BAMBOO SKEWERS

TOPIC: Sets, Inequalities, Intersections, Unions, and Subsets with Bamboo Skewers

● **Grade Level** /Activating Prior Knowledge

Junior High and beyond/Any student who has a fundamental knowledge of sets
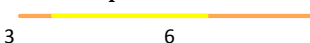
● **Learning Objective**

A hands-on activity with manipulatives teaching properties of sets on the number line, inequalities, intersections, unions, and subsets. Students will sort objects by various properties and identify sets, their subsets, common parts, sums and differences.

● **Materials (per student)**

✓ 12-inch Ruler (to represent the number line)
✓ 9-inch Bamboo Skewer, tip removed (to represent sets)
✓ Two different colored highlighters, **yellow** and **blue.** One more highlighter of different color.
✓ A piece of paper with inequalities written on it (make sure that the solutions overlap).

$3 \leq x \leq 6$
$5 \leq x \leq 8$

● **Lesson Plan**

1. Discussion of inequalities, sets and their intersections, and unions. Make a vocabulary list on the board. Answer questions.
2. Each student should have the materials listed above. Students place the skewer next to the ruler allowing the ruler to act as a number line. Tell the students to thickly highlight the bamboo skewer with the **yellow** highlighter to represent the first inequality. For example $3 \leq x \leq 6$ will look like this on the skewer: ₃ ━━━━━ ₆ Explain that this first set is represented in **yellow**.
3. Repeat the same process with the second inequality and the **blue** highlighter.
4. ₃ ━ ₅ ━ ₆ ━ ₈ The students will notice that the overlapping section turns **green**. Ask students to describe the intersection of these two sets mathematically. Each student should write inequality for the intersection. For this example the intersection is $5 \leq x \leq 6$. Make sure to discuss the end points. Point out that the union is a subset of both sets.
5. Ask them to describe the union of these two sets. (**yellow**, **green**, and **blue**).
6. Ask students if some specific rational number (for example 5.37) is in their intersection or union or both. Ask also "Will the numbers in your intersection always be in your union?" (yes) "Why?" (because the intersection is a subset of the union)

● **Challenge**

Ask students to represent a third inequality, such as $4 \leq x \leq 10$ on the skewer. Have them figure out their intersections and unions.

📖 **Vocabulary:**

Inequalities statements comparing two quantities. When comparing sets of numbers we use symbols >, <, , ≥, ≤, (greater than or equal to, greater than, and less than or equal).
Intersection of sets: The common part of two or more sets is called an intersection.
Union of sets. Combining one or more sets into one set.
Difference of two sets A – B is a set that includes elements from the set A that do not belong to set B.
Subset is a smaller set included in a larger set.

TEST: SETS ON REAL LINES – TEACHER's SOLUTIONS

Set A: $1 \le x \le 9$

Set B: $4 \le x \le 5$

Set C: $2 < x \le 10$

Answer these questions:

1. On the number line below draw sets **A**, **B** and **C** using different shades or colors. Mark your own units. Make sure you include the endpoints.

2. Write an inequality describing an intersection of sets A and C. $2 \le x \le 9$

3. Write an inequality describing an intersection of sets A and B. $4 \le x \le 5$

4. Write an inequality describing the union of sets C and B. $2 \le x \le 10$

5. Write an inequality describing the union of sets A and B. $1 \le x \le 9$

6. Write an inequality describing the difference between sets A and B, i.e. (A-B)? $1 \le x < 4,\ 5 < x \le 9$

7. Is the number 4.34 in the intersection of sets A and B? Yes

8. Is the number 3.91 in the intersection of sets A and B? No

9. Is the number 3.15 in the difference of sets C and B? Yes

10. Is the number 10.5 in the difference of sets C and A? No

11. Write an inequality describing the common part of sets A, B and C. $4 \le x \le 5$

12. Write an inequality describing the union of sets A, B and C. $1 \le x \le 10$

Activity

BAMBOO SKEWERS

Materials you should have

- ✓ 12-inch Ruler (to represent the number line)
- ✓ 9-inch Bamboo Skewer, tip removed (to represent sets)
- ✓ Two different colored highlighters, preferably **yellow** and **blue**

Activity

Set A: $3 \leq x \leq 6$

Thickly highlight the bamboo skewer with the **yellow** highlighter to represent this inequality. Mark end points.

Set B: $5 \leq x \leq 8$

Thickly highlight the bamboo skewer with the **blue** highlighter to represent this inequality. Mark end points.

Answer these questions:

1. What color is the overlap of these two sets? _____
2. Write an inequality describing the common part (intersection) of sets A and B. _____
3. What color(s) is the union of these sets? _____
4. Write an inequality describing the union of sets A and B. _____
5. What color represents the difference between sets A and B, i.e. (A-B)? _____
6. What color represents the difference between sets B and A, i.e. (B-A)? _____
7. Is the number 5.37 in the intersection of sets A and B? _____
8. Is the number 3.97 in the intersection of sets A and B? _____
9. Is the number 3.5 in the difference of sets A and B? _____
10. Is the number 7.5 in the difference of sets B and A? _____

Challenge: Set C: $2 < x \leq 4$

Highlight the bamboo skewer with the highlighter of third color to represent this inequality. Mark end points. Looking at your skewer answer the following questions:

1. What color is the overlap of these three sets? _____
2. Write an inequality describing the common part of sets A, B and C. _____
3. What color(s) is the union of these sets? _____
4. Write an inequality describing the union of sets A, B and C. _____
5. What color represents the difference between sets A and B, i.e. (A-B)? _____
6. What color represents the difference between sets B and A, i.e. (B-A)? _____
7. Is the number 4.34 in the intersection of sets A and C? _____
8. Is the number 2.17 in the intersection of sets A and C? _____
9. Is the number 3.5 in the difference of sets A and C? _____
10. Is the number 7.5 in the difference of sets B and C? _____

TEST: SETS ON REAL LINES

Set A: $1 \leq x \leq 9$

Set B: $4 \leq x \leq 5$

Set C: $2 < x \leq 10$

Answer these questions:

1. On the number line below draw sets A, B and C using different shades or colors. Mark your own units. Make sure you include the endpoints.

    _____

2. Write an inequality describing an intersection of sets A and C.   _____

3. Write an inequality describing an intersection of sets A and B.   _____

4. Write an inequality describing the union of sets C and B.   _____

5. Write an inequality describing the union of sets A and B.   _____

6. Write an inequality describing the difference between sets A and B, i.e. (A-B)? _____

7. Is the number 4.34 in the intersection of sets A and B?   _____

8. Is the number 3.91 in the intersection of sets A and B?   _____

9. Is the number 3.15 in the difference of sets C and B?   _____

10. Is the number 10.5 in the difference of sets C and A?   _____

11. Write an inequality describing the common part of sets A, B and C.   _____

12. Write an inequality describing the union of sets A, B and C.   _____