Sunday, November 25, 2018
5:38 PM

Statistics Honors Normal Calculations (Day 9) Name KEY _____

Review NORMAL CALCULATIONS #1

Construct all graphs and answer all questions in your HW notebook...
label this assignment as ***Normal Calculations Review #1***

1. A study investigated the effect of car speed on accident severity. As part of the study, the vehicle speed at impact was extracted from a sample of 6000 accident reports of fatal automobile accidents. Analysis revealed that vehicle speed at impact could be described by a normal distribution with mean $\mu = 44$ mph and standard deviation $\sigma = 14$mph.

a. Draw a normal curve that represents the speed at impact for fatal accidents. Be sure to add appropriate scaling to the horizontal axis. (For example, use the information on mean and standard deviation to mark the center of the curve and indicate its spread.)

Use the Empirical Rule to answer parts (b) – (d).

b. Approximately what proportion of vehicle speeds were between 30 mph and 58 mph?

c. Approximately what proportion of vehicle speeds were less than 30 mph?

d. Approximately what proportion of vehicle speeds exceeded 72 mph?

2. A teacher gives two different statistics tests, but one is harder than the other. Scores on test A have mean 78 and standard deviation 6, and scores on test B have mean 65 and standard deviation 9. Carrie scored 79 on test B and Pat scored 85 on test A. Who had the higher standardized score? Justify your response.

3. The Army finds that the head sizes (forehead circumference) of soldiers vary according to the Normal distribution with mean $\mu = 22.8$ inches and standard deviation $\sigma = 1.1$ inches.

a. What proportion of solders have head size at least 21 inches? Explain how to use Table A to answer this question. Then verify your answer using your graphing calculator.

b. What proportion of soldiers have head size between 21 inches and 23 inches. Explain how to use Table A to answer this question. Then verify your answer using your graphing calculator.

4. Assume that in recent years the arrival time (in days since the spring equinox) for Blackpoll Warblers at Manomet Center for Conservation Sciences follows a normal distribution with mean $\mu =$ 67 and standard deviation $\sigma = 5.5$. a. Sketch a normal curve that represents the arrival time of Blackpoll Warblers passing through Manomet. Add an appropriate scale to the horizontal axis that uses the mean and standard deviation.

a. What percentage of Blackpoll Warblers passing through Manomet Center arrived before day 60?

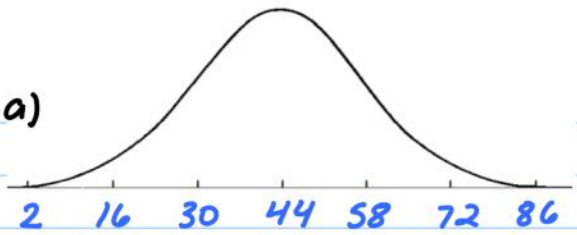
b. What percentage of Blackpoll Warblers arrived after day 70?

c. What percentage of Balckpoll Warblers arrived between day 60 and day 70?

CW/HW Chapter 2 Normal Calculations (day 9)

N(44, 14)

1) a)



b. This interval represents the data values that fall within one ***standard deviation*** of the mean. Using the ***68-95-99.7% Rule***, the percentage would be 68%. Thus, the proportion is

c. To find the proportion of speeds that are below 30 mph or above 58 mph, subtract 0.68 from 1: 1 – 0.68 = 0.32. The proportion of speeds that are below 30 mph is half this amount: 0.32/2 = 0.16.

d. The speed of 72 mph is two ***standard deviations*** from the mean of 44. We know that roughly 0.95 of the speeds fall within two ***standard deviations*** from the mean. Hence, 0.05 of the speeds fall beyond two ***standard deviations*** from the mean. Roughly 0.05/2 or 0.025 of the speeds exceeded 72 mph.

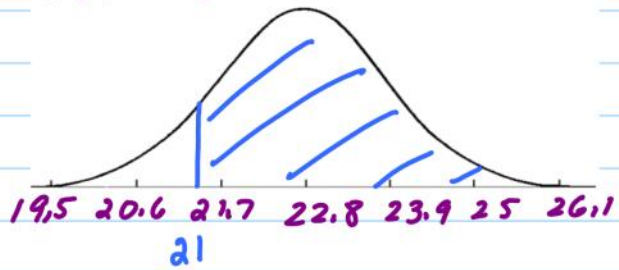
2. Carrie's ***standardized score*** on test B is z = (79 – 65)/9 = 1.56;
Pat's ***standardized score*** on test A is z = (85 – 78)/6 = 1.17.

Carrie has the higher ***standardized score***. If both tests cover the same material and both were taken by similar groups of students, then Carrie did better than Pat because her score is higher relative to the overall distribution of scores.

3a. Convert 21 inches into a ***standardized value***: z = (21 – 22.8)/1.1 ≈ - 1.64.
Using the ***standard normal table*** we get a proportion of 0.0505 soldiers with head sizes below the one observed.
That means that 1 – 0.0505, or a proportion of 0.9495, or 94.95% of soldiers has sizes above 21 inches.

