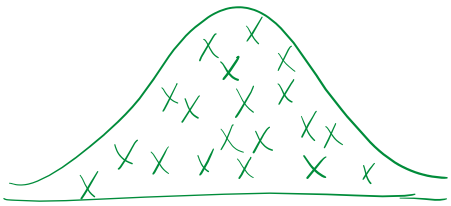
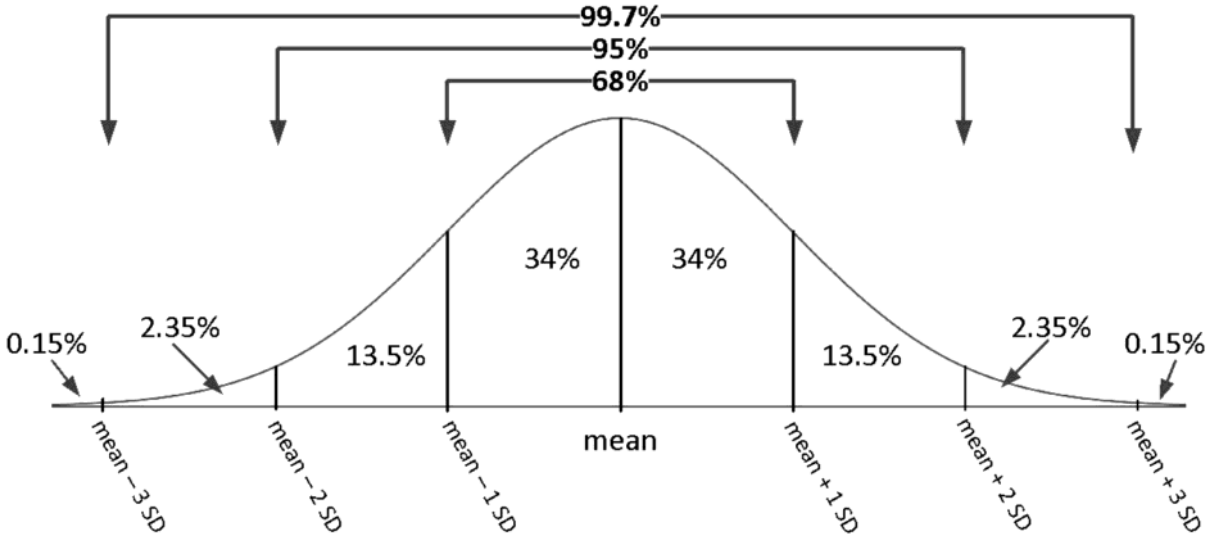
VI. Cont.

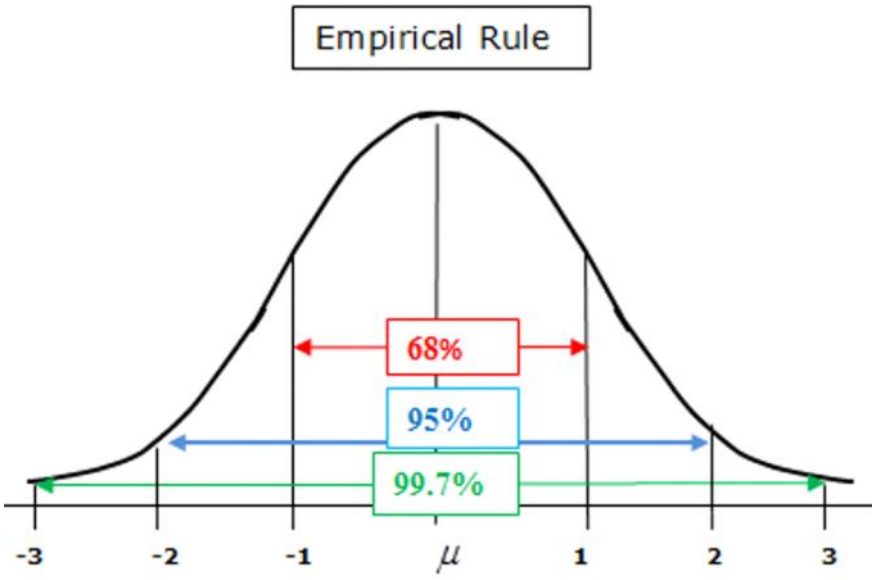


not that important (only 95% is the cutoff needs to be aware of.)

