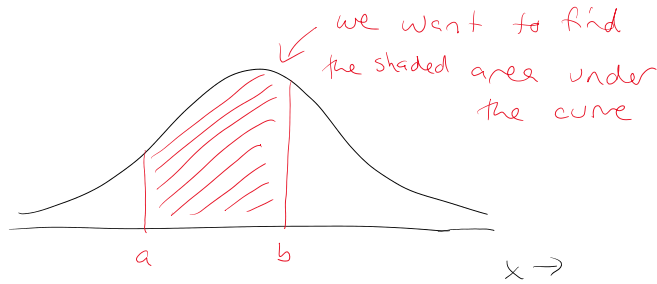


The Normal Distribution:

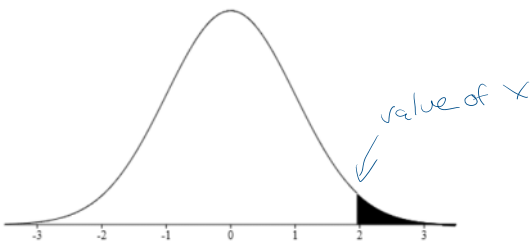
Calculating Probabilities from values

reminder:



the online calculator that we're going to use is the Hyperstat Online Statistics textbook

https://davidmlane.com/hyperstat/z_table.html



- Area from a value (Use to compute p from Z) ← default option
- Value from an area (Use to compute Z for confidence intervals)

Specify Parameters:

Mean 0

SD 1

Above 1.96

Below 1.96

Between -1.96 and 1.96

Outside -1.96 and 1.96

} input the mean and standard deviation here

} choose one of these options

Results:

Area (probability) 0.025

Recalculate

← this is your answer

example: suppose we know that the time it takes to commute between Camosun's two main campuses during rush hour is normally distributed with a mean of 50 minutes and standard deviation of 10 minutes.

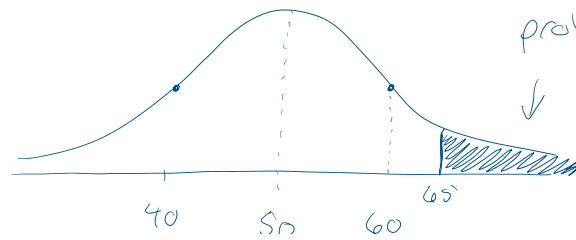
a) what is the probability that the next time you make this commute in rush hour traffic that you will take over 65 minutes?

mean = 50 minutes

std dev = 10 minutes

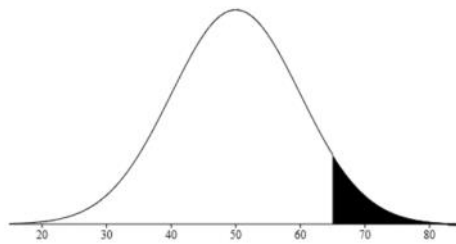
$x > 65$ minutes - x is the data point of interest

if we sketch this:



probability we want is equal to this area

Screen clipping taken: 2024-03-28 2:18 PM



- Area from a value (Use to compute p from Z)
- Value from an area (Use to compute Z for confidence intervals)

Specify Parameters:

Mean
SD
 Above
 Below
 Between and
 Outside and

Results:

Area (probability)

this is our probability

$$\text{so } p = 0.0668$$

$$\text{or } p = 6.68\%$$

okay to round to 6.7% or even 7% because question didn't have much precision

Section 9.3: cont'd 2024/04/03

b) what is the probability that the next time you make this commute in rush hour, that it will take you less than 65 minutes?

at random from a normal distribution is within

- a) one standard deviation of the mean?
- b) two " " " " " " " " ?

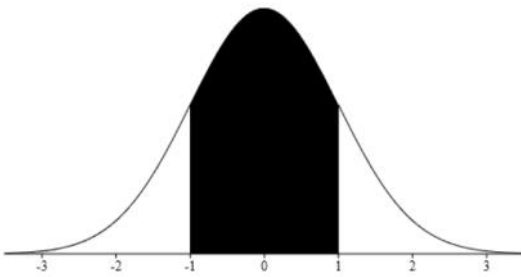
answer:

a)



mean = 0
std dev = 1

a)



- Area from a value (Use to compute p from Z)
- Value from an area (Use to compute Z for confidence intervals)

Specify Parameters:

Mean

SD

Above

Below

Between and

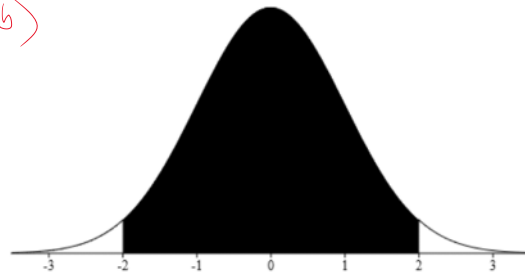
Outside and

Results:

Area (probability)

Screen clipping taken: 2024-04-03 11:01 AM

b)



- Area from a value (Use to compute p from Z)
- Value from an area (Use to compute Z for confidence intervals)

Specify Parameters:

Mean

SD

Above

Below

Between and

Outside and

Results:

Area (probability)

Screen clipping taken: 2024-04-03 11:02 AM

a) $p = 0.6827$ or 68.27%

b) $p = 0.9545$ or 95.45%

Oh, look! It's the Empirical Rule!

two last thoughts:

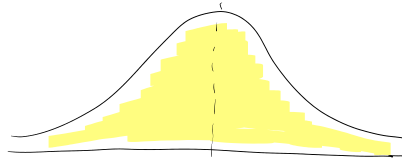
- ① if you know the z-score of a value and want to compute probabilities related to that z-score, then use

mean = 0

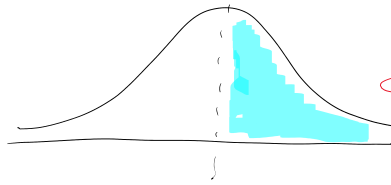
std dev = 1

then plug in your z-score for x in the online calculator

(2) when visualizing your answer, it can be helpful to use symmetry:



total area is equal to one



so this shaded area is equal to 0.5

and also



if this shaded area = 0.4



what's this area? $1 - 0.4 = 0.6$