

# GENETICS

## LESSON 6: PUNNETT SQUARES

### Learning Outcomes

- I can use a Punnett square to determine the probability of genotypes and/or phenotypes for autosomal traits.
- I can use a Punnett square to determine the genotype of the parents of autosomal alleles if the probability of the offspring outcomes is known.
- Punnett squares are used to determine the probability of genotypes and/or phenotypes showing up in offspring

### Steps

1. draw a 4-boxed square or “tic-tac-toe” board
2. identify the genotype of each parent
3. write one of the genotype letters for one parent in each of the top columns (leave top left box empty if using “tic-tac-toe” board)
4. write one of the genotype letters for the other parent in the left box of each row
5. in the four empty boxes, combine the letters of the two parents that match

**Examples** – Y = yellow seed colour    y = green seed colour

1. What are the possibilities for seed colour when a homozygous dominant plant and homozygous recessive plant are crossed?

|   |    |    |
|---|----|----|
|   | y  | y  |
| Y | Yy | Yy |
| Y | Yy | Yy |

2. What are the possibilities for seed colour when 2 heterozygous plants are crossed?

|   |    |    |
|---|----|----|
|   | Y  | y  |
| Y | YY | Yy |
| y | Yy | yy |

### Interpreting the Data

- the results of a Punnett square indicate the probability of each result occurring each time a sperm cell fertilizes an egg

**Examples** – Y = yellow seed colour    y = green seed colour

- What is the probability of getting a yellow seed when a homozygous dominant plant and homozygous recessive plant are crossed?

|   |    |    |
|---|----|----|
|   | Y  | y  |
| Y | YY | Yy |
| y | Yy | yy |

|             |    |     |    |     |                  |
|-------------|----|-----|----|-----|------------------|
| Yellow Seed | YY | 0/4 | 0% |     |                  |
|             |    |     | Yy | 4/4 | 100%             |
|             |    |     |    |     | 100% probability |

- When 2 heterozygous plants are crossed, what is the probability of getting:
  - A homozygous dominant offspring?
  - A heterozygous offspring?
  - A yellow seed?
  - A green seed?

|   |    |    |
|---|----|----|
|   | Y  | y  |
| Y | YY | Yy |
| y | Yy | yy |

- |                         |    |     |     |                 |
|-------------------------|----|-----|-----|-----------------|
| a. Homozygous Dominant  | YY | 1/4 | 25% | 25% probability |
| b. Heterozygous         | Yy | 2/4 | 50% | 50% probability |
| c. Yellow Seed          | YY | 1/4 | 25% |                 |
|                         | Yy | 2/4 | 50% | 75% probability |
| d. Homozygous recessive | yy | 1/4 | 25% | 25% probability |

3. If the probability of a cross with a heterozygous parent for yellow seeds results in 50% yellow seeds and 50% green seeds, what is the genotype of the other parent plant?

❖ Work backwards – fill in the Punnett square with what you know

|  |   |    |
|--|---|----|
|  | Y | y  |
|  |   | yy |
|  |   | yy |

❖ Fill in what the other parent must be.

|   |   |    |
|---|---|----|
|   | Y | y  |
| y |   | yy |
| y |   | yy |

❖ Complete the Punnett square to double check your answer.

|   |    |    |
|---|----|----|
|   | Y  | y  |
| y | Yy | yy |
| y | Yy | yy |

Yy      50%      yellow seed      probabilities match the question

Assignment: Sponge Bob Punnett Square Practice WS