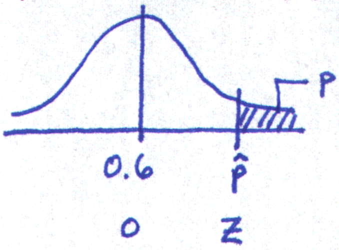
11. What is the probability that there are 607 or more users in a sample of 1000 that are 18-29, if the true proportion is 60% for the population?

$\hat{p} = \frac{607}{1000}$



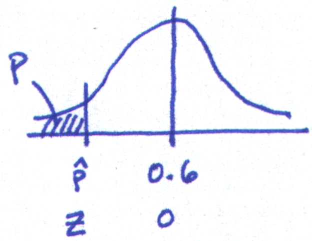
$z = 0.4518$

$P\left(\hat{p} \geq \frac{607}{1000}\right) = P(z \geq 0.4518) = \boxed{0.3257}$

12. A similar sample was taken in Georgia. In the SRS of 1000, there were 583 users in the 18-29 age range. Is this strong evidence that the population proportion in Georgia is less than 60%.

$\hat{p} = \frac{583}{1000}$

$583 < \frac{1}{10}N$ and there are still expected to be at least 10 successes + failures so $\approx$ Normal



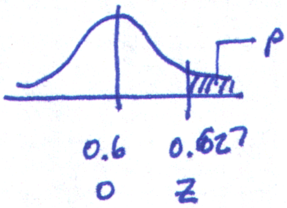
$z = \frac{0.583 - 0.6}{0.0155} = -1.0973$

$P\left(\hat{p} \leq \frac{583}{1000}\right) = P(z < -1.097) = \boxed{0.1363}$

Not strong evidence since $0.14 > 10\%$.

13. Another SRS was taken in North Carolina and this time there were 627 in the sample who were 18-29. Does this provide strong evidence that the proportion in NC is greater than 60%?

$627 < \frac{1}{10}N$ so indep.



$z = \frac{0.627 - 0.6}{0.0155} = 1.7428$

$p = 0.0407 < 10\%$

Since the prob of this occurring if $p = 0.6$ is less than 5% and 10% then it is very unlikely and is strong evidence that $p < 60\%$

14. Does the shape of the sampling distribution change if we use a SRS of 1000 from the whole US if the population proportion still is at 60%?

No, we still are assured independence and the sample size stays the same so the shape is unaffected.

15. Does the shape of the sampling distribution change if we use a SRS of 4000 from the whole US if the population proportion still is at 60%?

We can still assume independence but the curve becomes $\frac{1}{2}$ as wide since the sample was 4 times larger

$\sigma_{\hat{p}} = \sqrt{\frac{(0.6)(0.4)}{4000}} = 0.0077$