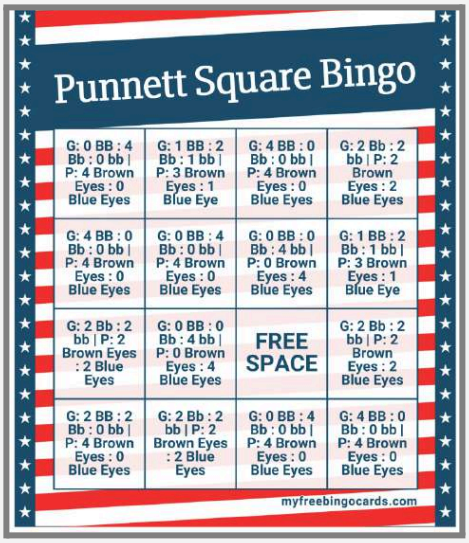
Engage: Punnett Square Bingo

INSTRUCTOR:
no_reply@example.com

Objective:

Engage in predicting genetic outcomes and asking questions about patterns of inheritance.



Background Information:

Genetics helps us understand how traits are passed from parents to children. Each person has two copies of every gene—one from their mother and one from their father. These genes come in different forms called **alleles**. Alleles can be **dominant** or **recessive**.

- **Dominant alleles** (represented by capital letters, like **B**) **only** need one copy to show a trait.
- **Recessive alleles** (represented by lowercase letters, like **b**) need two copies to show a trait.

The combination of alleles someone has is called their **genotype**. There are three possible genotypes:

1. **BB** – Two dominant alleles
2. **Bb** – One dominant and one recessive allele
3. **bb** – Two recessive alleles

The trait that actually shows up is called the **phenotype**. For example:

- **BB** and **Bb** both lead to brown eyes (the dominant trait).
- **bb** leads to blue eyes (the recessive trait).

Example Problem: Suppose one parent has the genotype **Bb** (brown eyes) and the other parent also has the genotype **Bb**. What are the chances their child will have brown or blue eyes?

1. **Set up a Punnett square:**

	B	**b**
B	**BB**	**Bb**
b	**Bb**	**bb**

Name: _____ Date: _____

2. **Find the genotypes and ratios:**
    - **BB** (1 box), **Bb** (2 boxes), **bb** (1 box)
    - **Genotype ratio: 1 BB : 2 Bb : 1 bb**
3. **Find the phenotypes and ratios:**
    - **BB** and **Bb** show brown eyes.
    - **bb** shows blue eyes.
    - **Phenotype ratio**: **3 brown eyes : 1 blue eye**

Instructions:

1. **Set up your Bingo card:**
    - Your teacher will give you a bingo card with different Punnett squares. Each square shows a genetic cross between two parents and the possible offspring's traits.
2. **Mark your squares:**
    - As the teacher calls out different genetic crosses (like "BB x Bb"), look for a matching square on your bingo card. If you find it, mark it.
3. **Ask questions as you play:**
    - While playing, think about these questions:
        - Why does this genetic combination give me a 50% chance of a trait?
        - What can I learn about genetic ratios from this game?
        - How do different allele combinations affect the traits I see?
4. **Call out "Bingo!"**
    - If you get a row, column, or diagonal filled with correct answers, shout "Bingo!"

Your Turn:

After the game, write down your observations using these sentence starters to help guide your thinking:

- *"I noticed that when both parents had one dominant and one recessive allele, the chance of the dominant trait showing up was ___."*
- *"One question I have about this is ___. I wonder why ___?"*
- *"A pattern I saw during the game was ___. I think this happens because ___."*
- *"If I had to explain how Punnett squares work to a friend, I would say that ___."*

Name: _____ Date: _____

Name: _____ Date: _____

Teacher Instructions:

Objective: Engage students in predicting genetic outcomes, observing patterns in inheritance, and developing questions about genetic ratios through a bingo game using Punnett squares.

