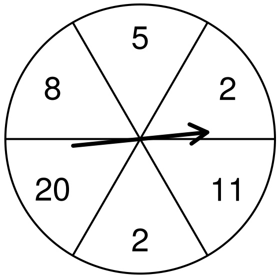
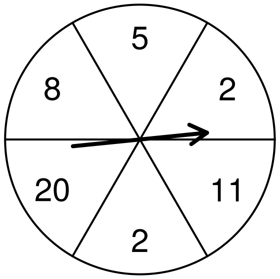
stdevp

Simple spinner (equally sized wedges)

- A simple spinner is split into equally sized wedges.
- As the spinner is the source of the data, it is the "population".
- The symbol for population mean is μ ("mu").
- The symbol for population standard deviation is σ ("sigma").
- In these slides, we will use N (upper case) as the number of equally-sized wedges.
- In these slides, we will use X (upper case) as the list of values on the wedges.



Population mean



From a simple spinner, the population mean can be found by summing the values and dividing by the number of wedges.

$$\mu = \frac{\sum X}{N} = \frac{2+5+8+20+2+11}{6} = 8$$

Population standard deviation

The population standard deviation uses a similar formula as the sample standard deviation, but there is not Bessel correction.

$$\sigma = \sqrt{\frac{\sum (X-\mu)^2}{N}}$$

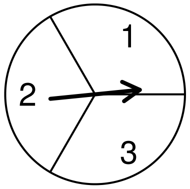
You can just use geogebra...

$$\texttt{stdevp(2,5,8,20,2,11)} = 6.244998$$

(notice the "p" at the end of "stdevp" stands for population)

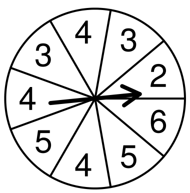
total of 2 spins

Consider the following spinner (X):

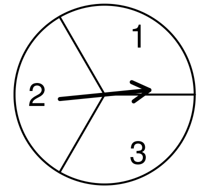


Now, consider the possibilities of spinning it twice and adding the results. Each of the following sequences would be equally likely: (1,1), (1,2), (1,3), (2,1), (2,2), (2,3), (3,1), (3,2), (3,3)

Thus, we could imagine the following spinner representing $X + X$:

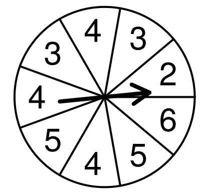


total of 2 spins



$$\mu = 2$$

$$\sigma = 0.8164966$$



$$\mu = 4$$

$$\sigma = 1.1547005$$

total of 2 spins

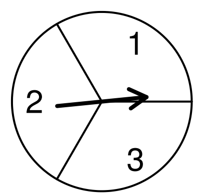
Notice the mean doubled, but standard deviation did not.

$$\frac{4}{2} = 2$$

$$\frac{1.1547005}{0.8164966} = 1.4142136 = \sqrt{2}$$

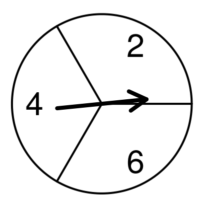
Doubling 1 spin

Consider the following spinner (X):

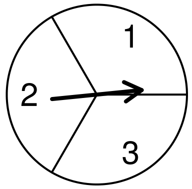


Now, consider the possibilities of spinning it once and doubling the results. Each of the following outcomes would be equally likely: 2, 4, 6

Thus, we could imagine the following spinner representing $2X$:

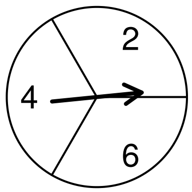


Doubling 1 spin



$\mu = 2$

$\sigma = 0.8164966$



$\mu = 4$

$\sigma = 1.6329932$

Doubling 1 spin

Notice that both the mean and standard deviation doubled.

$$\frac{1.6329932}{0.8164966} = 2$$

Theory (linear combination of random variables)

- If X and Y represent two random variables, and a and b represent two constants, then:

$$SD(aX + bY) = \sqrt{a^2 SD(X)^2 + b^2 SD(Y)^2}$$

$$SD(X + Y) = \sqrt{SD(X)^2 + SD(Y)^2}$$

$$SD(X+X) = \sqrt{SD(X)^2 + SD(X)^2} = \sqrt{2SD(X)^2} = \sqrt{2}SD(X)$$

$$SD(X + X + X) = \sqrt{SD(X)^2 + SD(X)^2 + SD(X)^2}$$

$$SD(aX) = \sqrt{a^2 SD(X)^2} = a \cdot SD(X)$$