Finding Probabilities for the Number of Successes

- Same as with the sample mean, sometimes problems are stated in terms of the number of successes rather than the proportion of successes. In that case we can again use either of two methods. If we use the second method we need to know about the distribution of the sum of the successes.
- If a random sample of size $n$ is selected from a population with proportion of success $p$, then the sampling distribution satisfies:

$$\mu_{\text{sum}} = np$$

$$\sigma_{\text{sum}} = \sqrt{np(1-p)}$$

- the shape of the sampling distribution will be approximately normal if $np$ and $n(1-p)$ are at least 10.

Note: To get the “sum” formulas just multiply by $n$.

Example

- Probability of 30 or More Wearing Seat Belts
  In a random sample of 40 Mississipians, what is the probability that 25 or more use seat belts?

E35

- The ethnicity of about 92% of the population of China is Han Chinese. Suppose you take a random sample of 1000 Chinese. [Source: CIA World Factbook.]
  - a. Make an accurate sketch, with a scale on the horizontal axis, of the sampling distribution of the proportion of Han Chinese in your sample.
  - b. Make an accurate sketch, with a scale on the horizontal axis, of the sampling distribution of the number of Han Chinese in your sample.
  - c. What is the probability of getting 90% or fewer Han Chinese in your sample?
  - d. What is the probability of getting 925 or more Han Chinese?
  - e. What numbers of Han Chinese would be rare events? What proportions?