

STT 200 7-16-10 12⁴⁰

NORMAL DISTRIBUTIONS, z-TABLE pg 210,
(ALL NORMALS ARE ALIKE IN σ UNITS FROM THE MEAN).
STANDARD SCORES.

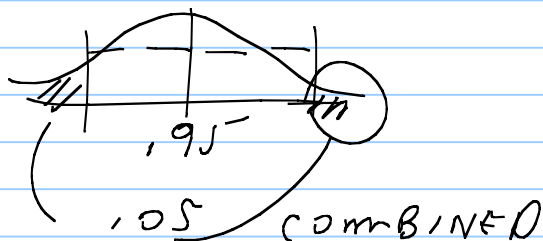
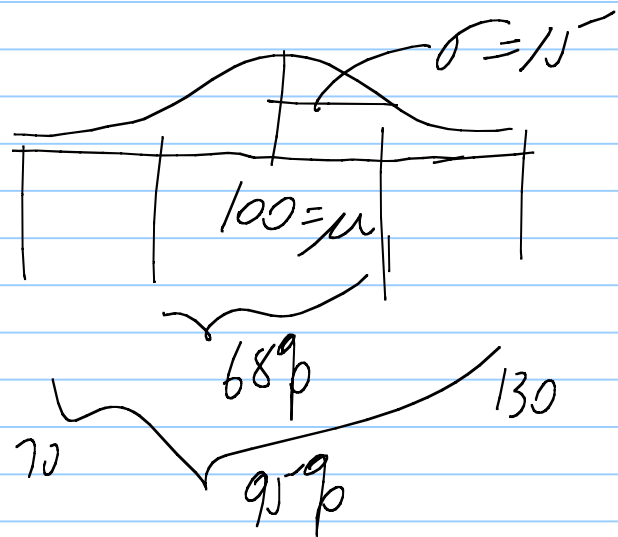
IQ NORMAL MEAN 100 SD $\sigma = 15$.

So $P(\text{IQ IN } 85 \text{ TO } 115) \sim .68$

~~$P(\text{IQ IN } 100 \text{ TO } 115) \sim .68/2 = .34$~~

$.68$ $P(\text{IQ IN } 70 \text{ TO } 130) \sim .95$ (RULE OF THUMB)

$P(\text{IQ} > 130) \sim .025$



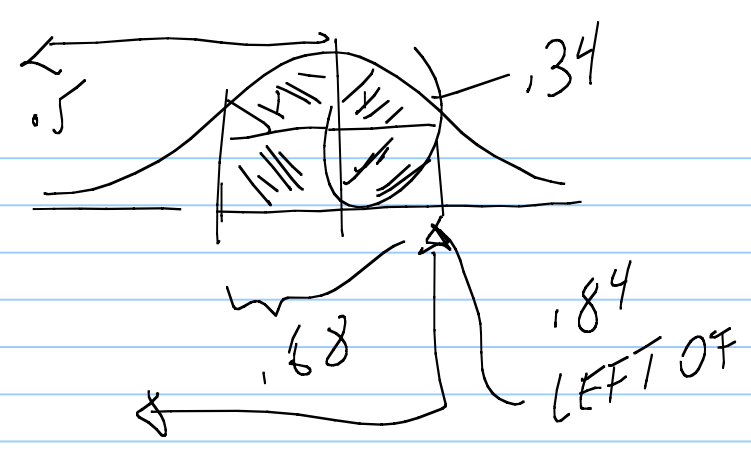
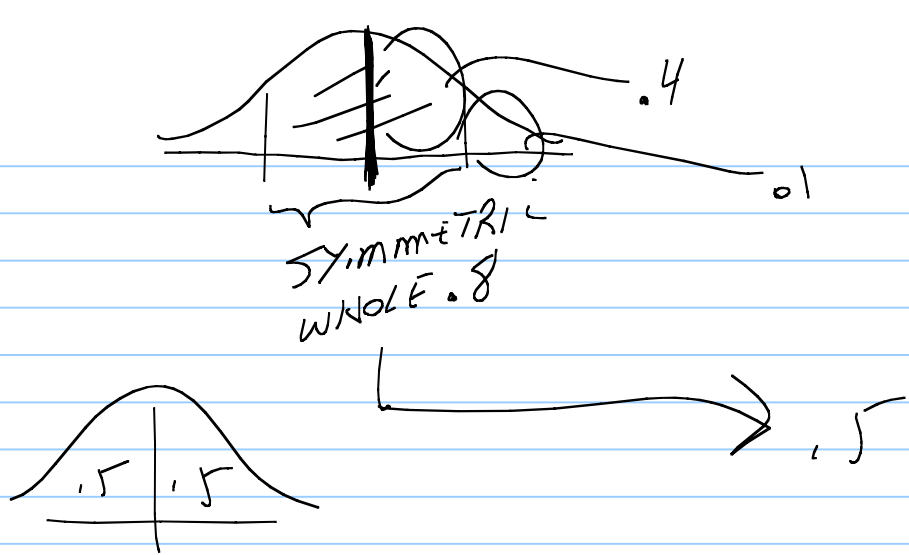
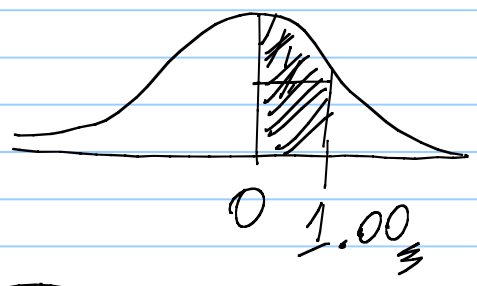


