Name: Caleb McWhorter — Solutions **Fall 2014**
MAT 221: Section 1 **Quiz 7**

Note: *You must show the details of the work to receive credit. Simply providing the final answer [from a calculator] will get* ***ZERO*** *points.*

Formulae: Sample count X out of a simple random sample (SRS) of size n, where the population proportion is p, has a Binomial distribution with parameters n and p.

i.) If $np \geq 10$ and $n(1-p) \geq 10$, then X is approximately normal, $N\left(\mu = np, \sigma = \sqrt{np(1-p)}\right)$.

ii.) If $np \geq 10$ and $n(1-p) \geq 10$ then $\hat{p} = \frac{x}{n}$ is approximately normal, $N\left(\mu = p, \sigma = \sqrt{\dfrac{p(1-p)}{n}}\right)$.

1. According to the Gallup-Healthways Well-Being Index[1], "9% of Americans are 'stressed' ."

(a) (2 points) If a simple random sample of 4 Americans is taken, what is the probability that 2 or more of them in the sample are "stressed"?

$$P(2) + P(3) + P(4) = 0.0402 + 0.0027 + 0.0001 = 0.043$$

(b) (4 points) If a simple random sample of 200 Americans is taken, what is the probability that at least 23 of them in the sample are "stressed" ? [Use the Normal Approximation.]

Using the Normal approximation ($np = 18$ *and* $n(1-p) = 182$*), the distribution is approximately* $N\left(\mu = np, \sigma = \sqrt{np(1-p)}\right) = N(18.0, 4.047)$. *Then*

$$z_{23} = \frac{23 - 18}{4.047} = \frac{5}{4.047} = 1.235 \rightsquigarrow 0.8916$$

Therefore, $P(\geq 23) = 1 - 0.8916 = 0.1084$.

(c) (4 points) If a simple random sample of 240 Americans is taken, what is the probability that at most 13% the sample are "stressed"? [Use the Normal Approximation.]

Using the Normal approximation ($np = 21.6$ *and* $n(1-p) = 218.4$*), the distribution is approximately* $N\left(\mu = p, \sigma = \sqrt{\frac{p(1-p)}{n}}\right) = N(0.09, 0.0185)$. *Then*

$$z_{13} = \frac{0.13 - 0.09}{0.0185} = \frac{0.04}{0.0185} = 2.16 \rightsquigarrow 0.9847$$

[1] http://www.gallup.com/poll/106915/Gallup-Daily-US-Mood.aspx