Standard Deviations of "Boxes"

The standard deviation is just the same standard deviation of Chapter 4, in Chapter 17 you are given slightly different or short cut formulas.

Example.

Suppose I have a list:

1, 2, 3, 4, 5

The average is 3, the SD is 1.4142

Suppose I have the list:

1, 1, 2, 2, 3, 3, 4, 4, 5, 5

Guess what, the average is still 3, the SD is still 1.4142. The reason? The relative frequency of the values didn't change…in other words, in the first list, each number represents 1/5 of the list, in the second list, they still represent 1/5 of the list. So if I had a box that looks like this:

1	2	3	4	5
.20	.20	.20	.20	.20

I could treat it in a number of ways (a) recognize that the proportions are the same so it's like a list that is 1, 2, 3, 4, 5 (b) or treat it as if I had 20 1's, 20 2's , 20 3's, 20 4's and 20 5's (c) or some other list that has the same relative frequency like 1,1,2,2,3,3,4,4,5,5

A more complicated box:

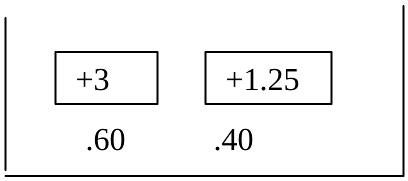
+3	+1.25	-20
.50	.40	.10

How should you treat this? Well, the simplest is probably 3,3,3,3,3,1.25,1.25,1.25,1.25,-20 and calculate an average and SD for this list.

The trick with the boxes is to convert the numbers to a list and work from there.

Boxes with only 2 tickets are simpler, but the same general principles hold.

Suppose I have a box which looks like this:



This is like a list that looks like:

3,3,3,3,3,3,1.25, 1.25, 1.25, 1.25

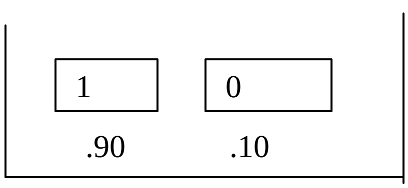
it's Standard Deviation is: .85732

but you can simplify it, according to Freedman (page 298) to

$(3 - 1.25) * \sqrt{.60 * .40}$

and you also get .85732

An even simpler box are "one-zero" boxes:



This is like a list that looks like:

1,1,1,1,1,1,1,1,1,0

it's standard deviation is: .30

but you can simplify it, according to Freedman (page 298) to

$(1- 0) * \sqrt{.90 * .10} =$

and you still get .30 but even more simply

$\sqrt{.90 * .10} = .30$

this is how "one-zero" boxes work.