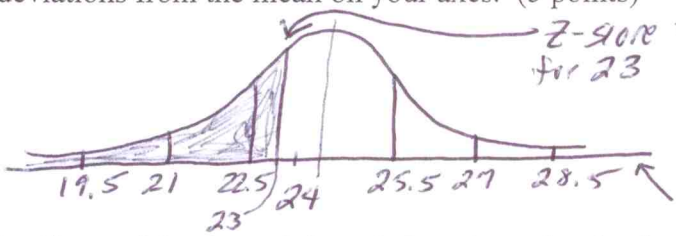
Pledge:

2/8/05 MATH 271 - Applied Stats Name: Solution
Dr. Lunsford Quiz 3 (20 points possible)

Please show all work (including how you use your calculator). Remember that pictures are great for communicating ideas!

A candy maker claims that the weight of their special candy bar (in grams) is normally distributed with mean 24.00 grams and standard deviation 1.5 grams. Please use this information to answer the following questions:

1. Draw a sketch of the distribution of the candy bar weights. Clearly label your axes. You should show the mean weight and the values of weights at ±1, ±2, and ±3 standard deviations from the mean on your axes. (5 points)



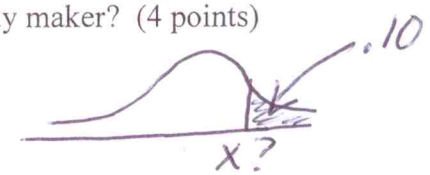
2. If one of these special candy bars is randomly chosen, then what is the probability that the weight of the candy bar will be at most 23 grams? Please represent this probability on your graph above. (4 points) Let X be the weight of a randomly chosen candy bar. We want $P(X \le 23) = .2525$ (using normalcdf(-1E99, 23, 24, 1.5)).

3. What candy bar weight corresponds to a z-score of 1.73? (3 points)

$24 + 1.73(1.5) = 26.595$ grams
(mean + z-score (std dev.))

4. What is the minimum weight for a candy bar to be considered among the top 10% (in terms of weight) of all special candy bars produced by this candy maker? (4 points)

$X = \text{invNorm}(.9, 24, 1.5)$
$= 25.922$ grams



5. If 9 special candy bars are randomly selected, then what is the probability that the *average weight of those 9 candy bars* will be at most 23 grams? Compare this probability to the one you computed in Problem 2 above (i.e. is it larger, smaller, etc). Why does your answer make sense? (4 points)

$P(\bar{X} \le 23) = .02275$ (using normalcdf(-1E99, 23, 24, 0.5))
$\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} = \frac{1.5}{\sqrt{9}}$

The probability is smaller. This makes sense b/c $\bar{X}$ has a smaller stand. dev. & thus 23 is further from the mean.

Bonus: Suppose you randomly select 9 of these special candy bars from a grocery store shelf and find the average weight of these 9 bars to be 22.5 grams. What do you think about the candy maker's claim about the average weight of these candy bars? (2 points)

22.5 is 3 std devs from the mean. If the claim is true, then the likelihood of getting data this extreme is less than a 2% chance (see 5.) Thus this casts doubt on the manufacture's claim.

Note: $P(\bar{X} \le 22.5) = .00135$

Distribution of $\bar{X}$ w/ $n = 9$
Average weights for samples of size 9.
$z = \frac{23-24}{1.5}$
23 22.5 23.5 24