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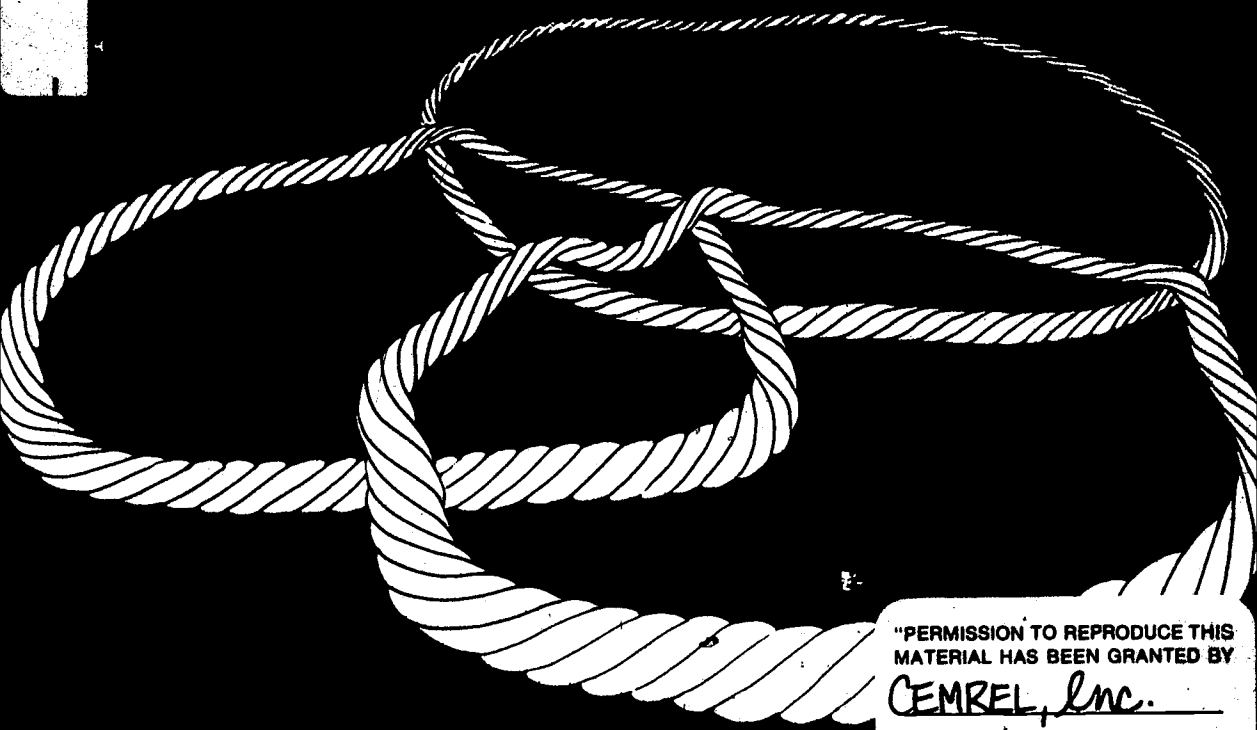
ABSTRACT

This document presents five activities which represent a part of the Comprehensive School Mathematics Program (CSMP) curriculum. The package is primarily designed to: (1) introduce instructors to one or more of the three non-verbal languages used in the CSMP elementary curriculum in such a way that teachers would want to pursue the possibility of adopting the curriculum; and (2) to provide some mathematically rich activities for immediate classroom use. This package introduces a classification game. The five activities are written in standard CSMP format of teacher-student dialogue. It is hoped the material will provide teachers and their pupils with a setting that allows for joyful development of logical and strategic thinking. (MP)



a-blocks string game

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The Comprehensive School Mathematics Program materials included herein are in the process of development. As a part of our continuing effort to evaluate and improve them, we ask that you comment in detail on the materials and on the way in which you used them.

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TABLE OF CONTENTS

Introduction ... 1

A CSMP Mini-Package ... 1

Classification and The Language of Strings ... 1

The String Game and CSMP ... 2

Five Activities and How to Use Them ... 3

Activity 1 ... 5

Activity 2 ... 11

Activity 3 ... 16

Activity 4 ... 22

Activity 5 ... 31

Concluding Remarks ... 34

Appendix ... 35

INTRODUCTION

A CSMP Mini-Package

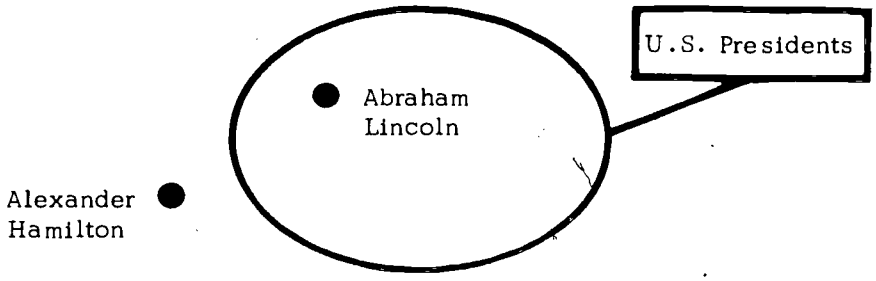
The CSMP Mini-packages present parts of the CSMP curriculum through introductory lessons that can be taught by teachers with no prior CSMP training to students with no CSMP background. The purpose of each CSMP Mini-package is twofold:

- to introduce you to one or more of the three non-verbal languages used in the CSMP elementary curriculum in such a way that you will want to pursue the possibility of adopting the entire curriculum, and
- to provide some mathematically rich activities which you can use immediately in your own classroom.

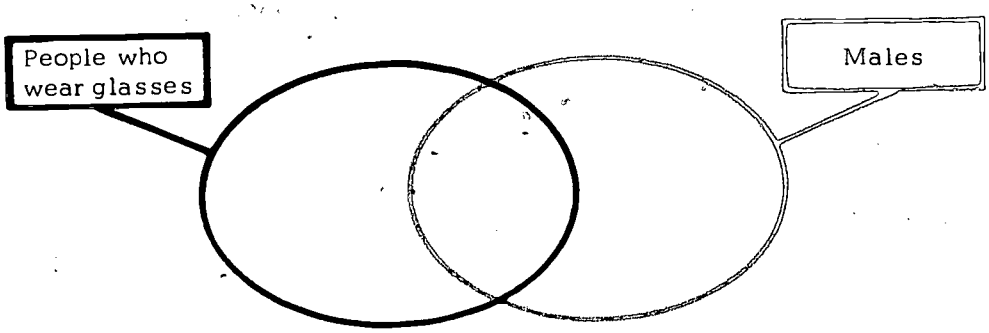
This CSMP Mini-package introduces the languages of strings through the String Game with A-Blocks.

Classification and The Language of Strings

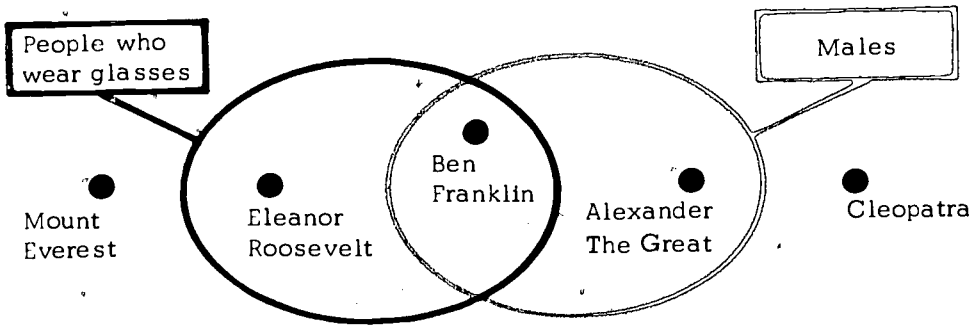
As the word implies, classifying means putting things into classes, or as mathematicians say: sets. The basic idea is simple. Given a set S and any object x, either x belongs to S (x is in S) or x does not belong to S (x is not in S). We can represent this simple act of sorting — "in and out" — by using "string pictures." In a string picture, objects to be sorted are represented by drawing closed curves (strings) around dots. A dot inside (the region delineated by) a set's string is for an object in the set and a dot outside a set's string is for an object not in the set. For example, consider the set of U.S. Presidents. Abraham Lincoln belongs to that set, but Alexander Hamilton does not. The string picture below records this information in a precise and clear fashion.



The situation becomes more interesting when we are sorting with respect to more than one property, i.e. when we are putting things into several sets, because then we can study the relations between sets. Suppose we consider the set of people who wear glasses and the set of males. We draw two different colored strings partially overlapping each other.