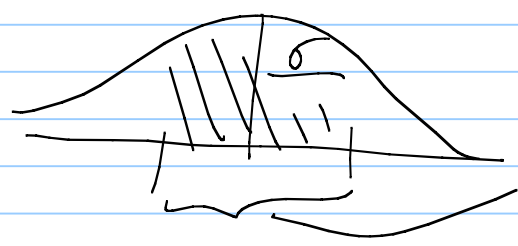
TABLE -



$\mu = 0$ $\sigma = 1$ STANDARD NORMAL

z .00
1.0 .3413

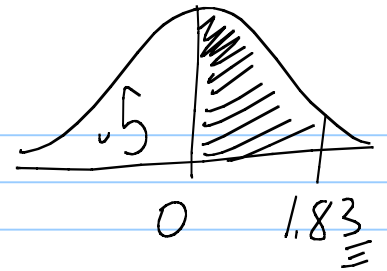
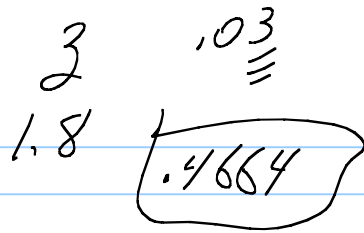
68% SHOULD
REALLY BE 68.26%



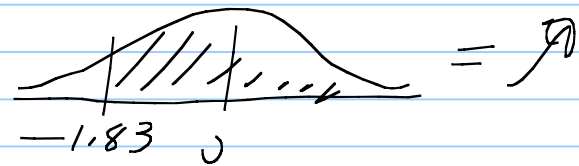
CLOSER TO .6826

Q. Find $P(Z < 1.83)$ (USE TAB(Z))

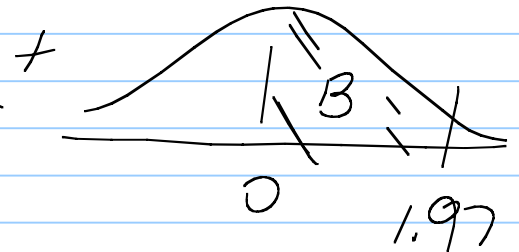
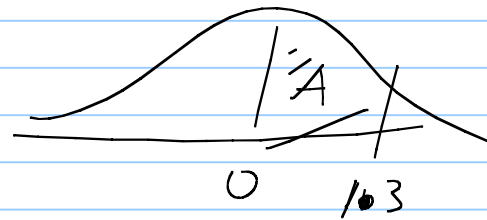
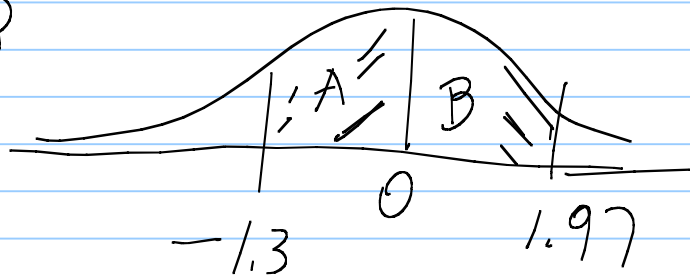
$$= 0.5 + 0.4664 = 0.9664$$



Q. $P(Z > -1.83)$



Q

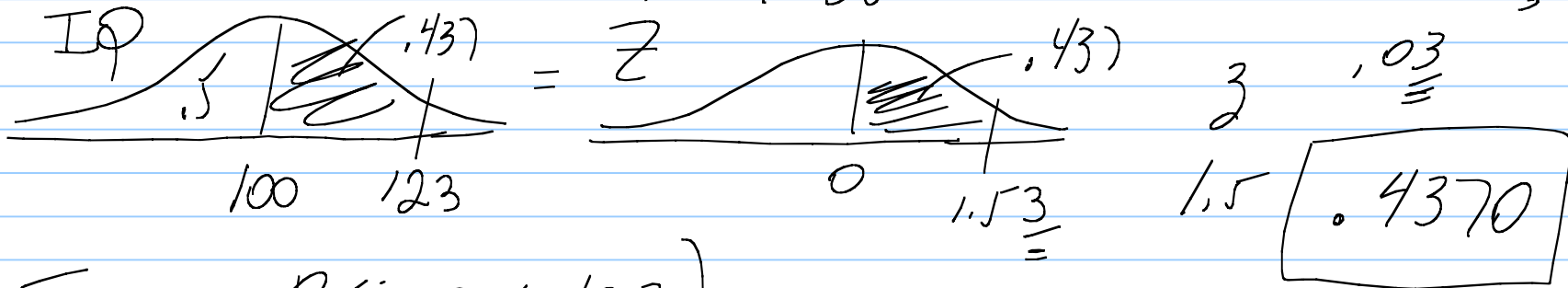


z-SCORES. IQ $\mu = 100$ $\sigma = 15$

