**TABLE 13.7** Areas under the Standard Normal Curve (the $z$-table)

The column under $A$ gives the area under the entire curve that is between $z = 0$ (or the mean) and a positive value of $z$.

| $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  | $z$  | $A$  |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  | .00  |
| .04  | .000 | .004 | .008 | .012 | .016 | .020 | .024 | .028 | .032 | .036 | .040 | .044 | .048 | .052 | .056 | .060 | .064 | .068 | .072 |
| .07 | .076 | .080 | .084 | .088 | .092 | .096 | .100 | .104 | .108 | .112 | .116 | .120 | .124 | .128 | .132 | .136 | .140 | .144 | .148 |

Title: Mar 29 - 11:21 AM (1 of 15)
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.

\[ = .5 + .341 \]

\[ = .841 \]

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

\[
P(x < 72) = P\left(\frac{x - 69}{6} < \frac{72 - 69}{6}\right) = P(z < .5)
\]

Multiply by 1000.

\[
= .5 + .192
= .692 \text{ or } 69.2\%
\]

Out of 1000, \(1000 \times .692\) = 692 should 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.

\[ = .5 - .445 \]
\[ = .055 \]
\[ = 5.5\% \]
84. **Grading on a Normal Curve** Mr. Sanderson marks his class on a normal curve. Those with z-scores above 1.8 will receive an A, those between 1.8 and 1.1 will receive a B, those between 1.1 and -1.2 will receive a C, those between -1.2 and -1.9 will receive a D, and those under -1.9 will receive an F. Find the percent of grades that will be A, B, C, D, and F.

![Graph showing normal distribution and percentiles]

- A: 3.6%
- B: 10%
- C: 74.9%
- D: 8.6%
- F: 2.9%

**Homework Section 13.7**
1. (2% each) Given the frequency distribution:

<table>
<thead>
<tr>
<th>Class</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;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>38-42</td>
<td>2</td>
</tr>
</tbody>
</table>

The total number of observed values is **28**.

a. The lower class limit of the second class is **8**.

b. The class width is **7**.

c. The modal class is **15-21** (3rd class).

d. The class mark of the third class is **18.5**. 

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

e. The total number of observed values is **28**.
2. (5% each) A survey of the 8745 vehicles on the campus of State University yielded the following circle graph.

![Circle graph showing vehicle types: Motorcycles 11%, Convertibles 14%, Hatchbacks 35%, Vans 9%, Sedans 3%]

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

\[
9 + 5 = 14 \quad \text{a.} \quad \frac{14}{8745} \times 100 = 1.57\%
\]

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

\[
26\% \text{ of } 360 \quad \text{b.} \quad 0.26 \times 360 = 93.6^\circ
\]
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>

Title: Apr 27 - 10:07 AM (8 of 15)
4. (5% each)

a. How many people were 20 years old?  
   a. 9

b. How many people at least 23 years old?  
   b. 8

23, 24, 25, 26

3 + 2 + 2 + 1 = 8
5. (5%) Construct a stem-and-leaf display for the given data table.

```
<table>
<thead>
<tr>
<th>Stems</th>
<th>Leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1 2 4 5</td>
</tr>
<tr>
<td>4</td>
<td>0 1 3 9</td>
</tr>
<tr>
<td>5</td>
<td>0 3 4</td>
</tr>
<tr>
<td>6</td>
<td>1 4 6 6 8</td>
</tr>
<tr>
<td>7</td>
<td>1 2</td>
</tr>
</tbody>
</table>
```
6. (4% each) Given the set of data: 16, 22, 25, 30, 36, 36, 39
Find:

a. The mean ____________.

b. The median ____________.

c. The mode ____________.

d. The midrange ____________.

e. The range ____________.
7. (5% each)
   a. Complete the following table:

<table>
<thead>
<tr>
<th>X</th>
<th>X - \bar{X}</th>
<th>(X - 52)^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>24</td>
<td>576</td>
</tr>
<tr>
<td>60</td>
<td>28</td>
<td>784</td>
</tr>
<tr>
<td>74</td>
<td>12</td>
<td>144</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>260</td>
<td></td>
<td>3032</td>
</tr>
</tbody>
</table>

   \[
   \frac{260}{5} = 52
   \]

   b. The standard deviation is \boxed{27.5}

   \[
   S = \sqrt{\frac{\sum(X - \bar{X})^2}{n-1}} = \sqrt{\frac{3032}{4}}
   \]

   \[
   = \sqrt{758} = 27.5
   \]
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

\[ x = \text{weight of cat} \]

\[ z = \frac{x - 11.5}{2.5} \]

a. at least 15 pounds?

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

\[ = P(z \geq 1.4) \]

\[ = .5 - .419 = .081 = 8.1\% \]
b. between 11.5 and 14 pounds?

\[ P(11.5 \leq X \leq 14) \]

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

= \[ P(0 \leq z \leq 1) = 0.341 \]

\( \approx 34.1\% \)
Test #4

Tuesday, May 9
12:30 - 2:30
Parkhouse 107