Exam: Test #4
Covers Chapter 13
Thursday, Dec. 15
12:30 - 2:30 p.m.
Parkhouse 109
Find the following probabilities for the standard normal distribution.

3. To the right of $-1.78$

$$P(z > -1.78) = .463 + .5 = .963$$

4. To the left of $1.96$

a. $P(z < 1.96) = .5 + .475 = .975$

4b. To the left of $-1.5$

$$P(z < -1.5) = .5 - .433 = .067$$
Non-standard normal distributions

\[ \text{Normal } \quad X \]

Mean \( \mu \) (population mean)

Standard deviation \( \sigma \) (population standard deviation)

\[ Z = \frac{X - \mu}{\sigma} \]

\[ = \frac{X - \bar{X}}{s} \]
In the following, assume that the heights of 18-year old males are normally distributed with a mean of 69 in. and a standard deviation of 6 in.

\[ z = \frac{x - \mu}{\sigma} = \frac{x - 69}{6} \]

5. What percent of 18-year old males are less than 75 in. tall?

\[ P(x < 75) = P\left( \frac{x - 69}{6} < \frac{75 - 69}{6} \right) = P(z < 1) \]

Convert to percent.

\[ P(z < 1) = .5 + .341 \]

\[ = .841 \text{ or } 84.1\% \]
6. If 1000 18-year old males are selected at random, how many will be less than 72 in. tall?

\[ z = \frac{x - 69}{6} \]

\[ P(x < 72) = P\left( \frac{x - 69}{6} < \frac{72 - 69}{6} \right) = P(z < 0.5) \]

Multiply by 1000.

\[ P(z < 0.5) = 0.5 + 0.192 = 0.692 \]

\[ 1000 \times 0.692 = 692 \] will be less than 72 inches tall
In the following, the wearout mileage of a certain tire is normally distributed with a mean of 35,000 miles and standard deviation of 2500 miles.

\[ x = \text{wearout mileage} \]
\[ z = \frac{x - 35000}{2500} \]

7. Find the percent of tires that will last at least 39,000 miles.

\[ P(x \geq 39000) = P\left(\frac{x - 35000}{2500} \geq \frac{39000 - 35000}{2500}\right) = P(z \geq 1.6) \]

Convert to a percent.
Sample Test

1. (2% each) Given the frequency distribution:

<table>
<thead>
<tr>
<th>Class</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-7</td>
<td>5</td>
</tr>
<tr>
<td>8-14</td>
<td>4</td>
</tr>
<tr>
<td>15-21</td>
<td>8</td>
</tr>
<tr>
<td>22-28</td>
<td>6</td>
</tr>
<tr>
<td>29-35</td>
<td>3</td>
</tr>
<tr>
<td>36-42</td>
<td>2</td>
</tr>
</tbody>
</table>

\[
\frac{15+21}{2} = \frac{36}{2} = \boxed{18}
\]

- a. The lower class limit of the second class is \(15\) or \(2\).
- b. The class width is \(7\).
- c. The modal class is \(15-21\) or \(3\text{rd class}\).
- d. The class mark of the third class is \(18\).
- e. The total number of observed values is \(28\).
(5% each) A survey of the 8745 vehicles on the campus of State University yielded the following circle graph.

a. Together, what percent of the vehicles are either vans or sedans?

9 + 5 = 14

How many are there? 14% of 8745 = 1224

b. How many degrees are in the piece representing the pickups?

26% of 360

b. 93.6°
3. (10%) Construct a histogram of the given frequency distribution.
   The frequency distribution indicates the age of 726 students in a college statistics course.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>160</td>
</tr>
<tr>
<td>19</td>
<td>138</td>
</tr>
<tr>
<td>20</td>
<td>128</td>
</tr>
<tr>
<td>21</td>
<td>98</td>
</tr>
<tr>
<td>22</td>
<td>84</td>
</tr>
<tr>
<td>23</td>
<td>62</td>
</tr>
<tr>
<td>24</td>
<td>42</td>
</tr>
<tr>
<td>25</td>
<td>14</td>
</tr>
</tbody>
</table>
4. (5% each)

How many people were 20 years old?  
How many people at least 23 years old?

23 or older  
\{23, 24, 25, 26\}  
3 + 2 + 2 + 1

\[ a. \quad 9 \]  
\[ b. \quad 8 \]
5. (5%) Construct a stem-and-leaf display for the given data table.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>35</td>
<td>43</td>
<td>53</td>
<td>64</td>
<td>68</td>
</tr>
<tr>
<td>32</td>
<td>40</td>
<td>49</td>
<td>54</td>
<td>66</td>
<td>71</td>
</tr>
<tr>
<td>34</td>
<td>41</td>
<td>50</td>
<td>61</td>
<td>66</td>
<td>72</td>
</tr>
</tbody>
</table>

Stems | Leaves
-----|------
3     | 1245 
4     | 0139 
5     | 034  
6     | 14668|
7     | 12  

6. (4% each) Given the set of data: 16, 22, 25, 30, 36, 36, 39

Find:

a. The mean \( \text{mean} = \frac{\sum x}{n} = \frac{204}{7} \) 

b. The median 30

c. The mode 36

d. The midrange \( \frac{16 + 39}{2} = \frac{55}{2} = 27.5 \)

e. The range 23 \( 39 - 16 = 23 \)
7. (5% each)
   
a. Complete the following table:

   \[
x = 52 \\
\overline{x} = \frac{76 + 60 + 74 + 40 + 10}{5} = \frac{260}{5} = 52 \\
\]

<table>
<thead>
<tr>
<th>X</th>
<th>(x - \overline{x})</th>
<th>((x - \overline{x})^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>24</td>
<td>576</td>
</tr>
<tr>
<td>60</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>74</td>
<td>22</td>
<td>484</td>
</tr>
<tr>
<td>40</td>
<td>-12</td>
<td>144</td>
</tr>
<tr>
<td>10</td>
<td>-42</td>
<td>1764</td>
</tr>
<tr>
<td></td>
<td>3032</td>
<td></td>
</tr>
</tbody>
</table>

\(n = 5\)

b. The standard deviation is 27.5

\[
s = \sqrt{\frac{\sum(x - \overline{x})^2}{n-1}} = \sqrt{\frac{3032}{4}} = 27.5
\]
8. The weight of cats that have been treated by a veterinarian is normally distributed with a mean of 11.5 pounds and a standard deviation of 2.5 pounds. What percentage of cats weigh

\[
X = \text{weight of cat} = \frac{X - 11.5}{2.5}
\]

a. at least 15 pounds?

\[
P(X \geq 15) = P\left(\frac{X - 11.5}{2.5} \geq \frac{15 - 11.5}{2.5}\right)
\]

\[
= P(z \geq 1.4) = .5 - .419 = .081
\]

b. between 11.5 and 14 pounds?

\[
P(11.5 \leq X \leq 14) = P\left(\frac{11.5 - 11.5}{2.5} \leq \frac{X - 11.5}{2.5} \leq \frac{14 - 11.5}{2.5}\right)
\]

\[
= P(0 \leq z \leq 1) = .341 \approx 34.1\%
\]
9. (3% each) Use one of the following terms in each of your answers:

<table>
<thead>
<tr>
<th>population</th>
<th>sample</th>
<th>random sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>ascending order</td>
<td>descending order</td>
<td></td>
</tr>
<tr>
<td>Measures of central tendency</td>
<td>measures of dispersion</td>
<td></td>
</tr>
</tbody>
</table>