Now the classification scheme must be concerned with two in-out decisions simultaneously. The illustration below shows where Eleanor Roosevelt, Benjamin Franklin, Cleopatra, Alexander the Great, and Mount Everest belong in this string picture.



Note that every object in the world has a place in this picture.

The String Game and CSMP

To gain children's interest in the language of strings, Burt Kaufman set out in 1973-74 to create a game situation which would involve classifications. He chose to start with a set of attribute blocks (A-Blocks) of varying shapes, colors, and sizes. These attributes are well-defined and familiar to elementary school students. After having tried various formats, he met with

tremendous success in the 1974-75 school year playing what we now introduce to you as "The String Game" with a group of fourth graders in St. Louis. Since that time the String Game has become a major tool in the CSMP curriculum for developing logical and strategic thinking.

The String Game is designed to be played with a class divided into two teams and with its teacher. The game is played with either a 2 or 3-string picture whose labels are known to the teacher and are hidden from the players. A team's goals are to place its share of game pieces correctly in the string picture and to identify the string labels. A game lasts approximately twenty minutes. See the appendix for a complete listing of the game rules.

In the CSMP curriculum for the first grade through the beginning of the fourth grade, the String Game is played with A-Blocks; versions increase in sophistication as the students' familiarity with the game grows. In the fourth through sixth grades, the same basic game is played only with sets of numbers and strings labeled with numerical properties; for example, one string might be for multiples of 3 and the other for numbers larger than 50.

In this booklet we introduce you to the String Game with A-Blocks and suggest how to introduce this game to your students.

Five Activities and How to Use Them

In this booklet we describe five String Game activities.

- Activity 1 introduces A-Blocks and a simple version (Version A) of the String Game. We suggest that you play this version many times before proceeding to Activity 2. In doing so, your students will become thoroughly acquainted with the A-Blocks and the basic rules of the String Game.
- Activity 2 introduces "not-cards" to the String Game. A string labeled with a not-card is for the A-Blocks that do not have a particular color or shape; for example, a string labeled NOT RED in the game is for the A-Blocks which are not red. The game increases in sophistication

with these additional possibilities for string labels. We suggest that you play the String Game with not-cards included (Version B) many times before proceeding to any of the other three activities.

- Activity 3 introduces 3-string pictures to the game. After an introductory 3-string game, we suggest you vary the number of strings in the games you play thereafter, i.e. sometimes play with two strings and sometimes play with three.
- Activities 4 and 5 are examples of the analysis exercises which can be found throughout the CSMP curriculum. These activities are for students who have played the String Game many times and are ready to begin discussing the kinds of thinking involved in making good plays.

Now we present the five activities, written in the standard CSMP format of a dialogue between teacher (T) and students (S). We hope that the String Game will provide you and your students with a setting to share the joy which comes from developing logical and strategic thinking.

ACTIVITY #1

NOTE: Read the appendix carefully before conducting these activities.

Preparation for the String Game

Put the twenty-four A-Blocks into a box about the size of a shoe box. Sort them so that you can locate any given one quickly.

T: In this box I have some cardboard pieces in different shapes, colors, and sizes. What different shapes do you think I have?

S: Circles.

T: Yes, I have some circles.

S: Rectangles.

T: Yes, I have some rectangles but they are a special kind of rectangle.

S: Squares!

T: Right, I have some squares.

S: Triangles.

T: Yes, I have some triangles.

When your class has guessed all three shapes, tell them that these are the only shapes the pieces have.

T: What different colors do you think the pieces are?

S: Red.

T: Yes, some of the pieces are red.

S: Brown.

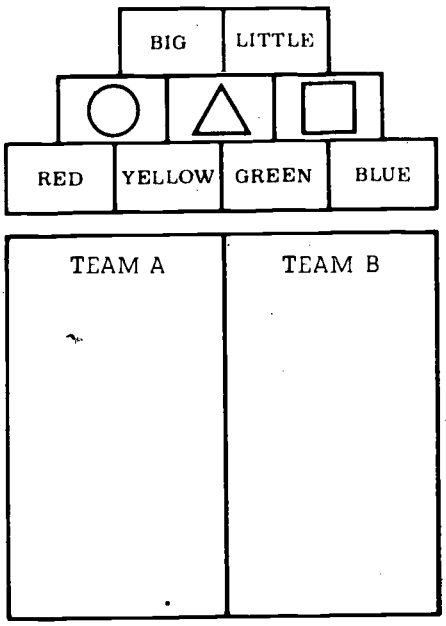
T: No, there aren't any brown pieces.

Continue until the class has guessed the four colors.

T: There are two different sizes. What are they?

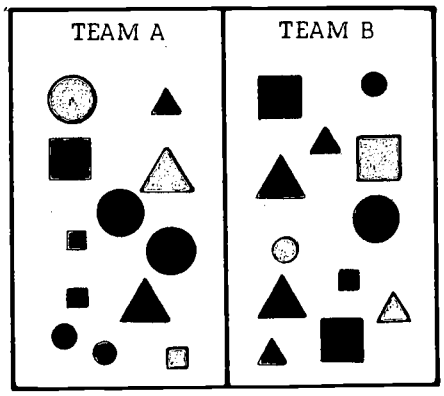
S: Big and little.

Tell the students that you are going to show them how to play a new game and divide them into two teams. Tape a copy of the A-Block String Game Poster (Version A) to the board. Draw or display the team board.



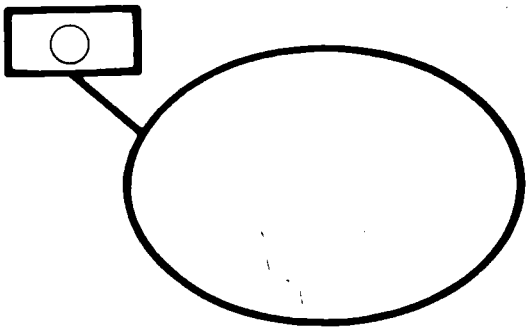
T: Our first task will be to divide the pieces between the two teams. Someone on Team A will tell me a piece to put on Team A's side of the board, and then someone on Team B will tell me a piece to put on Team B's side. The teams will continue taking turns choosing pieces until all the pieces are out of this box.

Alternating teams, let students describe pieces to put on the team board. Insist that descriptions be complete; a student describing a piece should say its color, shape, and size. If a piece described is already on the board, point it out and ask for another piece. Encourage students to be thinking about which pieces they will ask for when called upon. The next illustration shows one possible distribution of the game pieces.



T: We'll first play a warm-up game in which you know what the string labels are.

On the board draw a large red string and label it ◯ for circles.



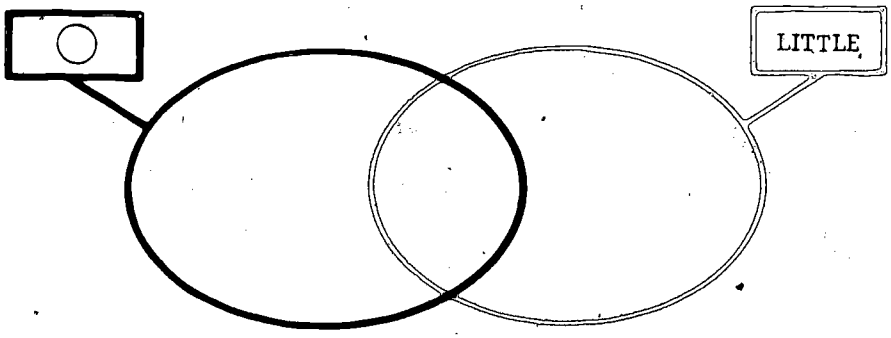
T: The red string is for ◯†. Only pieces which are circles belong inside this string. All other pieces belong outside of it.

† We refer to the string labels by the symbols that appear on the string cards. ◯ should be read "circles"; △, "triangles"; and □, "squares".

Take several pieces, one at a time, off the team board and ask whether each belongs inside or outside the red string. Return each piece to the side of the team board from which it was taken.

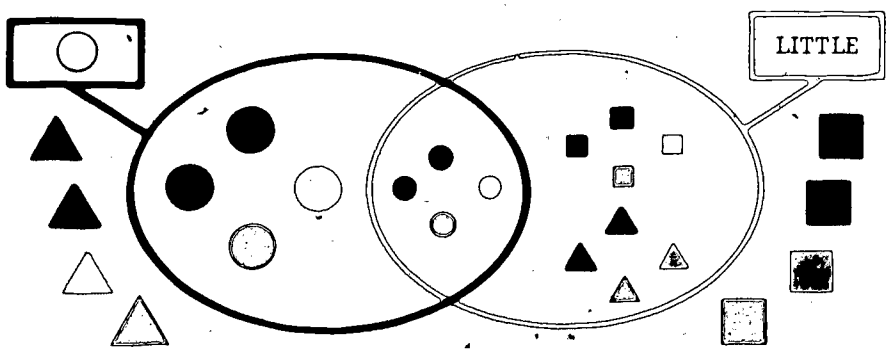
Draw a large blue string overlapping the red string and label the string LITTLE.

