6.62 A computer has a random number generator designed to produce random numbers that are uniformly distributed on the interval from 0 to 1. If this is true, the numbers generated come from a population with mean .5 and standard deviation .2887. A command to generate 100 random numbers gives outcomes with sample mean .4365. Assume that the population standard deviation remains unchanged throughout. We want to conduct a 2-sided hypothesis test of whether or not the population mean equals .5.

(a) Calculate the value \(z\) of the \(z\) test statistic.
(b) Is the result significant at the 5% level?
(c) Is the result significant at the 1% level?
Answer to 6.62

(a) $z = -2.20$

(b) Yes, since $P = .0278$.

(c) No, for the same reason.
Section 6.82 Suppose that SAT Mathematics (SATM) scores in the absence of coaching vary normally with mean \( \mu = 480 \) and standard deviation \( \sigma = 100 \). Suppose further that coaching may change the mean but does not change the standard deviation. An increase in the SATM score from 480 to 483 is of no importance in seeking admission to college, but this unimportant change can be statistically very significant. To see this, calculate the \( P \)-value for the test of

\[
H_0 : \mu = 480 \text{ versus } H_a : \mu > 480
\]

in each of the following situations:

(a) A coaching service coaches 100 students; their SATM scores average 483.

(b) By the next year, the service has coached 1000 students; their SATM scores average 483.

(c) An advertising campaign brings the number of students coached to 10,000; their average score is still 483.
Answer to 6.82

(a) $z = 0.3$ and $P = 0.3821$

(b) $z = 0.95$ and $P = 0.1711$

(c) $z = 3$ and $P = 0.0013$
6.106 An agronomist examines the cellulose content of a variety of alfalfa hay. Suppose that the cellulose content in the population has a standard deviation of 8 milligrams per gram of hay. A sample of 16 cuttings has mean cellulose content 140 milligrams per gram.

(a) Give a 95% confidence interval for the mean cellulose content in the population.

(b) A previous study claimed that the mean cellulose content was 135 milligrams per gram, but the agronomist believes that the mean is higher than that figure. State $H_0$ and $H_a$ and carry out a significance test to see if the new data support this belief.
Answer to 6.106

(a) 136.08 to 143.92 mg/g
(b) $z = 2.50$, so $P = .0062$ (for a one-sided test to the right)