

Name: _____

Plant Breeding Challenge

Part 1

Directions:

In this activity, you'll choose traits for your ideal crop and use Punnett Squares to predict how likely those traits are to appear.

Step 1: Choose Your Traits.

Pick three traits from the trait cards. Think about why each trait would be important for a successful plant.

Trait 1: _____

Why is this trait important? _____

Trait 2: _____

Why is this trait important? _____

Trait 3: _____

Why is this trait important? _____

Step 2: Assign Alleles for Each Trait.

Choose two-letter allele combinations (e.g., Dd = Drought Tolerant). Assume each parent is heterozygous.

Trait 1: _____

Parent A: _____ Parent B: _____

Trait 2: _____

Parent A: _____ Parent B: _____

Trait 3: _____

Parent A: _____ Parent B: _____

Step 3: Use Punnett Squares.

Fill in the Punnett Square below for each trait. Use capital letters for dominant traits and lowercase for recessive.

Trait 1 Punnett Square: _____

What percentage of the offspring will show the desired trait? _____%

Name: _____

Trait 2 Punnett Square: _____

What percentage of the offspring will show the desired trait? _____%

Trait 3 Punnett Square: _____

What percentage of the offspring will show the desired trait? _____%

Step 4: Reflection

1. Did your plant pass on all the traits you hoped for? Why or why not?
2. What would you change about your breeding plan if you could try again?

Name: _____

Part 2

Directions:

Now that you've used Punnett Squares to make predictions, it's time to simulate what might happen if you actually cross your plant traits in the real world. You'll roll dice to represent the genes passed from each parent plant, then figure out if your new plant has the traits you want.

1. For each of the three traits you selected, you will roll FOUR dice — two for each parent plant.
2. Use the chart below to figure out whether each parent passed on the dominant or recessive version of the trait.
3. Write the result (allele) from each parent. Cross them to make the offspring's genotype (like Dd or dd).
4. Complete a Punnett Square for each cross.
5. Record all of this on your Hybrid Creation Table.

Dice Roll to Allele Chart

This chart tells you which type of gene (allele) the parent passes down based on your roll:

Dice Roll	Allele Passed
1 – 3	Recessive allele (example: d)
4 – 6	Dominant allele (example: D)

Trait 1 Punnett Square:

Trait Name: _____

Roll the dice to determine the allele passed by each parent:

Parent A Roll: _____ Allele: ____

Parent B Roll: _____ Allele: ____

Now use the alleles to complete a Punnett Square:

Parent A Genotype: _____ Parent B Genotype: _____

What percentage of the offspring will show the desired trait? _____%

Name: _____

Trait 2 Punnett Square:

Trait Name: _____

Roll the dice to determine the allele passed by each parent:

Parent A Roll: _____ Allele: ____

Parent B Roll: _____ Allele: ____

Now use the alleles to complete a Punnett Square:

Parent A Genotype: _____ Parent B Genotype: _____

What percentage of the offspring will show the desired trait? _____%

Trait 3 Punnett Square

Trait Name: _____

Roll the dice to determine the allele passed by each parent:

Parent A Roll: _____ Allele: ____

Parent B Roll: _____ Allele: ____

Now use the alleles to complete a Punnett Square:

Parent A Genotype: _____ Parent B Genotype: _____

What percentage of the offspring will show the desired trait? _____%

Name: _____

Hybrid Creation Table

Fill this out for each trait you selected.

Trait Name	Parent A Die Roll	Parent B Die Roll	Offspring Genotype	Trait Shown? (✓/✗)

Reflection Questions:

1. Did your new plant get all three traits you wanted? Why or why not?
2. Which trait was the most difficult to pass on? What made it difficult?
3. If you did this again, would you pick the same parent genotypes? Why or why not?
4. If you did this 100 times, how do you think your results would change? What would stay the same?
5. Should scientists always try to create the “perfect” plant? Why or why not?

Name: _____

Part 3

Directions:

Prepare a three- to five-minute presentation. Use the questions and rubric below to guide your explanation.

1. What three traits did your group choose for your hybrid plant?
2. Why did you choose these traits? (Think about environment, nutrition, farmer use, etc.)
3. What genotypes did you assign to the parent plants for each trait?
4. Based on your dice rolls and Punnett Squares, what genotypes did your plant end up with?
5. Did your final plant have all the traits you wanted? Why or why not?
6. If you could do this again, what trait(s) or strategies would you change?

Presentation Rubric

Qualification	Very strong evidence of skill is present. (5–4 pts)	Moderate evidence of skill is present. (3–2 pts)	Weak evidence of skill is present. (1–0 pts)	Total Points (20 possible)
Presentation Skills	Is thorough and maintains eye contact	Somewhat professional and depends on the presentation	No evidence of preparation	
Grammar/Punctuation/Spelling	Spelling, grammar and punctuation are extremely high quality with two or less errors in the document.	Spelling, grammar and punctuation are adequate with three to five errors in the document.	Spelling, grammar and punctuation are less than adequate with six or more errors in the document.	
Time	Two minutes or more	Between one and two minutes	Under one minute	
Overall Impression	Presentation was professional, and presenter thoroughly explained the plan/idea.	Presentation was complete but lacked some detail.	The presentation lacked polish and information.	
			Total	

Name: _____

Part 4

Directions:

Choose one Plant Systems research and development career that interests you from the list below. Once you have identified your career, utilize the Career Profiles from AgExplorer (AgExplorer.FFA.org/focus/plant-systems/) to complete the profile below.

Careers in research and development:

- Research and Development Manager
- Plant Scientist/Field Agronomist
- Research Scientist
- Biotechnologist
- Plant Geneticist
- Plant Breeder
- Horticulturist
- Soil Scientist
- Agronomist
- Plant Pathologist

Career Name: _____

- Responsibilities  :

- Education/Training  :

- Where they work  :

- Job outlook  :