Hardy-Weinberg Equilibrium

Work with your class to come up with a trait that has two possible phenotypes – the entirety of imagination is available here!

Decide which phenotype is homozygous recessive.

Determine the alleles that confer each phenotype.

Do you know the genotype of:

The individuals with the recessive phenotype?

Record what you do know _____

The individuals with the dominant phenotype?

Record what you do know _____

Of the two phenotypes your class has chosen, which are you?

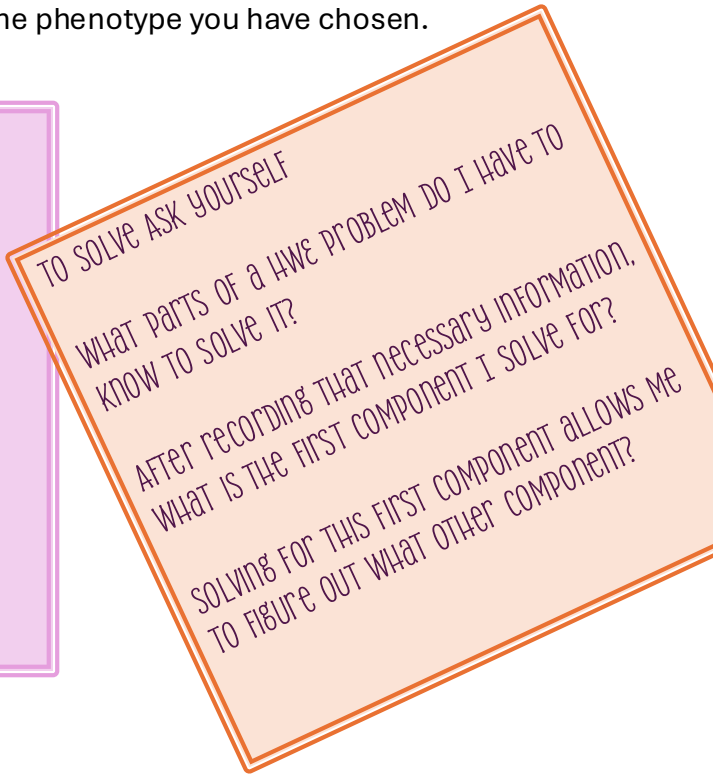
When your group leader asks, record yourself as the phenotype you have chosen.

Determine the following:

What are the frequencies of the dominant and recessive alleles?

How many individuals in the population are carriers (heterozygous)?

What <u>percentage</u> of the population is homozygous dominant?



Scratch paper for calculations

Evolutionary Forces

Collect 50 starburst of ONLY TWO COLORS (e.g. only pink and red 0R only orange and yellow, etc.)

Obtain a few sheets of construction paper that match ONE of your starburst colors

Put your construction paper down on your table.

Scatter the 50 starburst randomly on the construction paper in a single layer.

Using the materials provided, create a predator puppet/img to be attached to the 'predator's' hand.

Assign one group member as the predator.

- The predator must put one hand behind their back.
- When time starts, they will pick up as many starburst as possible using only one hand, picking up starburst <u>one at a time</u>.
- Each time the predator picks up a starburst they must put it in a designated location before returning to the population.

YOU are MIMICKING a VISUAL predator. SELECT 'prey' accordingly.

Set a timer for 10 seconds.

Start the timer and tell the predator 'hunt!'.

Yum!

After time is up, remove the "eaten" prey (you can eat the starburst).

Reproduce the survivors to bring the population back to the starting number:

For each remaining piece, add one more of the same color to simulate reproduction.

Assign a new group member to be the predator, repeat for each group member.

Record color counts and determine frequencies on the table after each round.

	Color 1 _____	Color 2 _____	Total Population	Color 1 freq	Color 2 freq
Starting Counts (parental generation = 0)					
Counts after reproduction (first offspring generation – F1)					
Counts after reproduction (2nd offspring generation – F2)					
Counts after reproduction (3rd offspring generation – F3)					
Counts after reproduction (4th offspring generation – F4)					
Counts after reproduction (5th offspring generation – F5)					

Did one of the color phenotypes increase in frequency?

Why?

Which evolutionary force does this simulate?

Would the results change if the environment (colored construction paper) changed color?

Evolutionary Forces part 2

Place 10 of one color starburst and 10 of a different color starburst into a paper bag. This your starting, genetically diverse population of 20 individuals.

Create an img/puppet of a force that could remove members of a population randomly.

Select a group member to act as the random force.

⚠ Catastrophe Strikes! Shake the bag. Then have the 'random force' draw 16 starburst without looking into the bag.

Remove these 16 from the population permanently, they did not survive.

Dump out the starburst remaining in the bag. These survivors will repopulate the population.

SLOW RECOVERY

POPULATIONS THAT EXPERIENCE AN EXTREME REDUCTION IN SIZE FREQUENTLY RECOVER SLOWLY, MEANING IT TAKES SEVERAL GENERATIONS TO GET BACK TO THE INITIAL POPULATION SIZE.

To simulate reproduction (Create Generation 1):

- Keep the 4 surviving Starbursts in the bag.
- Draw one starburst from the bag, record its color, put it back
- When you've completed 4 draws, you'll have a new generation of 8 individuals (slow recovery:
  - 4 original survivors
  - 4 new offspring

Record color counts and determine frequencies on the table after each round.

WHY DRAW WITH REPLACEMENT?

EACH DRAW REPRESENTS A NEW OFFSPRING, RANDOMLY INHERITING TRAITS (COLOR) FROM ONE OF THE SURVIVORS. DRAWING **WITH REPLACEMENT** ALLOWS THE SAME COLOR TO BE CHOSEN MULTIPLE TIMES – JUST LIKE REAL PARENTS CAN HAVE MANY KIDS WITH THE SAME GENE.

Generation 2
•Keep the 8 surviving Starbursts in the bag.
•Draw one starburst from the bag, record its color, put it back
•When you've completed 8 draws, you'll have a new generation of 16 individuals
- 8 Generation 1
- 8 new offspring

Generation 3
•Keep the 16 surviving Starbursts in the bag.
•Draw one starburst from the bag, record its color, put it back
•When you've completed 4 draws, you'll have a new generation of 20 individuals (population size has recovered)

	Color 1 _____	Color 2 _____	Total Population	Color 1 freq	Color 2 freq
Starting Counts (parental generation = 0)					
Counts after reproduction (first offspring generation – F1)					
Counts after reproduction (2nd offspring generation – F2)					
Counts after reproduction (3rd offspring generation – F3)					

Did one of the color phenotypes increase in frequency?

Why or why not?

Which evolutionary force does this simulate?

Did the phenotypes of the 'prey' matter?

Did the environment?

Did you notice a difference in the way which offspring were produced was determined in each activity?

Why was this different?