T (drawing the blue string): This blue string is for little pieces. Any piece which is little belongs in this string.



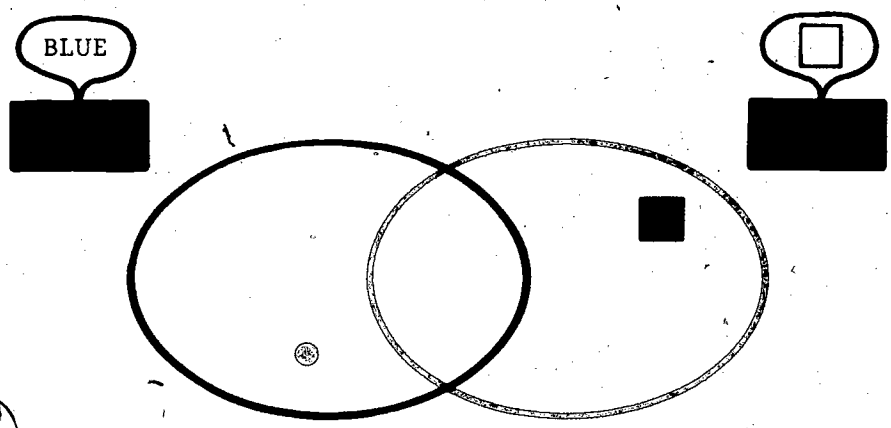
T: Now teams take turns trying to place their pieces correctly in the string picture. When it is your turn, select one piece from your team's side of the board and put it where you think it belongs in the picture. If you place it correctly, I will say "yes". If you place it incorrectly, I will say "no" and you must return the piece to your team's side of the board. The first team to place correctly all of its pieces in the string picture wins.

Play this game alternating teams and alternating turns among the members of a team. The next illustration shows the correct placement of the twenty-four game pieces.



The String Game with A-Blocks (Version A)

Distribute the A-Block pieces evenly between the two sides of the team board. Place the string card BLUE face-down near the red string and place the string card face-down near the blue string. Put two A-Block pieces correctly in the picture as starting clues. Each team should have eleven pieces on the team board.

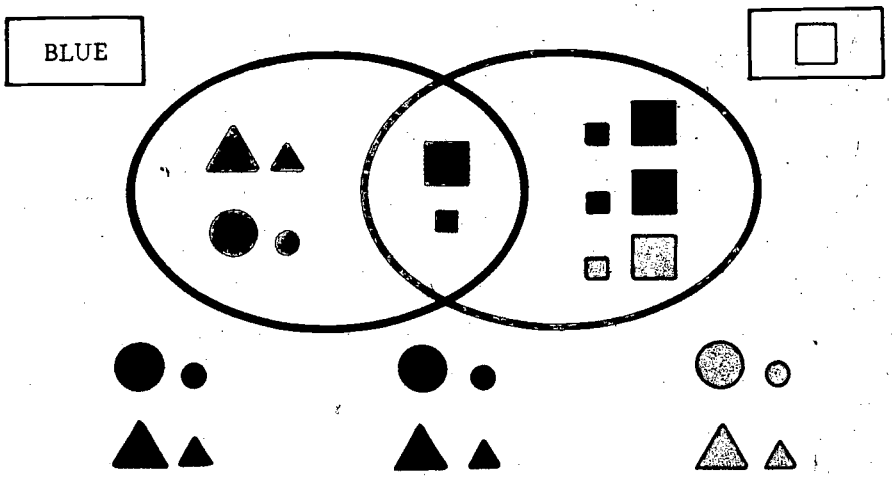


T: This time we'll play the game with the string labels hidden. Teams will take turns guessing where their team's pieces belong. We'll play with a "bonus" rule: if you place a piece correctly, you get another turn. After playing two pieces, though, it is the other team's turn, even if you are correct both times.

When a team has correctly placed all of its pieces, the player who placed its last piece can guess what the strings are for. If the player gives the correct labels for both strings, that team wins. If both or one (and I won't tell you which one) is incorrect, we continue with the other team's turn.

Begin playing the game. If a student correctly places a piece, say "yes" and allow the piece to remain in the picture (and allow the student a second turn). If the piece is placed incorrectly, say "no" and return it to the team board.

Continue until a team has correctly placed all of its pieces and has correctly identified both strings. To assist you in the judging, the correct placement of the twenty-four game pieces is shown below.



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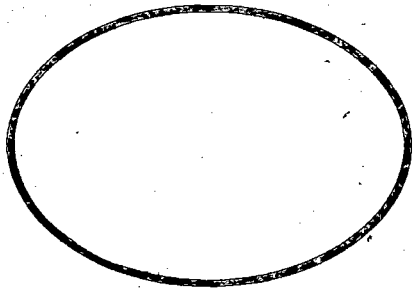
ACTIVITY #2

Introduction to "Not" Cards

With the class quickly review the attributes of the A-Blocks, that is, their sizes, colors, and shapes.

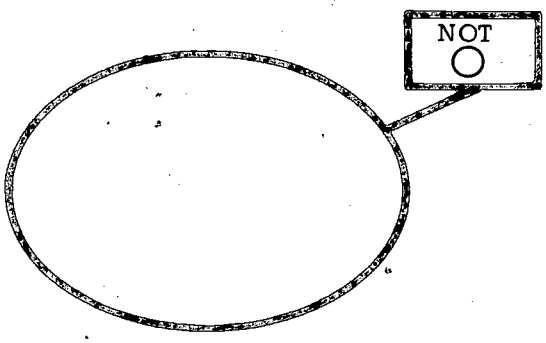
Draw a blue string on the board.



T: I'm going to show you some other possibilities for string labels.

Show the class the string card 

and label the string the same.



T: If this string is for NOT ◯ (read: not circles), what would be a piece that goes inside the string?

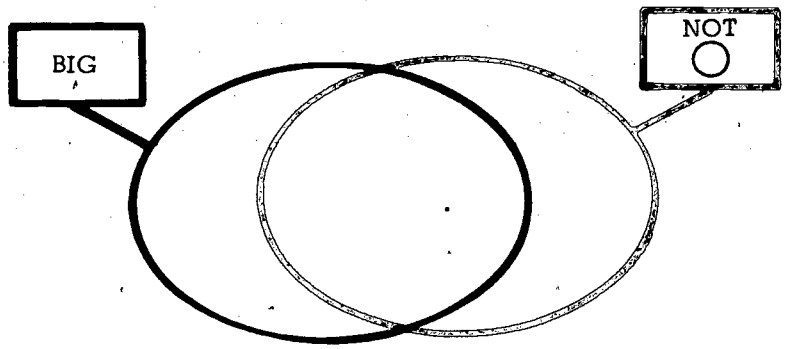
S: The small red square.

T (putting the piece inside the string): Yes, this piece is not a circle. What would be a piece that goes outside the string?

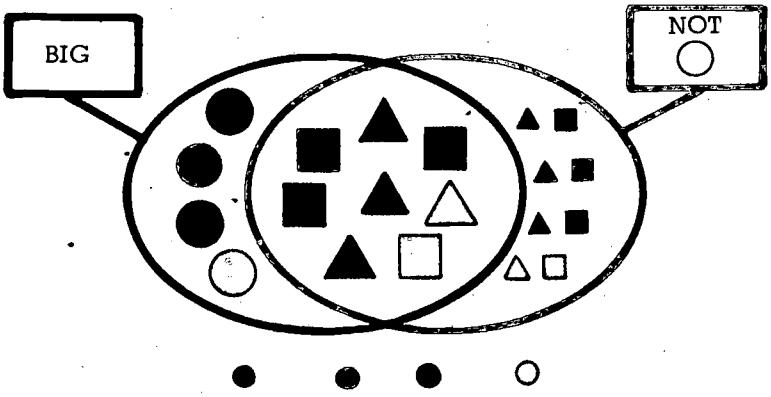
S: The large blue circle.

T (putting the piece outside the string): Yes, circles go outside the string.

Let several other students suggest pieces that go inside the string and pieces that go outside the string. Then clear the picture of all game pieces and draw a red string overlapping the blue string. Label it "BIG".



Call on students to place several game pieces of their choice in this picture. Discuss with the class why each placement is correct or incorrect, as the case may be. For your information, the following picture shows correct placement of the twenty-four game pieces.



After several pieces are in the picture, at least one in each region, clear the picture of all game pieces and erase the string labels.

T: What other new string labels do you think there are?

Show the class each string card as it is mentioned.

