Homework 13-4 Answers

1. a. 0.9699
   b. 0.0778
   c. 0.3483
   d. 0.6772
   e. 0.1973

2. a. 0.0228
   b. 0.4515

3. a. 0.220; ~3353 students
   b. 0.080; ~1219 students

4. 0.059

Name Key

Algebra 2 Homework 13-4

1. Find

   a. the area to the left of z = 1.88. 

Prob = .9699

   b. the area to the right of z = 1.42. .0778

   c. the area to the left of z = -0.39. .3483

   d. the area to the right of z = -0.46. .6772

   e. the area between z = -1.22 and z = -0.5. .1973

2. SAT scores were originally scaled so that the scores for each section were approximately normally distributed with a mean of 500 and a standard deviation of 100. Assuming that this scaling still applies, use **z-scores and your calculator** to find the probability that a randomly selected SAT student scores

   a. more than 700.

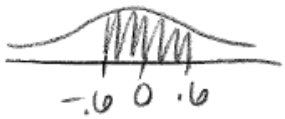
$z = \frac{700-500}{100} = 2$

Prob = .0228

   b. between 440 and 560.

$z = \frac{440-500}{100} = -.6$

$z = \frac{560-500}{100} = .6$

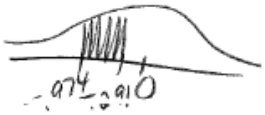


Prob = .4515

3. In 2012 the mean SAT math score was 514 and the standard deviation was 117. For the purpose of this question, assume that the scores were normally distributed. Using a **graphing calculator**, find the probability (rounded to the nearest thousandth) that a randomly selected SAT math student in 2012 scored

a. between 400 and 480.

$z = \frac{400-514}{117} = -.974$ $z = \frac{480-514}{117} = -.291$



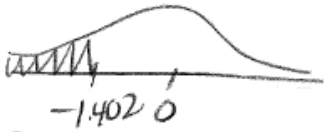
Prob = .220

If there were 15,245 students taking the test, how many scored between 400 and 480?

15245(.220) = 3353.9 ~ 3353 students

b. less than 350.

$z = \frac{350-514}{117} = -1.402$



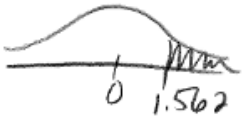
Prob = .080

If there were 15,245 students taking the test, how many scored less than 350?

15245(.080) = 1219.6 ~ 1219 students

4. A farmer has 625 female adult sheep. The sheep have recently been weighed. The weights of the 625 sheep have mean 174.21 pounds and standard deviation 10.11 pounds. For a normal distribution with this mean and standard deviation, what is the probability that a randomly selected sheep has a weight of at least 190 pounds? (Round your answer to the nearest thousandth.)

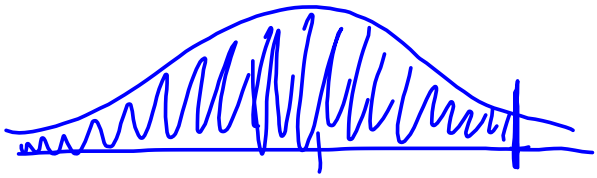
$z = \frac{190-174.21}{10.11} = 1.562$



Prob = .059

Normal Distribut
& Z-Scores in Reverse

What if you're given the percent below or above a specific value and you need to find the value, mean or standard deviation?

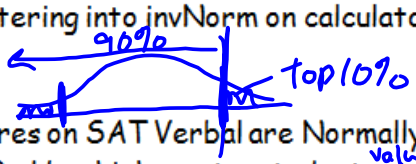


Answer: You work backwards!

You will be using the invNorm function:

2nd-->vars-->3:invNorm(percent as a decimal BELOW a specific value)

- invNorm tells you the z-score that corresponds to a percent BELOW a value
  - If they tell you a percent ABOVE a value, you have to subtract it from 1 before entering into invNorm on calculator



Example 1: Scores on SAT Verbal are Normally Distributed with a mean of 505 and a standard deviation of 110. How high must a student score (value) to be in the ~~top 10%~~?

