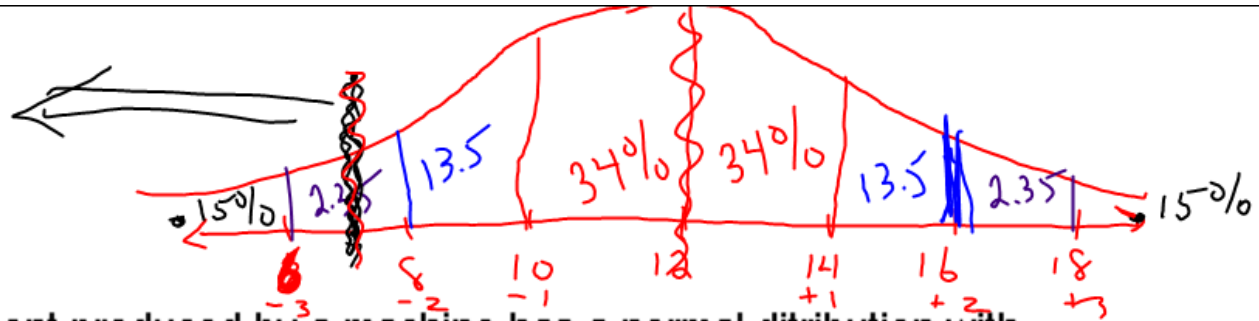


Warmup:



The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last

a) less than 7 months.

• 62%

b) between 7 and 12 months.

49.38%

"normalcdf"

mean = 12

$\sigma = 2$

L.B. $-\infty$ (-1E99)

