

Apple Genetics

Name _____

Part 1: Comparing Honeycrisp and Zestar! Apples

	Honeycrisp Apple	Zestar! Apple
Look	Explain what you observe on the outside and inside of this particular apple. Write down what you notice, stem structure, seed layout, and coloring.	
Outside of Apple		
Inside of Apple		
Smell	Explain what you observe using your sense of smell.	
Outside of Apple		
Inside of Apple		
Touch	Explain what you observe about the texture of the apple. i.e. skin, meat, seed, stem	
Outside of Apple (Texture)		
Inside of Apple (Number of seeds and seed shape)		
Taste	Explain what you observe when you taste your apple.	
Tartness		
Sweetness		
Juiciness		
Crunchiness		

Apple Genetics (continued)

Part 2: Analyzing the Data:

1. Explain what similarities you found in the Honeycrisp and Zestar! apples?

2. Explain what differences you found in Honeycrisp and Zestar! apples?

Part 3: Completing Punnett Squares

When making observations in Part 1, you described traits for each apple such as color, juiciness, or sweetness. These traits are determined by the genes in the apple. If we were to crossbreed blossoms on a Honeycrisp apple tree with pollen from a Zestar! apple tree, the resulting fruit would look, smell, taste, and feel like a Honeycrisp apple, but the seeds inside would possess genes from both of these parents. The seeds could be planted and grown into a new hybrid with fruit that has traits of both the Honeycrisp and Zestar! apple.

In this activity, we will imagine that the traits you observed are determined by Mendelian inheritance in which a single gene determines a trait. Each trait is dominant or recessive and the alleles passed down from the parents determine whether the trait will be observed in the offspring. Below are examples of genotypes that the Honeycrisp and Zestar! apples may possess. **NOTE: These genotypes are to be used as examples only and do not represent accurate genotypes.** You will use this information to complete Punnett Squares on the following page and calculate probabilities for each genotype.

- a. Sweetness is recessive (Honeycrisp's genotype is ss , Zestar's genotype is Ss)
- b. Juiciness is dominant (Honeycrisp's genotype is Jj , Zestar's genotype is Jj)
- c. Crunchiness is dominant (Honeycrisp's genotype is Cc , Zestar's genotype is cc)
- d. Red skin coloring is dominant (Honeycrisp's genotype is RR , Zestar's genotype is Rr)
- e. Smooth skin texture is dominant (Honeycrisp's genotype is Bb , Zestar's genotype is Bb)

Apple Genetics (continued)

Complete the Punnett Squares and calculate the probability of each genotype for all traits.

<p>Tartness</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">T</td> <td style="text-align: center;">T</td> </tr> <tr> <td style="text-align: center;">t</td> <td style="border: 1px solid black; padding: 5px;">Tt</td> <td style="border: 1px solid black; padding: 5px;">Tt</td> </tr> <tr> <td style="text-align: center;">t</td> <td style="border: 1px solid black; padding: 5px;">Tt</td> <td style="border: 1px solid black; padding: 5px;">Tt</td> </tr> </table> <p>Probability of offspring genotypes:</p> <p>TT= _____0%_</p> <p>Tt= _____100%_</p> <p>tt= _____0%_</p>		T	T	t	Tt	Tt	t	Tt	Tt	<p>Sweetness</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">S</td> <td style="text-align: center;">S</td> </tr> <tr> <td style="text-align: center;">S</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> <tr> <td style="text-align: center;">s</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> </table> <p>Probability of offspring genotypes:</p> <p>SS= _____</p> <p>Ss= _____</p> <p>ss= _____</p>		S	S	S			s		
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<p>Juiciness</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">J</td> <td style="text-align: center;">j</td> </tr> <tr> <td style="text-align: center;">J</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> <tr> <td style="text-align: center;">j</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> </table> <p>Probability of offspring genotypes:</p> <p>JJ= _____</p> <p>Jj= _____</p> <p>jj= _____</p>		J	j	J			j			<p>Crunchiness</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">C</td> <td style="text-align: center;">c</td> </tr> <tr> <td style="text-align: center;">c</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> <tr> <td style="text-align: center;">c</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> </table> <p>Probability of offspring genotypes:</p> <p>CC= _____</p> <p>Cc= _____</p> <p>cc= _____</p>		C	c	c			c		
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<p>Red Skin Coloring</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">R</td> <td style="text-align: center;">R</td> </tr> <tr> <td style="text-align: center;">R</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> <tr> <td style="text-align: center;">r</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> </table> <p>Probability of offspring genotypes:</p> <p>RR= _____</p> <p>Rr= _____</p> <p>rr= _____</p>		R	R	R			r			<p>Smooth Skin Texture</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">B</td> <td style="text-align: center;">b</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> <tr> <td style="text-align: center;">b</td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> <td style="border: 1px solid black; width: 40px; height: 40px;"></td> </tr> </table> <p>Probability of offspring genotypes:</p> <p>BB= _____</p> <p>Bb= _____</p> <p>bb= _____</p>		B	b	B			b		
	R	R																	
R																			
r																			
	B	b																	
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Apple Genetics (continued)

Part 4: Sweetango Apple Observation:

Sweetango Apple Observations	
Look	Explain what you observe on the outside and inside of this particular apple. Write down everything you notice, stem structure, seed layout, and coloring.
Outside of Apple	
Inside of Apple	
Smell	Explain what you observe using your sense of smell.
Outside of Apple	
Inside of Apple	
Touch	Explain what you observe about the texture of the apple. i.e. skin, meat, seed, stem
Outside of Apple	
Inside of Apple	
Taste	Explain what you observe when you taste your apple.
Tartness	
Sweetness	
Juiciness	
Crunchiness	

Apple Genetics *(continued)*

Part 5: Comparing Honeycrisp, Zestar!, and

Sweetango Apples Similarities and differences found:

1. Describe similarities you found among all 3 apple varieties.

2. Describe differences you found among all 3 apple varieties.

Crossbreeding apples

1. Which of the three apples was your favorite? Why?

2. Why do apple breeders crossbreed apple varieties?