Summary : SEs

So far: We looked at random samples, and estimated a quantity of interest.

The *expected value* (EV) of these random quantities is what we use as a predictor for our quantity of interest. The value we get from the sample is what we use to estimate the EV, and it will be off due to *chance error*. The ***standard error*** gives us a handle on how far off we are.

All the formulas that we have studied apply to samples drawn at random, with replacement, from a population that is represented using a box model.
Sample size = number of draws.

The basic calculation is the first one that we encountered : the standard error for the *sum of draws*. All the others are derived from this.

Note that if we are drawing without replacement, then the formulas are approximate, but for large population sizes (relative to the sample size), the correction factor is very close to 1.

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1. Basic calculation: We compute the EV and SE for the **sum of draws**

$$\text{EV of sum} = \#\text{ of draws} \times \text{average of box.}$$

$$\text{SE for sum} = \sqrt{\#\text{ of draws}} \times \text{SD of box}$$

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2. If we repeat this computation for a $0 - 1$ box, we get the EV and SE for **count of 1's** in the sample:

$$\text{EV of } \#\text{ of } 1'\text{s in sample} = \#\text{ of draws} \times \text{fraction of } 1'\text{s in box.}$$

$$\text{SE for } \#\text{ of } 1'\text{s in sample} = \sqrt{\#\text{ of draws}} \times \text{SD of } 0 - 1 \text{ box}$$

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3. We can divide the quantities in (1) by the number of draws to get the EV and SE for the **average of the sample**

$$\text{EV of sample average} = \text{average of box.}$$

$$\text{SE for sample average} = \frac{\text{SD of box}}{\sqrt{\#\text{ of draws}}}$$

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4. If we divide the quantities in (2) instead, by the number of draws, then we get the EV and SE for the **percentage of 1s** in the sample.

$$\text{EV of percent of } 1'\text{s in sample} = \text{percent of } 1'\text{s in box}$$

$$\text{SE for percent of } 1'\text{s in sample} = \left(\frac{\text{SD of } 0 - 1 \text{ box}}{\sqrt{\#\text{ of draws}}} \times 100\right)\%$$
