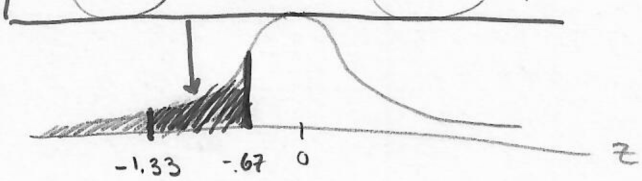
$P(1.00 < x < 1.10)$

$z = \frac{x - \mu}{\sigma}$

$P\left(\frac{1.00 - 1.2}{.15} < z < \frac{1.10 - 1.2}{.15}\right)$ ROUNDING

$\boxed{P(-1.33 < z < -.67)}$



LEFT OF -.67, NOT LEFT OF -1.33

$P(z < -.67) - P(z < -1.33)$

$.2514 - .0918$

$= .1596 \approx .1613$

CLOSE!

CALCULATOR: $\boxed{\text{DISTR}} \rightarrow \boxed{\text{NORMALCDF}}$

NORMALCDF(LOWER BOUND (LEFT), UPPER BOUND (RIGHT), μ, σ)

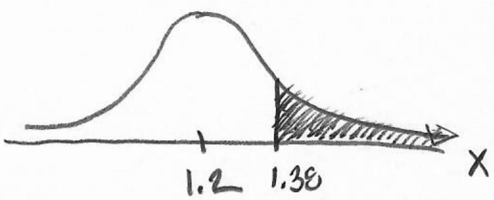
1

$P(x > 1.38)$

$z = \dfrac{x-\mu}{\sigma}$

NORMALCDF(LEFT, RIGHT, μ, σ)

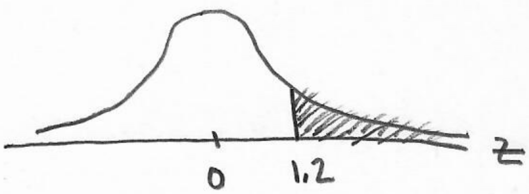
$P\left(z > \dfrac{1.38 - 1.2}{.15}\right)$



$= P(z > 1.2) = 1 - P(z < 1.2)$

1) SWITCH INEQ.

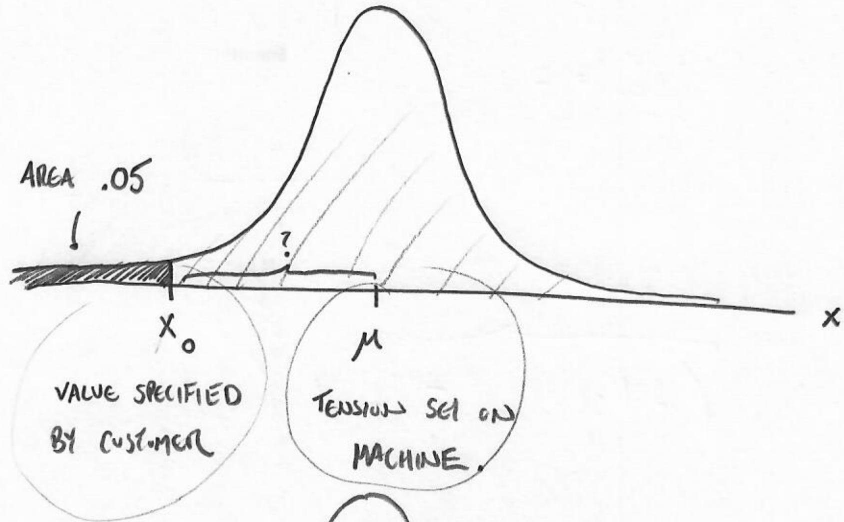
2) 1 - PROB.

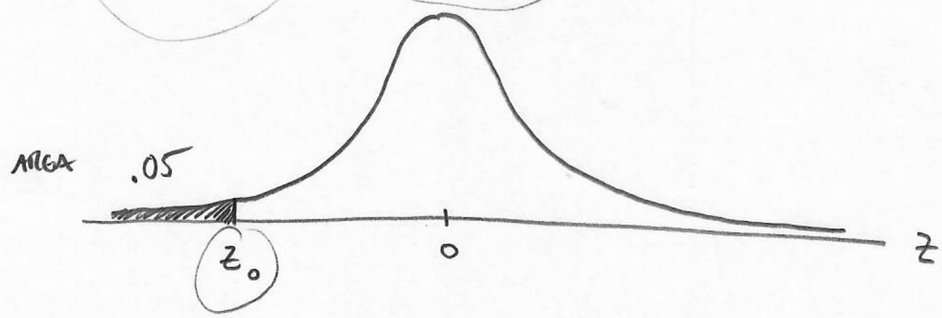


$= 1 - .8849 = .1151$

X NORMAL RANDOM VARIABLE

= STRING TENSION ACHIEVED.