$$P(\text{IQ IN RANGE } 100 \text{ TO } 123) = P\left(Z \text{ IN } \frac{100-100}{15} \text{ TO } \frac{123-100}{15}\right)$$

$$\text{IQ } 100 \rightarrow z = \frac{100 - \mu}{\sigma} = \frac{100 - 100}{15} = 0 \quad \text{RAW } 123 \rightarrow z = \frac{123 - 100}{15} = 1.53$$

$$\text{So } P(\text{IQ} \text{ IN } 100 \text{ TO } 123) = P(Z \text{ IN } 0 \text{ TO } 1.53)$$



$$\text{So } P(\text{IQ} < 123) = .5 + .437 = .937$$

SOMEONE w/ IQ = 123 IS ALMOST AT 94TH PERCENTILE OF IQ.

NORMAL APPROX OF BINOMIAL

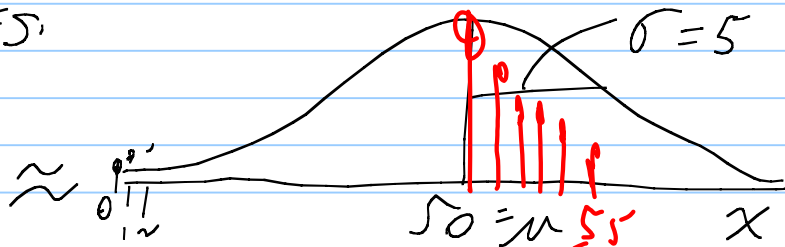
eg Toss coin 100 TIMES: $X = \# \text{ H IN } 100 \text{ TOSSES}$

