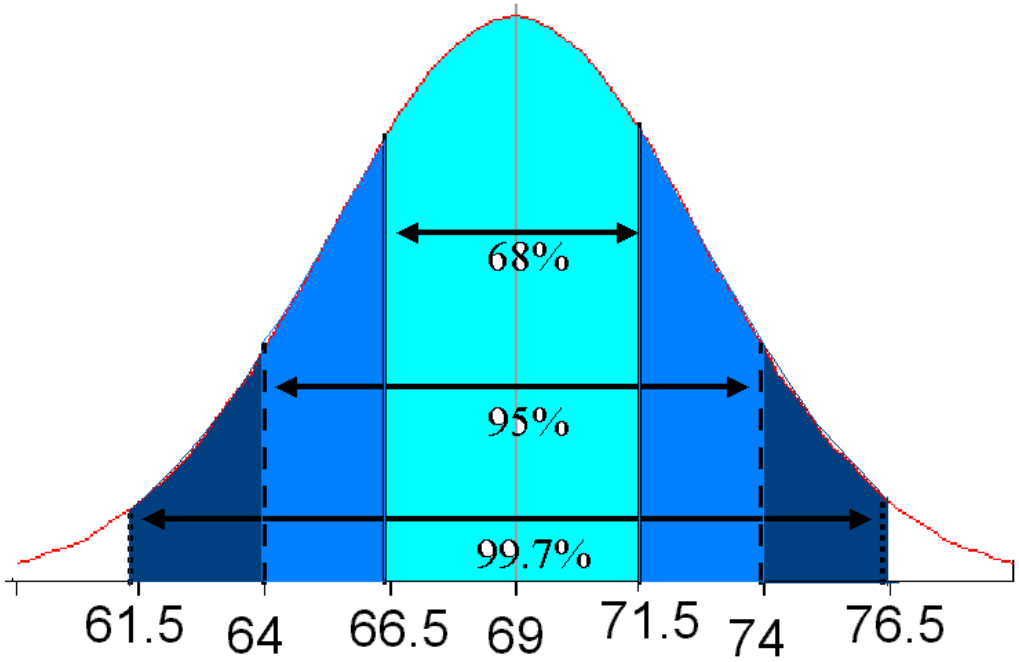
Unit 6: Data Analysis

Z-SCORE

Z-Scores are measurements of how far from the center (mean) a data value falls.



Ex: A man who stands 71.5 inches tall is 1 standardized standard deviation from the mean.

Ex: A man who stands 64 inches tall is -2 standardized standard deviations from the mean.

Standardized Z-Score

To get a Z-score, you need to have 3 things

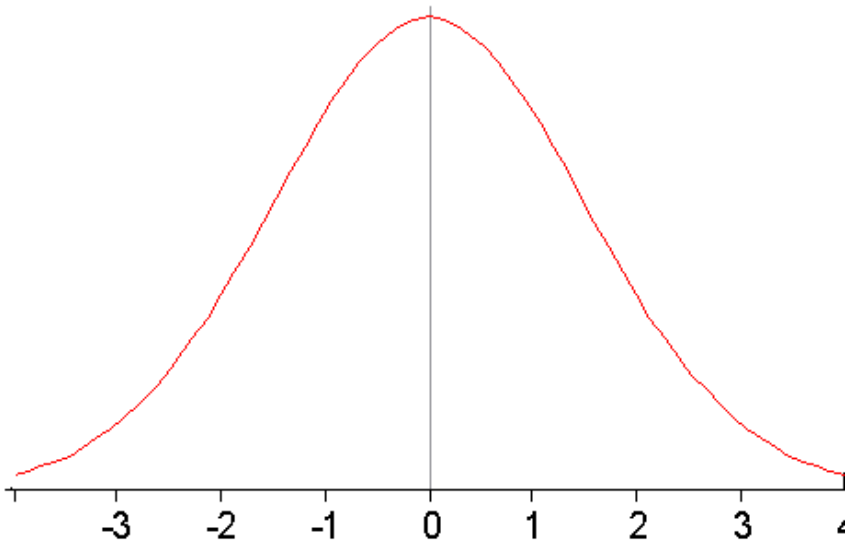
1) Observed actual data value of random variable x
2) Population mean, μ also known as expected outcome/value/center
3) Population standard deviation, σ

Then follow the formula.