NOTE: If a student mentions "Not Little" or "Not Big", discuss why such string cards are not needed. Pieces that are not little are the same as those that are big, and pieces that are not big are the same as those that are little.

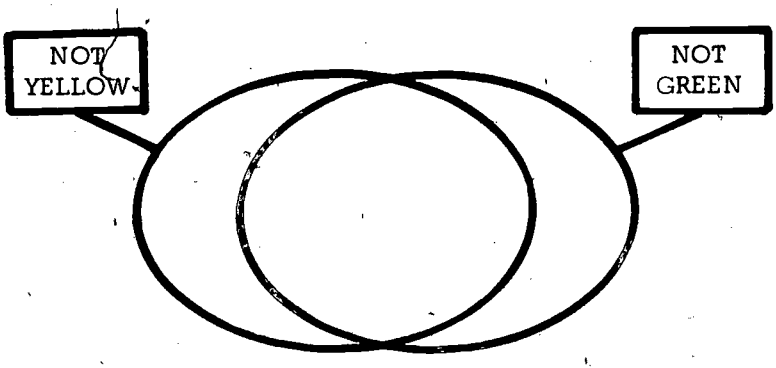
Tape a copy of the A-Block String Game Poster, Version B, to the board. Draw or display the team board.

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

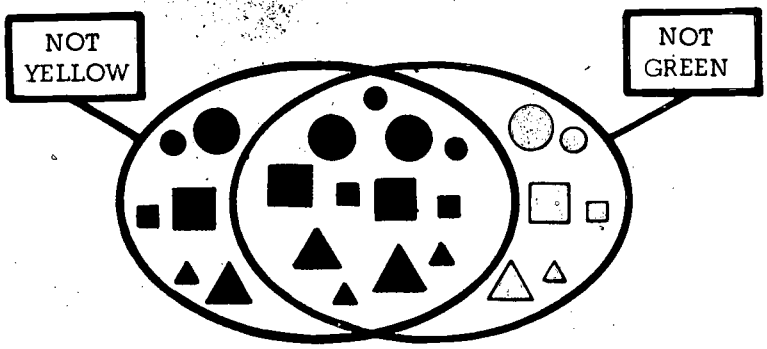
TEAM A	TEAM B

T: Now, when we play the String Game, we have all of these possibilities for the string labels. Before we play an actual game, let's play a warm-up game in which you know what the string labels are.

Divide the class into two teams, Team A and Team B. Distribute the game pieces on the two sides of the team board. Label the strings as shown below. Since the labels are visible, no starting clues are necessary.



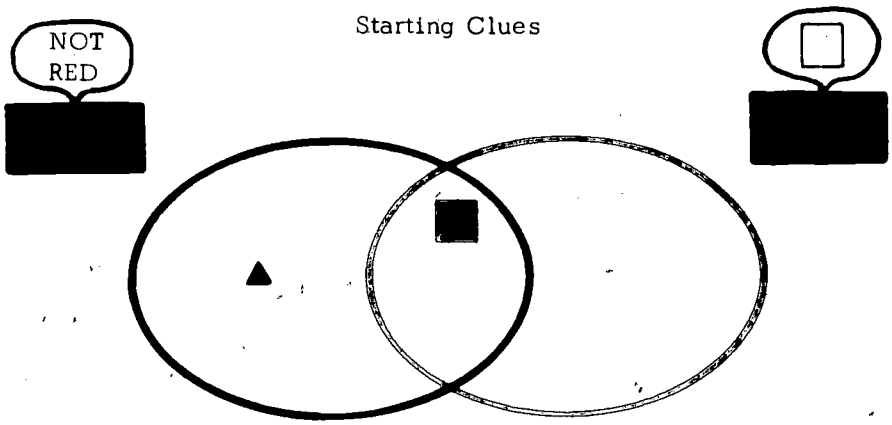
Let the teams take turns placing their respective pieces in the picture. If a piece is correctly placed, say "yes" and let the piece remain in the picture. If a piece is incorrectly placed, say "no" and ask the student who made the play to return the piece to the team board. The first team to place correctly all of its game pieces wins. For your information, correct placement of the twenty-four game pieces is shown below.



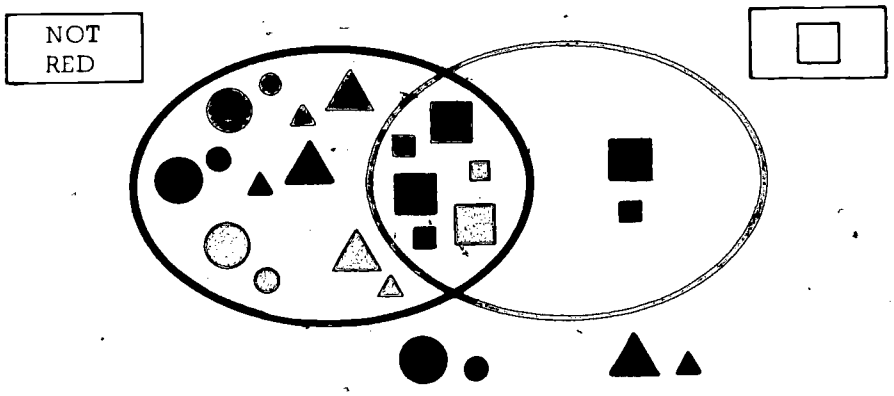
The String Game with A-Blocks, using "Not" Cards

Play the String Game with face-down string cards as described in Activity #1, only this time include the not-cards. Tell your class that there are sixteen possibilities (point to the poster) for each string. The first of the next two illustration suggests a choice of string labels (indicated in the bubbles) and appropriate starting clues. The second illustration shows correct placement of the twenty-four game pieces.

Starting Clues



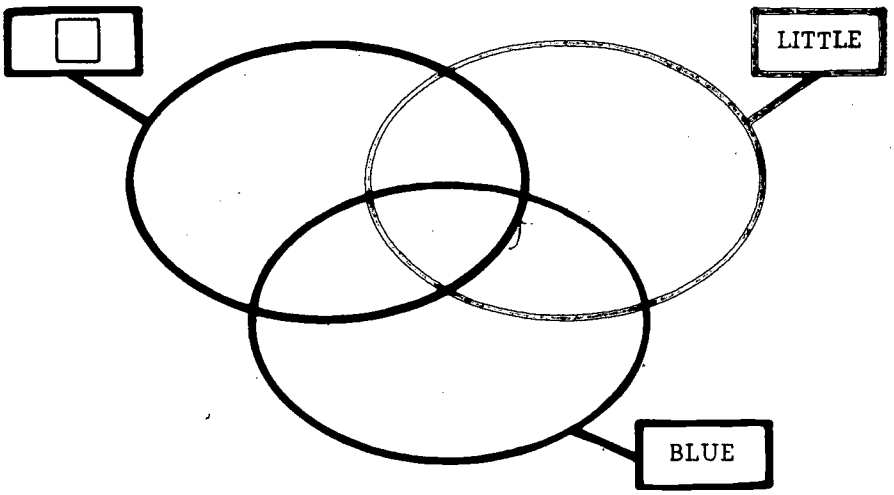
Correct Placement
of Game Pieces



ACTIVITY #3

Introduction to 3-String Pictures

Display the A-Blocks and draw this string picture on the board.

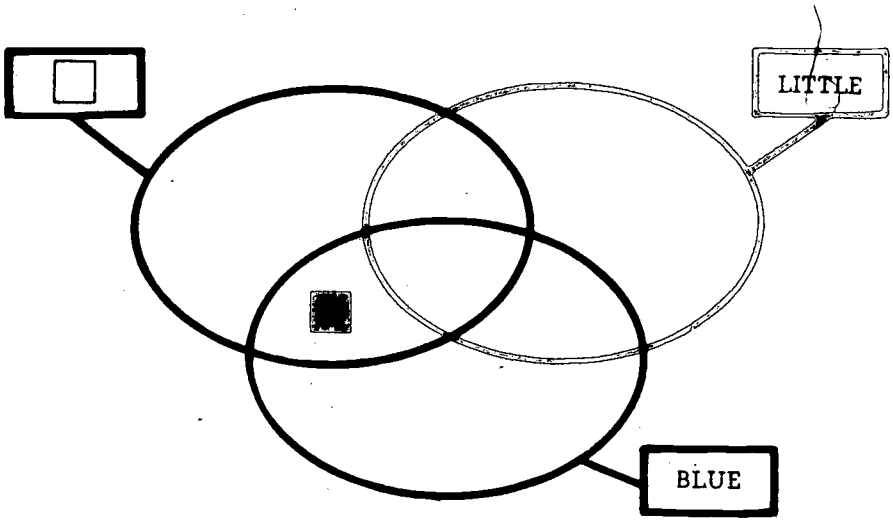


Trace each of the three strings as you say what it is for. Then point to any one of the regions† in the picture as you ask:

T: Who knows a piece which belongs here?