Materials:

- Bingo cards with pre-filled Punnett squares (see list of crosses below)
- Markers or chips for students to cover squares
- List of genetic crosses to call out during the game

Preparation:

1. Create bingo cards with various **Punnett squares** showing different genetic crosses (e.g., BB x Bb, Bb x bb).
2. Prepare a list of genetic crosses to call out, ensuring a variety of dominant/recessive combinations. Use the **Genetic Bingo List** provided below:

Genetic Bingo List:

☐ **1. BB x Bb**

G: 2 BB : 2 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **2. bb x Bb**

G: 2 Bb : 2 bb | **P:** 2 Brown Eyes : 2 Blue Eyes

☐ **3. Bb x Bb**

G: 1 BB : 2 Bb : 1 bb | **P:** 3 Brown Eyes : 1 Blue Eye

☐ **4. BB x BB**

G: 4 BB : 0 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **5. bb x bb**

G: 0 BB : 0 Bb : 4 bb | **P:** 0 Brown Eyes : 4 Blue Eyes

☐ **6. Bb x bb**

G: 2 Bb : 2 bb | **P:** 2 Brown Eyes : 2 Blue Eyes

☐ **7. Bb x BB**

G: 2 BB : 2 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **8. BB x bb**

G: 0 BB : 4 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **9. bb x BB**

G: 0 BB : 4 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **10. BB x Bb**

G: 2 BB : 2 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **11. bb x Bb**

☐ **G:** 2 Bb : 2 bb | **P:** 2 Brown Eyes : 2 Blue Eyes

☐ **12. Bb x Bb**

Name: _____ Date: _____

G: 1 BB : 2 Bb : 1 bb | **P:** 3 Brown Eyes : 1 Blue Eye

☐ **13. Bb x bb**

G: 2 Bb : 2 bb | **P:** 2 Brown Eyes : 2 Blue Eyes

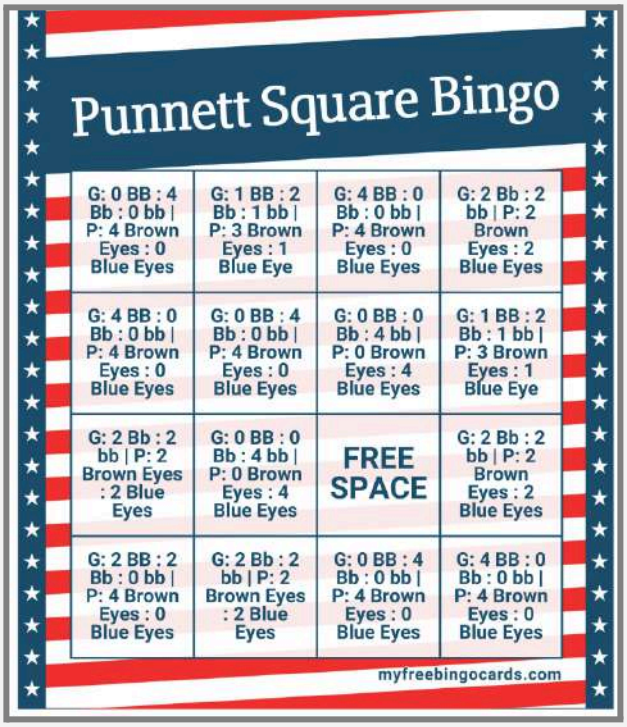
☐ **14. BB x bb**

G: 0 BB : 4 Bb : 0 bb | **P:** 4 Brown Eyes : 0 Blue Eyes

☐ **15. bb x bb**

G: 0 BB : 0 Bb : 4 bb | **P:** 0 Brown Eyes : 4 Blue Eyes

Procedure:



1. **Explain the background:**
   - Start by reviewing the basic concepts of alleles, genotypes, phenotypes, dominant and recessive traits, and how Punnett squares work. Use a sample cross (like **Bb x Bb**) to show how to predict both genotype and phenotype ratios.
2. **Start the game:**
   - Distribute bingo cards to students. Explain that as you call out genetic crosses (e.g., **BB x Bb**), they will look for and mark the corresponding Punnett square on their bingo card.
3. **Encourage inquiry:**
   - While the game is in progress, encourage students to ask questions about the outcomes they are marking. Ask them to think about why certain combinations give specific ratios, and how these combinations predict traits.
4. **Conclude the activity:**
   - When a student calls "Bingo!", review their completed row, column, or diagonal. Discuss why the genetic crosses they marked led to specific genotypes and phenotypes. Encourage students to explain their reasoning using the terms **genotype**, **phenotype**, **dominant**, and **recessive**.
5. **Wrap up:**
   - Have students reflect by writing down their observations using the sentence starters provided. Then, have a class discussion to review patterns and questions about inheritance that came up during the game.

Bingo Cards – LINK