LOOK UP PROB. 0.05 IN BODY OF TABLE 2
TO FIND $Z_0 = -1.645$

i.e. Z_0 IS 1.645 STAND. DEV. BELOW MEAN

$\Rightarrow X_0$ IS 1.645 STAND DEV. BELOW MEAN

$$X_0 = \mu - 1.645\,\sigma$$

$$X_0 = \mu - 1.645(2)$$
$$+ 1.645(2)$$

$$X_0 + 1.645(2) = \mu$$

$$X_0 + 3.29 = \mu$$

3.29 PSI ABOVE VALUE.

§6.4 THE NORMAL APPROXIMATION TO THE BINOMIAL PROBABILITY DISTRIBUTION.

LET X BE A BINOMIAL RANDOM VARIABLE.

n TRIALS (INDEPENDENT, IDENTICAL)

PROB. OF SUCCESS p, PROB OF FAILURE $q = 1-p$.

X = # SUCCESSES IN n TRIALS.

RECALL: X HAS MEAN / EXPECTED VALUE $\boxed{\mu = np}$

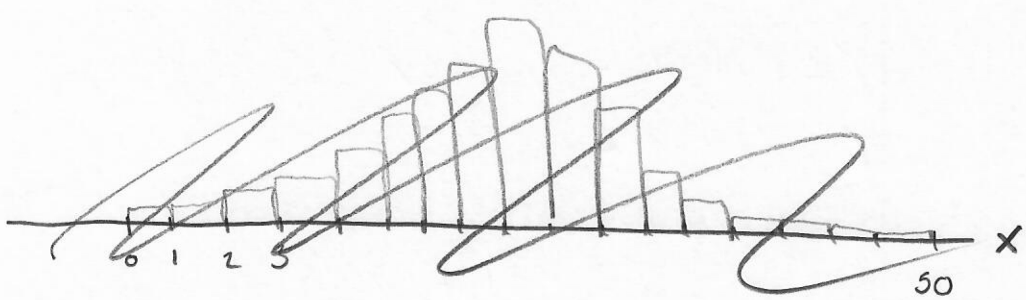
AND STANDARD DEV $\boxed{\sigma = \sqrt{npq}}$

(FOR ANY DISCRETE R.V. $\mu = \sum x\,p(x)$

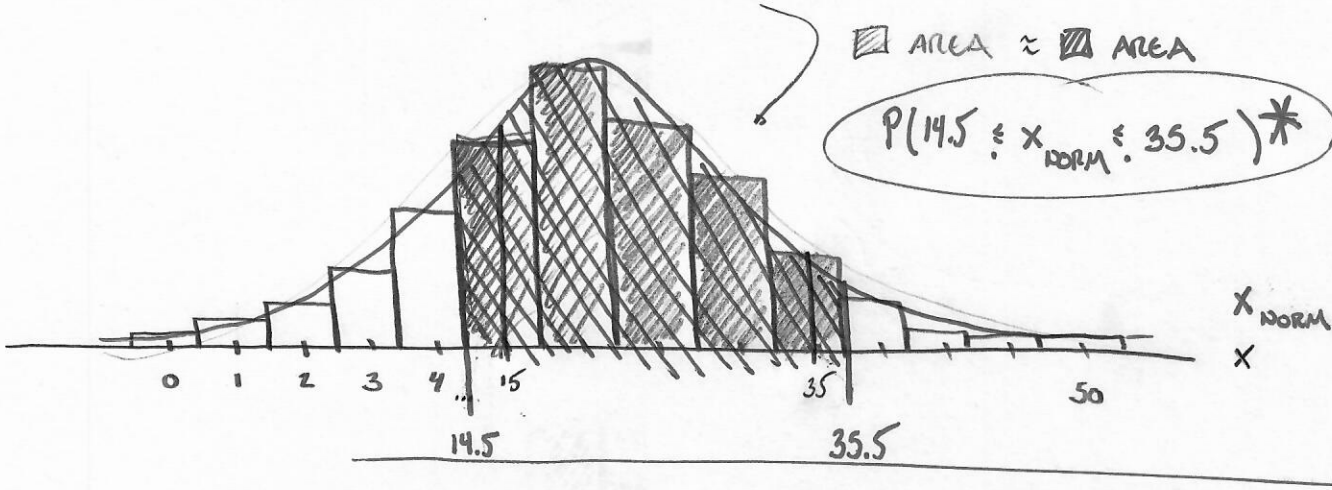
DON'T NEED TO MEMORIZE $\longrightarrow$ $\sigma = \sqrt{\sum (x-\mu)^2 p(x)}$)

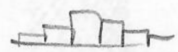
ex. SUPPOSE X IS BINOMIAL R.V. WITH $n = 50$, $p = .4$.