† There are pieces which belong in each of the eight regions of this picture. This is not true for all choices of string labels. See the appendix for examples of 2 and 3-string pictures in which one or more regions are empty.

Check a student's choice by considering each label. For example, suppose a student places the large blue square here (see the next illustration).

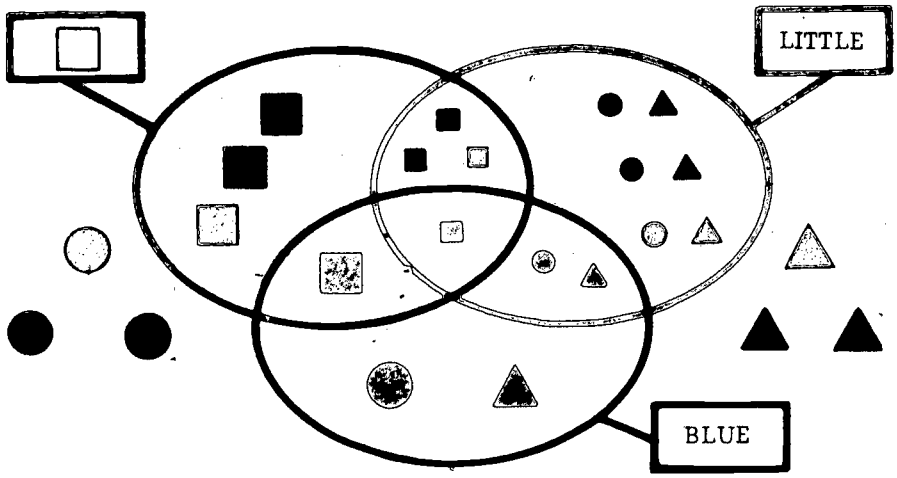


T (pointing to the string labels, one at a time): Is this piece a square? (Yes) Is it blue? (Yes) Is it little? (No) So it belongs inside the red and green strings but outside the blue string.

Repeat this activity with three or four other regions. If someone chooses a piece which does not belong in the region being considered at the time, the class should notice the error. Lift the piece from the picture and ask where it does belong in the picture.

Next, hold up some of the pieces that are not yet in the picture. Ask where those pieces belong in the picture.

Although your picture might only have about six to nine pieces in it, correct placement of the twenty-four game pieces is shown below.



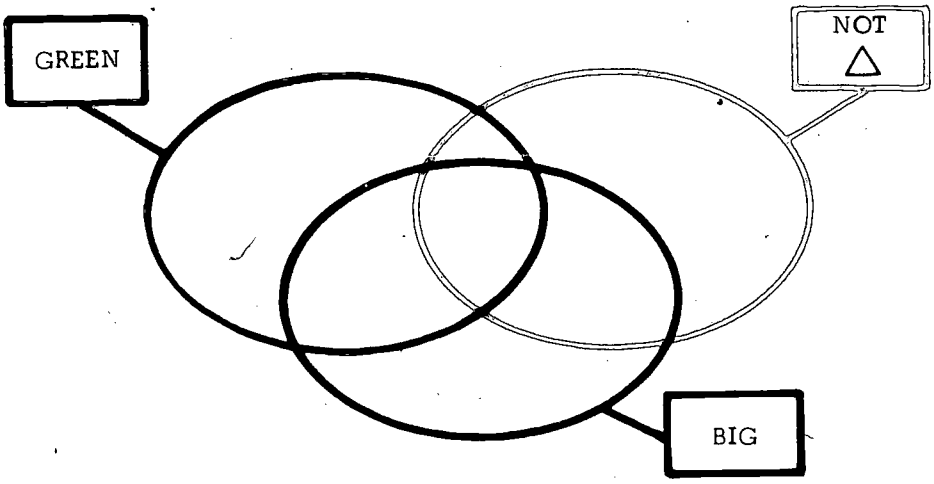
Tape a copy of the A-Block String Game Poster, Version B, to the board. Draw or display the team board.

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

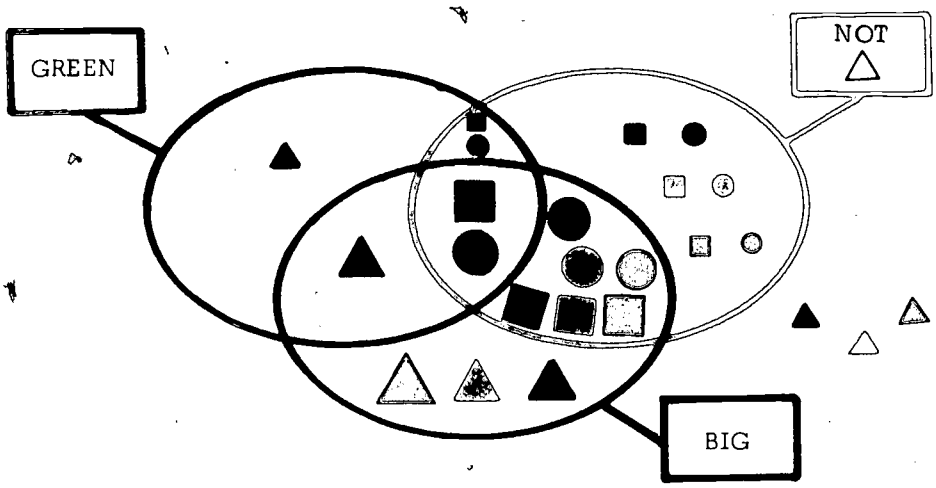
TEAM A	TEAM B

T: Before we play an actual game with a 3-string picture, let's play a warm-up game in which you know what the string labels are.

Divide the class into two teams, Team A and Team B. Distribute the game pieces on the two sides of the team board. Label the strings as shown below. Since the labels are visible, no starting clues are necessary.



Let the teams take turns placing their respective pieces in the picture. If a piece is correctly placed, say "yes" and let the piece remain in the picture. If a piece is incorrectly placed, say "no" and ask the student who made the play to return the piece to the team board. The first team to place correctly all of its game pieces wins. For your information, correct placement of the twenty-four game pieces is shown below.

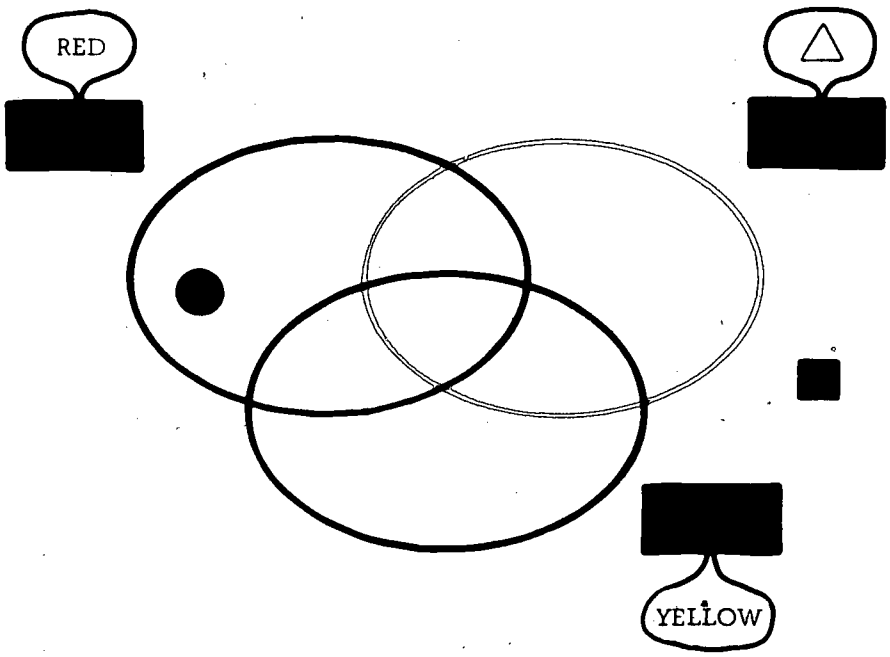


The String Game with A-Blocks, 3-String Pictures

Play the String Game with three strings. Tell your class that there are sixteen possibilities† (point to the poster) for each string. Remember that for a team to win, it must be first to place correctly its share of game pieces and the player who played the last of its pieces must identify all three string labels.

