Name/Date: Key **AP Statistics Unit 5** **HW #5.18A**

1. Draw some Normal models for sample proportions based on the 68-95-99.7 Rule. Always check the conditions first!

EX 3: We don't know it, but 52% of voters plan to vote "Yes" on the upcoming school budget. We poll a random sample of 300 voters. What might the percentage of yes-voters appear to be in our poll?

Conditions:

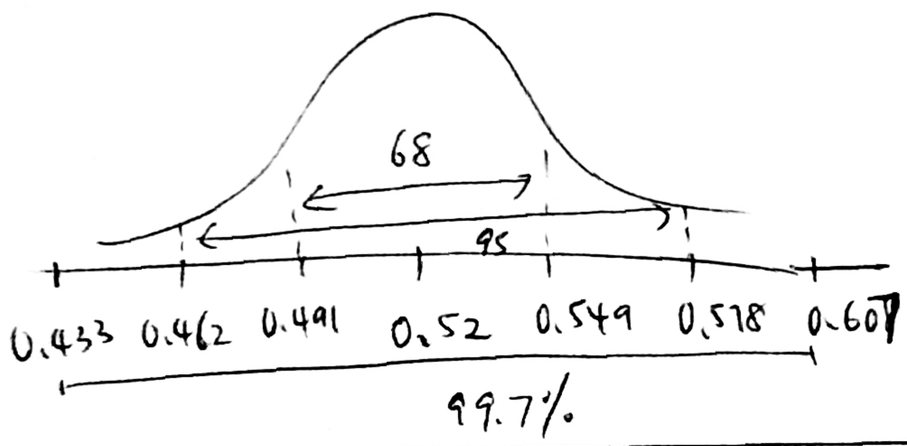
1) Random sampling

2) 10% condition: 3000 voters can be considered a representative sample of all voters, 300 is less than 10% of all voters

3) Success/failure condition: $np = 300(0.52) = 156$, $n(1-p) = 300(0.48) = 144 \geq 10$

$$\mu_{\hat{p}} = 0.52 \; ; \; \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.52(0.48)}{300}} \approx 0.029$$

$N(0.52, 0.029)$



* According to the Normal model, we expect 68% of the samples of 300 voters have proportions of "yes" - voters btw 0.491 and 0.549, 95% of the samples to have proportions btw 0.462 and 0.578, and 99.7% btw 0.433 and 0.607.

2. 1. It is generally believed that electrical problems affect about 14% of new cars. An automobile mechanic conducts diagnostic tests on 128 new cars on the lot.

a. Describe the sampling distribution for the sample proportion by naming the model and telling its mean and standard

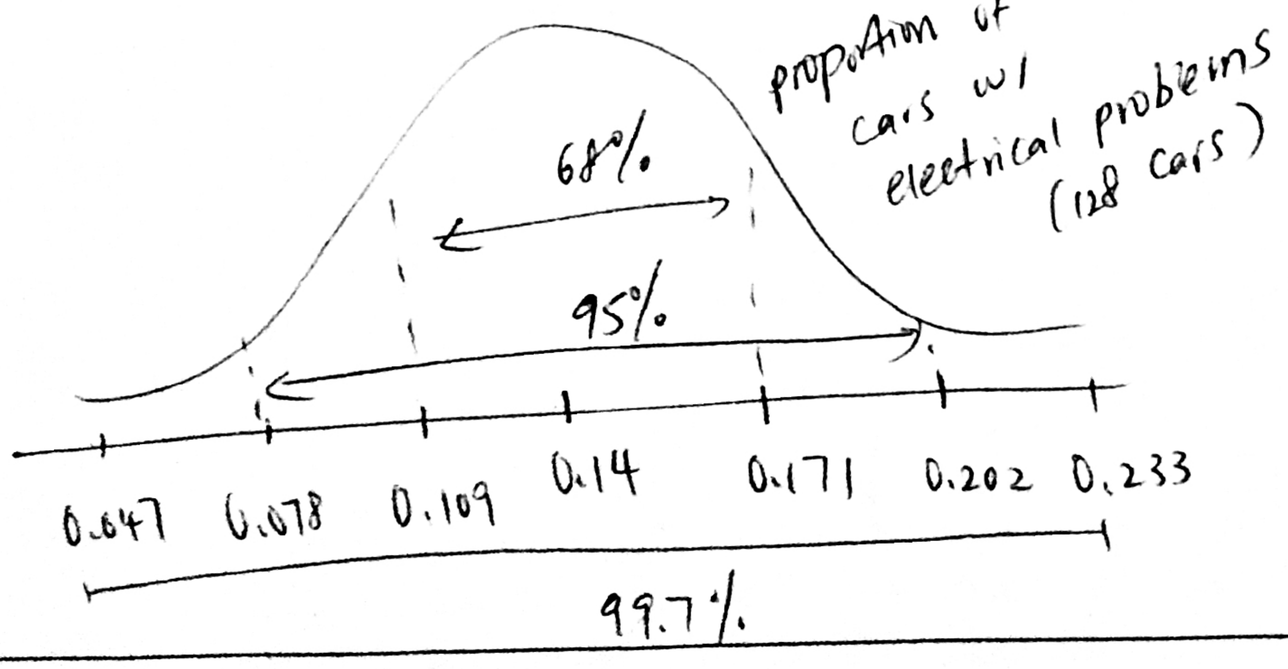
10% condition
Success/failure condition
Random sample
make sure to check conditions!