FIND $P(15 \leq X \leq 35)$



$P(15 \le X \le 35)$





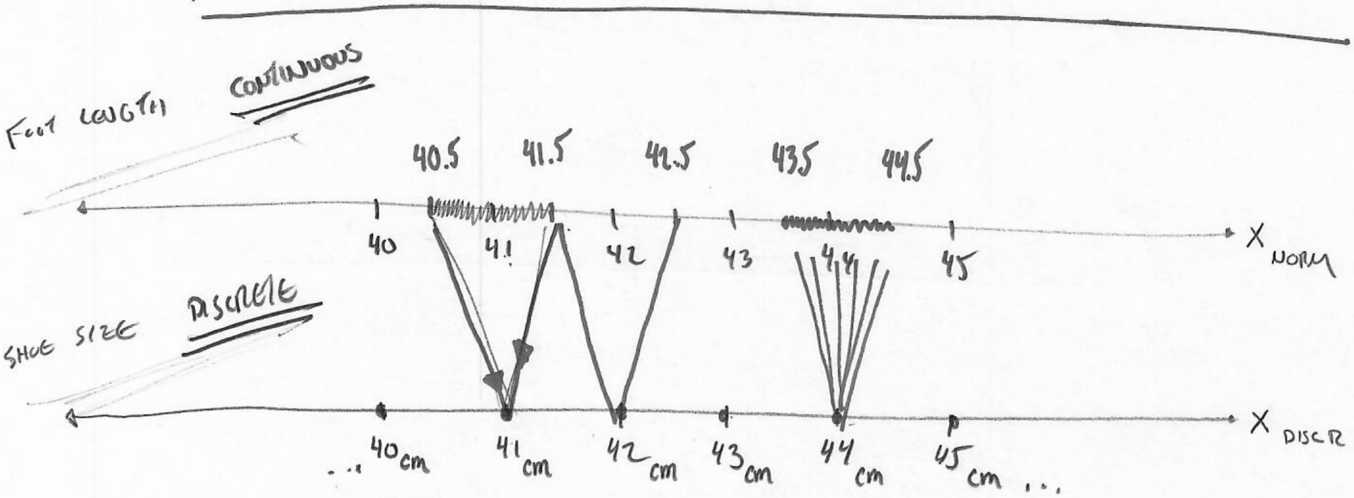
FACT: THE PROBABILITY DISTR. FOR X (BINOMIAL, DISCRETE) IS APPROXIMATELY NORMAL 

WITH

$$\mu = np \qquad \sigma = \sqrt{npq}$$

AS LONG AS n IS LARGE & NEITHER p NOR q IS TOO SMALL.

* RULE OF THUMB: $np \ge 5$, $nq \ge 5$ *



$* \; P(14.5 \le X_{NORM} \le 35.5)$

$\mu = np = (50)(.4) = 20$

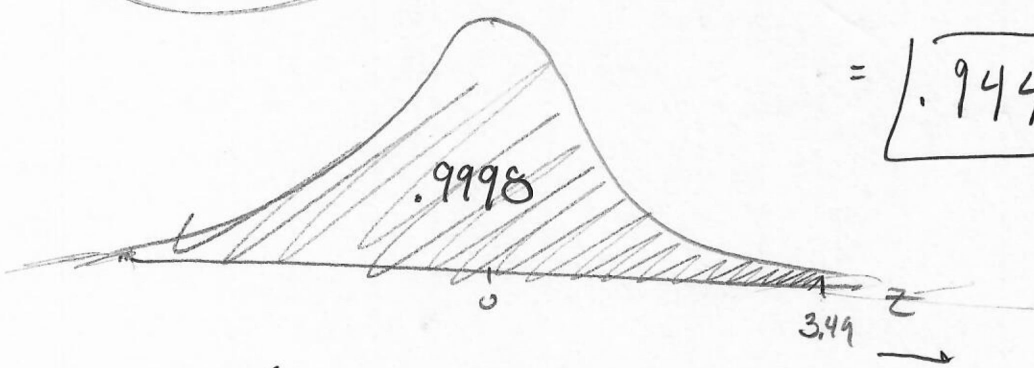
$\sigma = \sqrt{npq} = \sqrt{(50)(.4)(.6)} = \sqrt{12} \approx 3.4641$

$$P\left(\frac{14.5-20}{3.4641} \le Z \le \frac{35.5-20}{3.4641}\right)$$

$$= P(-1.59 \le Z \le 4.47)$$

$$= P(Z \le 4.47) - P(Z \le -1.59) = 1 - .0559$$

$$= \boxed{.9441}$$



$$P(Z \le Z_0) = \begin{cases} 0 & \text{IF } Z_0 \le -3.49 \\ \text{TABLE} & \text{IF } -3.49 \le Z_0 \le 3.49 \\ 1 & \text{IF } Z_0 \ge 3.49 \end{cases}$$

