The warmest November...

Make sure you've got access to the spreadsheet with historical daily temperatures T!

1. Calculate the mean of the historical daily max temperatures for November 8. Write it down. Do the same for historical daily minimum temperatures.

2. What's the median maximum temperature for this day? Median minimum temperature?

3. Make a histogram of the daily max and daily min temperatures on your spreadsheet. Put them next to each other to compare the two distributions. Notice the differences in the axes: do the axes make it easier or harder to compare the two data sets?

   If you're feeling artistic, you can hand-draw a nice version of this. Choose your bin sizes so that it's not too much work.

4. Do these look like uniform distributions? Normal distributions? Do you know? Discuss! Especially pay attention to the bin sizes you are using – as these change, your impression of the data may change.

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5. Let's model maxes and mins using a normal distribution. You know the mean μ_{max} and the mean μ_{min}, but now you need to find the standard deviations. Find these in the following way:

   (a) Create a column with entries $T_{max} - \mu_{max}$. These are the differences from the mean for the maxes. Do the equivalent for minima.

   (b) Create a column with entries $(T_{max} - \mu_{max})^2$, squared differences from the mean. Do the equivalent for minima.

   (c) Then find the average of the column with entries $(T_{max} - \mu_{max})^2$. This is your variance $\sigma^2_{\max}$. Do the equivalent for mins.

   (d) Given the variance, what's the standard deviation σ_{max}? What is σ_{min}?

   Ok – you now can work with normal distributions $\mathcal{N}(\mu, \sigma^2)$ and you know μ and σ for both maxima and minima.

6. Given the model for the minimum temperature using the normal distribution, can you find $P(T_{min} > 40)$ for this day? You'll need to standardize and use a z-table.

7. The actual maximum temperature on November 8, 2015, was 59 Fahrenheit. What is $P(T_{max} > 59)$ according to your model?