,p=0.07)
  pdf1 <- dbinom(y,size=12,prob=0.07)
  pdf1

## Subpart iii

  # generate cdf of y and store in var cdf1
  # y~bin(n=12,p=0.07)
  cdf1 <- pbinom(y,size=12,prob=0.07)
  cdf1
```

```
## Subpart iv

  # Generate values of P(Y > y) and store in var sdf1
  # Y~Bin(n=12,p=0.07)
  sdf1 <- pbinom(y, size=12,prob=0.07, lower=FALSE)
  sdf1

## Subpart v

  # use cbind function to generate a data frame with y1, pdf1, cdf1, and
sdf1
  all_together <- cbind(y,pdf1,cdf1,sdf1)
  all_together



## Subpart vi

  # P(X = 3)
  p6 <- dbinom(3,size=12,prob=0.07)
  p6

## Subpart vii

  # P(X <= 3)
  p7 <- pbinom(3,size=12,prob=0.07, lower=TRUE)
  p7

## Subpart viii

  # P( 2 <= X <= 4) = P( X <= 4) - P(X <= 2)
  p8       <-       pbinom(4,size=12,prob=0.07,       lower=TRUE)       -
pbinom(2,size=12,prob=0.07, lower=TRUE)
  p8

## Subpart ix
```

```
  plot(y, pdf1,
       xlab = "y",
       ylab = "pdf1",
       main = "Plot of y vs pdf1"
       )

## Subpart x

  plot(y, cdf1,
       xlab = "y",
       ylab = "cdf1",
       main = "Plot of y vs cdf1"
       )


# R Question 2
  # normally distributed, mean = 40 pounds, std dev = 0.50
  # functioning level = 38.75 to 41.25
  # randomly selected from assembly line


## Subpart i

  # Prob bag is underfilled
  # P(X<38.75)
  # pnorm(x,mean,sd)
  p1 <- pnorm(38.75,mean=40,sd=0.50)
  p1

## Subpart ii

  # Prob bag is not underfilled
  # P(X > 38.75), lower tail is FALSE
  p2 <- pnorm(38.75,mean=40,sd=0.50, lower=FALSE)
  p2
```

```
## Subpart iii

  # Prob bag is overfilled or underfilled
  # P(X<38.75) + P(X>41.25)
  p3   <-   pnorm(38.75,mean=40,sd=0.50)   +   pnorm(38.75,mean=40,sd=0.50,
lower=FALSE)
  p3

## Subpart iv

  # Prob bag has a fill amount that meets specifications
  # P(38.75<X<41.25)
  #     = P(X < 41.25) - P(X < 38.75)
  p4 <- pnorm(41.25,mean=40,sd=0.50) + pnorm(38.75,mean=40,sd=0.50)
  p4


## Subpart v
  # Find the 97th percentile
  # use the quantile function qnorm(quantile, mean, sd)
  p5 <- qnorm(0.97,mean=40,sd=0.50)
  p5


# R Question 3

## Subpart i
  # Read from file into p1 with header, skip one line
  p1 = read.table(file="agility.dat",header=TRUE,skip=1,sep="")
  p1

## Subpart ii
  # add code that allows the columns to be accessible individually
  attach(p1)
  # display columns to verify that the code above worked
  names(p1)
```

SAS Code:

```
title1 'Statistics 147 Assignment #2';
title2 'Summer 2020';
title3 'Wesley Chang';

options nocenter ps = 55 nocenter ls = 78 nodate nonumber
formdlim='*';
DM log "odsresults; clear; out; clear; log; clear;";
ods graphics off;

title4 'Question 1';


/* pdf of Y~Bin(n=25,p=0.65) */
/* P(X=15) */

data question1;
     /* Create variables using pdf, cdf and sdf functions
          Format:
                    P(X = x) = pdf('Binom',x,p,n)
                    P(X <= x) = cdf('Binom',x,p,n)
                    P(X > x) = sdf(íBinomí,x,p,n) */

          /*   Part (i)
               p1 = P(X = 15) */
          p1 = pdf('Binom',15,.65,25);

          /*   Part (ii
               p2 = P(X <= 15) */
          p2 = cdf('Binom',15,.65,25);

          /*   Part (iii)
               p3   = P(16 < X < 19) =
                    = P( X <= 19) - P( X > 16)    */
          p3 = cdf('Binom',19,.65,25) - sdf('Binom',19,.65,25);