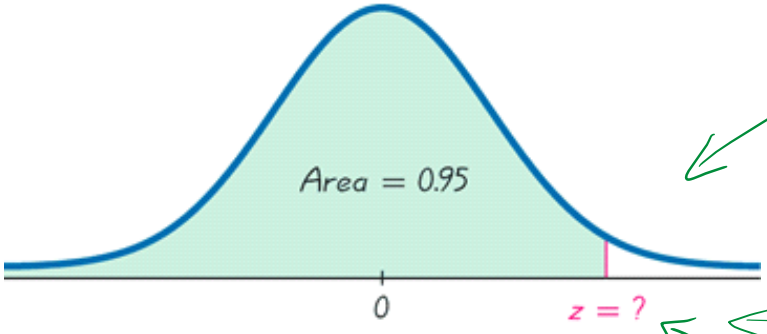
The **empirical rule** or the **68 – 95 – 99.7** Rule states that for a normal distribution we are able to determine the area under the curve in regions one, two, or three standard deviations from the mean.

1. About 68% of all values fall within 1 standard deviation of the mean.
2. About 95% of all values fall within 2 standard deviations of the mean.
3. About 99.7% of all values fall within 3 standard deviations of the mean.





eg



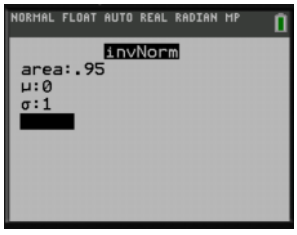
P = 0.95 given

ask for the z-score

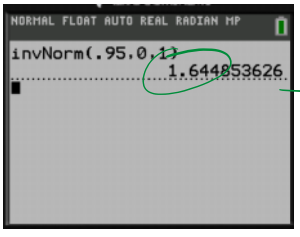
S:

TI-84:

2nd → distr → 3 : invNorm(



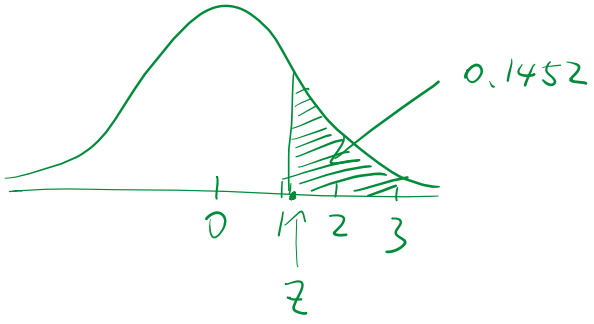
→



$z = 1.645$

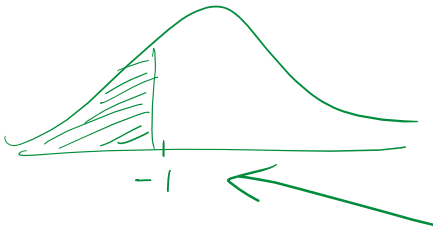
* older version of TI-84 is left tail by default.

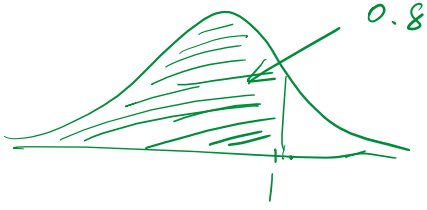
eg Find the z-score:

