Chapter 5 & 6: Self Practice Questions

Note: These questions are not meant to be an exhaustive representation of the material you will see on exams or quizzes. They are designed to help you familiarize yourself with the material. These questions are neither submitted nor graded.

1) Consider the experiment of tossing a coin twice.
   a) List the experimental outcomes.
   b) Define a random variable that represents the number of heads occurring on the two tosses.
   c) Show what value the random variable would assume for each of the experimental outcomes.
   d) Is this random variable discrete or continuous?

2) The probability distribution for the random variable x follows
   \[ x \quad f(x) \]
   \[
   \begin{array}{c|c}
   20 & .20 \\
   25 & .15 \\
   30 & .25 \\
   35 & .40 \\
   \end{array}
   \]
   a) Is this probability distribution valid? Explain.
   b) What is the probability that \( x = 30 \)?
   c) What is the probability that \( x \) is less than or equal to 25?
   d) What is the probability that \( x \) is greater than 30?
3) The following table is a partial probability distribution for the MRA Company’s projected profits (x: profit in $1000s) for the first year of operation (the negative value denotes a loss).

<table>
<thead>
<tr>
<th>x</th>
<th>f(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-100</td>
<td>.10</td>
</tr>
<tr>
<td>0</td>
<td>.20</td>
</tr>
<tr>
<td>50</td>
<td>.30</td>
</tr>
<tr>
<td>100</td>
<td>.25</td>
</tr>
<tr>
<td>150</td>
<td>.10</td>
</tr>
<tr>
<td>200</td>
<td>??</td>
</tr>
</tbody>
</table>

a) What is the proper value for f(200)? What is your interpretation of this value?
b) What is the probability that MRA will be profitable?
c) What is the probability that MRA will make at least $100,000?

4) The following table provides a probability distribution for the random variable y.

<table>
<thead>
<tr>
<th>y</th>
<th>f(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>.20</td>
</tr>
<tr>
<td>4</td>
<td>.30</td>
</tr>
<tr>
<td>7</td>
<td>.40</td>
</tr>
<tr>
<td>8</td>
<td>.10</td>
</tr>
</tbody>
</table>

a) Compute E(y).
b) Compute Var(y) and $\sigma$.

5) The assembly time for a product is uniformly distributed between 6 to 10 minutes. The probability of assembling the product in 7 minutes or more is

a) 0.25 
b) 0.75 
c) Zero 
d) 1
6) The travel time for a college student traveling between her home and her college is uniformly distributed between 40 and 90 minutes. The probability that her trip will take longer than 60 minutes is
   
   a) 1.00  
   b) 0.40  
   c) 0.02  
   d) 0.600

7) $Z$ is a standard normal random variable. Compute the following probabilities.
   
   a) $P(-1.33 \leq z \leq 1.67)$  
   b) $P(1.23 \leq z \leq 1.55)$  
   c) $P(z \geq 2.32)$  
   d) $P(z \geq -2.08)$  
   e) $P(z \leq -1.08)$

8) The miles-per-gallon obtained by the 1995 model Q cars is normally distributed with a mean of 22 miles-per-gallon and a standard deviation of 5 miles-per-gallon.
   
   a) What is the probability that a car will get between 13.35 and 35.1 miles-per-gallon?  
   b) What is the probability that a car will get more than 29.6 miles-per-gallon?  
   c) What is the probability that a car will get less than 21 miles-per-gallon?  
   d) What is the probability that a car will get exactly 22 miles-per-gallon?

9) $Z$ is a standard normal variable. Find the value of $z$ in the following.
   
   a) The area between 0 and $z$ is 0.4678.  
   b) The area to the right of $z$ is 0.1112.  
   c) The area to the left of $z$ is 0.8554  
   d) The area between -$z$ and $z$ is 0.754.
e) The area to the left of \(-z\) is 0.0681.

f) The area to the right of \(-z\) is 0.9803.

10) The daily dinner bills in a local restaurant are normally distributed with a mean of $28 and a standard deviation of $6.

a) Define the random variable in words.

b) What is the probability that a randomly selected bill will be at least $39.10?

c) What percentage of the bills will be less than $16.90?

d) What are the minimum and maximum of the middle 95% of the bills?

e) If twelve of one day’s bills had a value of at least $43.06, how many bills did the restaurant collect on that day?
ANSWERS
1. 
   a) Head, Head (H, H); Head, Tail (H, T); Tail, Head (T, H); Tail, Tail (T, T)
   b) \( x \) = number of heads on two coin tosses
   c) Outcome Values of \( x \)
      \[
      \begin{array}{ccc}
      (H, H) & 2 \\
      (H, T) & 1 \\
      (T, H) & 1 \\
      (T, T) & 0 \\
      \end{array}
      \]
   d) Discrete; it may assume 3 values: 0, 1, and 2

2. 
   a) \( f(x) \geq 0 \) for all values of \( x \); \( \sum f(x) = 1 \); therefore, it is a valid probability distribution
   b) Probability \( x = 30 \) is \( f(30) = .25 \)
   c) Probability \( x \leq 25 \) is \( f(20) + f(25) = .20 + .15 = .35 \)
   d) Probability \( x > 30 \) is \( f(35) = .40 \)

3. 
   a) .05
   b) .70
   c) .40

4. 
   a) \( \mu = 5.2 \)
   b) \( \sigma^2 = 4.56 \); \( \sigma = 2.14 \)

5. b

6. d

7. 
   a. 0.8607
   b. 0.0487
   c. 0.0102
   d. 0.9812
   e. 0.1401

8. 
   a. 0.9538
   b. 0.0643
   c. 0.4207
   d. 0.0000

9. 
   a. 1.85
   b. 1.22
c. 1.06  
d. 1.16  
e. 1.49  
f. 2.06  

10.  
a. the daily dinner bills  
b. 0.0322  
c. 3.22%  
d. minimum = $16.24    maximum = $39.76  
e. 2,000