$N(0.14, 0.031)$

$$\mu_{\hat{p}} = 0.14$$

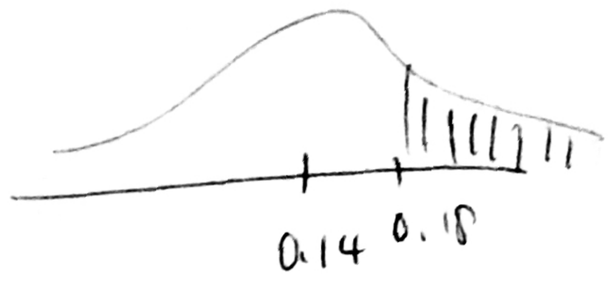
$$\sigma_{\hat{p}} = \sqrt{\frac{0.14(0.86)}{128}} = 0.031$$

b. Sketch and clearly label the model.



c. What is the probability that in this group over 18% of the new cars will be found to have electrical problems?

$$z = \frac{\hat{p} - p}{SD(\hat{p})} = \frac{0.18 - 0.14}{0.031} = 1.3$$



$P(z > 1.30) = 0.096$

about 10%.

3. According to Gallup, about 33% of Americans polled said they frequently experience stress in their daily lives. Suppose you are in a class of 45 students.

a) What is the probability that no more than 12 students in the class will say that they frequently experience stress in their daily lives. (Make sure to identify the sampling distribution you use and check all necessary conditions.)

1) 10% condition: 45 students < 10% of population

2) success/failure condition: $np = 45(0.33)$ ≥ 10

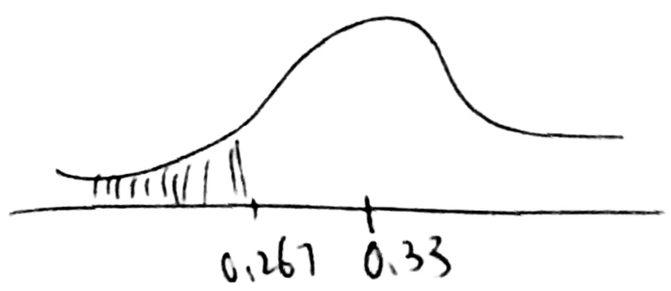
$nq = 45(0.67) = 30.15$

$\mu_{\hat{p}} = 0.33$

$\sigma_{\hat{p}} = \sqrt{\frac{0.33(0.67)}{45}} = 0.07$

$N(0.33, 0.07)$

$\frac{12}{45} = 26.7\%$



$z = \frac{0.267 - 0.33}{0.070} = -0.9$

$P(z < -0.9) = 0.1841$

b) If 20 students in the class said they frequently experience stress in their daily lives, would you be surprised? Explain and use statistics to support your answer.

$N(0.33, 0.070)$

$\frac{20}{45} = 44.4\%$ This is about 1.63 S.D. above what we would expect, which is not a surprising result.