Making a histogram by hand:

Each student should know how to construct a histogram by hand. The steps are illustrated in Example 1.4. If looking at that example does not make it completely clear to you how to construct a histogram, and how the histogram shows the shape of the data, then you should practice it by doing a problem like this.   The data table is given at the end of this document.

Problem: How long must you travel each day to get to work or school? The table gives the average travel time to work for workers in each state who are at least 16 years old and don't work at home. Make a histogram of the travel times using classes of width 2 minutes starting at 15 minutes. (Make this histogram by hand even if you have software, to be sure you understand the process. You may then want to compare your histogram with your software's choice.)

Solution:

   Pay attention specifically to each of these steps.

- Look over the data to see the smallest and largest observations, so you know what range you need on your horizontal axis.

- Decide on a reasonable "bin size" and start it at a reasonable number. Here they tell you to use a bin size of 2 and start it at 15.   An example of unreasonable choices would be to use a bin size of 3.4 and start it at 14.7. That's a joke! Probably you wouldn't choose something like that. But the point is to choose something that makes the resulting graph easy to read.

- Write your classes, with some room beside each one. (Each observation should fit into exactly one category. For observations exactly on an endpoint, make some reasonable decision about whether you'll put it into the lower interval or the upper interval and then do it consistently for the entire histogram.)

- Start through the data, making a tally mark for each observation in the correct class.

- When you are finished, count your tally marks so that you know the frequency for each class. (The number of observations in that interval is the frequency for that class.)

- Look at the endpoints of your bins and your lowest and highest frequencies and let that guide you about how to make the scales along the horizontal and vertical axes.

- Draw your histogram, with your bins along the horizontal axis and your frequencies up the vertical axis.

Result:

This tally is only partially done, in order to illustrate how you should do it. I filled in the tally marks for Alabama through Colorado. You should continue that. When you finish putting a tally mark for every state, then count them and fill in the count column.

Classes	Tally	Count
$15.0 \leq$ observation < 17	etc.	4
$17.0 \leq$ observation < 19	| etc.	4
$19.0 \leq$ observation < 21	| etc.	7
$21.0 \leq$ observation < 23	| | etc.	13
$23.0 \leq$ observation < 25	| etc.	14
$25.0 \leq$ observation < 27	| etc.	4
$27.0 \leq$ observation < 29	etc.	3
$29.0 \leq$ observation < 31	etc.	2
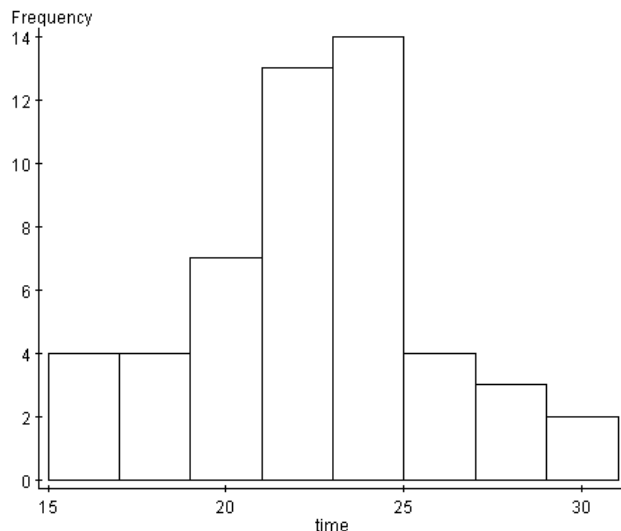
Original data:

state	time				
Alabama	22.7	Massachusetts	26	Texas	23.7
Alaska	18.9	Michigan	22.7	Utah	19.7
Arizona	23.4	Minnesota	21.7	Vermont	20.3
Arkansas	19.9	Mississippi	21.6	Virginia	25.8
California	26.5	Missouri	23.3	Washington	24.8
Colorado	22.9	Montana	16.9	WestVirginia	24.7
Connecticut	23.6	Nebraska	16.5	Wisconsin	20.4
Delaware	22.5	Nevada	21.8	Wyoming	17.5
DistColumbia	28.4	NewHampshire	24.6		
Florida	24.8	NewJersey	28.5		
Georgia	26.1	NewMexico	19.4		
Hawaii	24.5	NewYork	30.4		
Idaho	19.5	NorthCarolina	23.2		
Illinois	27	NorthDakota	15.4		
Indiana	21.2	Ohio	22.1		
Iowa	18.1	Oklahoma	19.1		
Kansas	17.5	Oregon	21		
Kentucky	22.1	Pennsylvania	23.8		
Louisiana	23.3	RhodeIsland	21.8		
Maine	22.6	SouthCarolina	23		
Maryland	30.2	SouthDakota	15.2		
		Tennessee	23.4		