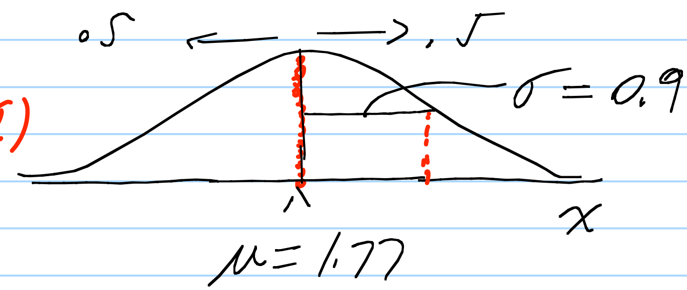
STT 200 7-19-10 L40

Note Title 7/19/2010

7-19-10 ASSIGNMENT NORMAL, Z-TABLE, BINOMIAL ≈, POISSON ≈

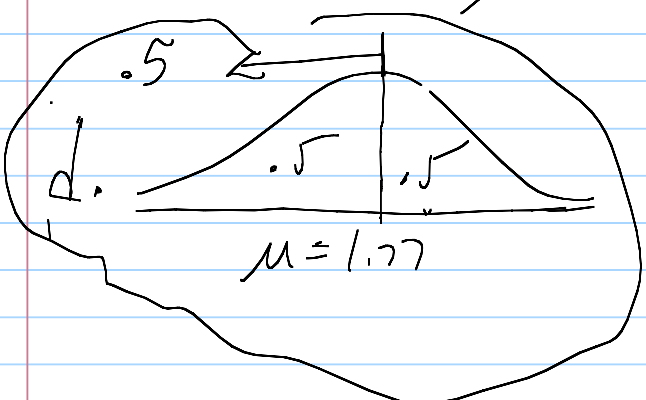
1. METAL CASTINGS HAVE EACH A DENSITY X; DIST'N OF X IS (≈) NORMAL, $\mu = 1.77$, $\sigma = 0.9$

(a)



(b) 68% INTERVAL $\mu \pm \sigma$

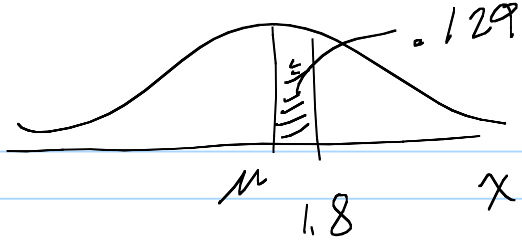
MORE EXACTLY



z	.00
1.0	$\boxed{.3413}$

(c) 95% INTERVAL $\mu \pm 2\sigma$

z	~~.00~~	.06
1.9 ~~2.0~~	$\boxed{\cancel{0.4750}}$	$\boxed{0.4750}$

e. 

STD SCORE OF 1.8 IS $\dfrac{1.8-\mu}{\sigma} = \dfrac{1.8-1.77}{0.09} = 0.333$

f. TABLE pg 210:

z	.03
0.3	$\boxed{0.1293}$

DENSITY OF RANDOMLY SAMPLED CASTING

P(X IN 1.77 TO 1.80)

IDEAL

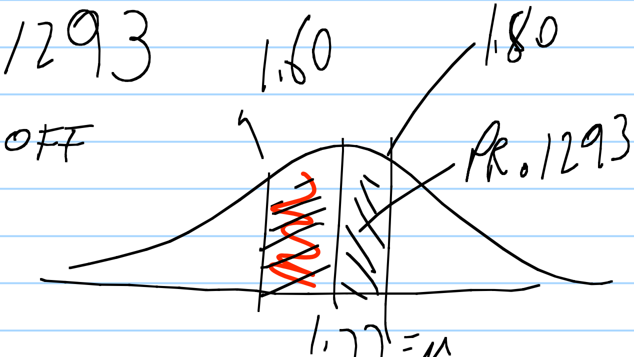
$= P\left(Z \text{ IN } \dfrac{1.77-\mu}{\sigma} \text{ TO } \dfrac{1.80-\mu}{\sigma} \right)$ μ

$= P(Z \text{ IN } 0 \text{ TO } 0.33) = 0.1293$

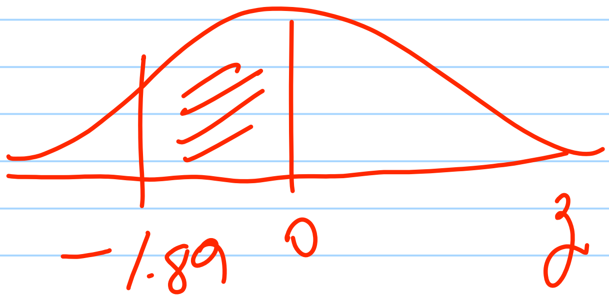
DIRECTLY OFF TABLE

NOTE: ? P(X IN 1.6 TO 1.8)

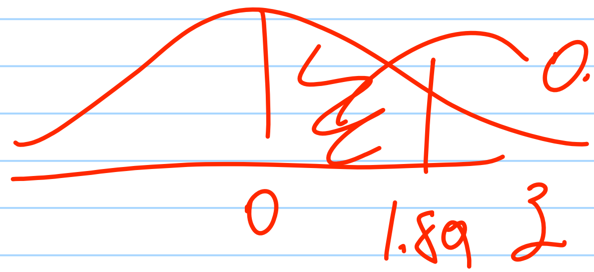
BELOW μ ABOVE μ



LOOK AT STD SCORE OF $1.6 = x$ IS $\left(\dfrac{1.6 - 1.77}{.09}\right) = z = -1.89$ NEG



≡



0.4706

ANS = .1293

.4706

ans =

NORMAL APPROX OF POISSON.

