**MA 207 - Binomial Distribution Group Members: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

In Canada, Internet service providers (ISPs) are required to send a notice to subscribers who are downloading files illegally, asking them to stop. A certain ISP found that 53% of subscribers who were notified did not reoffend. Consider a simple random sample of 183 of these subscribers who received a first notice. Let *X* be the number of reoffenders.

1. Is *X* binomial? If not, what type of distribution is it?

No! It is Hypergeometric.

1. Can *X* be usefully approximated by a binomial? Why?

Yes! Presumably the sample is less than 10% of the population size.

1. Give the parameters, *n* and *p,* for the Binomial distribution that gives the probabilities associated with the *count,* *X,* of reoffenders.

n = 183, p = .47

1. Can you use the Normal distribution to approximate the binomial distribution in this case? Why or why not?

Yes!

E(reoffenders) = .47\*183 = 86 > 15 E(Not reoffenders) = .53\*183 = 97 > 15

1. Find the mean and standard deviation for the count *X* of reoffenders.

E(X) = μ = .47\*183 = 86. SD = **σ =** [183\*(.47)(.53) ]½ = 6.75

1. Use the normal distribution to approximate the probability that at most 82 subscribers in the sample reoffended.

P(X ≤ 82) = P(N < 82.5) = P(Z < -.52) = .3015 Don’t forget the continuity correction!

1. Use the normal distribution to approximate the probability that at least 90 subscribers in the sample reoffended.

P(X ≤ 90) = P(N < 90.5) = P(Z < .67) = .7486

1. Use the normal distribution to approximate the probability that between 82 and 90 reoffended.

Oops! Can’t just use answers to 6 and 7! My bad on poor writing!

P(82 ≤ X ≤ 90) = P( 81.5 < N < 90.5) = P( -.67 < Z < .67) = .7486 - .2514 = .4972 <- Almost half in this range

1. Find the probability that exactly 86 users reoffended (you do not need to simplify).

P(X = 86) = [ (183!)/(86! 97!) ] (.47)86(.53)97 = .059 <= from my calculator

1. Use the normal distribution to approximate your answer to part 9.

P(X = 86) = P( 85.5 < N < 86.5) = P(-.07 < Z < .07) = .5279 - .4721 = .0558

The bounds on z-scores were ±.074. The error is in the SNT precision level, we needed thousandths digit