**Section 1: Probability**

1. The following table gives the sex and age group of college students at a Midwestern university.

Female Male Total

15 to 17 years 89 61 150

18 to 24 years 5,668 4,697 10,365

25 to 34 years 1,904 1,589 3,493

35 years or older 1,660 970 2,630

Total 9,321 7,317 16,638

One student is to be selected at random.

1. The probability that the selected student is female is…(2pts)
2. The probability that the selected student is 25 to 34 years old given that the student is male is…(3pts)
3. A survey of university recreation users finds that 52% are female, 68% are students, and 35% are female and a student. Make a table and answer the following questions.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Female | Male | Total |
| Student | 0.35 |  | 0.68 |
| Employee |  |  |  |
| Total | 0.52 |  | 1 |

* 1. Complete the table. (5pts)
  2. The conditional probability that a user is male given that he is an employee is…(3pts)

1. The following table lists the probabilities of positive and negative test results for diagnosing a particular disease when patients experience symptoms and when patients do not experience symptoms.

|  |  |  |
| --- | --- | --- |
|  | Test positive | Test negative |
| Symptoms present | 0.9997 | 0.0003 |
| No symptoms present | 0.0005 | 0.9995 |

Suppose 3% of a large population experience symptoms.

1. Make a tree diagram for selecting a person from this population and performing the test to determine if the person has the disease. (10pts)
2. What is the probability that the test is positive for a randomly chosen person from this population? (3pts)
3. Based upon past experience, 40% of all customers at the Campus Pizza Place order the meat lover’s pizza. If a random sample of five customers is selected, what is the probability that (9pts)
   1. None order the meat lover’s pizza?
   2. At least four order the meat lover’s pizza?
   3. Not more than three order the meat lover’s pizza?

**Section 2: Distributions**

Draw a picture, label and shade it, and find the specified value.

1. P(Z > -1.18) (3pts)
2. P(-0.38 < Z < 1.34) (3pts)
3. P(Z < k) = 0.9750 (5pts)
4. Suppose that the package of cookies lists the weight as 16 ounces. The actual weights of bags of cookies vary according to a Normal distribution with mean μ = 16.5 ounces and standard deviation σ = 0.205 ounces.
5. What proportion of bags of cookies weigh less than the advertised 16 ounces? (6pts)
6. What is the weight such that only 1 bag of cookies in 500 weighs less than that amount? (4pts)

CHOOSE EITHER **part c** OR **part d**. That is, only answer **one** of the following two parts to question 8. (6pts)

1. If the manufacturer wants to adjust the production process so that only 1 bag of cookies in 500 weighs less than the advertised weight, what should the mean of the actual weights be (assuming that the standard deviation of the weights remains 0.205 ounces)?
2. If the manufacturer wants to adjust the production process so that the mean remains at 16.5 ounces but only 1 bag of cookies in 500 weighs less than the advertised weight, how small does the standard deviation of the weights need to be?
3. What two checks do you need to perform before you can use the facts and to evaluate a sampling distribution of the sample mean? **Do both have to be true?** (3pts)
4. What two checks do you need to perform before you can use the Normal approximation to the binomial distribution to evaluate binomial probabilities? **Do both have to be true?** (3pts)
5. Twenty percent of American households own three or more TVs. A random sample of 200 American households is selected. Let *X* be the number of households selected that own three or more TVs.
6. The mean of *X* is…(2pts)
7. The standard deviation of X is…(2pts)
8. Interpret the mean and standard deviation in terms of the situation. (3pts)

1. Using the normal approximation, the probability that at least 45 of the households selected own at least 3 or more TVs is…(5pts)
2. The scores of students on the ACT college entrance examination have a Normal distribution with mean 19.3 and standard deviation of 6.2.
   1. What is the probability that a single student randomly chosen has an ACT score less than 22? (5pts)
   2. What is the probability that 30 randomly chosen students have a mean score less than 18? (5pts)
   3. **EXTRA CREDIT:** What is the probability that 30 randomly chosen students have a sum score greater than 600? (3pts)
   4. **EXTRA CREDIT:** The probability that a single student randomly chosen has an ACT score above a certain score is 0.45. What is the score? (3pts)