



Genetics of Selu Worksheet

Names _____ Date _____ Period _____

In these activities you will investigate phenotypes of corn that are expressed in the seed. You will be given ears of corn for your investigation. Each seed/kernel on an ear of corn results from a separate fertilization event and thus represents an offspring.

STEP 1:

We begin with the parent plants, or Generation F₀. Both plants are homozygous, meaning they have two of the same alleles (AA and aa).

Parent Plants – F₀

Homozygous
AA

Dominant



Homozygous
aa

Recessive

- One plant produces **purple ears** of corn, the dominant color. Let's use a capital "**A**" (for allele) to represent this. Place it first in order within each square.
- The other plant produces **yellow ears** of corn, the recessive color, considered an absence of pigment. Let's use a small "**a**" to represent this.
- Below, draw a **Punnett square** to represent the possible offspring resulting from this cross. These offspring will be known as First Generation (F₁).

Draw a Punnett Square of possible F₁ outcome:

Purple = A

Yellow = a

Instructions:

- Label your Punnett square: "A, A" in the top greyed squares and "a, a" in the left vertical squares.
- Note the possible combinations in the bottom white squares. (Ex: AA, aa, Aa, etc.)

Questions

- What is the **genotype** of the F₁? (circle) Heterozygous (Aa) or Homozygous (AA or aa)
- What is the likely **phenotype** of the F₁? (circle dominant color) Purple or Yellow

STEP 2:

Using the information that you recorded on the first page and your knowledge of genetics, draw in the space below another **Punnett square** showing the results of crossing your F₁ generation to produce the second generation of offspring, F₂.

F₁ Generation Crossed

Heterozygous
Aa



Heterozygous
Aa

Draw a Punnett Square of possible outcome of F₂:

Purple = A
Yellow = a

1. Label the Punnett Square, this time with the “Aa” first generation allele combination. Fill out the rest of the box with the resulting outcome. (“A, a” for the top row. “A, a” for the left-hand column.)
2. What are the **genotypes** of the F₂?
_____ % Homozygous Dominant (AA)
_____ % Heterozygous (Aa)
_____ % Homozygous Recessive (aa)

STEP 3:

Using your completed Punnett square, **make a hypothesis** about the inheritance of phenotypes for F₂ and their expected percentages or ratios. (How the kernel color will likely be affected, more purple, or more yellow?). Using your hypothesis, predict what you will find in the F₂ offspring.

STEP 4:

You will now test your hypothesis and prediction made in step 3. You will get an ear of corn from the cross you diagramed in step 2 for F₂. Working in pairs or small groups of three or four, count and record in Table 1 the number of grains of each phenotype (purple or yellow) and determine the resulting ratios.

Table 1: Team Counts for F ₂ Purple and Yellow Seeds (phenotypes)		
1. Team Count - Count two adjacent rows of kernels along the length of the cob and note the color of each kernel. a. One team member slowly calls out each kernel color aloud. b. Their partner(s) should make a tally mark (++++) on the chart below under the appropriate color. (One tally mark per kernel color called out.)		
Phenotype:	Purple	Yellow
2. Color Totals: Add results for each color above and record your totals below.		
	Purple Total:	Yellow Total:
3. Total number of all kernels counted (combine total of purple and yellow above):		
4. Percentages: Divide number of Purple Kernels by Total Number of Kernels: Divide number of Yellow Kernels by Total Number of Kernels:		

STEP 5:

To test your results with a larger sample size, each group will report their counts for each kernel color and the results will be tallied with all the data from the teams.

Table 2: Class F2 Counts for Purple and Yellow Seeds		
Phenotype	Purple	Yellow
1. Class Counts		
2. Class Color Totals	Purple Total:	Yellow Total:
3. Total number of all kernels counted (combine total of purple and yellow above):		
4. Percentages: Divide number of Purple Kernels by Total Number of Kernels: Divide number of Yellow Kernels by Total Number of Kernels:		

STEP 6: ANALYSIS

Compare your expected counts / ratios from Step 3 with the actual counts from Step 5: Table 2. Are the actual counts different from the expected counts?

- Expected ratio of purple to yellow: _____
- Actual ratio of purple to yellow: _____
- Explain why:



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ANSWER KEY (answers are in RED)

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STEP 1:

We begin with the parent plants, or Generation F₀. Both plants are homozygous, meaning they have two of the same alleles (AA and aa).

