

Statistics 101 – Homework 3

Solution

Assignment:

1. Do the following problems from the text, *Intro Stats*, 3rd Edition. If you have an earlier edition of the text, check with someone who has the 3rd Edition to make sure you do the correct problems.

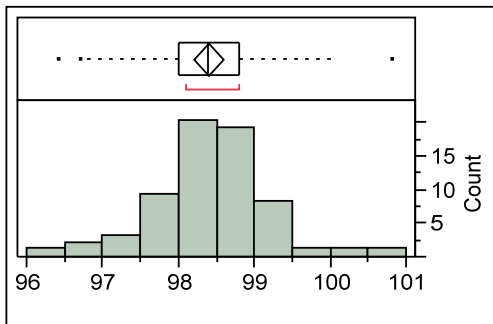
- Chapter 5 – problems 5, 6, 19 and 24
- Chapter 6 – problems 3, 7, 9, 12, 27, 28, and 51

If you have questions about the solutions to these problems, see your instructor.

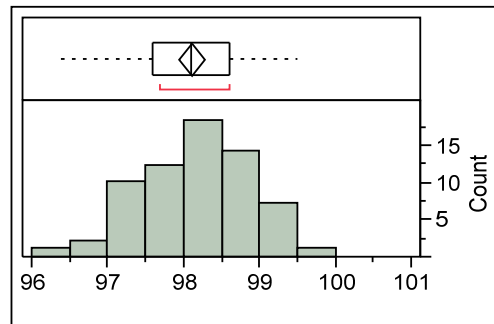
2. Most people believe that a “normal” body temperature is 98.6 °F. Go to the link on www.stat.iastate.edu/courses/ for (all) sections of Stat 101 to find a JMP data table for body temperatures of 65 males and 65 females.

a) Use Analyze – Distribution to create histograms and numerical summaries of the samples of male and female body temperatures. Use Fit Y by X to display a comparison of Body Temperature for the two Genders. Include box plots in your display. Turn in the output from JMP with your homework and use it to answer the following questions.

Female Body Temperature



Male Body Temperature



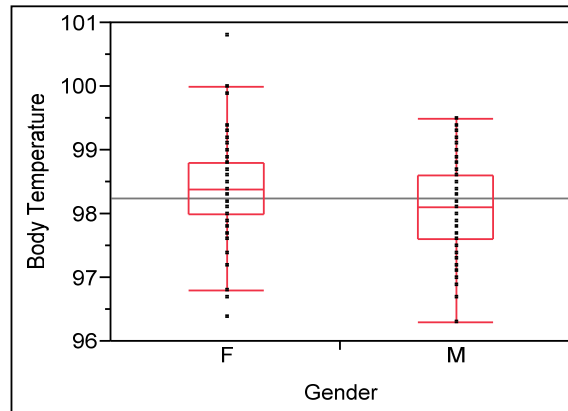
Female Body Temperature

100.0%	maximum	100.8
75.0%	quartile	98.8
50.0%	median	98.4
25.0%	quartile	98
0.0%	minimum	96.4
	Mean	98.393846
	Std Dev	0.7434878
	N	65

Male Body Temperature

100.0%	maximum	99.5
75.0%	quartile	98.6
50.0%	median	98.1
25.0%	quartile	97.6
0.0%	minimum	96.3
	Mean	98.104615
	Std Dev	0.6987558
	N	65

Oneway Analysis of Body Temperature By Gender



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
F	65	98.3938	0.743488	0.09222	98.210	98.578
M	65	98.1046	0.698756	0.08667	97.931	98.278