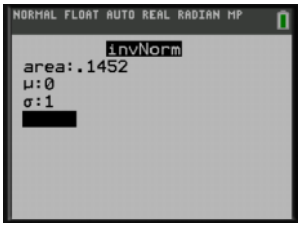


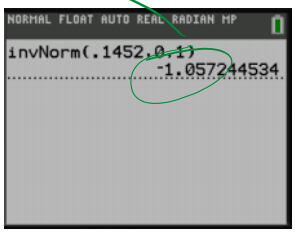
1 − 0.1452 ↓ 0.8548

S: " " or





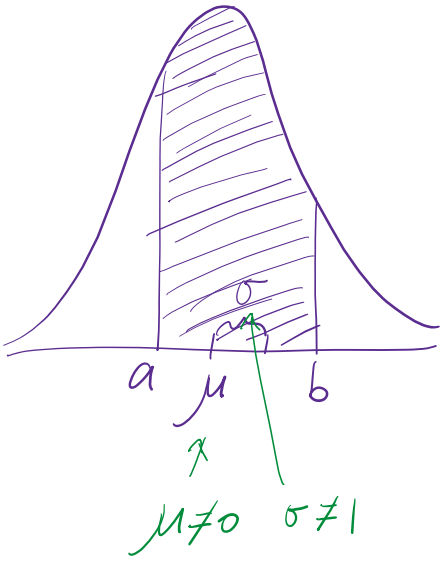




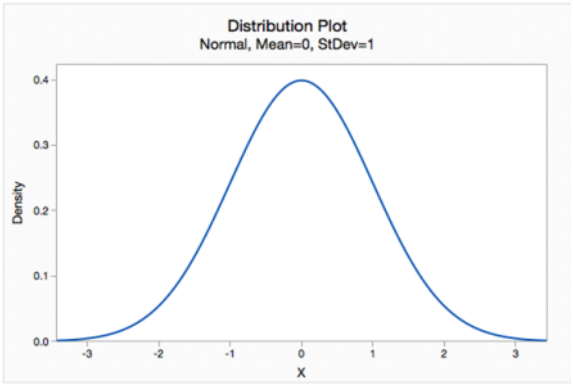
z = 1.057 ← it is for

VII. Normal Distribution (Regular)

When we work with a real life example, the regular Normal Distribution applies, we have to deal with any non-standard ($\mu \neq 0$, $\sigma \neq 1$). That is, the mean μ is no longer 0, and σ is no longer 1.



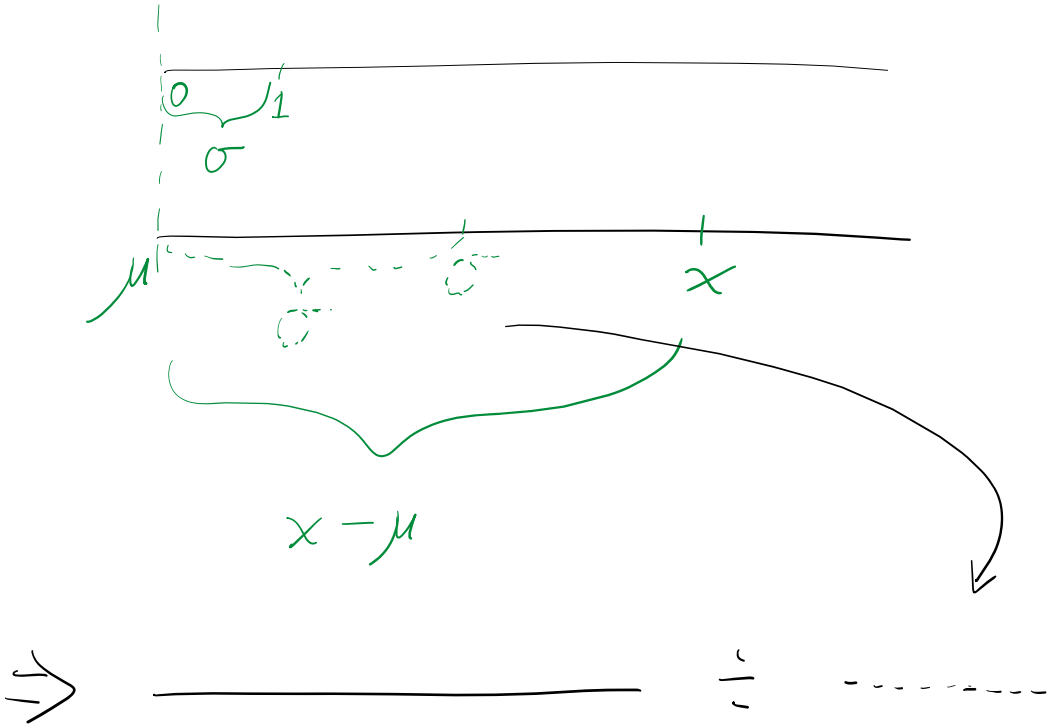
$$z = \frac{x-\mu}{\sigma}$$



Thus, the conversion (from the old-days) is

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

Graphic approach:

