8.3 Find the margin of error in estimating a population mean \( \mu \).
(a) \( n = 30, \sigma^2 = .2 \) \( ME = .16 \)
\[
\sigma = \sqrt{.2}, SE = \frac{\sigma}{\sqrt{n}} = \frac{\sqrt{.2}}{\sqrt{30}}, \\
ME = 1.96SE = 1.96\left(\frac{\sqrt{.2}}{\sqrt{30}}\right) = .1600
\]

8.5 Find the margin of error.
(a) \( n = 50, s^2 = 4 \) \( ME = .55 \)
\[
\sigma \approx s = \sqrt{4} = 2, SE = \frac{\sigma}{\sqrt{n}} = \frac{2}{\sqrt{50}}, \\
ME = 1.96SE = 1.96\left(\frac{2}{\sqrt{50}}\right) = .5544
\]

8.7 Find the margin of error for estimating a binomial proportion. Use \( p = .5 \) to find the standard error of the estimator.
(a) \( n = 30 \) \( ME = .18 \)
\[
SE = \sqrt{pq/n} = \sqrt{.5(.5)/30} = \frac{.5}{\sqrt{30}}, \\
ME = 1.96SE = 1.96\left(\frac{.5}{\sqrt{30}}\right) = .1789
\]

8.9 Find the margin of error for estimating a binomial proportion using samples of size \( n = 100 \) and the given estimated values of \( p \).
(a) \( p = .1 \) \( ME = .059 \)
\[
SE = \sqrt{(pq)/n} = \sqrt{(.1)(.9)/100} = \frac{.09}{\sqrt{10}}, \\
ME = 1.96SE = 1.96\left(\frac{.09}{\sqrt{10}}\right) = .0588
\]

8.11 A random sample of \( n = 900 \) observations from a binomial population produced \( x = 655 \) successes. Estimate the binomial proportion \( p \) and calculate the margin or error.
\[
\hat{p} = .728 \quad ME = .029
\]
\[
\hat{p} = \frac{655}{900} = .7277, SE = \sqrt{\hat{p}(1-\hat{p})/n} = \sqrt{(.7277)(1-.7277)/900}, \\
ME = 1.96SE = 1.96\left(\frac{(.7277)(1-.7277)}{900}\right) = .02908
\]

8.17 In a survey of 1000 adults, 78% felt sports had a positive effect on society.
(a) Estimate of the proportion of adults who feel sports have a positive effect.
\[
\hat{p} = .78
\]
(a') Find the margin of error.
\( ME = .026 \)
(b) A magazine reports that in a separate poll of 1000 adults has a margin of error of 3.1%. What value of \( p \) produces this margin of error. Hint: Set the formula for the margin of error equal to .031 and then use the quadratic formula to solve for \( p \).
\[
p = .5
\]
\[
SE = \sqrt{\frac{p(1-p)}{1000}}, ME = 1.96SE = 1.96\sqrt{\frac{p-p^2}{1000}}
\]
Given: \( ME = .031 \)
\[
\therefore 1.96\sqrt{\frac{p-p^2}{1000}} = .031 \\
\therefore p - p^2 = \left(\frac{.031}{1.96}\right)^2 \\
\therefore p - p^2 = .25 \\
\therefore p^2 - p + .25 = 0 \\
\therefore p = \frac{1 \pm \sqrt{1 - 4(.25)}}{2} = \frac{1}{2} = .5