Each quiz had 5 of the following problems.

1. A researcher models the length of human pregnancies using a normal distribution with mean \( \mu \) and population standard deviation \( \sigma = 16 \) days. How many pregnant women would he need in a study in order to compute a 98% confidence interval for \( \mu \) with margin of error of 4 days or less?  
(a) 16 \hspace{1cm} (b) 62 \hspace{1cm} (c) 10 \hspace{1cm} (d) 87  

**Solution.** Use the formula  
\[
    n = \left( \frac{c \sigma}{B} \right)^2
\]
with \( c = 2.33, \sigma = 16, \) and \( B = 4 \) to get \( n = 86.8624 \). Round up to the next integer, 87.

2. From a sample of \( n = 15 \) observations, a researcher would like to compute a 99% confidence interval for a population mean \( \mu \) using the formula \( X \pm c S \sqrt{n} \). Here \( X \) is the sample mean, and \( S \) is the sample standard deviation. The researcher is willing to assume that the population distribution is normal. What value should the researcher use for \( c? \)  
(a) 2.57 \hspace{1cm} (b) 2.977 \hspace{1cm} (c) 2.947 \hspace{1cm} (d) 2.624 \hspace{1cm} (e) 2.602  

**Solution.** Find \( c \) from Table B.3 using the \( 15 - 1 = 14 \) degrees of freedom row. The correct answer is \( c = 2.977. \)

3. A researcher would like to form a confidence interval for a population proportion \( \pi \) with confidence level 95% and margin of error 0.005 or less. What sample size is required?  
(a) 38416 \hspace{1cm} (b) 193 \hspace{1cm} (c) 221 \hspace{1cm} (d) 960400  

**Solution.** Use the formula  
\[
    n = \frac{c^2(0.5)(0.5)}{B^2}
\]
with \( c = 1.96 \) and \( B = 0.005 \) to get \( n = 38416. \)

4. In a study of women’s bone health, the daily calcium intakes of 28 women were measured. The sample mean of the 28 values was 926 and the sample standard deviation of the 28 values was 427.2. Compute a 98% confidence interval for the population mean calcium intake \( \mu \) assuming that the population distribution is normal.  
(a) 926 \pm 188.1084 \hspace{1cm} (b) 926 \pm 199.6532 \hspace{1cm} (c) 926 \pm 203.3169 \hspace{1cm} (d) 926 \pm 37.73091

**Solution.** Find \( c = 2.473 \) from Table B.3 using the \( 28 - 1 = 27 \) degrees of freedom row. The interval is \( 926 \pm 2.473(427.2/\sqrt{28}) \approx 926 \pm 199.6532. \)

5. The first six observations from Cavendish’s study of the density of the earth have sample mean 5.31 and sample standard deviation 0.293. Assuming the population distribution is normally distributed, which of the following gives a 90% confidence interval for the true density of the earth?  
(a) 5.31 \pm 1.943(0.293/\sqrt{6}) \hspace{1cm} (b) 5.31 \pm 2.015(0.293/\sqrt{6}) \hspace{1cm} (c) 5.31 \pm 1.64(0.293/\sqrt{6}) \hspace{1cm} (d) 5.31 \pm 1.476(0.293/\sqrt{6})
Solution. Find $c = 2.015$ from Table B.3 using the $6 - 1 = 5$ degrees of freedom row. The interval is $5.31 \pm 2.015(0.293/\sqrt{6})$.

6. A researcher models the length of human pregnancies using a normal distribution with mean $\mu$ and population standard deviation $\sigma = 16$ days. How many pregnant women would he need in a study in order to compute a 95% confidence interval for $\mu$ with margin of error of 4 days or less?
(a) 16 (b) 62 (c) 10 (d) 87

Solution. Use the formula

$$n = \left( \frac{c\sigma}{B} \right)^2$$

with $c = 1.96$, $\sigma = 16$, and $B = 4$ to get $n = 61.4656$. Round up to the next integer, 62.

7. A researcher would like to form a confidence interval for a population proportion $\pi$ with confidence level 95% and margin of error 0.001 or less. What sample size is required?
(a) 38416 (b) 193 (c) 221 (d) 960400

Solution. Use the formula

$$n = \frac{c^2(0.5)(0.5)}{B^2}$$

with $c = 1.96$ and $B = 0.001$ to get $n = 960400$. 
