85 points.

Elements of Statistics (Math 106) - Quiz 2   Name *Brad Hartlaub.*
Fall 2009 - Brad Hartlaub

Directions: Please answer all of the questions below.   The point values for each problem are indicated in parentheses.   Partial credit will be awarded if you show your work.

1. The revenues from fines or traffic citations in a certain community are normally distributed with a yearly mean of $45,000 and a standard deviation of $3500.   These revenues go toward maintaining the fleet of patrol cars, which amounts to an annual expense of $38,000.

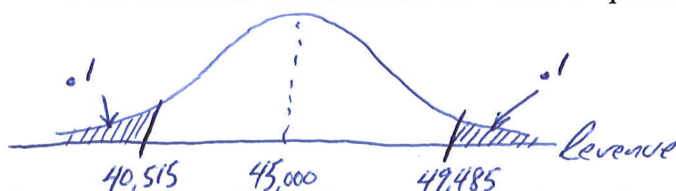   a. What is the chance that the revenue from this year will cover the fleet's maintenance expense?   (5)

.977

Graph > Prob Dist Plot > View Prob
Mean: 45,000
Std dev: 3500
Right tail: 38,000.   X

   b. Determine the revenues that mark the 10th and 90th percentiles.   (10)

40,515   45,000   49,485   Revenue

Graph > Prob Dist Plot > View Prob
Mean: 45,000, Std dev 3500
• Probability
Both tails (.2)

2. The nicotine content in a single cigarette of a particular brand has a distribution with mean 0.8 mg and a standard deviation of 0.1 mg.   If a pack, 20 cigarettes, is analyzed, what is the probability that the resulting sample mean nicotine content will be less than 0.79 mg?   (15)
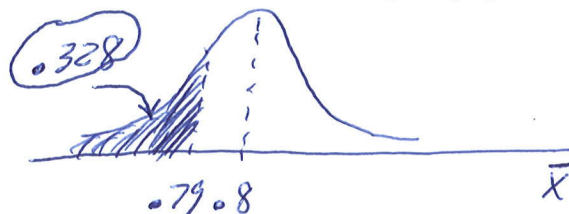
$$\mu_{\bar{x}} = \mu = .8 \text{ mg}$$

$$\sigma_{\bar{x}} = \sigma/\sqrt{n} = .1/\sqrt{20} = .0224 \text{ mg}$$

Graph > Prob Dist Plot > View Prob
Mean = .8 Std dev = .0224
• X-value: .79

.328

.79 .8 $\bar{x}$

3. College students with a checking account typically write relatively few checks in any given month, whereas nonstudent residents typically write many more checks during a month. Suppose that 50% of a bank's accounts are held by students and that 50% are held by nonstudent residents.   Let X denote the number of checks written in a given month by a randomly selected bank customer.   Give a sketch of what the probability distribution of X might look like.   (10)

f(x)

peak for students
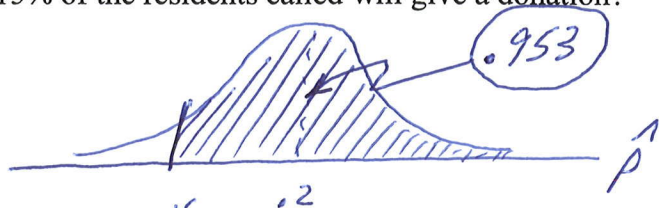peak for residents.
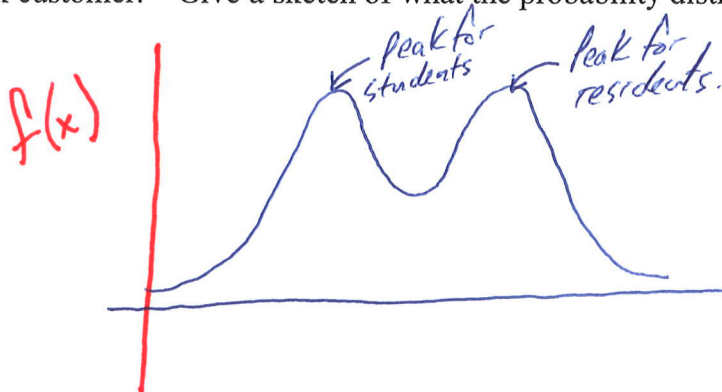
X = # of checks written

4. A booster club is interesting in raising money to support a hockey team. Suppose that 20 percent of the residents in a community are willing to give a donation to support the team. The eighteen players on the team each decided to call ten different residents in this community. $P = .2$, $n = 18 \times 10 = 180$ residents are called.

a. What is the probability that more than 15% of the residents called will give a donation? (10)
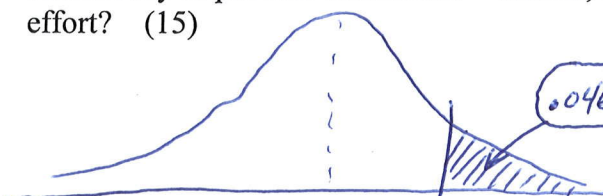
$\mu_{\hat{p}} = .2$

$\sigma_{\hat{p}} = \sqrt{\dfrac{.2(.8)}{180}} = .0298$

Graph > Prob Dist Plot > View Prob
Mean: .2, Std dev: .0298
X value: .15

.953

b. At a team meeting after the players completed all of the calls, the players learned that 25% of the contacted residents provided a donation. Is it unusual to get 25% or more of this community to provide donations? That is, should the team view this as a successful effort? (15)

.0467

Graph > Prob Dist Plot > View Prob
Mean: .2 Std dev: .0298
X value: .25

Yes it is unusual for more than 25% of the community to provide donations. Since there is only a 4.7% chance of getting more than 25% of the community to provide donations, the team should be extremely happy.

c. Suppose the average donation in this community is $10 with a standard deviation of $5. If forty-five residents donate money, what is the expected total donation? What is the standard deviation of the total donation? How likely is it that the team will make more than $500? (20)

Expected donation total $= E\left[\sum_{i=1}^{45} X_i\right]$ where $X_i =$ the size of the donation for resident i.

$= 45 \mu = 45(\$10) = \$450$

Variance of total donation $= 45\sigma^2 = 45(5)^2 = \$1,125$

Std deviation of the total $= \sqrt{1125} = \$33.54$

.0680
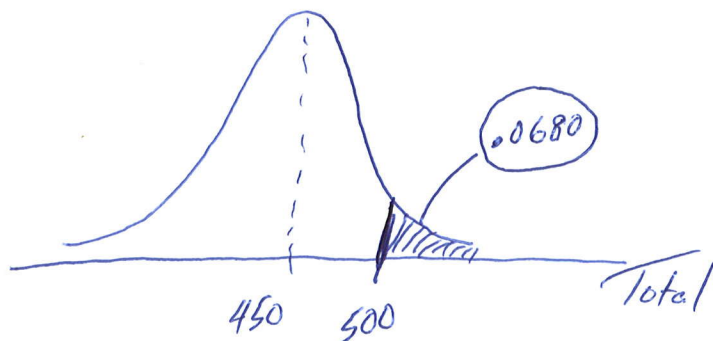
There is a 6.8% chance that the team will make more than $500.

450   500   Total