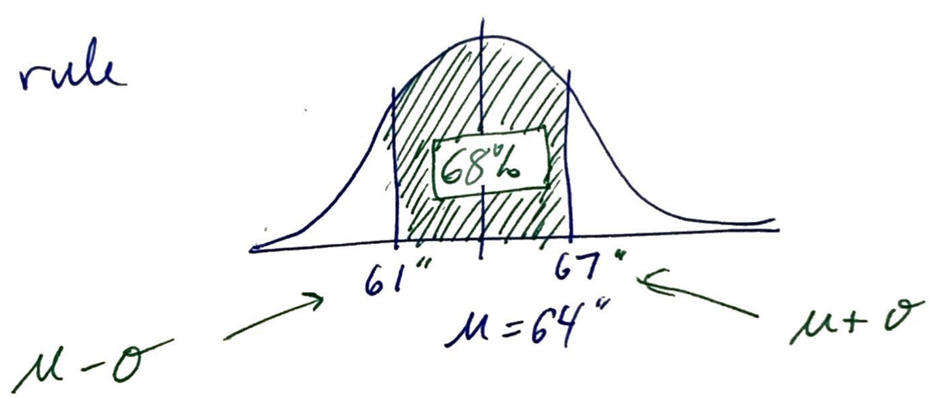
7.2 Applications of the Normal Distribution

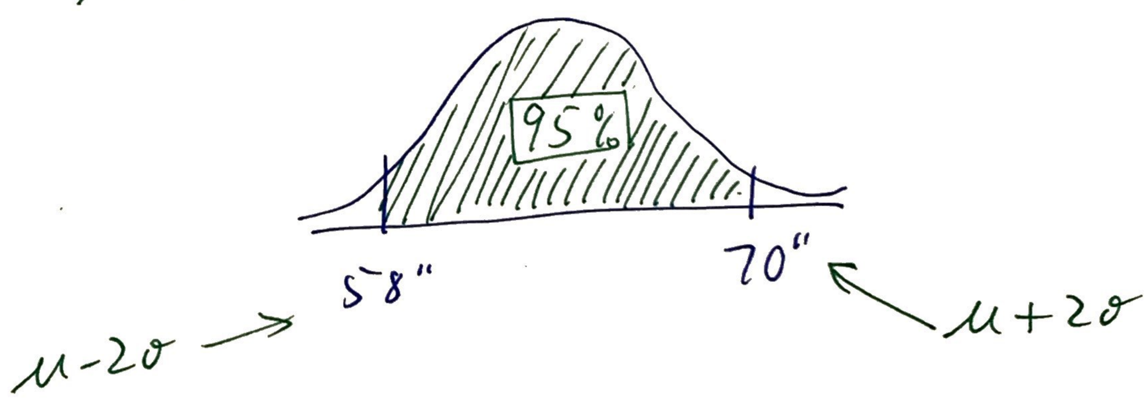
Q: What happens if our model does not have a mean of zero nor a standard deviation of 1?

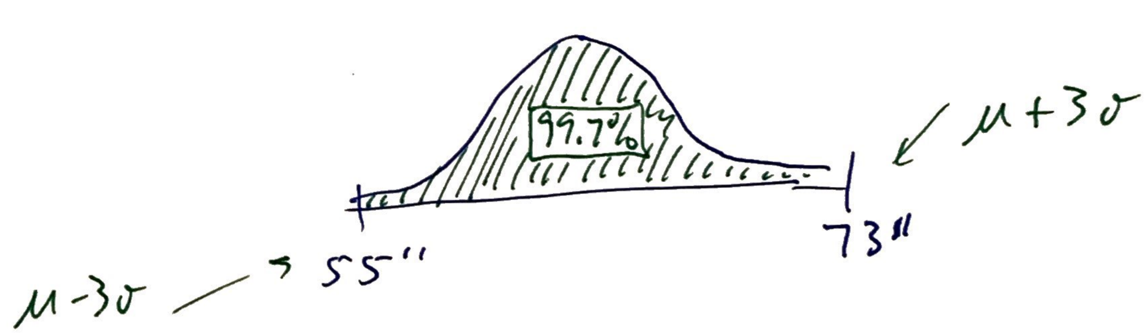
Ans: $\boxed{z = \dfrac{x-\mu}{\sigma}}$ This "normalizes" to fit the Std. Dist. Curve and Tables

