8.49 a. \( \frac{1.5 - 0}{1} = 1.5 \).
b. \( \frac{4 - 10}{6} = -1 \).
c. \( \frac{0 - 10}{5} = -2 \).
d. \( \frac{-25 - (-10)}{15} = -1 \).

8.50 Table A.1 can be used to find the answers.

a. .5000  
b. .3632  
c. .6368  
d. .9750  
e. .0099  
f. .9951  
g. .9505  

8.51 a. Answer = .8413. For 200 lbs, \( z = \frac{200 - 180}{20} = 1 \). \( P(Z \leq 1) = .8413 \).

b. Answer = .2266. For 165 lbs, \( z = \frac{165 - 180}{20} = -0.75 \). \( P(Z \leq -0.75) = .2266 \).

c. Answer = .7734. This is the “opposite” event to part (b), so calculation is 1-.2266 = .7734.

8.59 a. For 65, \( z = 0 \) because 65 is the mean while for 62, \( z = \frac{62 - 65}{2.7} = -1.11 \).

So, \( P(62 \leq X \leq 65) = P(-1.11 \leq Z \leq 0) = P(Z \leq 0) - P(Z \leq -1.11) = .5 - .1335 = .3665 \)

b. For 60, \( z = \frac{60 - 65}{2.7} = -1.85 \) while for 70, \( z = \frac{70 - 65}{2.7} = 1.85 \).

So, \( P(60 \leq X \leq 70) = P(-1.85 \leq Z \leq 1.85) = P(Z \leq 1.85) - P(Z \leq -1.85) = .9678 - .0322 = .9356 \)

c. \( P(X \leq 70) = P(Z \leq 1.85) = .9678 \)

d. \( P(X \geq 60) = P(Z \geq -1.85) = P(Z \leq 1.85) = .9678 \)

e. \( X \) is either less than or equal to 60 or greater than or equal to 70 so the answer can be computed as \( P(X \leq 60) + P(X \geq 70) = P(Z \leq -1.85) + P(Z \geq 1.85) = .0322 + .0322 = .0644 \)

9.4 The truth refers to the population parameter. The sample statistic is computed from the data, so we know its value. It is the population parameter we are trying to estimate.
9.6  
a. Statistics. The given means are summaries of samples taken from a larger population. 
b. The sample means alone do not provide enough information to say whether the mean salary for 
male in the company is higher than the mean salary for females. It might be that the observed 
difference between sample means is consistent with the type of difference that could occur for any 
two randomly selected samples of n = 100 taken from the same population. We might ask how 
likely it is that the difference in means would be as large as $1,500 (the observed difference) if 
there were actually no difference between males and females in the population. To answer this, we 
need to know the sampling distribution for possible differences between the means of two 
different samples taken from the same population. Later in the text, it will be seen that the relevant 
sampling distribution can be determined, as long as the sample standard deviations are also 
provided. 
c. No, the sample means most likely would not be the same for two new samples. A sample mean 
is a random variable and varies from sample to sample.

9.10  
a. \( \bar{x} \) because it is a sample mean. 
b. \( \mu \) because it is the mean for the whole population.

9.11  
\textbf{Hint:} This is an example of Situation 1 on page 336 of the text. 
a. Research question: What proportion of parents in the school district support the new program? 
b. Population parameter: \( p \) = proportion of all parents in the school district who support the new program 
c. Sample estimate: \( \hat{p} = \frac{104}{300} = .347 \)

9.12  
\textbf{Hint:} This is an example of Situation 3 on page 337 of the text. 
a. Research question: What is the mean number of emails received the previous day by customers of the 
Internet provider? 
b. Population parameter: \( \mu \) = mean number of emails received the previous day by all customers 
c. Sample estimate: \( \bar{x} = 13.2 \), the mean number for the sample

9.25  
a. The population proportion would not change. It is the proportion of all adults in the population that buys 
organic vegetables. 
b. The sample proportion would change for each sample. 
c. The standard deviation of \( \hat{p} \) would not change. It is based on the population proportion and on the 
sample size, which is 1000 for each of the samples. 
d. The standard error would change because it is an estimate of the standard deviation of the sampling 
distribution, and it uses the sample data, which changes for each sample. 
e. The sampling distribution of \( \hat{p} \) remains the same for all samples of the same size (1000 in this case) 
from the same population.
9.31  
\[ a. \text{ Mean } = \frac{1}{2}; \text{ s.d. } = \sqrt{\frac{0.5(1-0.5)}{400}} = 0.025 \]
\[ b. \text{ Mean } = \frac{1}{2}; \text{ s.d. } = \sqrt{\frac{0.5(1-0.5)}{1600}} = 0.0125 \]
\[ c. \text{ Mean } = \frac{1}{2}; \text{ s.d. } \left(\hat{p}\right) = \sqrt{\frac{0.8(1-0.8)}{64}} = 0.05 \]
\[ d. \text{ Mean } = \frac{1}{2}; \text{ s.d. } \left(\hat{p}\right) = \sqrt{\frac{0.8(1-0.8)}{256}} = 0.025 \]

9.32  
A change in the sample size does not affect the value of the mean of the sampling distribution. Increasing the sample size decreases the value of the standard deviation. For a four-fold increase in sample size the standard deviation is cut in half.

9.57  
\[ a. \text{ Mean } = \text{ population mean } \mu = 7.05 \text{ hours.} \]
\[ b. \text{ s.d.}(\bar{x}) = \frac{\sigma}{\sqrt{n}} = \frac{1.75}{\sqrt{190}} = 0.127 \text{ hours.} \]
\[ c. \bar{x} = 6.923 \text{ and } 7.177, \text{ calculated as } 7.05 \pm 0.127. \]
\[ d. \bar{x} = 6.796 \text{ and } 7.304, \text{ calculated as } 7.05 \pm (2 \times 0.127). \]

9.59  
\[ s.e.(\bar{x}) = \frac{s}{\sqrt{n}} = \frac{7.2}{\sqrt{60}} = 0.93. \]

9.62  
The standard error of the sample mean is calculated using the standard deviation of the measurements in an observed sample, and it (the standard error) estimates the "true" standard deviation of the sampling distribution of the sample mean. The standard deviation is found using the known (or assumed to be known) value of the standard deviation of the population of measurements.

The formula for the standard error is \( s.e.(\bar{x}) = \frac{s}{\sqrt{n}}. \)

The formula for the standard deviation is \( s.d.(\bar{x}) = \frac{\sigma}{\sqrt{n}}. \)

In practice, the standard error will be used more often because the value of the population standard deviation usually will not be known.