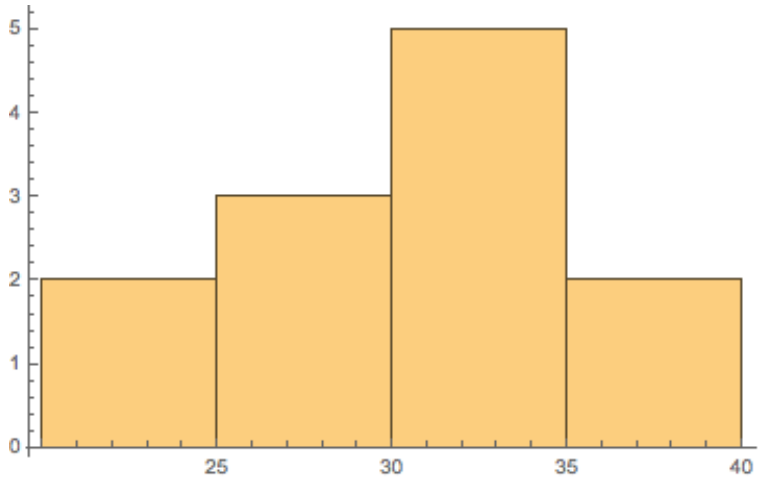
Name: *Caleb McWhorter — Solutions* **MAT 121**
Summer 2018 **Lab 5**

Problem 1: Make a histogram for the following frequency table. What are the lower and upper class limits? What are the class midpoints? What are the class boundaries? What is the class width?

Weight (lb)	Number Pumpkins
20–24	2
25–29	3
30–34	5
35–39	2



Lower Class Limits: 20, 25, 30, 35
Upper Class Limits: 24, 29, 34, 39
Class Boundaries: 19.5, 24.5, 29.5, 34.5, 39.5
Class Midpoints: 22, 27, 32, 37
Class Width: 5

Problem 2: For the data below, give the 5-number summary. Also, compute the mode, range, midrange, mean, and standard deviation.

$$3,\ 8,\ 8,\ 9,\ 10,\ 12,\ 13,\ 13,\ 13,\ 16$$

Min	Q_1	Median	Q_3	Max
3	8	11	13	16

$$\begin{aligned}
\textit{Mode} &= 13 \\
\textit{Range} &= 16 - 3 = 13 \\
\textit{Midrange} &= \frac{3+16}{2} = 9.5 \\
\textit{Mean} &= \frac{3+8+8+9+10+12+13+13+13+16}{10} = \frac{105}{10} = 10.5
\end{aligned}$$

x	$x - \overline{x}$	$(x - \overline{x})^2$
3	-7.5	*56.25*
8	-2.5	*6.25*
8	-2.5	*6.25*
9	-1.5	*2.25*
10	-0.5	*0.25*
12	*1.5*	*2.25*
13	*2.5*	*6.25*
13	*2.5*	*6.25*
13	*2.5*	*6.25*
16	*5.5*	*30.25*
		Total: 122.5

$$\begin{aligned}
\sigma^2 &= \frac{1}{n-1}\sum (x - \overline{x})^2 \\
\sigma^2 &= \frac{1}{9} \cdot 122.5 \\
\sigma^2 &= 13.6111 \\
\sigma &= \sqrt{13.6111} \approx 3.69
\end{aligned}$$

Problem 3: In a certain city, 85% of the households have cable TV. Suppose 15 households are chosen at random from the city.

(a) What is the probability that exactly 13 of the chosen households have cable TV?

$$ {}_{15}C_{13}\ (0.85)^{13}\ (0.15)^{2} = 0.2856 $$

(b) What is the probability that 13 or more of the chosen households have cable TV?

$$ P(N = 13) + P(N = 14) + P(N = 15) = 0.2856 + 0.2312 + 0.0874 = 0.6042 $$

(c) What is the probability that at least one household has a cable TV?

$$ 1 - P(N = 0) = 1 - 0. = 1.0 $$

Problem 4: The average commute time in an area are known to be normally distributed. A random sample of 19 people's commute time has a mean of 55.3 min with a sample standard deviation of 14.9 min. Find a 90% confidence interval for the mean commute time in the city.

$$ \overline{x} \pm t_{\alpha/2}\ \frac{s}{\sqrt{n}} $$

$$ 55.3 \pm 1.734\ \frac{14.9}{\sqrt{19}} $$

$$ 55.3 \pm 5.93 $$

$$ (\ 49.37,\ 61.23\ ) $$

Problem 5: A researcher wants to estimate the proportion of people who support a local ordinance bill in a certain city. The researcher wants to make a 99% confidence interval for the proportion and wants the error to be at most 0.01. No prior estimate of the proportion is available. What sample size should be used to make the confidence interval?

$$
\begin{aligned}
n &= \left\lceil \frac{z_{\alpha/2}^2 \cdot 0.25}{E^2} \right\rceil \\
n &= \left\lceil \frac{2.575^2 \cdot 0.25}{0.01^2} \right\rceil \\
n &= \left\lceil \frac{1.65766}{0.0001} \right\rceil \\
n &= \lceil 16,576.6 \rceil \\
n &= 16,577
\end{aligned}
$$