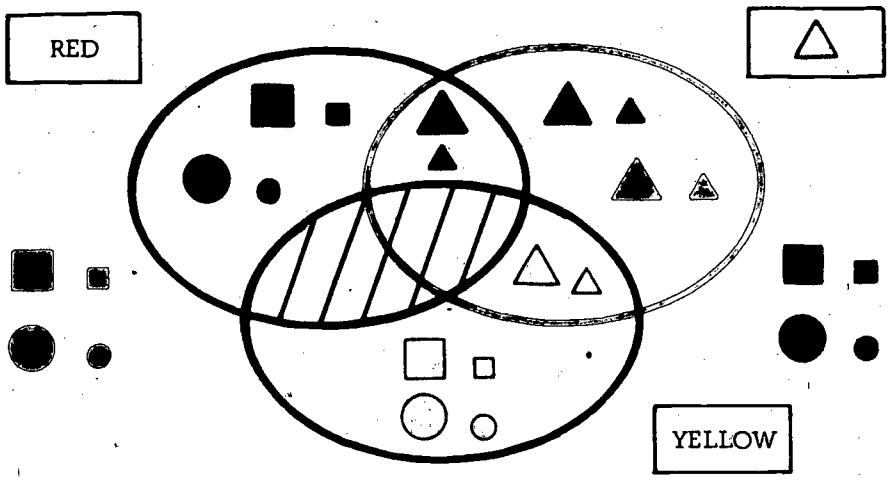
The first of the next two illustrations suggests a choice of string labels (indicated in the bubbles) and appropriate starting clues. The second illustration shows correct placement of the twenty-four game pieces.

Starting Clues



† Although each string has sixteen possible labels, we suggest that you do not choose not-cards for any of the three string labels until your students are quite familiar with 3-string pictures. For 3-string games, not-cards add a considerable level of difficulty, both for the teacher and for the student.

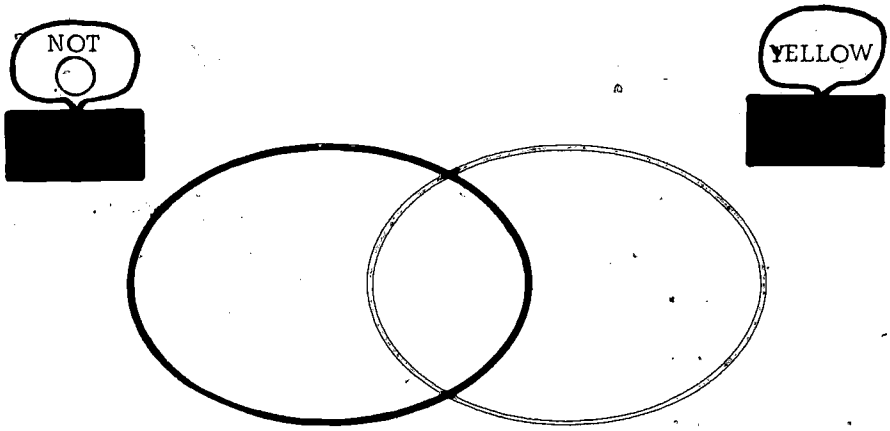
Correct Placement
of Game Pieces



NOTE: There are no A-Block pieces which are both red and yellow, so we "hatched" the intersection of the red and green strings.

ACTIVITY #4

Set up your board for the String Game as illustrated below. The bubbles show what is on the hidden tags. Tape two A-Block String Game Posters (Version B) to the board, one for the red string and one for the blue string.



RED

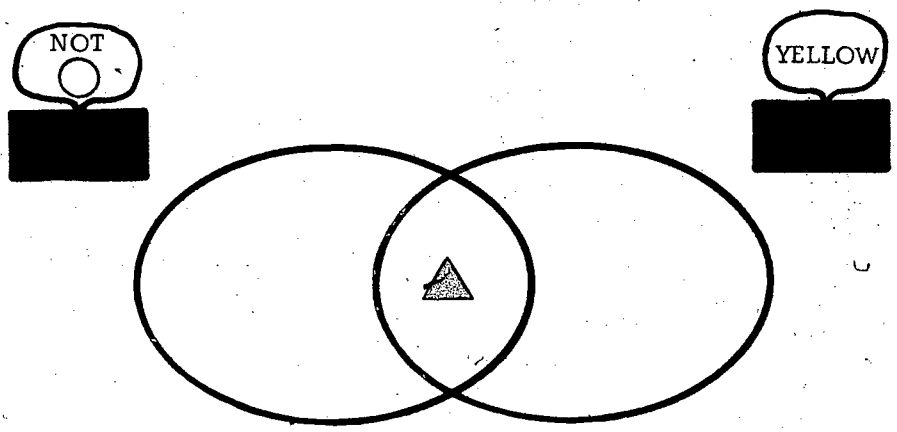
RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

BLUE

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

T: We are going to play the String Game today, but first we are going to look at what information we get from knowing where some of the game pieces belong in the picture. Finding out what the strings are for will be like solving a detective story; each piece placed will be a clue.

First clue



T: Your first clue is that the big yellow triangle belongs inside both strings. What information does this give about the strings? Are there any of these labels (point to one of the posters) that the strings cannot have?

S: RED, because that piece is yellow and inside the strings.

T: We can cross out RED in which list?

S: In both.

Use red and blue felt-tip markers or crayons to cross out RED in both lists.

RED

~~RED~~	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

BLUE

~~RED~~	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

In the same manner, let students continue analyzing the situation. Each time they say to cross out a label in one list because the corresponding string cannot have that label, they should see that the same label should be crossed out in the other list. A piece in the center region gives the same information about both strings.

A student may suggest incorrectly that some label be crossed out in the lists and you will need to point out the error; for example,

S: Cross out NOT RED.

T: But this piece (point to the big yellow triangle) <u>is</u> not red.

When your class has exhausted this clue of information, they will find that there are eight remaining possibilities for each string.

RED

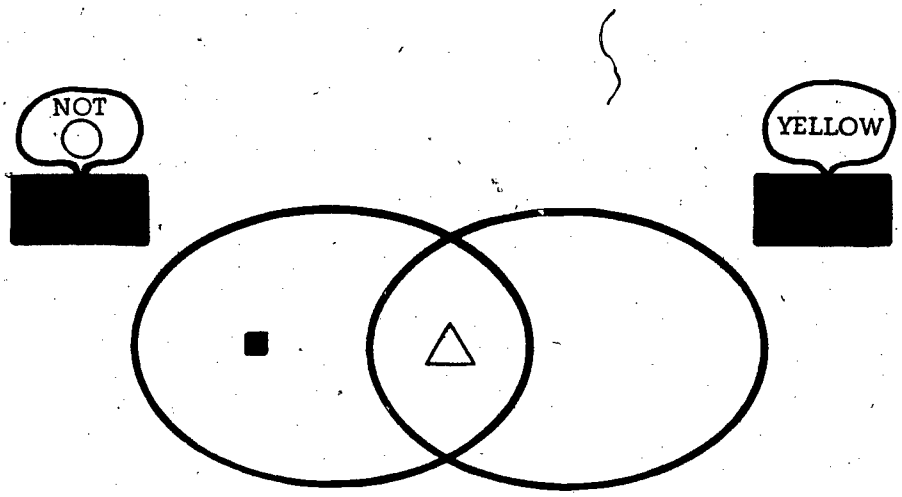
~~RED~~	YELLOW	~~GREEN~~	~~BLUE~~
NOT RED	~~NOT YELLOW~~	NOT GREEN	NOT BLUE
~~○~~	~~△~~	~~□~~	BIG
NOT ○	~~NOT △~~	NOT □	~~LITTLE~~

BLUE

~~RED~~	YELLOW	~~GREEN~~	~~BLUE~~
NOT RED	~~NOT YELLOW~~	NOT GREEN	NOT BLUE
~~○~~	~~△~~	~~□~~	BIG
NOT ○	~~NOT △~~	NOT □	~~LITTLE~~

Second clue

T: I'll give you another clue. The little red square belongs in the red string but not in the blue string.



Consider as a class the remaining labels in the RED list. Ask if there are any of those labels which the red string cannot have.

T (tracing the red string): Could the red string be for BIG?

S: No, because there is a little piece in the red string.

Cross out BIG in the RED list.

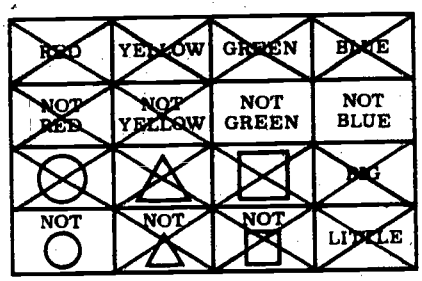
T (tracing the red string): Could the red string be for NOT ◯ ?

S: Yes, neither piece in the red string is a circle.

Do <u>not</u> cross out NOT ◯ in the RED list.

Continue the analysis until your class concludes that only three possibilities remain for the red string.