          /*Part (iv)
               Find average number of dog owners
               mu = n * p */
          p4 = 25 * 0.65;

run;
/* Print the results */
```

```
proc print noobs data = question1;
/* Revise title4 and title5 */
title5 'Subpart (i) P(X = 15)';
var p1;
run;

proc print noobs data = question1;
title5 'Subpart (ii) P(X <= 15)';
var p2;
run;

proc print noobs data = question1;
title5 'Subpart (iii) P(X 16 < X <= 19)';
var p3;
run;

proc print noobs data = question1;
/* Modify title5 */
title5 'Subpart (iv) Average number of dog owners that prefer a male
dog';
var p4;
run;


title4 'Question 2';

/*   cdf of normal distribution, mean = 13.25, std dev = 0.10
     appropriate level is between 13.15 and 13.35
     */

data question2;

     /* Subpart (i) find probability that the can is underfilled
          X~N, P( X <= 13.15)*/
     p1 = cdf('Normal',13.15,13.25,.1);

     /* Subpart (ii) find probability that can is not underfilled
          X~N, P(X > 13.15) */
     p2 = 1 - cdf('Normal',13.15,13.25,.1);

     /*Subpart (iii) find probability that can meets specification
          X~N, P( 13.15 < X < 13.35)
                          = P(x <= 13.35) - P(X <= 13.15) */
     p3 = cdf('Normal',13.35,13.25,.1) -
cdf('Normal',13.15,13.25,.1);
```

```
     /* Subpart (iv) find probability that can is overfilled or
underfilled
          X~N, P(X < 13.15) + P(X > 13.35)
                         = P(X <= 13.15) + 1 - P(X <= 13.35) */
     p4 = cdf('Normal',13.15,13.25,.1) + 1 -
cdf('Normal',13.15,13.25,.1);

     /* Subpart (v) find the 97th percentile */
     p5 = quantile('Normal',.97,13.25,.1);
run;

proc print noobs data = question2;
     title5 'Subpart (i)';
     var p1;
run;

proc print noobs data = question2;
     title5 'Subpart (ii)';
     var p2;
run;

proc print noobs data = question2;
     title5 'Subpart (iii)';
     var p3;
run;

proc print noobs data = question2;
     title5 'Subpart (iv)';
     var p4;
run;

proc print noobs data = question2;
     title5 'Subpart (v)';
     var p5;
run;
quit;

title5;

title4 'Question 3';

/* y = 3n + sqrt(4.5m^-0.5n), for n=1,3,5 and m = 2,5,8 */

data question3;
```

```
     /* do loop for n */
     do n = 1 to 5 by 2;
          /* nest m loop */
          do m = 2 to 8 by 3;
               /* calculate equation given n and m and store in y */
               y = 3 * n + sqrt(4.5*m**(-0.5*n));
               output;
          end;
     end;
run;

/* print results */
proc print noobs data = question3;
run;
quit;


title4 'Question 4';

title5 'Subpart (i)';
data question4;

     /* read file */
     infile
'\\apporto.com\dfs\UCR\Users\wchan061_ucr\Desktop\agility.dat'
firstobs = 3;

     /* do loop for 8 rows of data */
     do rows = 1 to 8;
          /* do loop for 3 columns of data, assigned by owner */
          do column = 1 to 3;
               if        column = 1 then owner = 'Cody';
               else if column = 2 then owner = 'Dusty';
               else                    owner = 'Shadow';
                    /* input statement to read observations */
                    input time @@;

                    /* output */
                    output;

          end;
     end;
run;

/* print data */
```

```
proc print noobs data = question4;
     var owner time;
run;

/* Subpart (iii) */
title5 'Subpart (iii)';
proc sort;
     by owner;
run;
proc print;
     var owner time;

/* Subpart (iv) */
title5 'Subpart (iv)';
proc means mean stddev median;
     by owner;
     var time;
quit;

/* Subpart (v) */
title5 'Subpart (v)';
data onlyC;
     set question4;

     if owner = 'Cody';
run;

proc print data = onlyC;
run;

/* Subpart (vi) */
title5 'Subpart (vi)';
data bothDS;
     set question4;

     if owner = 'Dust' or owner = 'Shad';
run;
proc print data = bothDS;
run;
quit;
```