DISCRETE AND CONTINUOUS VARIABLES
Section 6.1A

Warm-up
- Find the least squares regression line:
- What would you predict for Test 2 if a person made an 80 on Test 1?
- What percent of variation in Test 2 can be explained by the least squares regression between Test 1 and Test 2?

\[
\begin{array}{cc}
\text{Test 1} & \text{Test 2} \\
67 & 72 \\
58 & 63 \\
38 & 54 \\
98 & 95 \\
78 & 84 \\
84 & 89 \\
88 & 90 \\
\end{array}
\]

Random Variable
- Numerical variable whose value depends on the outcome in a chance experiment.
- It connects a numerical value with each outcome.

Two types of numerical data
- **Discrete** – collection of isolated points. Can be counted.
- **Continuous** – includes an entire interval. Can be measured.

Identify as Discrete or Continuous.
- The number of desks in the room.
- The average height of all students.
- Number of gallons of gasoline purchased on a particular day.

Examples of random variables.
- # of keys on a key chain: 0, 1, 2, 3, ...
- # of heads when 2 coins are tossed: 0, 1, 2
What is the random variable and what type of variable is it?

- Social worker involved in study about family structure – finds the number of children per family.
- Archer shoots arrows at the bull’s eye and measures the distance from the center to the arrow.

Probability distribution

- Model that represents the long-run behavior of the variable.
- Gives the probability associated with each possible x-value.
- Can be graphed as well.

Ex: Toss 3 coins. Let x = # heads

Ex: A box contains 4 slips of paper with $1, $1, $10, $20 on them. The winner of a contest selects 2 slips and gets the sum of the 2 as her prize. Let x = possible amount won.

A company inspects products coming in. They receive computer boards in lots of five. Two boards are selected from each lot for inspection. Boards #1, 2 are defective. Let x = # defective boards.

We know that 10% of people who purchase cars buy manual transmissions and 90% purchase automatics. Three people purchase a car. Find the probability distribution for the number who purchase automatics.
35% of children wear contacts. Find the probability distribution for the number wear contacts in a group of four.

### Properties of Probability Distribution

- For every possible \( x \) value,
  
  \[ 0 \leq p(x) \leq 1 \]

- The sum of all possible probabilities is equal to 1.

\[ \sum p(x) = 1 \]

---

Let \( x = \# \) defects out of a lot of 10 parts

<table>
<thead>
<tr>
<th>( x )</th>
<th>( P(x) )</th>
<th>Find ( P(\text{exactly 4}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.041</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.13</td>
<td>Find ( P(\text{at least 8}) )</td>
</tr>
<tr>
<td>2</td>
<td>0.209</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.223</td>
<td>Find ( P(\text{at most 2}) )</td>
</tr>
<tr>
<td>4</td>
<td>0.178</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.114</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.061</td>
<td>Find ( P(\text{more than 6}) )</td>
</tr>
<tr>
<td>7</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.011</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

- NC State released the grade distributions for online classes. For a specific class the students received 26% As, 42% Bs, 20% Cs, 10% Ds, 2% Fs. The grades are on a four—point scale where an A=4.

1. What does \( P(X \geq 3) \) mean?

2. How would we write the equation if a student received a grade worse than a C? What is the probability?

Value of \( X \): 0 1 2 3 4

| Probability: | 0.02 | 0.10 | 0.20 | 0.42 | 0.26 |

### Do you think that you can tell the difference between Pepsi and Coke?

P(\text{Correct})=

<table>
<thead>
<tr>
<th># Correct</th>
<th>Tally</th>
<th>P(\text{Correct})</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Homework

- Worksheet