RED



Consider the eight remaining possibilites for the blue string. The analysis involved is slightly different for this string because the small red square is outside the blue string. Because of the position of this piece in the picture,

- whenever a label is eliminated as a possibility for the red string, it remains as a possibility for the blue string;
- whenever a label remains as a possibility for the red string, it is eliminated as a possibility for the blue string.

In the following dialogue, two of the eight remaining labels are discussed.

T (tracing the blue string): Could the blue string be for YELLOW?

S: Yes, the little red square is outside the blue string.

T (tracing the blue string): Could the blue string be for NOT ◯ ?

S: No, because the little red square is not a circle and it is outside the blue string.

If no one responds, ask where the little red square would belong in the picture if the blue string were for NOT ◯. Cross out NOT ◯ on the BLUE list.

After each of the eight remaining possibilities for the blue string have been discussed, your lists should look like these.

RED

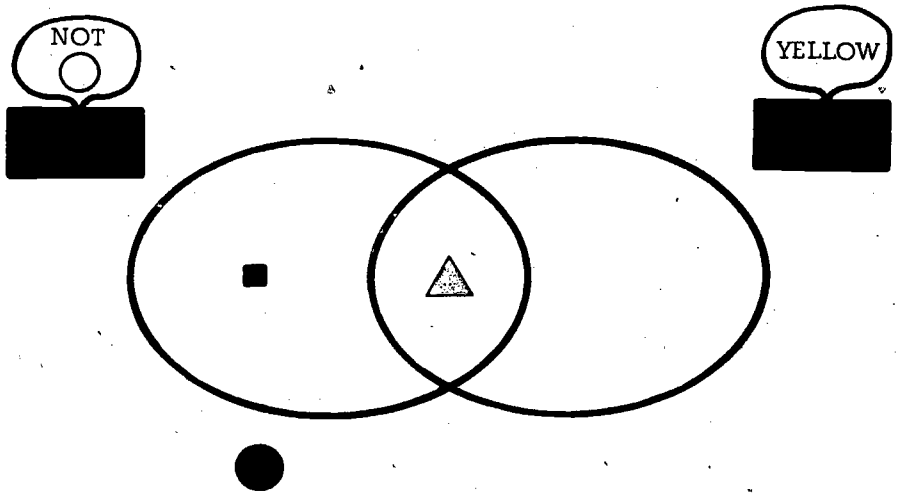
~~RED~~	~~YELLOW~~	~~GREEN~~	~~BLUE~~
~~NOT RED~~	~~NOT YELLOW~~	NOT GREEN	NOT BLUE
⊗	△	⊠	~~BIG~~
NOT ○	~~NOT △~~	~~NOT ⊠~~	~~LITTLE~~

BLUE

~~RED~~	YELLOW	~~GREEN~~	~~BLUE~~
NOT RED	~~NOT YELLOW~~	~~NOT GREEN~~	~~NOT BLUE~~
⊗	△	⊠	BIG
~~NOT ○~~	~~NOT △~~	NOT □	~~LITTLE~~

Third clue

T: Your next clue is that the big blue circle belongs outside both strings.



As before, use the information to try to eliminate possibilities for the string labels. Since the big blue circle is outside both strings, the analysis for each string is the same as that used to consider the blue string after the second clue (little red square outside the blue string).

After considering the remaining labels (from the second clue) on the lists, you should have only two possibilities left for the red string and two possibilities left for the blue string.

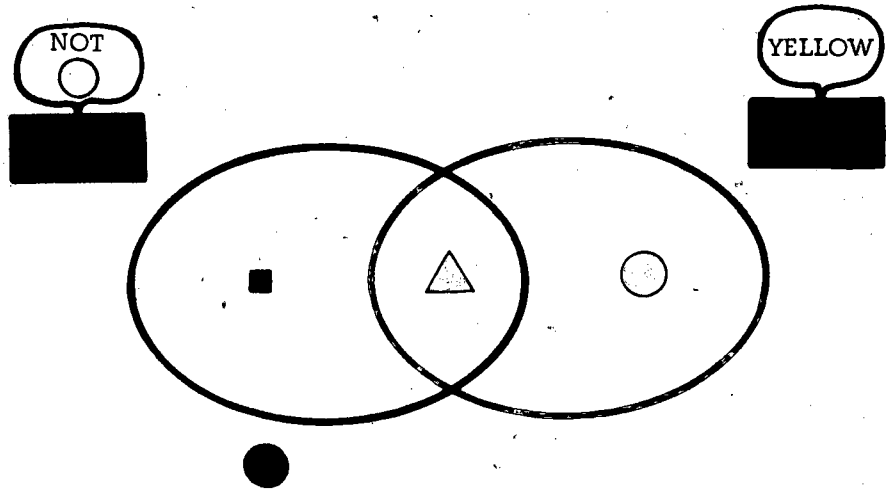
RED

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
⊗	△	⊠	BIG
NOT ○	NOT △	NOT ⊠	LITTLE

BLUE

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
⊗	△	⊠	BIG
NOT ⊗	NOT △	NOT ⊠	LITTLE

Fourth clue

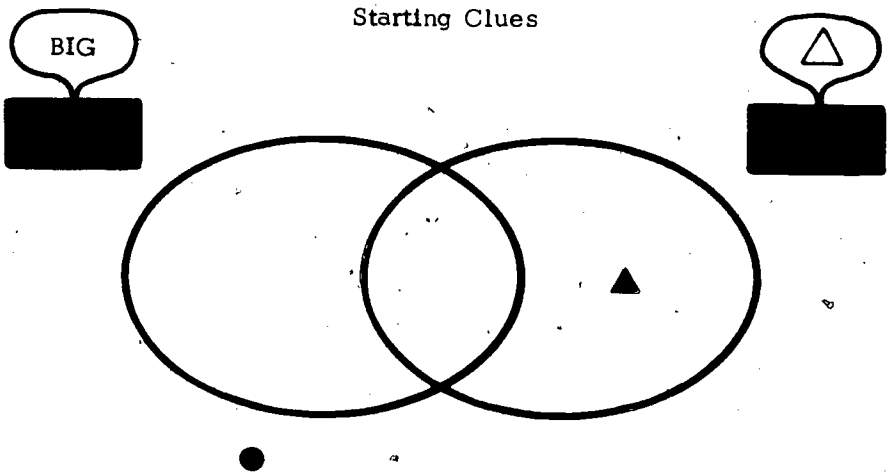


From this clue, your class should conclude:

- that the red string is for NOT ○ (the large yellow circle is not blue, so NOT BLUE can be crossed out on the RED list); and
- that the blue string is for YELLOW (the large yellow circle is not a triangle, so △ can be crossed out on the BLUE list).

Distribute analysis sheets† to the students. Play the String Game using not-cards (Version B). Before beginning to play, collectively analyze the starting situation as you did with any of the clues in Activity #3. Then continue the game in the usual way. As information is gained from plays, encourage the students to cross out on their analysis sheets labels that the strings cannot have. A choice of string labels and appropriate starting clues for a game are suggested below. The possibilities which are eliminated by the starting clues are crossed out in the lists below the string picture. Correct placement of the twenty-four game pieces is shown on the next page.

Starting Clues



RED

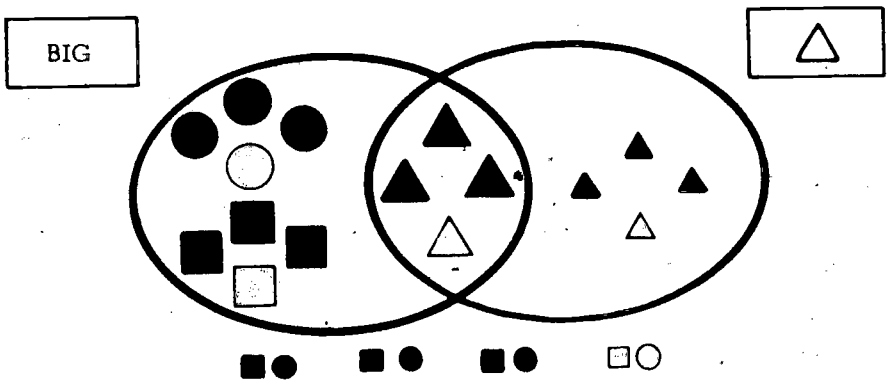
~~RED~~	YELLOW	GREEN	~~BLUE~~
~~NOT RED~~	~~NOT YELLOW~~	~~NOT GREEN~~	~~NOT BLUE~~
~~○~~	~~△~~	□	BIG
~~NOT ○~~	~~NOT △~~	~~NOT □~~	~~LITTLE~~

BLUE

~~RED~~	~~YELLOW~~	~~GREEN~~	BLUE
NOT RED	~~NOT YELLOW~~	~~NOT GREEN~~	~~NOT BLUE~~
~~○~~	△	~~□~~	~~BIG~~
NOT ○	~~NOT △~~	~~NOT □~~	~~LITTLE~~

