ECON 0150 | Fall 2024 | Homework 5 Solutions

Question 1

Given: $\mu = \$3.26M$, $\sigma = \$1.2M$, n = 100

$\sigma_{\bar{x}} = \sigma/\sqrt{n} = 1.2/\sqrt{100} = 0.12$

$P(\bar{X} < 3.5) = P(Z < \frac{3.5-3.26}{0.12}) = P(Z < 2) = 0.975$

Answer: C) 0.975

Question 2

Given: $\mu = 1$ cm, $\sigma = 0.1$ cm, n = 25

$\sigma_{\bar{x}} = 0.1/\sqrt{25} = 0.02$

For 16% above: $\mu + 1\sigma_{\bar{x}} = 1 + 1(0.02) = 1.02$

Answer: A) 1.02 centimeter

Question 3

Given: p = 0.36, n = 64

$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.36(0.64)}{64}} = 0.06$

$P(0.30 < \hat{p} < 0.48) = P(-1 < Z < 2) = 0.815$

Answer: C) 0.8150

Question 4

Given: n = 144, $\bar{x} = 258$, s = 60

a) $\sigma_{\bar{x}} = 60/\sqrt{144} = 5$
$P(\bar{X} < 273) = P(Z < 3) = 0.9985$

b) $P(34992 < \text{Total} < 37872) = P(243 < \bar{X} < 263) = P(-3 < Z < 1) = 0.8385$

c) \$12.65 corresponds to 253 candy bars
$P(\text{Profit} \geq \$12.65) = P(\bar{X} \geq 253) = P(Z \geq -1) = 0.84$

Question 5

a) Given n = 76 > 30, by CLT sample mean follows normal distribution with:
$\mu = 4.803$ and $\sigma_{\bar{x}} = 1.819/\sqrt{76} = 0.209$

Answer: B) Normal distribution with μ = 4.803 and σ = 0.209

b) $P(\bar{X} > 5) = P(Z > \frac{5-4.803}{0.209}) = P(Z > 0.943) = 0.174$

Answer: B) Between 18% and 20%

Question 6

The confidence interval relates to the true population mean, not individual observations or sample means.

Answer: B) Only statement II is correct

Question 7

Given: $\sigma = \$1500$, n = 200

Width = $2 \times$ critical value $\times \sigma_{\bar{x}}$
$= 2 \times 1 \times \frac{1500}{\sqrt{200}} = \$212$

Answer: C) $212

Question 8

Given: n = 1000, $\hat{p} = 0.45$

$\sigma_{\hat{p}} = \sqrt{\frac{0.45(0.55)}{1000}} = 0.016$

68% CI: $[0.45 - 1(0.016), 0.45 + 1(0.016)] = [0.434, 0.466]$

Answer: D) Between 43.4% and 46.6%

Question 9

Given: n = 256, $\bar{x} = 25.25$, s = 10

a) 95% CI = $[\bar{x} - 2\frac{s}{\sqrt{n}}, \bar{x} + 2\frac{s}{\sqrt{n}}]$
$= [25.25 - 2\frac{10}{\sqrt{256}}, 25.25 + 2\frac{10}{\sqrt{256}}]$
= [24, 26.5]

b) Since Pain Reliever B's mean time (26.75 minutes) lies outside and above the 95% CI [24, 26.5], we can conclude that Pain Reliever A is more effective than B in reducing mean time to relief with 95% confidence.