EXAM 2 REVIEW

Round probabilities to 4 decimal places. Round any other answers to 2 decimal places.

1. Suppose that the speed of trains over a certain railroad bridge varies between 42 and 58 miles per hour and is uniformly distributed.
   a. Define the random variable X, in words: X =
   b. X ~
   c. \( \mu = \)
   d. \( \sigma = \)
   e. \( f(x) = \)
   f. Find the probability that the speed of a train over the bridge is at least 53 miles per hour.
   g. Find the probability that the speed of a train over the bridge is between 47 and 53 miles per hour.
   h. 30% of the trains travel at least how fast over the bridge?

2. The U. S. Census in the year 2000 gathered data about the people living in owner-occupied housing units (such as houses and condominiums). The census data shows that the number of people per household follows the probability distribution shown:

<table>
<thead>
<tr>
<th>Household Size for Owner-Occupied Housing Units</th>
<th>X = number of people in household</th>
<th>P(X=x)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>0.02</td>
</tr>
</tbody>
</table>

   a. Find the probability that a household has 5 people.
   b. Find the expected number of people per household.

3. A college newspaper reporter decides to randomly survey 25 students to see if they will vote in the college's Student Government election. Based on past years, she knows that 36% of students vote in the Student Government elections. We are interested in the number of students included in the survey who will vote in the election. Let X = the number of students included in the survey who will vote in the election.

   a. X~_______________
   b. The values that x can take on are _________________
   c. \( \mu = \)
   d. \( \sigma = \)
   e. The expected number of students that will vote is ____________
   f. Find the probability that at most 10 students will vote in the election.
   g. Find the probability that at least 15 students will vote in the election.

4. Answer in the blank space T for true or F for False.

   a. _______If X ~ Exp(0.1), then \( P(X \leq 12) = e^{-0.1\times12} \)
   b. _______The exponential distribution has a parameter of decay that is the reciprocal of the mean.
5. The life of a particular brand of cell phone battery, measured in months, is exponentially distributed with a decay parameter of 0.08. We are interested in the life of such batteries.

a. Define the random variable, \( X \), in words. \( X = \) 

b. \( X \sim \) 

c. How long on average would you expect this type of battery to last?

d. The probability that a battery lasts more than 24 months is \( \text{______________} \).

e. 80% of these batteries should last at least how long?

6. The percent of calories from fat a person in America consumes each day is normally distributed with a mean of 41 and a standard deviation of 7. Suppose a person is selected at random. Let \( X = \) percent of calories from fat.

a. \( X \sim \text{______________} \).

b. Find the probability that the percent of calories a person consumes from fat is greater than 45.

c. Find the probability that the percent of calories a person consumes from fat is between 40 and 50.

d. Find the maximum number of calories from fat a person in the first quartile consumes each day.

e. What is the minimum number of calories from fat consumed by a person in the top 25 percent?

7. The income of a citizen of Boone county is exponentially distributed with the average income being $42,000 per year. One citizen of Boone county is randomly selected. (Let \( X = \) the income of a citizen of Boone county)

a. In words, define the random variable \( X \). \( X = \)

b. \( X \sim \text{______________} \)

c. Find the probability that one citizen of Boone county makes more than $40,000 per year.

d. Find the probability that one citizen of Boone county makes between $39,000 and $45,000 per year.

e. Find the 45th percentile.

8. Using the distribution given in #1 above, suppose a random sample of 35 trains is taken.

a. Define the random variable \( \overline{X} \), in words: \( \overline{X} = \)

b. \( \overline{X} \sim \text{______________} \)

c. Find the probability that the average speed of the 35 trains is at least 52 mph.

d. Find the probability that the average speed of the 35 trains over is between 47 and 53 mph.

e. Find the 30th percentile for the average speed of the 35 trains.

9. Make sure you know how to compare different normal distributions using the z-score.

10. Make sure you know how to do problems like #8 with the original distribution being exponential or normal.