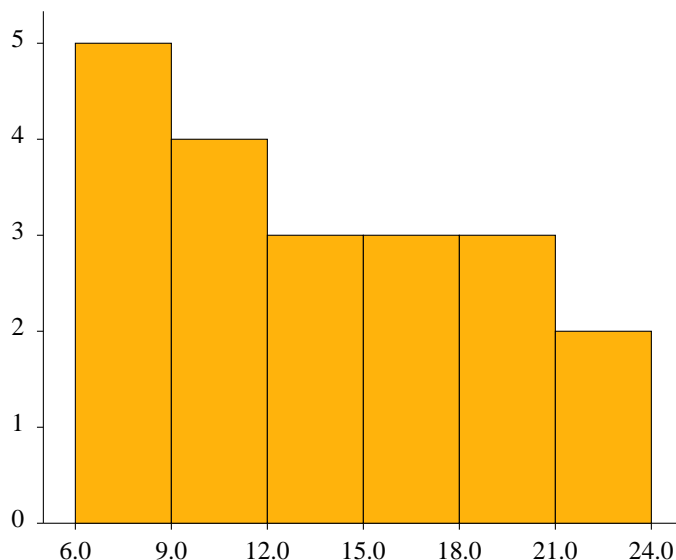


1. (12 pts)

- (a) (8 pts) A good choice is to have 6 classes each of width 3.0. Other choices are possible, but do not use fewer than 5 classes. In this example, with only 20 data points, it would be good not to use more than about 8 classes, either. To draw the histogram, we must first get the frequencies for each class.

Class	Frequency
6.0 - 8.9	5
9.0 - 11.9	4
12.0 - 14.9	3
15.0 - 17.9	3
18.0 - 20.9	3
21.0 - 23.9	2

Now draw the histogram.

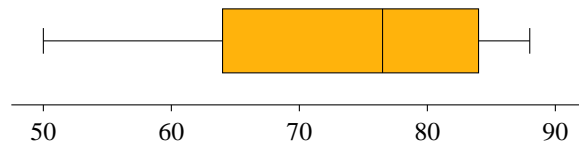


- (b) (4 pts) The distribution is unimodal and skewed right.
2. (30 pts) Enter the data into your TI-83. Enter Prof. Smith's data into list L_1 and Prof. Jones's data into list L_2 .
- (a) (5 pts) Enter **1-Var-Stats** L_1 into the TI-83. In the display, $\bar{x} = 73.7$ is the mean and **Med** = 76.5 is the median.
- (b) (5 pts) In the same display, read the sample standard deviation as **Sx** = 12.31. The sample variance is not displayed, but it is the square of the sample standard deviation. So calculate $s^2 = (12.31)^2 = 151.57$.

- (c) (5 pts) The five-number summary is also in the display, at the bottom. (You might have to re-enter **1-Var-Stats L₁**).

Min = 50
 Q₁ = 64
 Med = 76.5
 Q₃ = 84
 Max = 88.

- (d) (6 pts) This is a regular boxplot, not a modified boxplot, so we do not consider outliers.



- (e) (3 pts) Based on the boxplot, it appears that the scores are unimodal and skewed left. That is because the lengths of the four sections get ever longer as we move from right to left, meaning that the data are more clustered to the right and sparser to the left.
- (f) (3 pts) The formula is $z = \frac{x - \bar{x}}{s}$. We have already found \bar{x} and s in parts (a) and (b).

$$z = \frac{77 - 73.7}{12.31} = \frac{3.3}{12.31} = 0.2681.$$

- (g) (3 pts) We need to find \bar{x} and s for Prof. Jones's class. Using **1-Var-Stats L₂** (assuming the data are in L₂), we get $\bar{x} = 82.5$ and $s = 10.92$. So

$$z = \frac{78 - 82.5}{10.92} = -\frac{4.5}{10.92} = -0.4121.$$

3. (16 pts) For each of (a), (b), and (c), use **normalcdf**. For (d), use **invNorm**.

- (a) (4 pts) **normalcdf**(-E99, 1.34) = 0.9099.
 (b) (4 pts) **normalcdf**(0.63, E99) = 0.2643.
 (c) (4 pts) **normalcdf**(-282, 1.282) = 0.8002.
 (d) (4 pts) **invNorm**(.60) = 0.2533.

4. (16 pts) In parts (a) and (b), use **normalcdf**. In part (c), use **invNorm**. In this case, the distribution is not *standard* normal, so we must enter the mean (500) and the standard deviation (100) as the third and fourth parameters.

- (a) (6 pts) **normalcdf**(600, E99, 500, 100) = 0.1587.
 (b) (4 pts) **normalcdf**(650, 680, 500, 100) = 0.0309.

- (c) (6 pts) The point that cuts off the top 10% is also the point that cuts off the bottom 90%, so we want the 90th percentile of this distribution. $\text{invNorm}(0.90, 500, 100) = 628$.

5. (16 pts)

- (a) (8 pts) The Central Limit Theorem says that the mean of \hat{p} is p , which is 0.065 if H_0 is true. It also says that the standard deviation of \hat{p} is $\sqrt{\frac{p(1-p)}{n}}$, which is

$$\sqrt{\frac{(0.065)(0.935)}{2000}} = 0.005512.$$

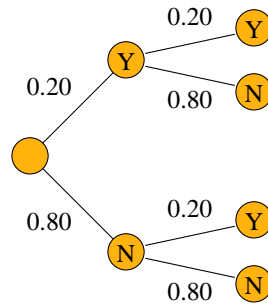
Lastly, it says that \hat{p} has a normal distribution provided $np \geq 5$ and $n(1-p) \geq 5$, which are both the case in this problem. In summary, \hat{p} is $N(0.065, 0.005512)$.

- (b) (5 pts) The p -value of 0.076 is the probability of observing a value as extreme as 0.076 if $p = 0.065$. So the p -value is

$$\text{normalcdf}(0.076, E99, 0.065, 0.005512) = 0.02299.$$

- (c) (3 pts) The results are significant. That is because the p -value (0.02299) is less than the level of significance (0.05).

6. (10 pts) Here is the tree diagram, where Y means strongly approve and N means does not strongly approve:



From this we can calculate the distribution. The YY outcome has probability $(0.2)(0.2) = 0.04$, the YN outcome has probability $(0.2)(0.8) = 0.16$, the NY outcome has probability $(0.8)(0.2) = 0.16$, and the NN outcome has probability $(0.8)(0.8) = 0.64$. We lump YN and NY together because we are counting only the number of Y's and both of those outcomes have one Y. Here is the distribution.

\hat{p}	Prob.
0	0.64
1/2	0.32
1	0.04