CONCEPT: MATHMATICAL MEASRUMENTS

● Common statistical measurements are used in genetics to _____ phenotypes

□ The **mean** is an average of values

- A **population** is all individuals within the group you're measuring

- A **sample** is a representative subset of individuals in a population

EXAMPLE: Mean calculation

$$M = \frac{\Sigma(X)}{N}$$

Where Σ = Sum of
X = Individual data points
N = Sample size (number of data points)

□ The **variance** measures how far a set of values is from the mean

- **Covariance** measures how much variation is common to 2+ traits

EXAMPLE: Variance calculation

$$S^2 = \frac{\Sigma(X\text{-}M)^2}{n - 1}$$

Where Σ = Sum of
X = Individual score
M = Mean of all scores
N = Sample size (number of scores)

□ The **standard deviation** measures the amount of variation that exists within a set of data

- **Standard error** measures the accuracy of the sample mean

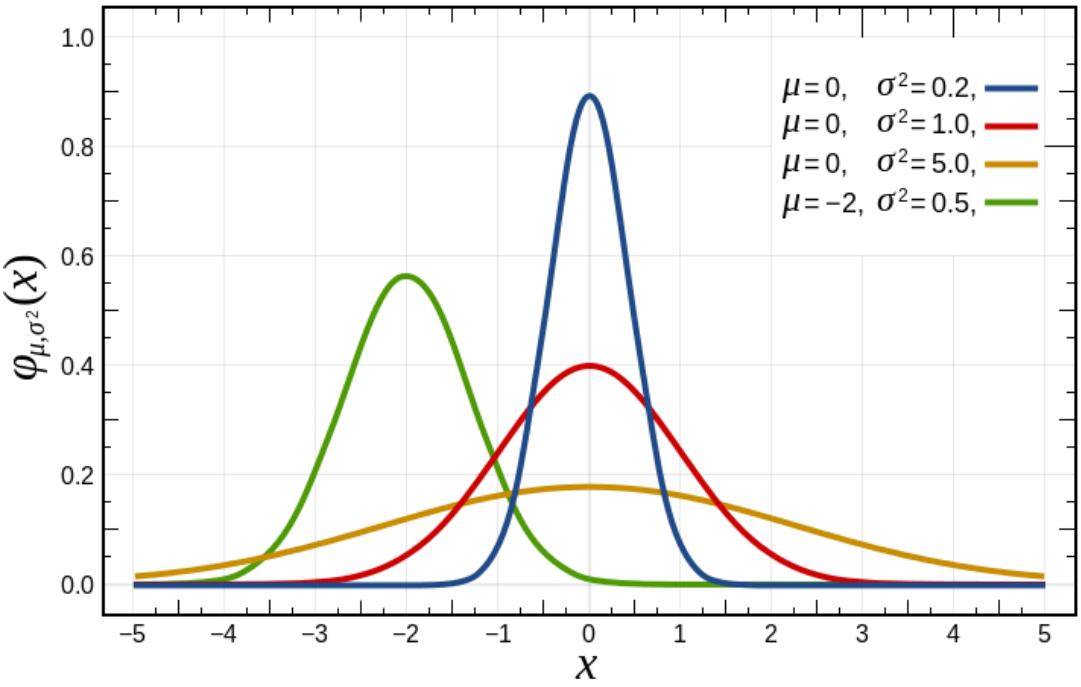
EXAMPLE: Standard deviation calculation

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

□ A **normal distribution** is the “bell curve” and visualizes the range of variation of a phenotype

- Sometimes called a “frequency histogram” as it measures frequency of the trait on y axis

EXAMPLE:



PRACTICE:

Bristle Number	Number of Individuals
1	2,
2	3,
3	9
4	29,
5	55,
6	18,
7	4,

1. The table shows a distribution of bristle numbers in a *Drosophila* population. What is the mean bristle number?
    a. 4.7
    b. 80
    c. 562
    d. 5.0

Bristle Number	Number of Individuals	$(X-M)^2$	Sum $(X-M)^2$
1	2	13.69	27.38
2	3	7.29	21.87
3	9	2.89	26.01
4	29	0.49	14.21
5	55	0.09	4.95
6	18	1.69	30.42
7	4	5.29	21.16

2. The table shows a distribution of bristle numbers in a *Drosophila* population. What is the variance?
    a. 1.0
    b. 1.2
    c. 5.5
    d. 3.0

3. Using the variance calculated in problem #2, what is the standard deviation?
    a. 1.0
    b. 1.1
    c. 2.3
    d. 1.7