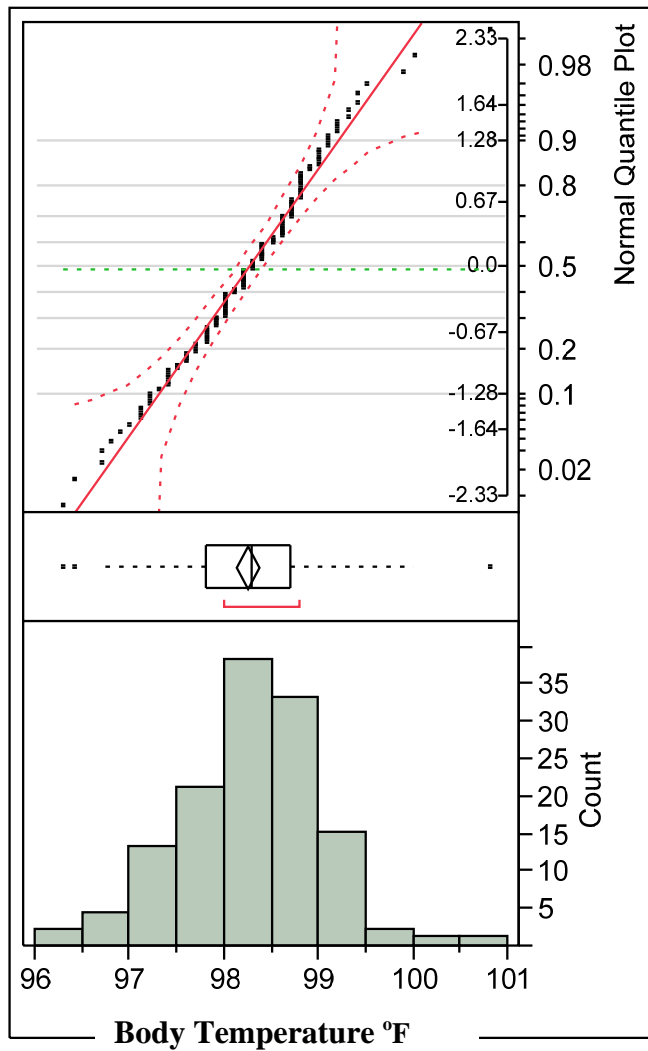
- b) Compare male body temperatures to those of females. Be sure to comment on shape, center, spread and if there are any outliers for either gender.

The distributions of both male body temperatures and female body temperatures are symmetric and mounded in the middle. Females have a slightly higher average temperature (98.4 °F) compared to males (98.1 °F). Females temperatures are also a little more variable (std dev = 0.74 °F) compared to males (std dev = 0.70 °F). There are outliers, high and low, for females but no outliers for males.

- c) Use Analyze – Distribution to create a histogram, box plot, and normal quantile plot for the combined sample of male and female body temperatures. Turn in the output from JMP with your homework and use it to answer the following questions.
- d) Does a normal model seem reasonable for describing body temperatures? Explain briefly.

The histogram shows a symmetric distribution that is mounded in the middle. The box plot is symmetric with the mean and median virtually the same. There are a few outliers, two on the low side and one on the high side. The normal quantile plot shows the data points following the diagonal line that represents a normal model.

The comments above indicate that a normal model is reasonable for describing body temperatures.



3. Use a normal model with mean of 98.2 °F and a standard deviation of 0.7 °F to answer the following questions.

a) What proportion of body temperatures are less than or equal to 98.6 °F?

$$z = \frac{y - \mu}{\sigma} = \frac{98.6 - 98.2}{0.7} = \frac{0.4}{0.7} = 0.57$$

z 0.00 0.01 0.02 0.03 0.04 0.05 0.06 **0.07** 0.08 0.09



0.5 —————> **0.7157**

71.57% of body temperatures are less than or equal to 98.6 °F

b) What proportion of body temperatures are greater than 100 °F?

$$z = \frac{y - \mu}{\sigma} = \frac{100.0 - 98.2}{0.7} = \frac{1.8}{0.7} = 2.57$$

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	
2.5	—————→							0.9949			

99.49% of body temperatures are less than or equal to 100 °F, therefore 0.51% of body temperatures are greater than 100 °F.

c) Compute the “normal range” i.e. the values that contain the central 95% of body temperatures.

The central 95% of body temperatures will be within 2 standard deviations of the mean.

$$98.2 - 2(0.7) = 98.2 - 1.4 = 96.8 \text{ °F}$$

$$98.2 + 2(0.7) = 98.2 + 1.4 = 99.6 \text{ °F}$$

d) Compute the cutoff such that 2% of body temperatures are greater than this cutoff.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	
2.0	←————					0.9798	0.9803				

$$z = \frac{y - \mu}{\sigma} \Rightarrow 2.05 = \frac{y - 98.2}{0.7}$$

$$y = 2.05(0.7) + 98.2 = 99.635 \text{ °F}$$