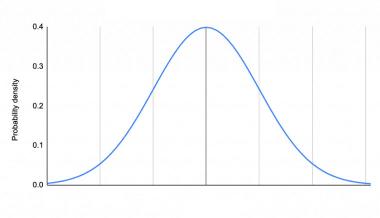
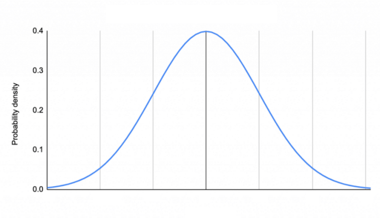
ACTIVITY 14 For each question where applicable 1) shade the normal distribution, 2) state the function you use (pnorm, qnorm, pt, qt) 3) state the answer.

Part 0 In class examples

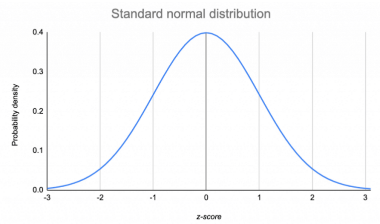
Example 1: Calculate the probability of being LESS THAN 1 std dev BELOW the mean.



Example 2: Find the STAT (CV) for being in the highest 30%.



Example 3: The amount of money spent buying weekly groceries follows a normal distribution. We are lucky enough to know the population mean is \$150 and the population standard deviation is \$20. Find the probability an individual spent less than \$120.



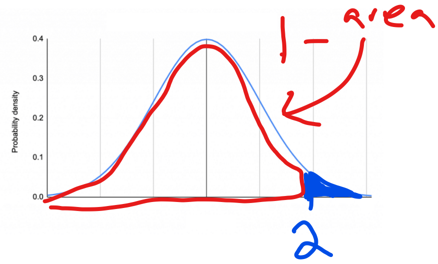
Part 1 The following set of questions are using the STANDARD NORMAL distribution.

1 - pnorm(q=2)

a) What is the probability of being more than two standard deviations above the mean (STAT = 2)?

pnorm(q = 2, lower.tail = FALSE)

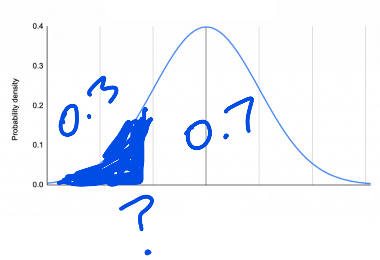
0.02275 or 2.28%



b) 30% of our data is below what STAT (critical value)? (ie: is how many standard deviations below the mean?)

qnorm(p =0.3)

-0.52 ie: 0.52 standard deviations LESS than the mean

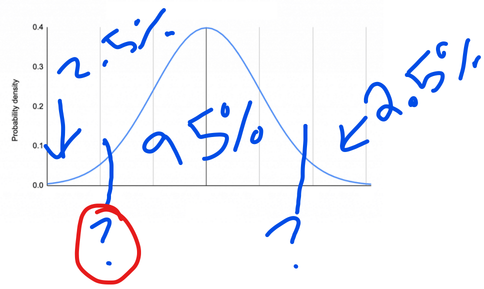


c) 95% of our data is between what STAT (critical value)?

qnorm(p = 0.025) = -1.96

qnorm(p = 0.025, lower.tail = FALSE) area to right
OR qnorm(p = 0.975) area to left

+1.96



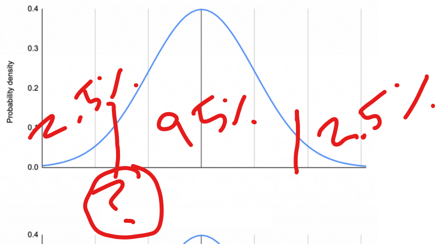
Part 2 Now let's compare the spread of a standard normal distribution to a t-distribution.

a) Consider a t-distribution with $df = 10$. 95% of our data is between what two STAT values?

qt(p = 0.025, df =10) = -2.23

+2.23

qt(p = 0.025, df=10, lower.tail = FALSE)

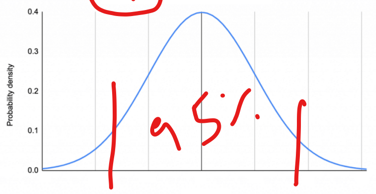


b) Consider a t-distribution with $df = 30$. 95% of our data is between what two STAT values?

qt(p = 0.025, df = 30)

-2.04

+2.04



c) How does this compare to the normal distribution in Part 1e? In other words, how does a STAT change as sample size increases?

Critical values get closer to 0 (less extreme) as sample size increases

For smaller sample sizes we have a fatter tail = more uncertainty

Part 3 The scores on SAT scores are normally distributed with a mean of 1050 and a sd of 200.

a) Using the empirical rule, 68% of SAT scores are between what two values?

1050 -200 and 1050+200

850 and 1250

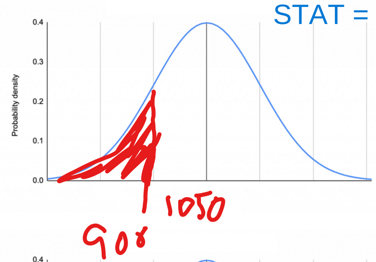
b) What percent of students score lower than 900?

pnorm(q=900, mean = 1050, sd = 200)

22.66%

pnorm(q = -0.75)

STAT = $\dfrac{900 - 1050}{200}$



STAT = -0.75

c) In order to get into the University your SAT score must be in the top 15% of all students. What is the lowest SAT score you can get to be accepted?

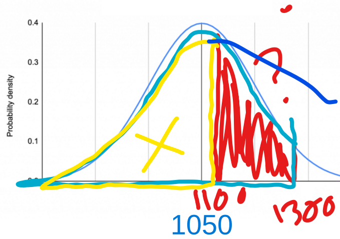
qnorm(p=0.15, mean = 1050, sd = 200, lower.tail = FALSE)

1257.29

d) What proportion of students score between 1100 and 1300 on the SAT?

pnorm(q=1300, mean = 1050, sd = 200) = 0.89435

pnorm(q=1100, mean = 1050, sd = 200) = 0.5987



1050

0.8944-0.5987

29.56%

Part 4: Standardization

The weight of male elephants follows a normal distribution with an average of 9,000 pounds and standard deviation of 1,300 pounds. The weight of female elephants follows a normal distribution with an average of 7,000 pounds and standard deviation of 1,000 pounds.

- Mabu is a male elephant that weighs 13,015 pounds.
- Nandi is a female elephant that weighs 3,585 pounds.

Whose weight is more extreme?

Mabu $\dfrac{13015 - 9000}{1300} = 3.088$

Nandi

Nandi $\dfrac{3585 - 7000}{1000}$ -3.4