

Venn Turf War (维恩抢地盘)

Purpose (游戏目的)

This is a 1 vs 1 territory game designed to help students **understand set ideas through play**.

By the end of the game, students should be able to:

- Recognize a **universe** (U) and **subsets** (A,B,C).
- Interpret a **Venn diagram** as “which numbers belong where.”
- Understand and use the three key operations:
 - **Union** ($A \cup B$): in A **or** in B (or both)
 - **Intersection** ($A \cap B$): in A **and** in B (both)
 - **Complement** (A^c): **not** in A (relative to (U))

The game stays fun because every move is a “skill card” that changes the map, and students compete to control the same five “treasure numbers.”

Materials (材料)

- A sheet with a **3-set Venn diagram** for sets (A,B,C) (7 regions):
 - A-only, B-only, C-only, AB, AC, BC, ABC
 - Numbers **1–20** (cards or written slips)
 - Two colors (red/blue markers or stickers)
 - A score sheet for **8 rounds**
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Setup (准备)

Step 1: Define the universe

- ($U=\{1,2,\dots,20\}$).

Step 2: Distribute numbers into the 7 regions

For each number 1–20, randomly place it into **one** of the 7 Venn regions.

- Quick method: roll a 7-sided random (or phone random 1–7)
 - 1 → A-only
 - 2 → B-only
 - 3 → C-only
 - 4 → AB
 - 5 → AC
 - 6 → BC
 - 7 → ABC

Step 3: Choose 5 treasure numbers (Method A)

- Randomly draw **5** numbers from 1–20.
- Mark them with ★ on the board. These are the **treasures**.

Step 4: Give each player the same 9 cards

Each player has **9 cards**. Each card can be used **at most once**.

- Unions: $(A \cup B)$, $(A \cup C)$, $(B \cup C)$
- Intersections: $(A \cap B)$, $(A \cap C)$, $(B \cap C)$
- Complements: (A^c) , (B^c) , (C^c)

The game lasts 8 rounds, so each player will have **1 unused card** at the end.

What each card covers (每张牌涂哪些区域)

In this version, every number is inside the 7 regions (no outside region).

Intersection cards (small, precise)

- $(A \cap B)$: AB + ABC
- $(A \cap C)$: AC + ABC
- $(B \cap C)$: BC + ABC

Union cards (large area)

- $(A \cup B)$: all regions **except C-only**
 - A-only + B-only + AB + AC + BC + ABC
- $(A \cup C)$: all regions **except B-only**

- $(B \setminus C)$: all regions **except A-only**

Complement cards (flanking)

- (A^c) : regions that do **not** include A
 - B-only + C-only + BC
 - (B^c) : A-only + C-only + AC
 - (C^c) : A-only + B-only + AB
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Gameplay (玩法)

Rounds and turn order

- The game has **8 rounds**.
- Turn order alternates for fairness:
 - Round 1: Player 1 goes first, then Player 2
 - Round 2: Player 2 goes first, then Player 1
 - Continue alternating until Round 8

In each round

1. **First player plays 1 unused card**
 - Color every number in the regions covered by that card with the first player's color.
 - If a number was the opponent's color, it is **overwritten** (captured).
2. **Second player plays 1 unused card**
 - Do the same coloring/overwriting with the second player's color.
3. **Score the treasures (end of the round)**
 - Look only at the **5 treasure numbers**.
 - For each treasure:
 - If it is red, red gets **+1**.
 - If it is blue, blue gets **+1**.

- (If it is uncolored, no one scores for that treasure.)

4. Record the scores and start the next round.

Winning (胜利)

- After 8 rounds, the player with the higher total score wins.

Tie-break (optional, simple)

If tied after Round 8:

- Compare how many treasures each player controls **on the final board**.
- If still tied, play a **Round 9**:
 - Each player uses their **one remaining unused card** (if any), following the alternating order.

Teacher tips (课堂小贴士)

- Keep the pace: 8 rounds usually fits **10–15 minutes**.
- After 2 rounds, pause for 60 seconds and ask:
 - “What does $A \cup B$ mean in words?”
 - “Why is $A \cap B$ more precise?”
 - “What does A^c mean relative to U ?”
- Encourage students to explain moves using language:
 - “I used union, so I cover A or B.”
 - “I used intersection, so I only cover the overlap.”
 - “I used complement, so I cover everything not in A.”