U.B. 7

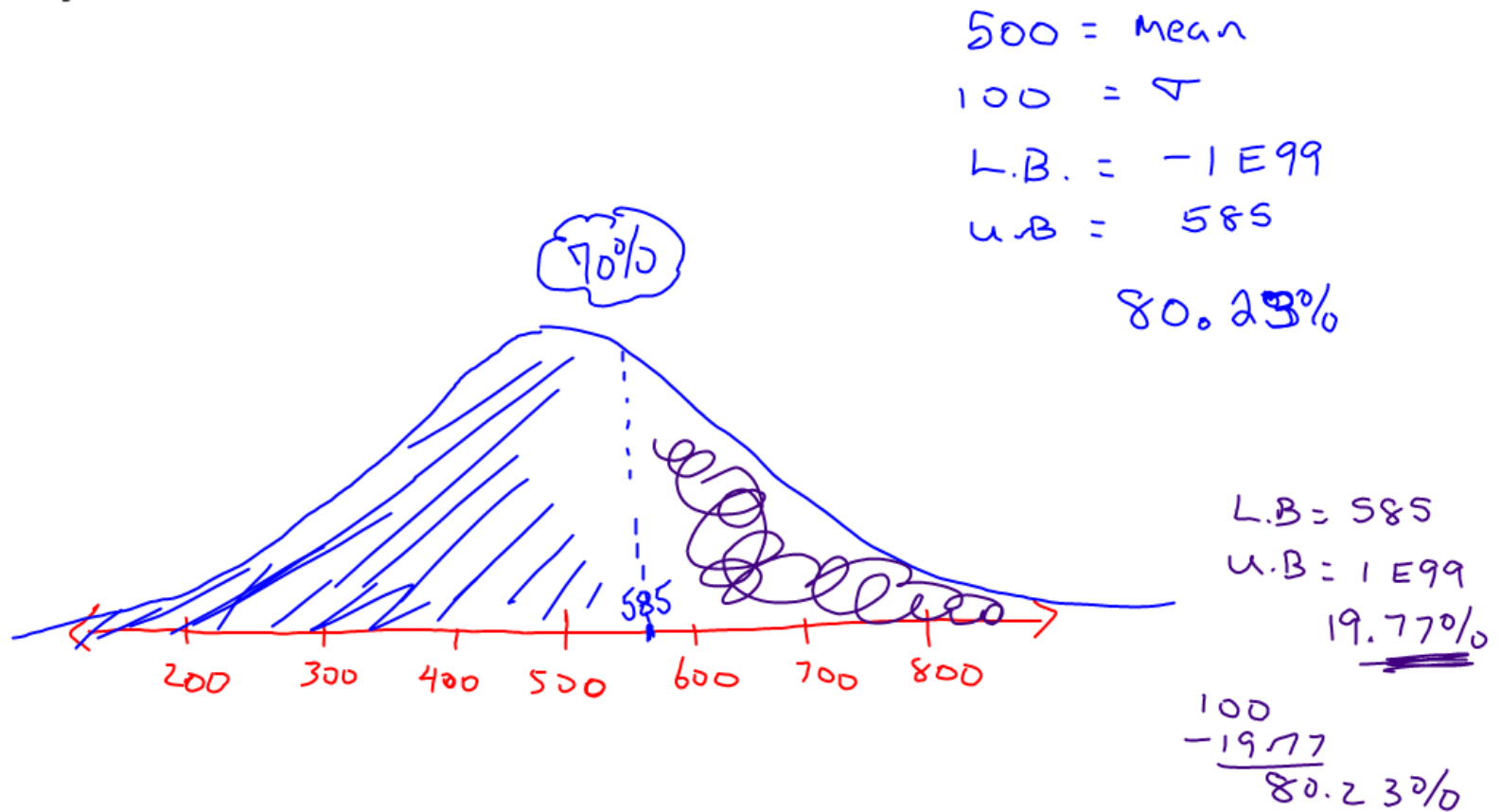
L.B. 7

U.B. 12

$(-\infty, 7)$

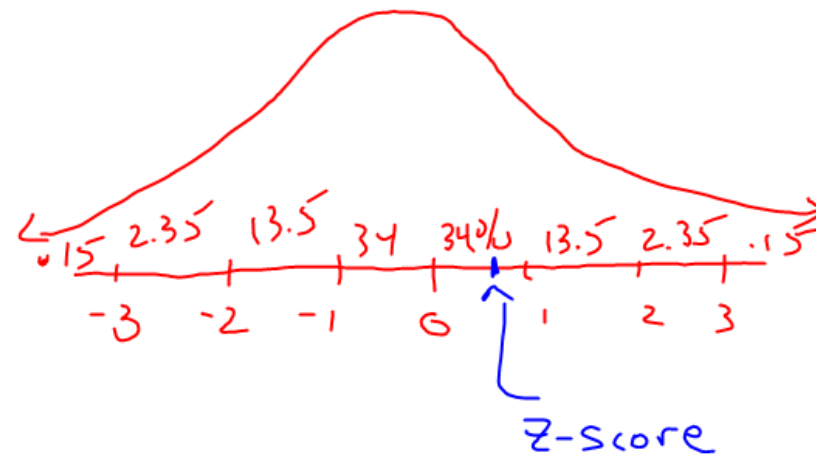
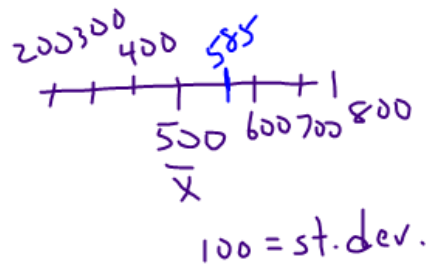
greater than.
 $(7, \infty)$

Entry to a certain University is determined by a national test. The scores on this test are normally distributed with a mean of 500 and a standard deviation of 100. Tom wants to be admitted to this university and he knows that he must score better than at least 70% of the students who took the test. Tom takes the test and scores 585. Will he be admitted to this university?



Standard Normal Distribution

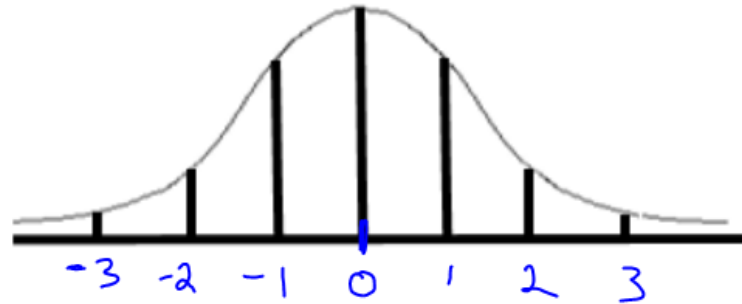
Normal
Ex



Z-Score:

The number of standard deviations the x-value lies above or below the mean.

$$Z = \frac{(x - \bar{x})}{\sigma}$$



We can use z-score to compare two different sets of data

Ex. 1 A normal distribution has a mean of 50 and a standard deviation of 5.

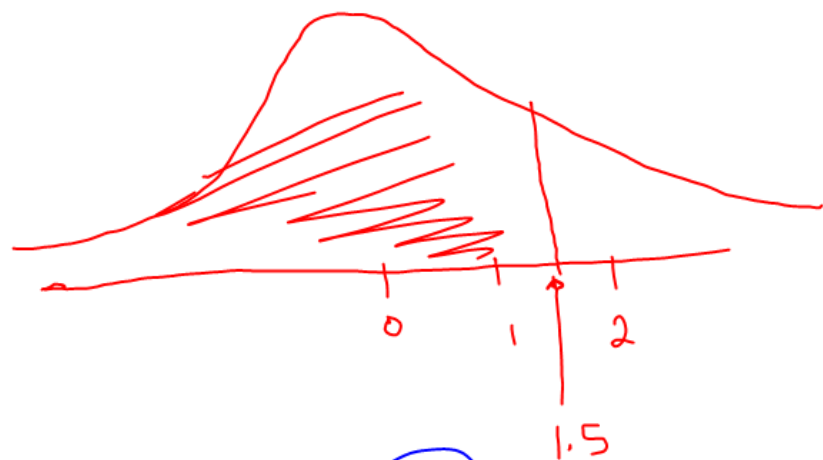
Find the z-score for a value of 67.

