Box Model.

- What numbers go into the box?
- How many of each kind?
- How many draws?

Example: Flip a coin 100 times, win 2$ with a head, loss 1$ with a tail. The net win will be 100 draws randomly with replacement from a box [+2 -1]

Numbers go into each box: +2 -1

How many of each kind: one for each.

How many draws? 100.

Roll a dice 50 times, win 5$ with number 1 on the face, lose 1$ without 1 on the face. The net win 50 draws randomly with replacement from the box [+5 -1 -1 -1 -1 -1]

Numbers go into each box: +5 -1

How many of each kind: one +5, five -1

How many draws? 50

Expected value for the sum of the draws made at random with replacement from a box equals: (number of draws) x (average of box)

Example: Suppose you are going to Las Vegas to play keno. Your favorite bet is a dollar on a single number. When you win, they give you the dollar back and two more. When you lose, they keep the dollar. There is 1 chance in 4 to win.

About how much should you expect to win (or loss) in 100 plays, if you make this bet on each play?

100

+3	-1	-1	-1

Avg. of box: $\frac{3-1-1-1}{4} = 0$.

Expect value = $100 \times 0 = 0$

Standard error for sum.

Standard error for sum of draws $\sqrt{\text{number of draws}} \times (\text{SD of the box})$

Example: 25 draws from the box | 0 2 3 4 6 |

What is the standard error of sum of 25 draws from this box?

SD of the box: $\frac{0+2+3+4+6}{5} = 3.$

$$\sqrt{\frac{(0-3)^2+(2-3)^2+(3-3)^2+(4-3)^2+(6-3)^2}{5}} = \sqrt{\frac{9+1+0+1+9}{5}} = \sqrt{\frac{20}{5}} = \sqrt{4} = 2.$$

Standard error of sum of 25 draws: $\sqrt{25} \times 2 = 10.$