Math 263 **Name**_____

Quiz 9

A confidence interval for the mean of a population is computed from a sample. In each of the following cases, how does the ***length*** of the confidence interval change, assuming other quantities remain constant?

(a) If the sample size increases, the length of the confidence interval (circle one answer)
- Increase
- Decreases
- Remains same
- Can't tell without further information

REASON

(b) If the sample mean increases, then the length of the confidence level (circle one answer)
- Increases
- Decreases
- Remains same
- Can't tell without further information

REASON

(c) If the population standard deviation doubles, then the length of the confidence interval (circle one answer)
- Doubles
- Quadruples
- Halves
- Is divided by 4
- Can't tell without further information

(d) If the sample size quadruples, then the length of the confidence interval (circle one answer)
- Doubles
- Quadruples
- Halves
- Is divided by 4
- Can't tell without further information

(e) If the confidence level decreases (for example, say 95% to 90%), then the length of the confidence interval (circle one answer)
- Increases
- Decreases
- Remains same
- Can't tell without further information

ANSWER

A confidence interval has formula

$$\left(\bar{x} - z\frac{\sigma}{\sqrt{n}}, \bar{x} + z\frac{\sigma}{\sqrt{n}}\right),$$

where z corresponds to the confidence level.

(a) Decreases, since increasing n decreases the $SE = \frac{\sigma}{\sqrt{n}}$ because n is in the denominator. Alternatively, larger n means more accuracy.
(b) Remains the same, since the interval is centered on $\bar{x}$ but its length does not depend on $\bar{x}$.
(c) Doubles, because the length of the interval is proportional to σ.
(d) Halves, since there will be an additional factor or $\sqrt{4} = 2$ in the denominator.
(e) Decreases, because decreasing the confidence level decreases z. A shorter interval is less likely to contain μ.