$P(Z \le 4.47) \approx 1$

$n = 500$

$q = .5$

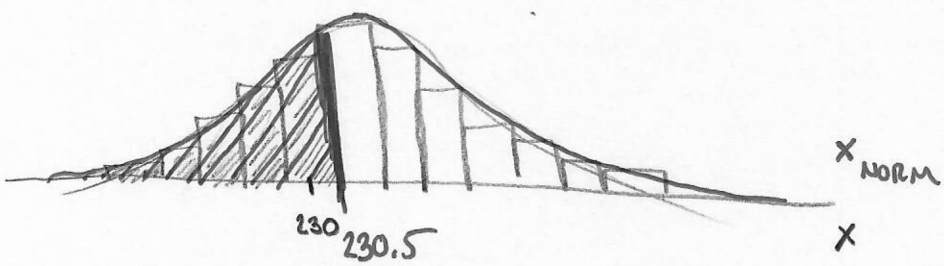
ex. EXPERIMENT: FLIP A COIN 500 TIMES.

(ASSUME SUCCESS = HEADS & $P(\text{SUCCESS}) = p = .5$)

$X = \#$ HEADS.

FIND $P(X \leq 230) = \underbrace{P(X=0)} + P(X=1) + \ldots + P(X=230)$

$$\underbrace{C_0^{500}(.5)^0(.5)^{500} + \ldots + C_{230}^{500}(.5)^{230}(.5)^{270}}_{\text{BINOMIAL PROB. DISTR.}}$$



X_{NORM} AND X HNG $\boxed{\begin{array}{l}\mu = np \\ \sigma = \sqrt{npq}\end{array}}$ $\begin{array}{l} = (500)(.5) = 250 \\ = \sqrt{(500)(.5)(.5)} \\ = \sqrt{125} = 11.1803 \end{array}$

$P(X \leq 230) = ▨ = ▨ = P(X_{NORM} \leq \underline{\underline{230.5}})$

§6.3

$$= P\left(Z \leq \frac{230.5 - 250}{11.1803}\right) \qquad Z = \frac{X - \mu}{\sigma}$$

$$= P(Z \leq -1.74) = \boxed{.0409}$$

ex. BASEBALL PLAYER WITH CAREER BATTING AVERAGE OF .281 GOES TO BAT 300 TIMES IN A SEASON. FIND THE PROBABILITY THAT SHE GETS A HIT MORE THAN 70 TIMES.

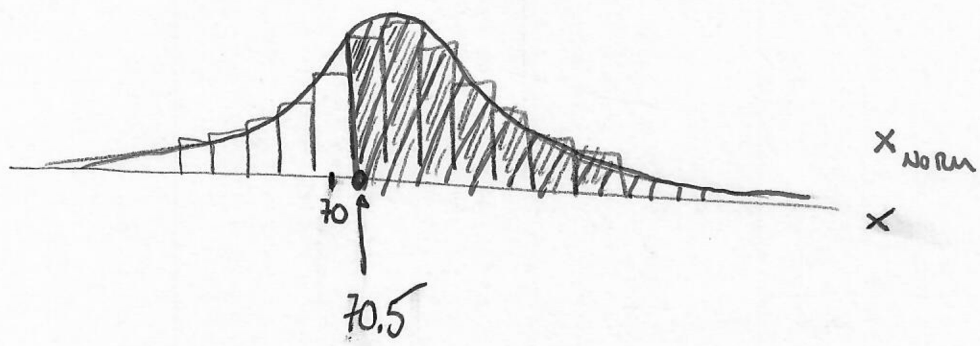
BINOMIAL EXP: $n = 300$

$q = 1 - p$

$p = .281 \quad (q = .719)$

$X = \#$ SUCCESSES (HITS)

FIND $P(X > 70) = P(X \geq 71)$



$\approx P(X_{NORM} \geq 70.5)$

$\mu = np = (300)(.281) = 84.3$

$\sigma = \sqrt{npq} = \sqrt{(300)(.281)(.719)}$

$= 7.7854$

$z = \dfrac{x - \mu}{\sigma}$

$$P\left(Z \geq \frac{70.5 - 84.3}{7.7854}\right)$$

$$= P(Z \geq -1.77) = 1 - P(Z \leq -1.77)$$

$$= 1 - .0384 = \boxed{.9616}$$