Section 9.3 practice

1. We want to find out what percent of students copy homework on a regular basis. On a regular basis is defined as more than 2 times per week. We take an SRS of 300 students and find that 115 of them answered yes!
   a. Check the 3 conditions.

Random - Stated SRS
Normal - $np \geq 10$ $n(1-p) \geq 10$ $(300)(.383) = 114.9$ $(300)(.617) = 185.1$
Independent - $10(300)$ There are more than 3000 students.

   b. Estimate the true proportion that cheat regularly with 95% confidence. Interpret your interval.

$\hat{p} = 115/300 = 0.383$ $n = 300$ 95% confidence

$$0.383 \pm (1.96)\sqrt{\frac{(0.383)(0.617)}{300}} = (0.328, 0.438)$$

We are 95% confident that the true percent of students who copy homework regularly is between 32.8% and 43.8%.

2. We take a survey of 150 local 16-21 year old drivers and find that 90 of them have gotten at least one speeding ticket.
   a. Check the 3 conditions.

Random: Assume representative of population
Normal: $(150)(.60) = 90$ $(150)(.40) = 60$
Independent: population $> 10(n)$ There are more than 1500 teen drivers

   b. Find a 99% confidence interval for the true proportion of young drivers that have gotten at least one speeding ticket. Interpret your interval.

$\hat{p} = 90/150 = 60\%$ $n = 150$ Confidence = 99%

$$0.60 \pm (2.576)\sqrt{\frac{(0.60)(0.40)}{150}} = (0.49696, 0.70304)$$

We are 99% confident that the true % of 16-21 year old drivers who have gotten at least one speeding ticket is between 49.696% and 70.304%.

3. Regardless of age, about 20% of American adults participate in fitness activities at least twice a week. However, as many people age, their fitness activities decrease. In a SRS of 100 adults over 40 years of age, 15 people indicated that they participated in a fitness activity at least twice a week. Do these data indicate that the participation rate for adults over 40 years of age is significantly **less** than the 20% figure?

   a. Check the 3 conditions.

Random - Stated SRS
Normal - $(100)(.20) = 20$ & $(100)(.80) = 80$ Both are >10
Independent - $(100)(10)$ - There are more than 1000 American Adults over 40.

   b. Perform a hypothesis test, and use a 0.05 significance level.

$p = .20$ $\hat{p} = \frac{15}{100} = 0.15$ $n = 100$ $\alpha = .05$

$H_0: p = 0.20$
$H_A: p < 0.20$

where p= percent of American adults that participate in fitness activities at least twice a week.

$$z = \frac{0.15 - 0.20}{\sqrt{\frac{(0.20)(0.80)}{100}}} = -1.25$$

$P(z < -1.25) = 0.1056$ using Table A.

We do not reject H_0 because p-value of $.1056 > \alpha = 0.05$
We do not have sufficient evidence that the true % of adults over 40 years old who exercise regularly is less than 20%.

4. A researcher is testing a new medication out on rats. The old medication claimed that only 6% of people saw serious side effects. 21 out of 200 rats that were given the medication suffered serious side effects.

   a. Check the 3 conditions

Random - assume representative
Normal - $(200)(.06)$ & $(200)(.94) > 10$
Independent - There are more than 2000 rats $(200)(20)$

   b. Is there sufficient evidence at the 0.08 level of significance that the true proportion is not equal to 6%?

$H_0: p = 0.06$
$H_a: p \neq 0.06$

$$z = \frac{0.105 - 0.06}{\sqrt{\frac{(0.06)(0.94)}{200}}} = 2.6797 \quad (\text{or } 2.68)$$

$2 * P(z > 2.6797) = 0.0074$

We reject H_0 b/c p-value of $0.0074 < \alpha = 0.08$.
We have sufficient evidence that the true % of rats suffering serious side effects from the medication is not 6%