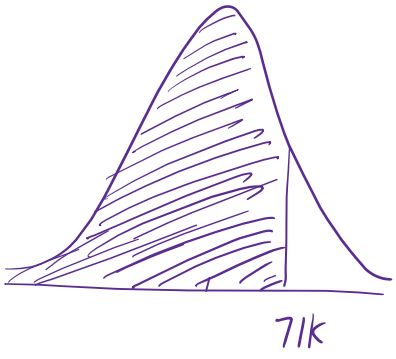


$= x - \mu \quad \div \quad \sigma$

$= \ldots -3, -2, -1, 0, 1, 2, 3, \ldots$

$=$ **Z-score** from the table.

eg Find the probability below:



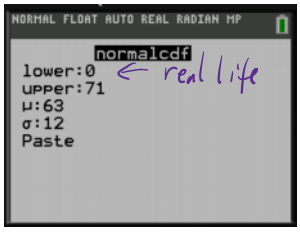
← Salary at a certain state of the U.S.

$\mu = 63k, \quad \sigma = 12k$

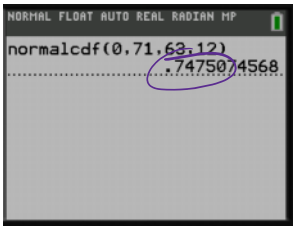
S:

$$z = \frac{x - \mu}{\sigma} = \frac{71 - 63}{12} \approx 0.67 \Rightarrow$$

$\Rightarrow$ table $p =$ **0.7486** from the table.

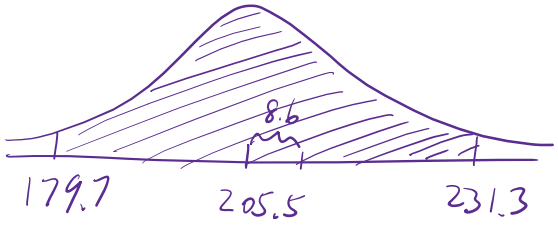


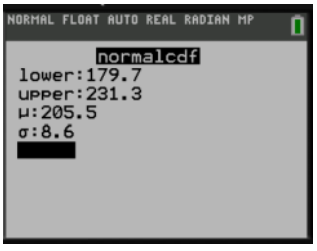
→



Eg Given that the overhead reach distances of adult females: μ = 205.5 cm, σ = 8.6 cm, and overhead reach distances are normally distributed. The overhead reach distances are used in planning assembly work stations. If an adult female is randomly selected, find the probability that her overhead reach is between 179.7 cm and 231.3 cm.

S: Draw it every time: ← base on the problem





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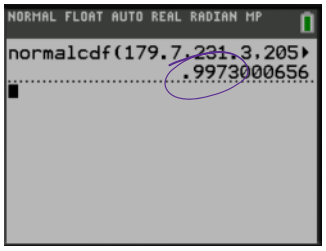
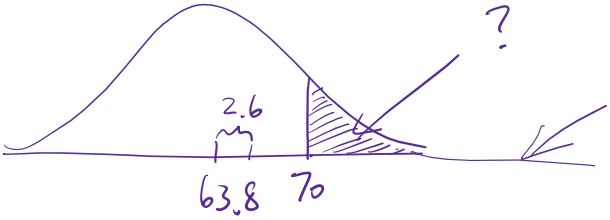


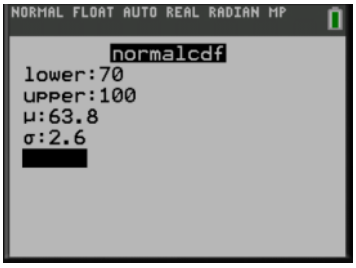
Eg Tall Clubs International has a requirement that women must be at least 70 inches tall. Given that women have normally distributed heights with a mean of 63.8 inches and a standard deviation of 2.6 inches, find the percentage of women who satisfy that height requirement.