$$EX = np = 100 \left(\frac{1}{2}\right) = 50$$

$$\sigma_x = \sqrt{np(1-p)}$$

$$= \sqrt{100 \frac{1}{2} \frac{1}{2}} = 5$$

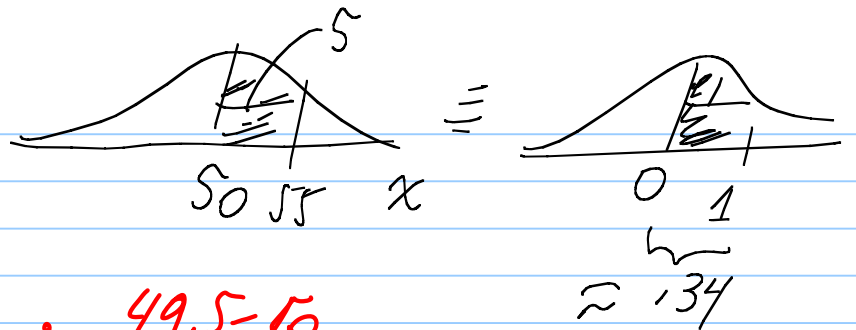
NORMAL APPROX



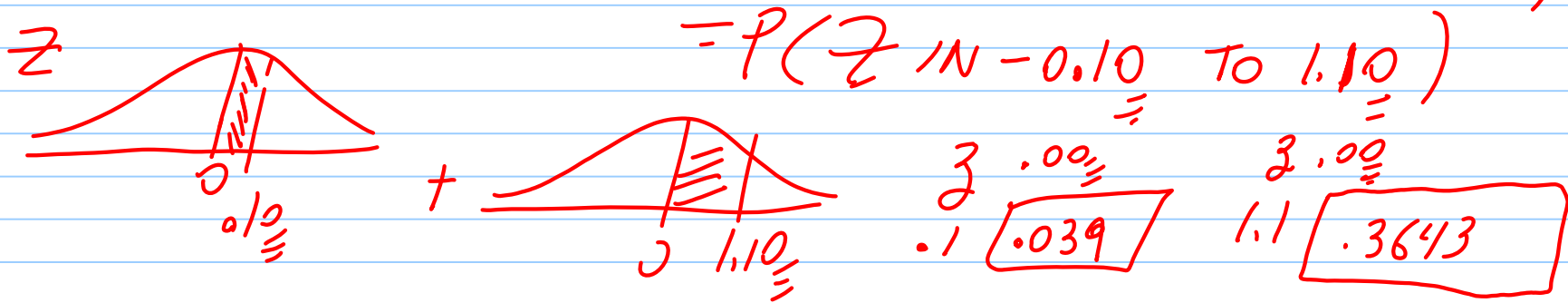
$$\text{RAW } x = 55 \rightarrow z = \frac{55 - 50}{5} = 1$$

$$P(\text{\#H IN } 50 \text{ TO } 55)$$

INCL INCL

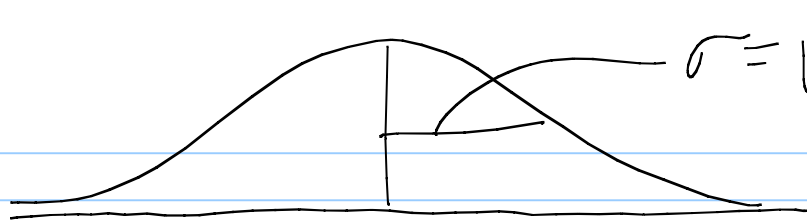


$$\approx P\left(\frac{49.5}{5} \text{ TO } \frac{55.5}{5}\right) = P(z \text{ IN } \frac{49.5-50}{5} \text{ TO } \frac{55.5-50}{5})$$