$$Z_{\text{score}} = \frac{67 - 50}{5} = \frac{17}{5} = 3.4$$

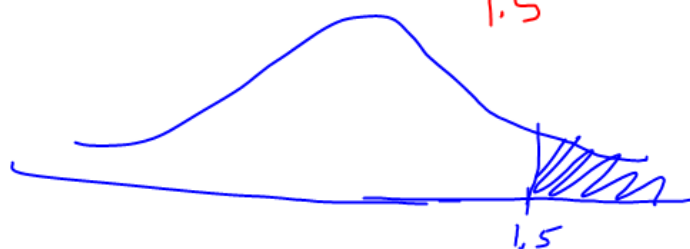
Normal Dist

Std. Normal





$$P(\text{less than } 1.5) = 93.319\%$$



$$P(\text{greater than } 1.5) =$$

$$\approx 100 - 93.319$$

$$= 6.681\%$$

$$P(\text{in b/w } 0 \text{ \& } 1.5)$$



$$\underline{\underline{93.319}} - 50 = 43.319\%$$

Ex. 2 A normal distribution has a mean of 55 and a standard deviation of 6.

Find the z-score for a value of 42

$$Z\text{-Score} = \frac{42 - 55}{6} = \frac{-13}{6} = -2.1\overline{66666} \\ -2.17$$

$$P(\text{less than a } 42) = .01500 = 1.5\%$$

$$P(\text{greater than a } 42) = \underline{\underline{98.5\%}} \quad 100 - 1.5 =$$

Ex. 3 Test scores on the last major test were normally distributed with a mean of 60 and a standard deviation of 9. You made a 54. (Yikes!)

a. What is the z-score associated with your grade?

$$\frac{54-60}{9} = \frac{-6}{9} = -.67$$

b. Your very kind teacher decided to curve the grades. She changed the mean to a 70 and the standard deviation to 5 but kept the z-scores the same. What is your new score?

$$Z = \frac{X - \bar{X}}{\sigma}$$

$$5(-.67) = \left(\frac{X - 70}{5} \right)$$

$$\begin{array}{r} -3.35 \\ + 70 \\ \hline \end{array} = \begin{array}{r} X - 70 \\ + 70 \\ \hline \end{array}$$

$$\begin{array}{r} 66.65\% = X \\ \approx 67\% \\ \hline \end{array}$$

Ex. 4 Bill plays for the Silver Hawks basketball team. He scores 8 points a game. The team average is 6.5 points per game with a standard deviation of 1.0.

His friend Ryan plays for the Red Hawks basketball team. He scores 8 points per game. The team average is 5 points per game with a standard deviation of 1.5.

They argue that they are equally as good as each other. Are they right? Who is more valuable to their team?

Bill z-score

$$\frac{8 - 6.5}{1} = 1.5$$

Ryan z-score

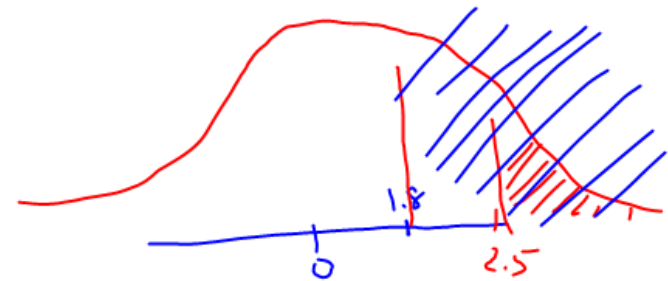
$$\frac{8 - 5}{1.5} = 2$$

Ex. 5 At Eastview Pizza, orders for delivered pizza are free if the pizza is delivered more than 45 minutes after it is ordered. It always takes 15 minutes to prepare a pizza at this restaurant, so you have to add this to each driver's mean delivery time. This table shows statistics on the delivery times for two drivers.

Which driver is more likely to give away free pizzas?

Pizza Delivery Driver Statistics

Driver	Mean Delivery Time	Standard Deviation
Ben	12 minutes	10 minutes
Jim	15 minutes	6 minutes



$$\text{Ben avg} + \text{prep. time} = 27 \text{ min.}$$

$$\text{Jim avg} + \text{prep time} = 30 \text{ min.}$$

Z-score

$$\frac{45 - 27}{10} = \frac{18}{10} = 1.8$$

$$\frac{45 - 30}{6} = \frac{15}{6} = 2.5$$

Ex. 6 Lewis earned 85% on his biology test & 80% on his history test. In his biology class the mean was 79% with a standard deviation of 3. In his history class the mean was 76% with a standard deviation of 4.

- a. What percentage of the class was below Lewis in the biology class?

$$\frac{85 - 79}{3} = 2.00$$

97.725%

- b. What percentage of the class was below Lewis in the history class?

$$\frac{80 - 76}{4} = 1.00$$

84.134%

- c. On which test did he do better compared to the rest of the class?

Biology