PHR

MAT150.5 Test 2 Practice Exam

Statistics:

Read each question carefully. Show all your work! For each question, unless otherwise indicated, round each decimal to the nearest thousandth and each percent to the nearest tenth.

1. The number of violent crimes committed in a day possesses a distribution with a mean of 28 crimes per day and a standard deviation of 4 crimes per day. A random sample of 36 days was observed, and the sample mean number of crimes for the sample was calculated. Find the mean and standard deviation (standard error) of sampling distribution

$n \geq 30$ (approximately normal)

$\mu_{\bar{x}} = \mu = \underline{28}$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{4}{\sqrt{36}} = \frac{4}{6} = 0.6666\ldots \quad \underline{0.667}$

2. A history lecture hall class has 15 students. There is a 15% absentee rate per class meeting.

a.) Find the probability that exactly one student will be absent from class.

n = no. trials = 15
p = prob. of success = 0.15 (absence)
q = prob of failure = 1 − 0.15 = 0.85
x = no. successful trials = 1

$P(x=1) = {}_{15}C_1 (0.15)^1 (0.85)^{14}$
$= 15(0.15)(0.1028) = 0.2312$

$\underline{0.231}$

b.) Find the probability that at least 2 students will be absent from class. (2 or more)

Instead of adding $P(2) \rightarrow P(15)$
Do $1 - [P(0) + P(1)]$

$P(x=0) = {}_{15}C_0 (0.15)^0 (0.85)^{15}$
$= 1(1)(0.0874) = \quad 0.0874$

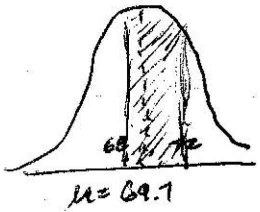
$P(x=1)$ from Part a) $\quad 0.2312$

$\quad 0.3186$

$1 - 0.3186 = 0.6814$

$\underline{0.681}$

3. According to a National Health Survey, American men's heights are normally distributed with a mean given by $\mu = 69.7$ inches and a standard deviation given by $\sigma = 2.8$ inches. If a man is randomly selected, find the probability that his height is between 68 and 72 inches.



$z_{68} = \frac{x-\mu}{\sigma} = \frac{68-69.7}{2.8} = \frac{-1.7}{2.8} = \cancel{-0.607} - 0.61$

$z_{72} = \frac{72-69.7}{2.8} = \frac{2.3}{2.8} = 0.82$

$P(z < .82) = 0.7939$

$P(z < -0.61) = 0.2709$

$0.7939 - 0.2709 = 0.5230$

4. Find the 90% confidence interval for the mean for the price of a movie ticket. The data represents a selected sample of nationwide movie theaters. Assume the variable is normally distributed.

11 10 7 12

$\bar{x} = \frac{\Sigma x}{N} = \frac{40}{4} = 10$

Price	Deviation $x - \bar{x}$	$(x-\bar{x})^2$
7	-3	9
10	0	0
11	1	1
12	2	4
		14

$s^2 = \frac{\Sigma(x-\bar{x})^2}{n-1} = \frac{14}{3} = 4.66... \approx 4.7$

$\sqrt{s^2} = s = \cancel{2.16}\ 2.2$

$n-1$ degrees of freedom $4-1=3$

$E = t_c \frac{s}{\sqrt{n}} =$

$= 2.353 \frac{2.2}{\sqrt{4}} = 2.6$

Confidence Interval $\begin{matrix} 10 + 2.6 = 12.6 \\ 10 - 2.6 = 7.4 \end{matrix}$

5. Suppose the amount of a popular sport drink in bottles leaving the filling machine has a normal distribution with mean 101.5 milliliters (mL) and standard deviation 1.6. If 16 bottles are randomly selected, find the probability that the mean content is

$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

a) Less than 100.9 mL.

$z = \frac{100.9 - 101.5}{1.6/\sqrt{16}} = \frac{-0.6}{1.6/4} = \frac{-0.6}{0.4} = -1.5$ $\quad P(z < -1.5) = 0.0668$

b) More than 102.1 mL.

$z = \frac{102.1 - 101.5}{0.4} = \frac{0.6}{0.4} = 1.5$ $\quad P(z < 1.5) = 0.9332$

$1 - 0.9332 = 0.0668$

c) Between 100.9 mL and 102.1 mL.

$0.9332 - 0.0668 = 0.8664$

6. In a sample of 100 American adults, 44 admitted to having tried marijuana.

a.) Calculate the sample proportion, $\hat{p}$.

$\left(\begin{array}{l} n\hat{p} \geq 5 \\ n\hat{q} \geq 5 \end{array} \right)$

$\frac{44}{100} = \underline{0.44}$ or $\underline{44\%}$

b.) Calculate the sample error for a 95% confidence interval.

$\hat{q} = 1 - .44 = .56$

$E = Z_c \sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.96 \sqrt{\frac{(0.44)(0.56)}{100}}$

$E = 1.96 \sqrt{0.002464} = 1.96(0.0496) \approx \underline{0.097}$

c.) Construct a 95% interval of these data and determine if this was a representative sample based on the actual population proportion above.

$\hat{p} - E \approx 0.44 - 0.097 = 0.343$ Left Endpoint

$\hat{p} + E \approx 0.44 + 0.097 = 0.537$ Rt. Endpoint.

Can say with 95% confidence
that population proportion
of adults who tried marijuana
is between 34.3% & 53.7%