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

Empirical Rule & Z-Score

About 68% of data values in a normally distributed data set have z-scores between –1 and 1; approximately 95% of the values have z-scores between –2 and 2; and about 99.7% of the values have z-scores between –3 and 3.



Z-Score & Let H ~ N(69, 2.5)

mean s.d.

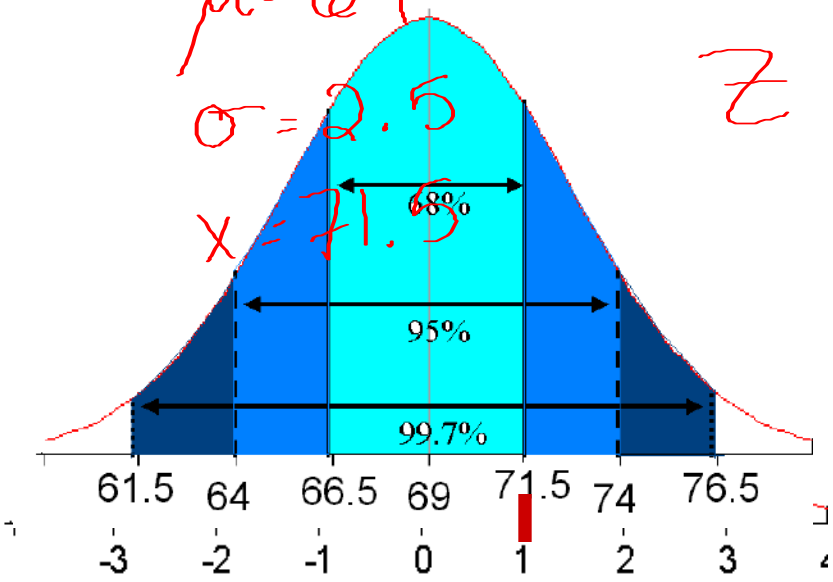
What would be the standardized score for an adult male who stood 71.5 inches?

$\mu = 69$

$\sigma = 2.5$

$x = 71.5$

$$Z = \frac{(71.5 - 69)}{2.5} = 1$$



$H \sim N(69, 2.5)$ $Z \sim N(0, 1)$

Z-Score & Let H ~ N(69, 2.5)

What would be the standardized score for an adult male who stood 65.25 inches?

$$\frac{65.25 - 69}{2.5} = -1.5$$

Comparing Z-Scores

Suppose Bubba's score on exam A was 65, where Exam A ~ N(50, 10) and Bubbette's score was an 88 on exam B,

where Exam B ~ N(74, 12).

Who outscored who? Use Z-score to compare.

Bubba: $\frac{65-50}{10} = 1.5$

Bubbette: $\frac{88-74}{12} = 1.17$

Comparing Z-Scores

Heights for traditional college-age students in the US have means and standard deviations of approximately 70 inches and 3 inches for males and 165.1 cm and 6.35 cm for females. If a male college student were 68 inches tall and a female college student was 160 cm tall, who is relatively shorter in their respected gender groups?

Male $z = (68 - 70)/3 = -.667$

Female $z = (160 - 165.1)/6.35 = -.803$

What if I want to know the PROBABILITY of a certain z-score?

Use the calculator! Normcdf!!!

