



### **Problem 1**

Topics: discrete random variable, probability distribution, expected value

The probability distribution for the delay in hours of the evening flight from Chicago to New York is as follows:

x	1	2	3	4	5	6
P(X=x)	0.1	0.1	0.2	0.3	0.2	0.1

1. What is the probability that a randomly selected evening flight from Chicago to New York is delayed more than 3 hours?
  - a) 0.3
  - b) 0.1
  - c) 0.6
  - d) 0.7
  - e) None of the above
  
2. If we take a sample of 100 evening flights from Chicago to New York, how many of them you would expect to have a delay of at least 4 hours?
  - a) 10
  - b) 20
  - c) 30
  - d) 60
  - e) It cannot be calculated

### **Problem 2**

Topics: discrete random variable, binomial distribution, estimates probability, expected value

In a certain country, the probability that a child dies during his or her first year of life is 0.014. We are interested in the expected number of infants who die before reaching their first birthdays in a random sample of 2,000.

3. In words, define the Random Variable X of interest.
  - a) The number of infants who dies in the first year of life.
  - b) The number of infants who dies during the first year of life in a random sample of 2,000.
  - c) The number of infants who are less that one year old.
  - d) The number of infants who survive their first year of life.
  - e) None of the above



4. How many infants are expected to die during their first year of life in a random sample of this size?
- a) 32
  - b) 10
  - c) 40
  - d) 28
  - e) 0 (zero)

5. Which is the probability that there are none deaths during the first year?

$$X \sim \text{Bin}(n=2000, p= .014)$$

$$P(X=0) = \binom{2000}{0} (.014)^0 (1 - .014)^{2000}$$

6. Which is the probability that there is a maximum of two deaths during the first year?

$$P(X \leq 2) = P(X = 0) + P(X = 1) + P(X = 2)$$

$$= \binom{2000}{0} (.014)^0 (1 - .014)^{2000} + \binom{2000}{1} (.014)^1 (1 - .014)^{1999} + \binom{2000}{2} (.014)^2 (1 - .014)^{1998}$$

### **Problem 3**



A popular fashion magazine has just recently published a poll saying that 45% of women who, if given the chance, would want to marry their first boyfriend. A random sample of 20 women from across the United States was taken. Answer the following questions.

1 This is clearly a binomial experiment. Which of the following is not a property of the Binomial?

- a) The observation for each woman is independent, since the women were randomly sampled.
- b) Each woman has the same probability they would like to marry their first boyfriend (45%).
- c) Each woman in the survey has based their response upon another woman's response.
- d) There is not enough information to answer this question.

2 What is the probability that half of the women sampled would like to marry their first boyfriend?

- a) 0.4500
- b) 0.1593
- c) 0.5513
- d) 0.6312
- e) Not enough information to answer this question.

3 Let's say we increased our sample to 100 women, what is the expected number of women in this new sample that would say that they would like to marry their first boyfriend?

- a) 45
- b) 55
- c) 65
- d) 75
- e) 35

#### **Problem 4**

Suppose  $X$  is a continuous random variable. If  $P(X \geq 16) = 0.03$ , then

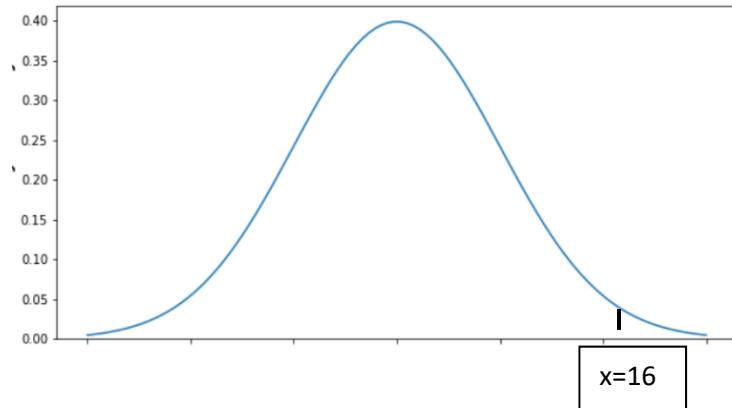
7.  $P(X < 16) = 1 - 0.03 = 0.97$



8.  $P(X \leq 16) = P(X < 16) = 0.97$

9.  $P(X > 16) = P(X \geq 16) = 0.03$

10.  $P(X = 16) = 0$



### **Problem 5**

Topics: continuous random variables, Normal distribution, empirical rule

Given an approximately normal distribution with a mean of 175 and a standard deviation of 37.

1. Draw a normal curve and label 1, 2, and 3 standard deviations on both sides on the mean.
2. What percent of values are within the interval (138, 212)?  
**Answer - 68%**
3. What percent of values are within the interval (64, 286)?  
**Answer - 99.7%**

### **Problem 6**

Topics: continuous random variables, Normal distribution, empirical rule

It is known that when a specific type of radish is grown in a certain manner without fertilizer the weights of the radishes produced are normally distributed with a mean of 40g and a standard deviation of 10g.

Determine the proportion of radishes grown:

4. Without fertilizer with weights less than 50 grams.  
**Answer - .84**
5. Without fertilizer with weights between 20 and 60 grams.  
**Answer - .475**
6. Without fertilizer that will have weights greater than or equal to 60 grams.  
**Answer - .025**

### **Problem 7:**



Topics: continuous random variables, Normal distribution, empirical rule

7. Which of the following would indicate that a dataset is **not** bell-shaped<sup>3</sup>?
- a. The range is equal to 5 standard deviations.
  - b. The range is larger than the interquartile range.
  - c. The mean is much smaller than the median.
  - d. There are no outliers.
  - e. None of the above