Statistics 1/Section 6 Exam 3

Name Soliitions	
November 26, 2008	

Calculators and one 8.5" by 11" sheet of handwritten notes allowed. Show all work and answers clearly in the space provided. Partial credit can only be determined based on the work shown on this exam paper. Tables are included at the end of the exam.

- 45% of Americans have Type O blood. 400 Americans are randomly selected and their blood type is determined.
 - a. What is the distribution of the sample proportion having Type O blood? (Include information about the shape, center and spread.) $\rho = 400(-45) = 180 > 5 2 50 \hat{\rho}$

$$\delta_{p} = 0.0249$$

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$$\delta_{p} = \sqrt{\frac{P9}{n}} = \sqrt{\frac{0.45(0.55)}{400}} = 0.0249$$

Mp = p=0.45 j jb. How does the distribution of the sample proportion changes as the sample size increases? The distribution will have less dispersion or spread. It will be narrower and more peaked. j c. What is the probability the sample proportion is over 0.50?

$$P(\hat{p} > 0.50) = P(\frac{\hat{p} - \mu_{\hat{p}}}{\sigma_{\hat{p}}} > \frac{0.50 - \mu_{\hat{p}}}{\sigma_{\hat{p}}})$$

= $P(Z > \frac{0.50 - 0.45}{0.0249})$ from part (a)

$$= P(Z > 2.01)$$

= $1 - P(Z \le 2.01) = 1 - 0.9778$
= 0.0222

2. Suppose the heights of Martians are normally distributed with mean 36 inches and standard deviation 5 inches.

M=36 0=5

a. What percent of Martians are over 50 inches tall?

$$P(X > 50) = P(Z > \frac{50 - 36}{5})$$

= P(Z > 2,80)
= I - P(Z ≤ 2,80)
= I - 0.9974 = 0.0026 or 0.26°/2

 χ b. Find the 80th percentile of the heights of Martians.

$$P(x \le x_{0}) = 0.80$$
(1) Find 80th perc. of z-distn.

$$\frac{2}{0.80}$$
(2) Convert to scale of X

$$\frac{x_{0} - M}{\sigma} = 0.84 \Rightarrow \frac{x_{0} - 36}{5} = 0.84$$

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c. In order to be a spacecraft pilot, a Martian must be among the 4% *tallest* Martians. What is the minimum height for a Martian pilot?



(1) Find Z-Value:
$$Z_{0}=1.75$$
 (look up 0.96 in
 $BODY = 0.96$
 $M=0^{1.75}$ (2) convert to X
 $\frac{\chi_{0}-M}{\sigma} = 1.75$
 $\frac{\chi_{0}-M}{5} = 1.75$
 $\frac{\chi_{0}-36}{5} = 1.75$
 $\chi_{0} = 36 + 5(1.75) = [44.75 \text{ in}]$

- 3. Identify each of the following as an observational study or designed experiment.
 - a. A study where subjects are randomly assigned to control and treatment groups.

Designed Experiment

b. A study is conducted to determine if a herbal remedy prevents dementia. 25 elderly people are randomly assigned to take the herbal remedy for 10 years while the other 25 elderly people are given a placebo. After the 10 years is over, the subjects are diagnosed as either having dementia or not.

c. A researcher collects data for 65 randomly selected full-time workers. The researcher collects data on job stress and blood pressure for each worker to determine if higher job stress is related to blood pressure.

d. Which of the studies in parts (a) through (c) would it be possible to establish cause and effect under?

4. Packages of food whose average weight is 16 ounces with a standard deviation of 0.6 ounces are shipped in boxes of 36 packages. M = 16 by $\sigma = 0.6$ by $\tau =$

 $T = \text{total weight } \overline{D} \text{ box}$ $P(T > 580) = P(\frac{T}{36} > \frac{580}{36})$ $= P(\overline{X} > 16.11)$ $= P(\frac{\overline{X} - M\overline{X}}{\overline{D_{\overline{X}}}} > \frac{16.11 - M\overline{X}}{\overline{D_{\overline{X}}}})$ $M_{\overline{X}} = M = 16$ $\sigma_{\overline{X}} = M = 16$

2 b. Do we need to assume the population is normally distributed to do part (a)?

no, the sample sing is large so
we can assume
$$\overline{X}$$
 is normally
distributed even if the population
is not.

- 5. A study is conducted to estimate the mean amount of time college freshman spend on homework. Suppose a random sample of 200 college freshman gives a mean amount of time spent on homework of 17.5 hours with standard deviation 5.1 hours. $\overline{x} = 17.5$ S = 5.1
 - \cdot_2 a. Give a point estimate for the population mean amount of time spent on homework by college freshman $\overline{X} = 17.5 \text{ Jurg}$.
 - 1 b. Calculate a 95% margin of error for your point estimate in part (a)

$$M_{0E} = 1.96 \cdot \frac{5}{m} \approx 1.96 \cdot \frac{5}{m} = 1.96 \left(\frac{5.1}{\sqrt{200}}\right) = 0.7068 \text{ trs.}$$

→ c. Calculate a 90% confidence interval estimate for the population mean amount of time spent on homework.

$$\overline{X} \pm \overline{Z}_{3/2} \cdot \frac{0}{10} \qquad \overline{Z}_{3/2} = \overline{Z}_{0.10} = \overline{Z}_{0.05} = 1.645$$

$$= 1.645 \left(\frac{5.1}{\sqrt{200}}\right) \qquad = 1.645$$

$$= 1.645$$

$$= 1.645$$

$$= 1.645$$

$$= 1.645$$

$$= 1.645$$

$$= 1.645$$