S:



real life: 100 inches ✓ (8 ft 3")

← overdraw :) it's okay!



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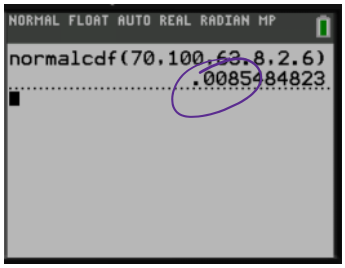
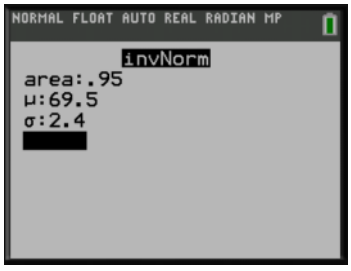


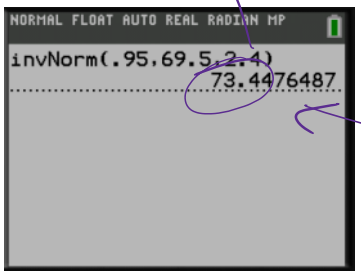
given

Eg When designing aircraft cabins, what ceiling height will allow 95% of men to stand without bumping their heads? Men's heights are normally distributed with a mean of 69.5 inches and a standard deviation of 2.4 inches.

S:

ask for x





inches

78. In a certain presidential election, Alaska's 40 election districts averaged 1,956.8 votes per district for Candidate A. The standard deviation was 572.3. (There are only 40 election districts in Alaska.) The distribution of the votes per district for Candidate A was bell-shaped. Let X = number of votes for Candidate A for an election district.

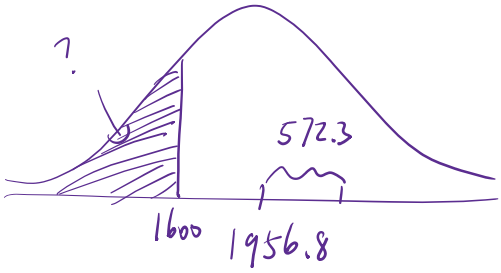
a. State the approximate distribution of X.
b. Is 1,956.8 a population mean or a sample mean? How do you know?
c. Find the probability that a randomly selected district had fewer than 1,600 votes for Candidate A. Sketch the graph and write the probability statement.
d. Find the probability that a randomly selected district had between 1,800 and 2,000 votes for Candidate A.
e. Find the third quartile for votes for Candidate A.

S: a. $X \sim N(1956.8, 572.3)$

b. Population, because all districts are included.

c.

c.



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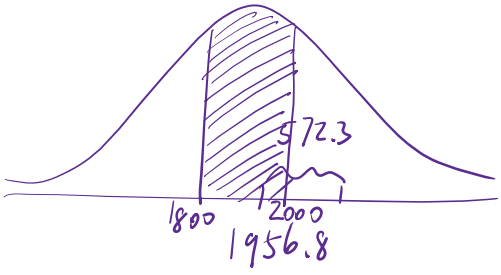
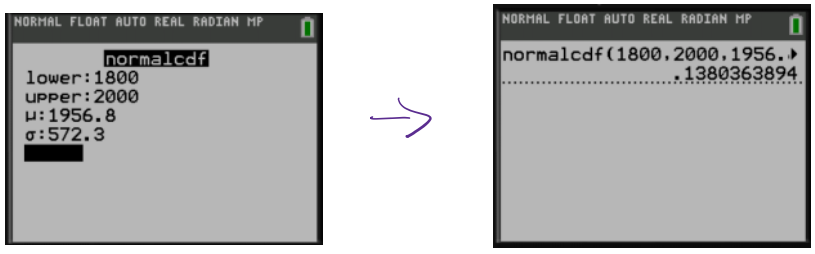
s: d.





e. 3rd quartile = Q_3 = 0.75

Give $p = 0.75$, find x votes

Give $p = 0.75$, find x votes