<u>**Mod 7 R and Discrete Probability Distributions**</u>
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Use R functions for probability distributions in this assignment. For example, if you are finding probabilities for the binomial, use the dbinom, pbinom, etc. Round all probabilities to 4 Decimal Places.

<u>**Use for Problems 1-3:**</u> According to American Airlines, its Flight 215 from Orlando to Los Angeles is on time 85% of the time. Suppose 8 flights are randomly selected and the number of on-time flights is recorded. Use R to create the Binomial distribution function.

___1. What is the probability that exactly 5 flights are on-time out of the eight randomly selected flights? (Answer to 4 decimal places) (1pt)
Code: (Insert code below)

```
> x_2 <- 5
> n_bin <- 8
> p_bin <- .85
> pmfx_2 <- dbinom(x_2,n_bin,p_bin)
> pmfx_2
[1] 0.0838603
> round(pmfx_2,4)
[1] 0.0839
```

Answer below:
   0.0839

___2. What is the probability that more than 4 flights are on-time out of the eight randomly selected flights? (Answer to 4 decimal places) (1pt)
Code: (Insert code below)

```
> round((pbinom(4,8,.85,lower.tail=FALSE)),4)
[1] 0.9786
```

Answer below:
   0.9786

___3. What is the probability that between 3 and 7 flights are on-time out of the eight randomly selected flights, inclusive (P(3≤X≤7)? (Answer to 4 decimal places) (1pt)
Code: (Insert code below)

```
> pbinom(7,8,.85)-pbinom(2,8,.85)
```

Answer below:
   0.7273

Use for Problems 4-6: A large supermarket stocks both national brands of coffee and its own house brand. Consider a single randomly selected customer purchasing coffee and let success = the customer purchases a national brand. Assume that p = 0.75 and that customers make coffee purchase decisions independently of one another. Use R to calculate the probabilities.

___4. Let X = number of house brand coffee purchasers before a certain number purchase a national brand. (Negative Binomial)

        a. Find the probability that 7 coffee purchasers will buy house brand coffee before 3 will purchase a national brand. (Answer to 4 decimal places) (1pt)
        Insert your code here:

```
> dnbinom(7,3,.75)
[1] 0.0009269714
```

        Answer:
          0.0009

        b. Find the probability that more than 2 coffee purchasers will buy house brand coffee before 2 will purchase a national brand. (Answer to 4 decimal places) (2pt)
        Insert your code here:

```
> pnbinom(2,2,.75,lower.tail=FALSE)
[1] 0.05078125
```

        Answer:
          0.0508

___5. Let X = the number of house brand coffee purchasers before one purchases a national brand. (Geometric, special case of the negative binomial)

        a. Find the probability that 5 coffee purchasers will buy house brand coffee before one will purchase a national brand. (Answer to 4 decimal places) (1pt)
        Insert your code here:

```
> dnbinom(5,1,.75)
[1] 0.0007324219
```

        Answer:
          0.0007

        b. Find the probability that at least 2 coffee purchasers will buy house brand coffee before one will purchase a national brand. (Answer to 4 decimal places) (2pt)
        Insert your code here:

```
> 1-pnbinom(1,1,.75)
[1] 0.0625
```

Answer:
0.0625

___6. If we are looking at 50 coffee purchasers and know that 40 purchased a national brand. If we want to find the probability a certain number of coffee purchasers will buy a national brand from a sample of 10 of the coffee purchasers, we are in the hypergeometric distribution.

a. Find the probability that exactly 5 of the 10 sampled coffee drinkers will purchase a national brand. (Answer to 4 decimal places) (1pt)

Insert your code here:
```
> dhyper(5,40,10,10)
[1] 0.01614228
```

Answer:
0.0161