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Homework #4
Math 080

Chapter 7 : 67,68,69,71
Chapter 8 : 95, 96, 97

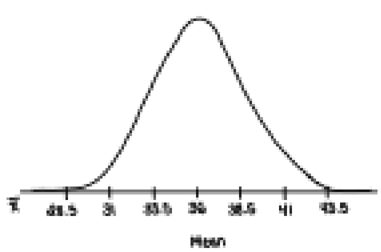
67. a) **True.** The central limit theorem states that when there's a large sample size, the $\bar{x}$ is essentially equal to the sample mean.

b) **True.** The central limit theorem states that when there's a large sample size, the $\bar{x}$ is approximately normally distributed i.e. the closer the sample mean becomes normal.

c) **True.** The central limit theorem states that when there's a large sample size, the standard deviation of $\bar{x}$ is approximately equal to the standard deviation of the sample mean.

68. a) $\bar{x} \sim N\ (36, 10/\sqrt{16})$
$\boldsymbol{\bar{x} \sim N\ (36, 2.5)}$

b) $P(\bar{x}\ \leq 5) = 1 - P(\bar{x}\ \leq 5)$
= 1-0
=**1**



c) $\boldsymbol{Q_1 = 34.3}$

69. a) X is the **yearly income of someone in a third world country**.

b) $\bar{x}$ is the **average salary of 1000 residents from a third world country**.

c) $\boldsymbol{\bar{x} \sim N\ (2000, 8000/\sqrt{1000})}$

d) A large standard deviation **indicates a wide range or difference in data values** where the averages are smaller than the standard deviation.

e) Because, $\boldsymbol{P(2000 < \bar{x} < 2100) = 0.15}$ **and** $\boldsymbol{P(2100 < \bar{x} < 2200) = 0.13}$. There will be increased probabilities of X that are closer to $\bar{x}$.

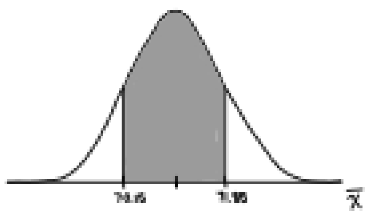
71. **B.**

95. a)
i. $\boldsymbol{\bar{x} = 71}$
ii. $\boldsymbol{\sigma = 3}$
iii. $\boldsymbol{n = 48}$

b) X is the **random variable of the heights collected of males Swedes**.
$\bar{x}$ is the **random variable for the mean height of the sample.** i.e. of the 48 male Swedes.

c) **Normal Distribution** as the standard deviation of the population is stated in the question and the sample size is large thus allowing for a normal distribution.

d)
i. Confidence Level: **(70.2 , 71.9)**
ii.



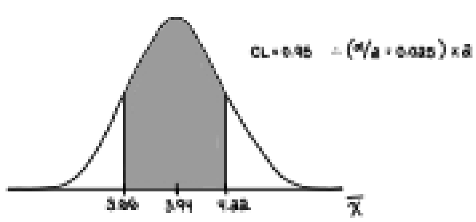
iii. EBM= $(71.9 - 70.2)/2$
Error bound is 0.85

e) **The confidence level will decrease as the sample size increases**. As an increased sample size decreases variability.

96. a) X is the **length of the engineering conferences**.
$\bar{x}$ is the **mean length of the 84 randomly selected engineering conferences.**

b) Assuming the underlying population is normal, a **normal distribution** could be used with $\bar{x} = 3.94$ and $s = 1.28$ thus X distributed $N(3.94{,}1.28)$.

c)
i. **(3.66 , 4.22)**
ii.



iii. **EBM= 0.27**

97. a) i. $\bar{x} = \mathbf{23.6}$
ii. $\sigma = \mathbf{7}$
iii. $n = \mathbf{100}$

b) X is the **time completion of a tax form**. $\bar{x}$ is the **mean time completion of 100 tax forms.**

c) Normal distribution with parameters, $\boldsymbol{N}\ (\mathbf{23.6}, \mathbf{7}/\sqrt{\mathbf{100}})$**.**

d) i. **(22.23 , 24.97)**
ii.

iii. **EBM= 1.37**

e) The change would be in **sample size** as the confidence level is chosen/increased then the same error bound is used to identify the new sample size.

f) The confidence level **increases** because sample size decreases as small sample increases variability.

g) $EBM = Z_{\frac{\alpha}{2}}\ (\sigma/\sqrt{7})$
$1 = 2.054 * 7/\sqrt{n}$
$\boldsymbol{n} = \mathbf{206}$
The firm would need to survey 206 people with an increased confidence level. The sample size of the error bound needs to be increased.