Parent Plants – F₀

Homozygous
AA

Dominant



Homozygous
aa

Recessive

- One plant produces **purple ears** of corn, the dominant color. Let's use a capital "**A**" (for allele) to represent this. Place it first in order within each square.
- The other plant produces **yellow ears** of corn, the recessive color, considered an absence of pigment. Let's use a small "**a**" to represent this.
- Below, draw a **Punnett square** to represent the possible offspring resulting from this cross. These offspring will be known as First Generation (F₁).

Draw a Punnett Square of possible F₁ outcome:

	a	a
A	Aa	Aa
A	Aa	Aa

Purple = A
Yellow = a

Instructions:

- Label your Punnett square: "A, A" in the top greyed squares and "a, a" in the left vertical squares.
- Note the possible combinations in the bottom white squares. (Ex: AA, aa, Aa, etc.)

Questions

- What is the **genotype** of the F₁? (circle **Heterozygous (Aa)** or Homozygous
- What is the likely **phenotype** of the F₁? (circle dominant color) **Purple** or Yellow

STEP 2:

Using the information that you recorded on the first page and your knowledge of genetics, draw in the space below another **Punnett square** showing the results of crossing your F₁ generation to produce the second generation of offspring, F₂.

F₁ Generation Crossed

Heterozygous
Aa



Heterozygous
Aa

Draw a Punnett Square of possible outcome of F₂:

	A	a
A	AA	Aa
a	Aa	aa

Purple = A
Yellow = a

1. Label the Punnett Square, this time with the "Aa" first generation allele combination. Fill out the rest of the box with the resulting outcome. ("A, a" for the top row. "A, a" for the left-hand column.)
2. What are the **genotypes** of the F₂?
25 % Homozygous Dominant (AA)
50 % Heterozygous (Aa)
25 % Homozygous Recessive (aa)

STEP 3:

Using your completed Punnett square, **make a hypothesis** about the inheritance of phenotypes for F₂ and their expected percentages or ratios. (How the kernel color will likely be affected, more purple, or more yellow?). Using your hypothesis, predict what you will find in the F₂ offspring.

About 75% of the kernels counted will be purple while 25% will be yellow for the phenotype. Giving us a ratio of 3:1.

STEP 4:

You will now test your hypothesis and prediction made in step 3. You will get an ear of corn from the cross you diagramed in step 2 for F₂. Working in pairs or small groups of three or four, count and record in Table 1 the number of grains of each phenotype (purple or yellow) and determine the resulting ratios.

Table 1: Team Counts for F ₂ Purple and Yellow Seeds (phenotypes)		
1. Team Count - Count two adjacent rows of kernels along the length of the cob and note the color of each kernel. a. One team member slowly calls out each kernel color aloud. b. Their partner(s) should make a tally mark (++++) on the chart below under the appropriate color. (One tally mark per kernel color called out.)		
Phenotype:	Purple	Yellow
	(Ex: tally marks totaling about 75)	(Ex: tally marks totaling about 25)
2. Color Totals: Add results for each color above and record your totals below.		
	Purple Total: 75	Yellow Total: 25
3. Total number of all kernels counted (combine total of purple and yellow above): 100		
4. Percentages: Divide number of Purple Kernels by Total Number of Kernels: Divide number of Yellow Kernels by Total Number of Kernels:		75 ÷ 100 = .75 25 ÷ 100 = .25

STEP 5:

To test your results with a larger sample size, each group will report their counts for each kernel color and the results will be tallied with all the data from the teams.

Table 2: Class F2 Counts for Purple and Yellow Seeds		
Phenotype	Purple	Yellow
1. Class Counts	(Ex: list team totals - 75x16) 75 73 76 74 etc...	(Ex: list team totals) 25 24 26 27, etc..
2. Class Color Totals	Purple Total: ex: 1200	Yellow Total: ex: 400
3. Total number of all kernels counted (combine total of purple and yellow above): 1600		
4. Percentages: Divide number of Purple Kernels by Total Number of Kernels: Divide number of Yellow Kernels by Total Number of Kernels:		1200 ÷ 1600 = .75 400 ÷ 1600 = .25

STEP 6: ANALYSIS

Compare your expected counts / ratios from Step 3 with the actual counts from Step 5: Table 2. Are the actual counts different from the expected counts?

- Expected ratio of purple to yellow: _____
- Actual ratio of purple to yellow: _____
- Explain why:

Why? The homozygous dominant (AA) is 25% + the heterozygous (Aa) (50%) likely resulting in purple, because it adds to 75% and is the dominant trait.