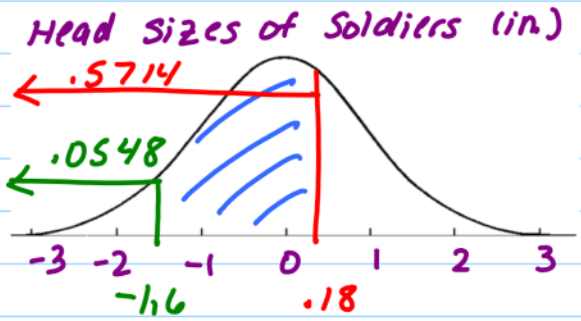
Using a graphing calculator, we do not have to first convert to a z-score. The result is slightly more accurate because we did not round a ***z-score*** to two decimals.

Head Sizes of Soldiers (in.)



N(22.8, 1.1)
normalcdf (min, max, μ, σ)
normalcdf (21, 10000, 22.8, 1.1)
= .9491

b. What proportion of soldiers have head size between 21 inches and 23 inches. Explain how to use a standard normal table to answer this question. Then verify your answer using technology.

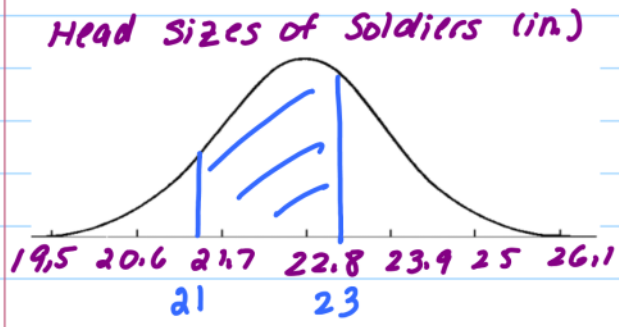


$z = \frac{x-\mu}{\sigma}$

$z = \frac{21-22.8}{1.1} = -1.64$

$z = \frac{23-22.8}{1.1} = .18$

$.5714 - .0548 = .5166$



$N(22.8, 1.1)$

normalcdf (min, max, μ, σ)

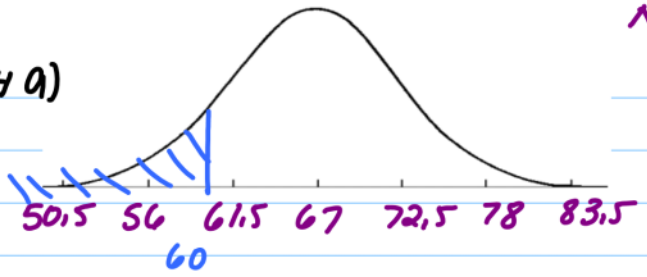
normalcdf (21, 23, 22.8, 1.1)

$= .5213$

Arrival Time for Blackpoll Warblers

N(67, 5.5)

4a)



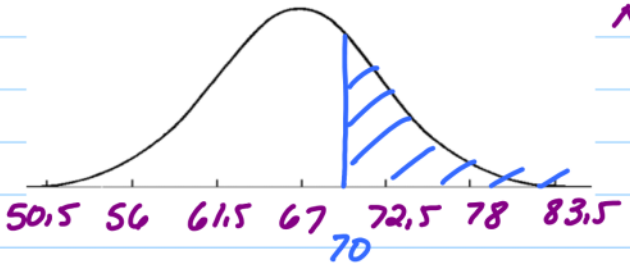
normalcdf (min, max, μ, σ)

normalcdf (-100, 60, 67, 5.5) = .1016 = 10.16 %

Around 10.16% of the Blackpoll Warblers arrived before day 60.

4b) Arrival Time for Blackpoll Warblers

N(67, 5.5)



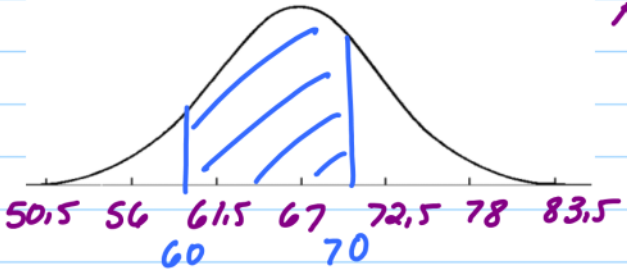
normalcdf (min, max, μ, σ)

normalcdf (70, 1000, 67, 5.5) = .2927 = 29.27%

Around 29.27% of the Blackpoll Warblers arrived after day 70.

4c) Arrival Time for Blackpoll Warblers

N(67, 5.5)



normalcdf (min, max, μ, σ)

normalcdf (60, 70, 67, 5.5) = .6057 = 60.57%

Around 60.57% of the Blackpoll Warblers arrived between days 60 & 70.