Ex. Heights of a certain population of women follow a normal distribution with a mean of $\mu = 64''$ and a std. dev. of $\sigma = 3$ inches

- emperical rule

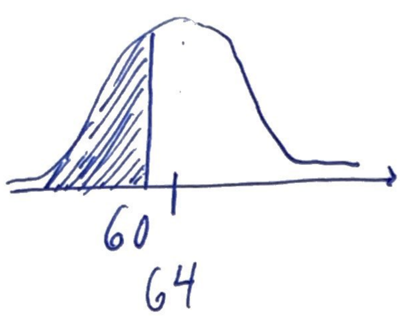






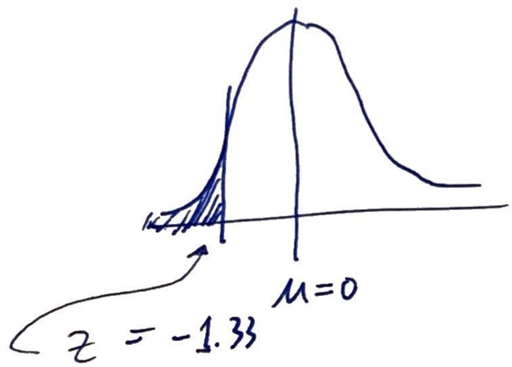
Q: what is the probability of selecting from a database of women in the navy a women whose hieght is below 60" : $\mu = 64$, $\sigma = 3$

(i)



(ii) $z = \frac{60-64}{3} = \frac{-4}{3} = \underline{\underline{-1.33}}$

Here is where we turn back to the std. Norm Cum



LHS

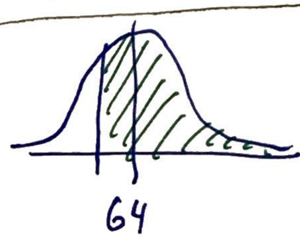
z-table : Neg. z-scores

	0.03
row -1.3	0.0918

Ans: $P(x < 60") = \boxed{0.0918}$

Q: Prob that the selected woman is greater than 61"

(i)



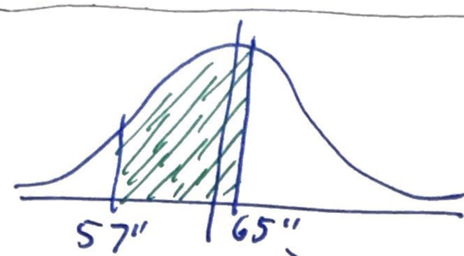
(ii) $z = \frac{60-64}{3} = -1.33$

(iii) table $1.0000 - 0.0918$

$P(x > 60") = \boxed{0.9082}$

Q: Find the prob. a selected woman has a height between 57" and 65"

(i)



$\mu = 64$

$z = -2.33$ $\qquad$ $z = 0.33$

(ii) $z = \dfrac{57-64}{3} = -\dfrac{7}{3} = \underline{\underline{-2.33}}$

$z = \dfrac{65-64}{3} = \dfrac{1}{3} = \underline{\underline{0.33}}$

(iii) $P(z < -2.33) = 0.0099$

$P(z < 0.33) = 0.6293$

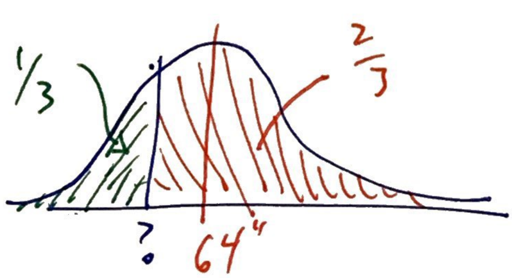
$$\begin{array}{r} 0.6293 \\ -0.0099 \\ \hline 0.6194 \end{array}$$

So $P(57" \leq X \leq 65") = 0.6194$ or $\underline{\underline{62\%}}$

⊛ Reading the table backwards.

Q: Maybe some one asks "In the population of Navy Women, what height separates the lower 1/3 from the upper 2/3?"

(i)



(ii) $1/3 = 0.3333$

⇒ z-table and search the body of data for 0.3333. Note the row $\underline{-0.4}$ & colum $\underline{0.03}$.

OK $\boxed{z = -0.43}$

(iii) Convert to X: $z = \dfrac{X-\mu}{\sigma} \Rightarrow \boxed{X = \mu + z\sigma} = 64" + (-0.43)3" = 62.7"$