Bottom 10%

$z = \text{invnorm}(.10) = -1.2816$

$z = \frac{\text{Value} - \text{mean}}{SD}$

$\frac{-1.2816}{1} = \frac{X - 505}{110}$

$-140.976 = X - 505$

$364.029 = X$

364 or less to be in the bottom 10%

Top 10% (90% below)

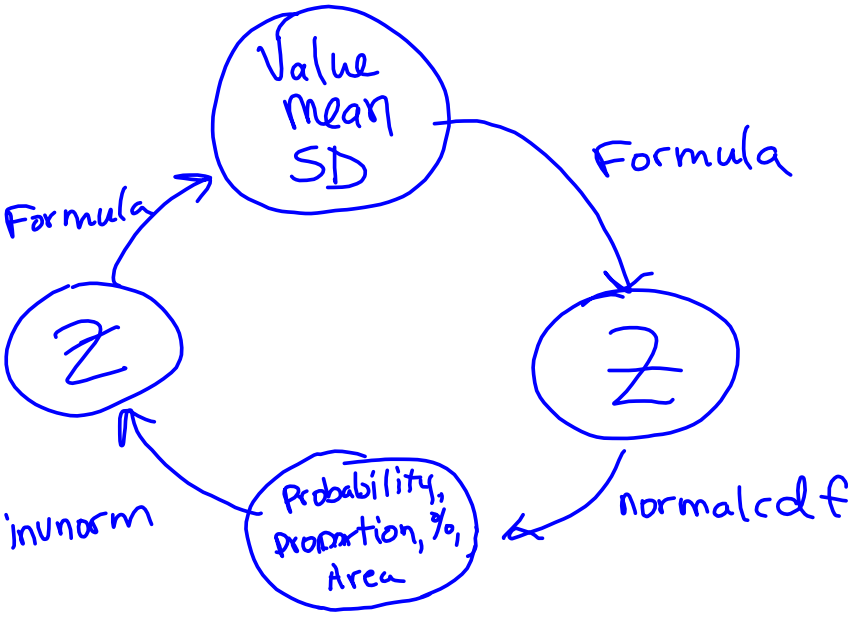
$z = \text{invnorm}(.90) = +1.2816$

$\frac{1.2816}{1} = \frac{X - 505}{110}$

$140.976 = X - 505$

$645.976 = X$

at least 646 to be in top 10%


Value
mean
SD
Formula
Z
normalcdf
Probability,
Proportion, %,
Area
invnorm
Z
Formula

Example 2: Given a normal distribution of σ = 10, what is the mean if 21% of values are below 50?

SD

$\bar{x}$

Value

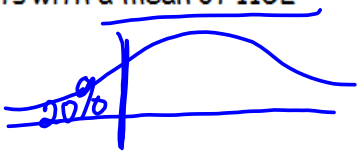
$$z = \text{invnorm}(.21) = \frac{50 - \bar{x}}{10}$$

$$-.8064 = \frac{50 - \bar{x}}{10}$$

$$-8.064 = 50 - \bar{x}$$

$$\bar{x} = 58.064$$

Example 3: Based on a Normal distribution model of Angus steer weights with a mean of 1152 lbs and a standard deviation of 84 lbs...



a. what is the cutoff value for the lowest 20% of the weights?

$z = \text{invnorm}(.20) = -.8416$

$-.8416 = \frac{x-1152}{84}$ → $-70.6944 = x - 1152$

$x = 1081.3056$ lbs.

b. what weight represents the 99th percentile?

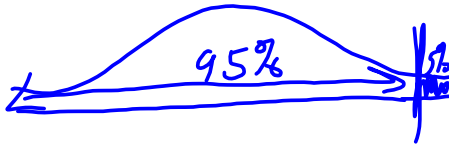
$z = \text{invnorm}(.99) = 2.3263$

$2.3263 = \frac{x-1152}{84}$

$x = 1347.4092$ lbs.

Example 4: Based on a Normal distribution model of IQs with mean 100 and standard deviation of 16....

a. what cutoff value will be the highest 5% of all IQs?

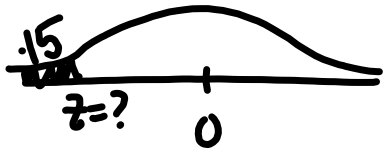


$z = \text{invnorm}(.95) = 1.6449$

$1.6449 = \frac{X - 100}{16}$

$X = 126.3184$

b. what IQ represents the 15th percentile?



$z = \text{invNorm}(.15) = -1.0364$

$-1.0364 = \frac{X - 100}{16}$

$-16.5824 = X - 100$

$83.4176 = X$