Warm Up:

Which of the following numbers is the smallest?

(a) $\frac{1}{3}$  
(b) $\frac{1}{4}$  
(c) $\frac{1}{5}$  
(d) $\frac{1}{6}$  
(e) $\frac{1}{7}$

6.1 Discrete and Continuous Variables

Learning Goals: Use the probability distribution of a discrete random variable to calculate the probability of an event. Make a histogram to display the probability distribution of a discrete random variable and describe its shape. Calculate and interpret the mean (expected value) of a discrete random variable. Calculate and interpret the standard deviation of a discrete random variable. Use the probability distribution of a continuous random variable (uniform or Normal) to calculate the probability of an event.

How many children are in your family?

Count up the number of children in your family (including yourself). Be sure to include all your stepbrothers/stepsisters and half-brothers/half-sisters.

Let $X$ = the number of children. Suppose we choose someone from the class at random.

<table>
<thead>
<tr>
<th>$X$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>$\frac{2}{20}$</td>
<td>$\frac{9}{20}$</td>
<td>$\frac{8}{20}$</td>
<td>$\frac{6}{20}$</td>
<td>$\frac{1}{20}$</td>
<td>$\frac{1}{20}$</td>
</tr>
</tbody>
</table>

1.) Is this a valid probability model? Explain.

*Yes, adds to 1, all values are between 0 & 1*

2.) Is 5.7167 a possible value of $X$? Explain.

*No, can't have part of a child*

3.) Make a histogram to display information with $X$ on the horizontal axis and describe its shape.

Slightly skewed right, 2 modes
4.) Describe in words what P(X\geq 3) and then find P(X\geq 3).

Probability that they have 3 or more children in their family. \( P(X\geq 3) = \frac{1}{6}/20 \)

5.) Describe in words what P(X>3) and then find P(X>3).

Probability that they have more than 3 kids in the family. \( P(X>3) = 8/20 \)

6.) Find the average of the X values.

\[
\frac{1+2+3+4+5+4}{6} = 3.5
\]

7.) Does this value tell us the average number of children in the families of students in this class? If yes, explain, no, why not?

No, 2.43 should have a larger impact on the mean.

\[
\frac{1(2) + 2(3) + 3(4) + 4(5) + 5(6)}{6} = 2.9615
\]

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**Discrete Random Variable:**
- Takes a fixed set of possible values with gaps between values

**Continuous Random Variable:**
- Can take on any value in any interval

**Expected Value (Mean):**
- \( \mu = \sum x_i p_i \)

**Histogram:**
- \( \text{X values} \)

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**How much do you get paid?**

Suppose you got a new job and each day your boss (Ms. Carder) draws a slip of paper from a bag to determine your wage for the day. Let the random variable \( X = \) daily wage ($ per hour).

1.) \( P(X=2) = .136 \)

2.) Probability that my student got a Br morning

\( P(X=2) = .319 \)

4.) \( 3.22 \)

If many, many students are chosen at random the average grade is 3.22.
1.) What is your wage for the day? _________________ Add your data to the table on the board and complete the table below.

<table>
<thead>
<tr>
<th>X</th>
<th>1</th>
<th>5</th>
<th>7</th>
<th>10</th>
<th>15</th>
<th>25</th>
</tr>
</thead>
</table>

2.) Calculate and interpret the expected value of X.

3.) Recall from Chapter 1 that standard deviation tells us the typical distance from the mean. Complete the table to calculate the standard deviation for the probability distribution.

<table>
<thead>
<tr>
<th>X - Mean</th>
<th>Distance from mean</th>
<th>Distance from mean^2</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/27</td>
<td>-1.852</td>
<td>3.427</td>
<td>3.427</td>
</tr>
<tr>
<td>7/27</td>
<td>-2.092</td>
<td>4.386</td>
<td>4.386</td>
</tr>
<tr>
<td>9/27</td>
<td>-2.092</td>
<td>4.386</td>
<td>4.386</td>
</tr>
<tr>
<td>3/27</td>
<td>2.092</td>
<td>4.386</td>
<td>4.386</td>
</tr>
<tr>
<td>2/27</td>
<td>3.700</td>
<td>13.690</td>
<td>13.690</td>
</tr>
</tbody>
</table>

4.) Interpret the standard deviation.

5.) Ms. Carder decides she would rather assign wages so that employees could get any amount from $10 to $20 and all are equally likely. Draw a graph to represent this probability distribution.

6.) What is the probability that an employee makes between $12 and $12.50?

Check your understanding on the back complete 1 and 2 then we will go over and do 3 and 4. You have 3 minutes!!!

3.) \( P(10 \leq Y \leq 64) \) \( \frac{64 - 64}{2.7} = .37 \)

\( \text{normalcdf}(-\infty, \infty, .37, 0, 1) = .3557 \)

4.) \( P(10 \leq Y \leq 70) \) \( \frac{70 - 64}{2.7} = 1.46 \)

\( \text{normalcdf}(1.46, \infty, 0, 1) = .5002 \)

Coursework:
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