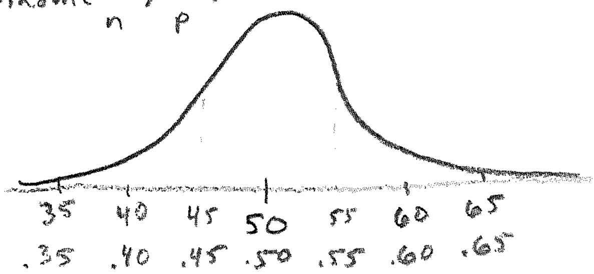
GOB: 1) Calculate Sum(RandInt(0,1,100)) and add your answer to the chart on the white board.

2) Sketch the binomial distribution for the number of tails you expect when flipping a fair coin 100 times. Then calculate the mean and standard deviation.

Binom(100, 0.5)
n p



$\mu = np$ / n

$\sigma = \sqrt{npq}$ / n $= \sqrt{\frac{npq}{n^2}}$

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

$\sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$

3 a) You play roulette 100 times, betting $10 on red each time. What is the probability you come out ahead (win more than half of the time)? Show that this Binomial probability model can be approximated by a Normal model. Then use the applicable Normal model to solve the problem.

Success / Failure

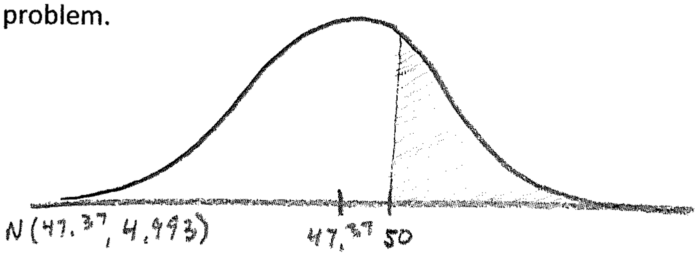
$np \geq 10$ $nq \geq 10$

$100\left(\frac{18}{38}\right) \geq 10$ $100\left(\frac{20}{38}\right) \geq 10$ (SO)

$47.37 \geq 10$ ✓ $52.63 \geq 10$ ✓

$\mu = np$
$= 100\left(\frac{18}{38}\right)$
$= 47.37$

$\sigma = \sqrt{npq}$
$= \sqrt{100\left(\frac{18}{38}\right)\left(\frac{20}{38}\right)}$
$= 4.993$



N(47.37, 4.993)

N(0, 1) 0 0.5267

$z = \frac{50 - 47.37}{4.993} = 0.5267$

normalcdf(0.5267, 99)

$p(x > 50) \approx$ **0.3**

3 b) You play roulette 900 times, betting $10 on red each time. What is the probability you come out ahead? Show that this Binomial probability model can be approximated by a Normal model. Then use the applicable Normal model to solve the problem.

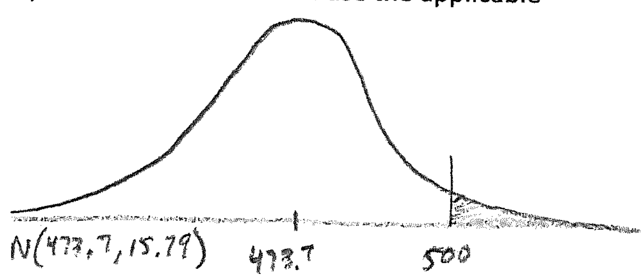
Success / Failure

$1000\left(\frac{18}{38}\right) \geq 10$ $1000\left(\frac{20}{38}\right) \geq 10$ (SO)

$473.7 \geq 10$ ✓ $526.3 \geq 10$ ✓

$\mu = np$
$= 1000\left(\frac{18}{38}\right)$
$= 473.7$

$\sigma = \sqrt{npq}$
$= \sqrt{1000\left(\frac{18}{38}\right)\left(\frac{20}{38}\right)}$
$= 15.7895$



N(473.7, 15.79)

N(0, 1) 0 → 1.6657

$z = \frac{500 - 473.7}{15.7895} = 1.6657$

normalcdf(1.6657, 99)

$P(x > 500) \approx$ **0.048**

3 c) Explain what happened to your probability of winning as the number of bets increased. Why?

/* after changing to proportions shows as n↗ $\sqrt{\frac{pq}{n}}$ ↘ & .5 becomes more SDs away from μ. */
100: .04993 1000: .01579