IF COUNTS OF RARE EVENTS MAYBE POISSON APPLIES

CONFIRM THAT ACTUAL COUNTS CONFORM TO POISSON PROBABILITIES

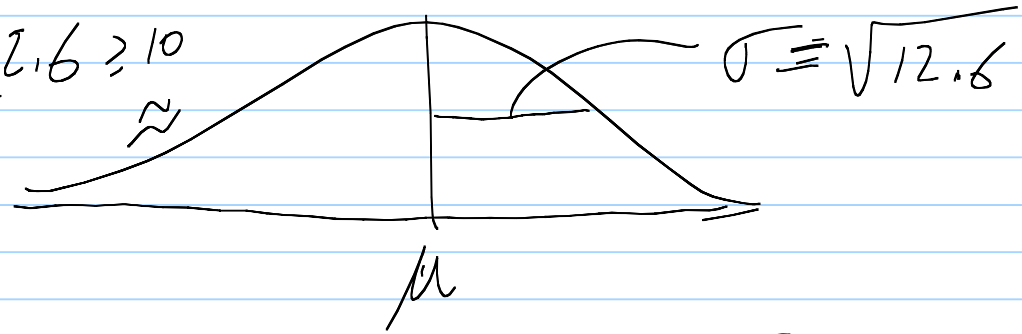
eg μ = AVG 6.4 RAISINS/COOKIE $\quad p(0) = e^{-6.4}\dfrac{6.4^0}{0!} \quad p(2) = e^{-6.4}\dfrac{6.4^2}{2!}$ ETC.

NO RAISINS

IF μ (OF POISSON) ≥ 10 THEN DIST^N $\approx$ NORMAL, $\sigma = \sqrt{\mu}$.

a. $\mu = 12.6 \geq 10$

$\sigma = \sqrt{12.6}$ $\approx$



b. 68% INTERVAL IS $\mu \pm \sigma$ i.e. $12.6 \pm \sqrt{12.6}$

c. 95% $\mu \pm 2\sigma$ i.e. $12.6 \pm 2\sqrt{12.6}$ POISSON!

d. STD SCORE $z = \dfrac{x-\mu}{\sigma} = \dfrac{20-12.6}{\sqrt{12.6}}$ $= 2.08$

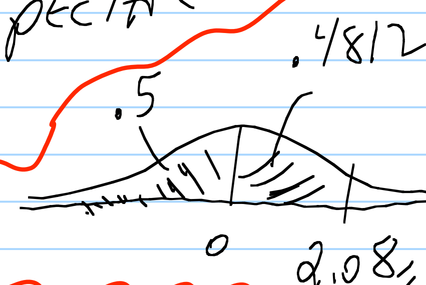
FACT THAT $\sigma = \sqrt{\mu}$ SPECIAL

RANDOM # AUTOS ENTERING

e. $P(X < 20) = .5 + .4812$

$P(X < x) \approx P\left(Z < \dfrac{x-\mu}{\sigma}\right)$

IN Z LAND



RECALL BERNOULLI TRIALS:

n = # INDEP TRIALS.

p = PROBABILITY ANY GIVEN TRIAL IS "SUCCESS"

3. NORMAL APPROX OF BINOMIAL.

$$p(x) = \frac{n!}{x!\,(n-x)!}\, p^{x} (1-p)^{n-x}$$

$$x = 0, 1, \ldots, n$$

$$P(\underset{uc}{X} \le \underset{lc}{x}) = p(0) + p(1) + \cdots + p(x) \approx P\left(Z < \frac{x - \mu}{\sigma}\right)$$

WONDERFUL SIMPLIFICATION $\mu = np$, $\sigma = \sqrt{np(1-p)}$

DEFECTIVE PARTS $n = 200$, $p = 0.19$

$\mu = np = 38$

$\sigma = \sqrt{200(.19)(.81)} = 5.55$

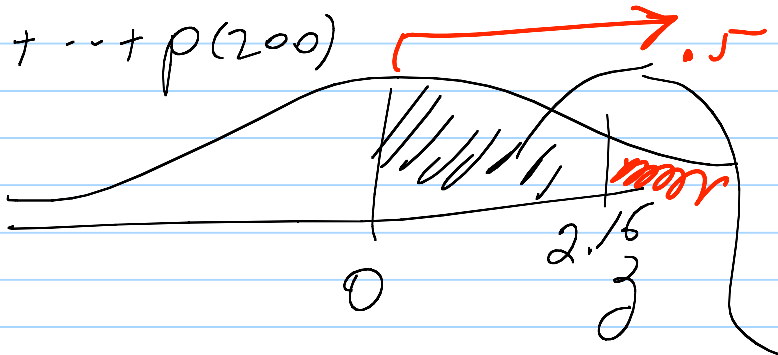
b. 68% 38 ± 5.55

c. 95% $38 \pm 2(5.55)$

d. STD SCORE OF $x = 50$ $z = \frac{x-\mu}{\sigma} = \frac{50-38}{5.55} = 2.16$

e. $P(X > 50) \approx P\left(Z > \dfrac{50-38}{5.55}\right) = P(Z > 2.16)$

$P(51) + \cdots + P(200)$



z	.06
2.1	.4846

ANS. $= .5 - .4846$