$$P(\text{\#H } 50 \rightarrow 55) = .039 + .3643 = .4033$$

BATTING $p = .3$ $n = 100$ $\mu = np = 30$ $\sigma = \sqrt{100 \cdot .3 \cdot .7}$



$$\sigma = \sqrt{np(1-p)} = 4.58$$

$\sigma = 4.58$ NOT SO FAR FROM 5

$$\mu = np = 30$$

$30 \pm 4.58 \approx 68\%$ INTERVAL

ACTUAL $P(\# \text{ HITS IN } 27 \rightarrow 34)$

$$\approx P\left(Z \text{ IN } \frac{26.5 - 30}{4.58} \text{ TO } \frac{34.5 - 30}{4.58}\right) \approx 0.61$$

WHY DID I NOT GO TO $26 \rightarrow 34$ - BLIPPED!

BINOMIAL n LARGE p SMALL

eg $n = 500$ $p = \frac{1}{100}$ $\mu = np = 500 \frac{1}{100} = 5$

$$P(3) = \frac{500!}{3! 497!} \left(\frac{1}{100}\right)^3 \left(\frac{99}{100}\right)^{497}$$

$n = 5000$ $p = \frac{1}{1000}$ $\mu = np = 5000 \frac{1}{1000} = 5$

$$P(3) = \frac{5000!}{3! 4997!} \left(\frac{1}{1000}\right)^3 \left(\frac{999}{1000}\right)^{4997}$$

$$\frac{\sqrt{np(1-p)}}{\sim \sqrt{np}}$$

VERY CLOSE TO ONE ANOTHER

AND $\sim e^{-5} \frac{5^3}{3!}$

$e \sim 2.718281828\dots$

form

$$e^{-\mu} \frac{\mu^x}{x!} \quad x = 0, 1, 2, \dots$$

POISSON

BISSON RAISIN COOKIES.

MAKE 144 COOKIES

$$576 = 4(144)$$

○ YOUR COOKIE

$$p = \frac{1}{144} \quad n = 576$$
$$np = 576 \left(\frac{1}{144} \right) = 4$$

$$p(3) \approx e^{-\mu} \frac{\mu^3}{3!} = e^{-4} \frac{4^3}{6}$$

$$3! = 3 \cdot 2 \cdot 1 = 6$$

$$p(0) = e^{-4} \frac{4^0}{0!} = e^{-4} = 0.018$$

COMMENT: YOU MAY JUSTIFY THIS APPLICATION

OF POISSON BY BAKING A LOT OF COOKIES, FINDING

~ 2% HAVE NO RAISINS, ~ 20% HAVE 3 RAISINS, ETC.

NORMAL APPROX OF POISSON.

POISSON
MEAN μ
(SD IS $\sigma = \sqrt{\mu}$)

$$P(X) = e^{-\mu} \frac{\mu^x}{x!} \approx$$

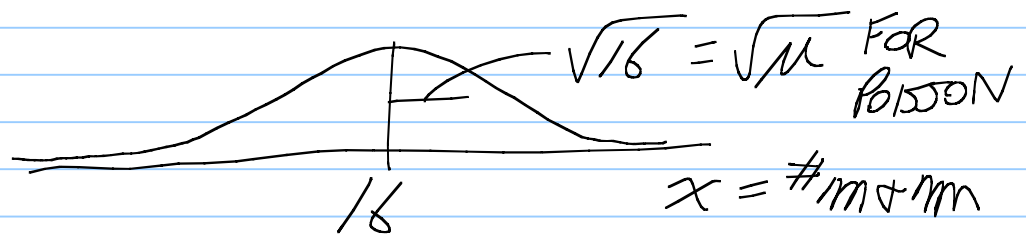


APPLICABLE (THIS COURSE) $\mu \geq 10$

SAY M&M OATMEAL COOKIES (9" DIAMETER) SAY AVG # M&M PER COOKIE IS 16

X = # OF M&M
IN A GIVEN
COOKIE.

\approx
 \approx
DIST



BEAUTIFUL! WE ONLY NEED μ !!

eg WE AVG 25 CLAIMS/DAY \sim
Dist

