Sets and Venn Diagrams

Sets and Venn Diagrams are ways to categorize and organize numbers or objects. These are easy and fun to teach to children of all ages, and can be incorporated into unit studies or taught as a rainy-day break from normal routine. As with the other activities in this section, you can review this periodically and use the vocabulary in daily activities, or you can add it to your child's 5-A-Day chart and review it as a math problem.

A set is a group. It can be a group of objects or a group of numbers.

Sets are usually labeled with letter names, and items in a set are written inside braces.

Set A, if consisting of even numbers greater than 2, would be written:

A = {4,6,8,10...}

If a number is included in a set, we say it is an element of the set, and it is written:

$12 \in A$

To show that a number is not a part or an element of the set, we write:

$13 \notin A$

Venn Diagrams are ways to show what is in a set, and if there is more than one set, which members of each set are in both sets.

Sets

Any group of items or numbers can be described as a *set*. A set is simply a group. The members of a set can be tangible items, such as blocks or foods, or they can be numbers. Sets can have a limited number of members, such as the people in your family, or an infinite number of members, such as all even numbers. Any group can be described as a set.

Sets are generally labeled with a *capital letter*, and the members of the set are listed inside *braces*. Here are some examples:

- *A = {4, 12, 22}*

- *B = {girls with red hair}*

- *C = {5, 10, 15, 20, 25...}*

Set A includes exactly 3 members, set B is a group with specific characteristics, and set C is an infinite set of numbers.

Each set lists each item *only once*. For example, consider food items at a snack bar. If the set includes the item and price, then each would be listed, as follows:
I = {candy $1.00, fruit $1.25, soda $1.25, chips $1.25, ice cream $1.50}

This set contains three different items that sell for $1.25. However, if the set only includes prices, then $1.25 would be listed once, not three times.
P = {$1.00, $1.25, $1.50)

Symbols

There are two new symbols to teach with sets: $\in$ means "is a member of" and $\notin$ means "is not a member of." For example, looking at Set A above, we could say:

$$12 \in A \qquad \text{and} \qquad 15 \notin A$$

Teaching Sets

To introduce set theory to your child, play "*What's My Set?*"

1. Make a circle of paper or outline a circle with string or yarn.

2. Take a variety of objects and put them in a box. Make sure there are different colors, shapes, sizes, etc. Use things like colored bottle caps, keys, small toys, small books, cards, blocks, crayons, pencils, paper clips, shells, rocks, etc. The more varied the box of items, the more interesting the game.

3. Think of a characteristic, such as *red.* Find a red object and put it inside the circle, but do not tell your child *why* you chose that object. Say, "This is a member of my set."

4. Choose an object that is not red, put it outside the circle, and say, "This is not a member of my set."

5. Repeat with 2 or 3 more objects, putting all red objects inside the set and all not-red objects outside the set. Then pick up an object and say, "Is this a member of my set?" The object of the game is for the child to discover the *rule* that determines if an object is a member of the set.

Colors are an easy way to start this game, and children can usually figure out the color pattern. Some other ways to group items could be:

- Size — large, small, thick, thin, tall, short
- Texture — smooth, bumpy, rough
- Function — toys, things to write with, things that are usually thrown away
- Shape — round, square, flat sides, curved
- Combinations — red toys, smooth round items

One variation on the *What's My Set* game is for you to decide on the rule and then have your child pick an object from the box and put it in the circle. You then respond with, "Yes, that is a member of my set," or "No, that is not a member of my set." When your child can correctly place objects inside or outside the set, ask for the rule.

This can also be played without physical items. In the car, for example, you might say, "I have a set." Have your child name something and you say whether or not it is a member of your set. Be aware that this is a challenging concept, and it may be too hard for young children. For young ones, keep to items that they can see in the car.

Vocabulary

As you play the *What's My Set* game or talk about sets, be sure to use the correct vocabulary. The terms *set* and *member* are important for your child to understand.

After your child can identify sets with physical items, show him or her the written symbols. Then you can play "What's My Set?" with written symbols instead of physical items. For example, choose Set S to be the multiples of 3 between 1 and 100 and write it down, but don't show your child. Have him or her guess numbers and you write whether or not the number is in your set:

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Guess: 7	Write: $7 \notin A$
Guess: 90	Write: $90 \in A$
Guess: 57	Write $57 \in A$
Guess: 102	Write: $102 \notin A$

When your child can correctly write the set, $S=\{3, 6, 9, 12...99\}$, the game ends.

Venn Diagrams

Once your child understands sets, *Venn diagrams* are easy. The circle that you used to teach sets is really a Venn diagram. Venn diagrams show what is included in a set and what is excluded, but they also can show elements that are contained in (or are common to) more than one set.

Intersection

If Set B is of red items and Set A is of squares, then any red square item will be in both sets. The area that overlaps is the *intersection* of the two sets and is written $A \cap B$.

Set A
Squares

Set B
Red

$A \cap B$
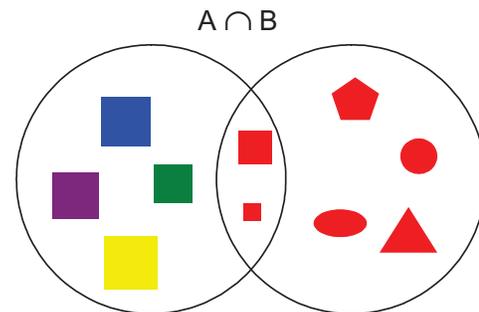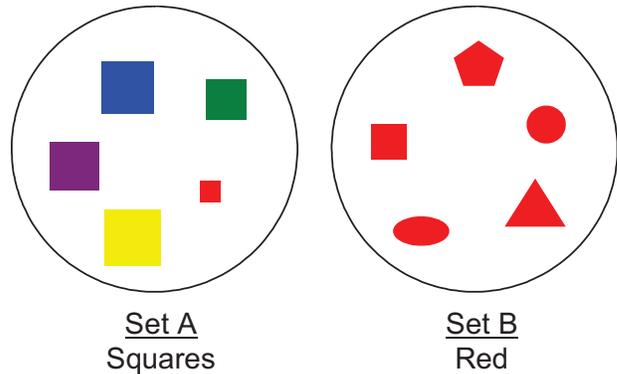
Union

When two sets are combined to form a new set that includes everything from both sets, it is called the *union* of the two sets and is written $A \cup B$.

To help your child remember which symbol means *union*, show him or her that $\cup$ looks like U, which stands for Union.em

$A \cup B$