2nd Vars

2: normcdf(

normcdf(lower, upper, mean(0), std. dev(1))

Find $P(z < 1.85)$

Find P(z > 1.85)

Find P(-.79 < z < 1.85)

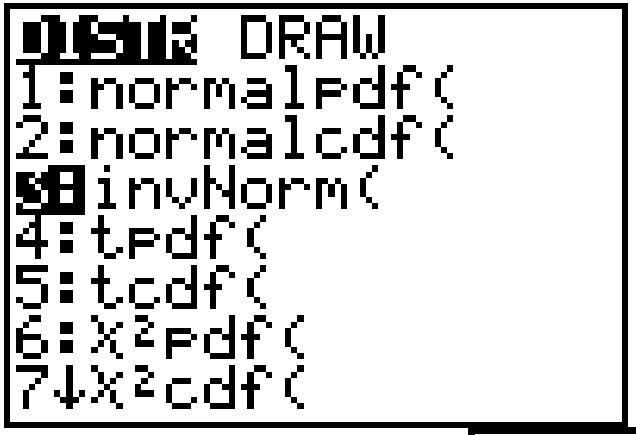
What if I know the probability that an event will happen, how do I find the corresponding z-score?

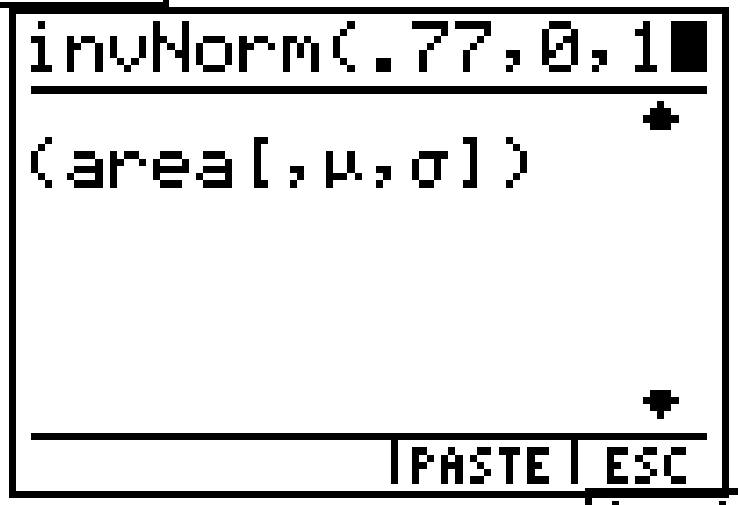
1) Use the z-score formula and work backwards!
2) Use the InvNorm command on your TI by entering in the probability value (representing the area shaded to the left of the desired z-score), then 0 (for population mean), and 1 (for population standard deviation).

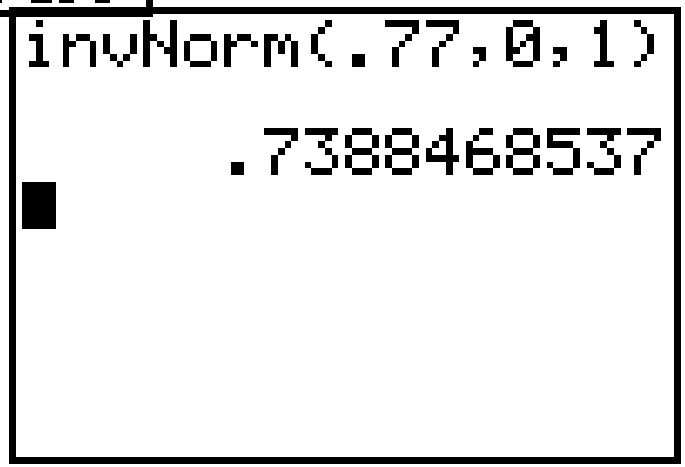
$P(Z < z^*) = .8289$

What is the value of **z^***?

Using TI-84


DRAW
1:normalpdf(
2:normalcdf(
3:invNorm(
4:tpdf(
5:tcdf(
6:χ²pdf(
7↓χ²cdf(


invNorm(.77,0,1
(area[,μ,σ])
PASTE
ESC


invNorm(.77,0,1)
.7388468537

P(Z < x) = .80

What is the value of **x**?

$P(Z < z^*) = .77$

What is the value of **z^***?