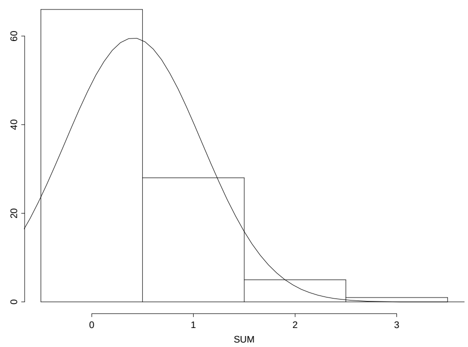
Lab #10 — Partial solutions

Question #1: When I did this, I got

	Theory	Sample
Mean	0.50	0.41
SD	0.67	0.61

Question #2: For my 100 samples of size 5, the histogram of sample sums with the normal curve overlaid looks something like this:

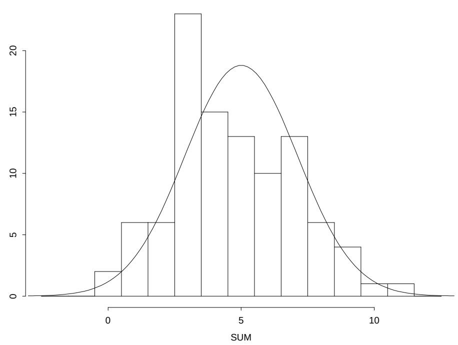


The match between the histogram and the normal curve isn't very good.

Question #3: When I did this, I got

	Theory	Sample
Mean	5.00	4.68
SD	2.12	2.33

Question #4: For my 100 samples of size 50, the histogram of sample sums with the normal curve overlaid looks something like this:



It looks like the histogram still exhibits some right skewing, but the match between the histogram and the normal curve is much better than at $n = 5$.

♣ **Question #5:** Overall, the normal approximation worked better for $n = 50$ than for $n = 5$

♣ **Question #6:**

$$P[X \leq 8] = P\left[\frac{X - \boxed{5.00}}{\boxed{2.12}} \leq \frac{8 - \boxed{5.00}}{\boxed{2.12}}\right]$$
$$= P\left[Z \leq \boxed{1.42}\right]$$

$$\approx \boxed{0.92}$$

where I found the probability using the “CDF” function in Minitab.

Question #7: The histograms of 100 sample averages, for samples of size 1, 5 and 20 are displayed below.

The means and standard deviations of the sets of 100 sample averages that I got are as follows (yours will be similar but not identical).

	$n = 1$	$n = 5$	$n = 20$
Mean of sample means	5.73	6.16	5.81
SD of sample means (SE)	4.37	1.85	1.02

♣ **Question #8:** Generally speaking, the histograms become more normal as the sample size increases. (Note: 20 isn’t really enough for the central limit theorem to “kick in”—it would have been more dramatic to try a sample size of 50 or 100 instead of 20. But still, it seems to be working).

♣ **Question #9:**

$$\begin{aligned} P[\overline{X} \leq 5] &= P\left[\frac{\overline{X} - 5.81}{1.02} \leq \frac{5 - 5.81}{1.02}\right] \\ &= P\left[Z \leq -0.79\right] \\ &\approx 0.21 \end{aligned}$$