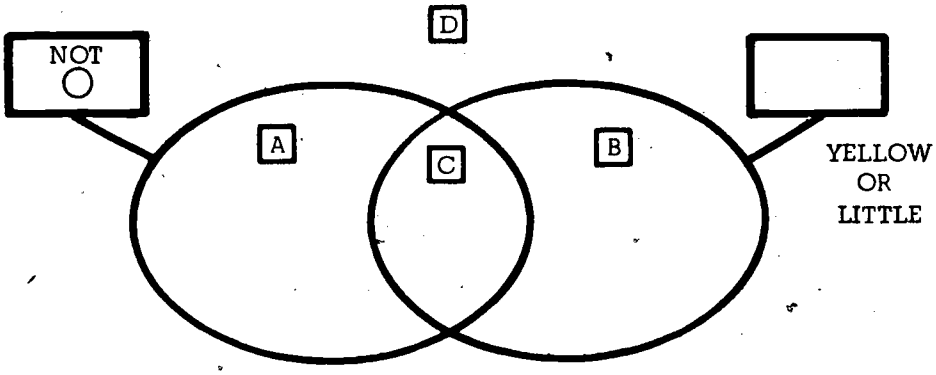
† The A-Blocks String Game kit includes two individual analysis sheets printed on a single page. Using a duplicating machine, prepare enough copies for your class.

Correct Placement
of Game Pieces



ACTIVITY #5

Draw this string picture on the board.



T: Imagine that we are playing the String Game and that we now know the red string is for NOT ◯, but we don't yet know whether the blue string is for YELLOW or for LITTLE. I labeled the four regions of the picture so that they will be easy to refer to.

Away from the string picture display the A-Blocks pictured below.

T: In which regions of the picture could each of these pieces belong? If there is only one possible location for a piece, we'll put it into the picture.

S: The large red circle belongs in region D.

T: Convince us.

S: All pieces which are circles belong outside the red string. Since that piece is neither yellow nor little, it belongs outside the blue string.

Put the large red circle in region D.

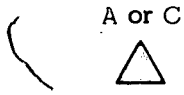
S: The large yellow triangle is not a circle, so it belongs in either region A or C of the red string.

T: Do we know for sure which of those regions it belongs to?

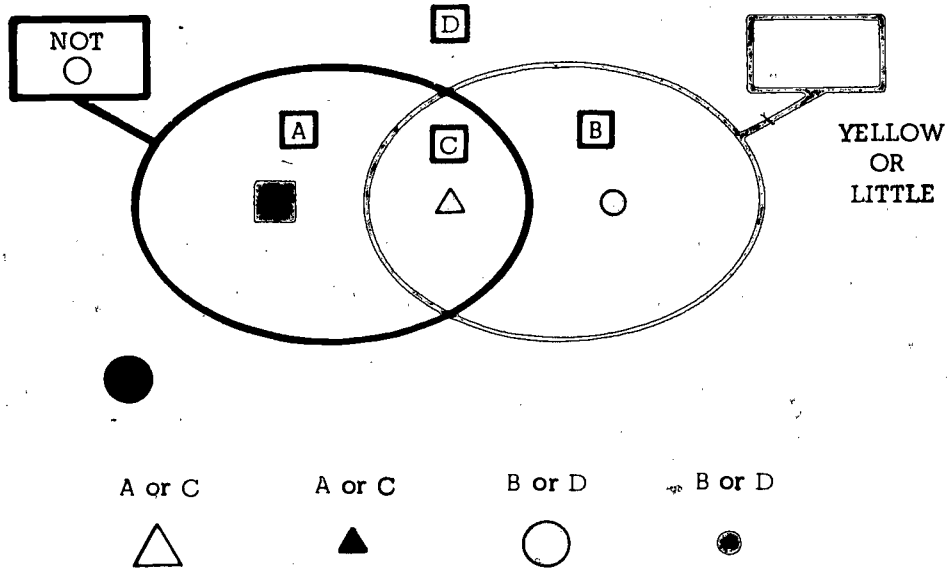
S: No. The large yellow triangle belongs in region C if the blue string is for YELLOW. It belongs in region A if the blue string is for LITTLE.

Go over the two possibilities for the benefit of any students who seem puzzled.

Record the possible locations above the piece.



Continue in this manner until your students find that there is sufficient information to locate four of the pieces and until they have discussed the possible locations of the other pieces.



T: Suppose it is your turn to make a play in the game and you select the little green triangle. Where would you play it?

S: In region A.

NOTE: Region C would also be a good answer. If a student says region B or D, point out that he or she is sure to get a "no" answer and ask another student to explain why this is so.

T: If I say "yes", what do you know about the blue string?

S: It must be for YELLOW.

T: Why?

S: Because if the blue string were for LITTLE, the little green triangle would belong inside it.

T: If I say "no" instead, what do you know about the blue string?

S: It must be for LITTLE, because if the blue string were for YELLOW the little green triangle would belong outside it.

We suggest you play the String Game with either two or three strings following this analysis activity.

CONCLUDING REMARKS

In this CSMP Mini-package, you have been introduced to a game format in which to pose classification questions. You have played the String Game with a set of blocks whose attributes (size, color, and shape) are familiar to elementary school students. This familiarity frees students during a game to focus on recognizing patterns and developing deductive strategies.

But the String Game can be played with objects other than attribute blocks. In the CSMP curriculum, we introduce the String Game with numbers in the fourth grade after having played the game with attribute blocks since first grade. Strings are labeled with properties of numbers such as "larger than 50", "multiples of 3", and "prime". Not only does playing the String Game with numbers further develop a student's analytic reasoning skills, it also aids in developing a student's understanding of numerical concepts such as multiples, divisors, and order.

The language of strings is one of the non-verbal languages of the CSMP curriculum. This CSMP Mini-package details only one context in which the language is used and gives a preview of CSMP's unique approach to mathematics at the elementary school level. For more information, contact:

Director: CSMP
CEMREL, Inc.
3120 59th Street
St. Louis, Missouri 63139

APPENDIX: The String Game

Equipment

PLAYING BOARDS

The equipment for this game may be most easily managed if you have a magnetic† chalkboard available. Many of the permanently mounted chalkboards in classrooms are magnetic, and you should test yours using one of the demonstration Minicomputer checkers. If your permanent chalkboards are not magnetic, try any portable chalkboard (grid board, etc.) that the school has available. If you do not have a magnetic chalkboard available, you can use your regular chalkboard.

TEAM BOARD

(Attach a poster list of string cards here.)

TEAM A	TEAM B

a) Magnetic: If you do locate a magnetic chalkboard, you will also need a magnetic or metallic team board. With a large magnetic chalkboard, say at least three chalkboard squares, the team board could be drawn on the chalkboard. However,

† Strictly speaking the chalkboard itself is not magnetic, but rather magnet-sensitive; i.e., magnets adhere to it. However, for simplicity we call such boards "magnetic".

if you have a relatively small (portable) magnetic chalkboard, then you will need to obtain a sheet of metal (minimum size: 60 cm by 80 cm) or locate a convenient metallic surface in the classroom such as the side of a file cabinet on which to put the team board. In this case, draw the team board on a large sheet of (easel pad) paper and tape this paper to your metallic surface.

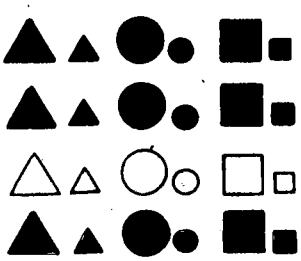
b) Non-magnetic: If you do not have a magnetic chalkboard available for the playing board, then your team board could be a large piece of poster board (minimum size: 60 cm by 80 cm). Using a felt-tip marker, divide the poster board into two regions and label them "Team A" and "Team B".

GAME PIECES and STRING CARDS

One set of game pieces and string cards are needed for each version of the game. A list of the string cards (A-Blocks String Game Poster) is to be posted above the team board — it is a constant reminder during the game of the possible labels for the strings.

Game Pieces

String Game with A-Blocks



String Cards

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

Game pieces, string cards, and the poster list of the string cards can be found in the A-Blocks String Game kit.

a) **Magnetic:** You can magnetize the game pieces (A-Blocks) by sticking a small piece of magnetic material to the back of each one. (Magnetic material is included in the A-Blocks String Game Kit, or it is available in many hobby and notions departments of stores.) Similarly, you can magnetize string cards by sticking a small piece of magnetic material to the front of each card, taking care not to obscure what is written thereon.

b) Non-magnetic: Game pieces can be attached to the team board by means of loops of masking tape stuck to the backs. A string card should have a loop of masking tape stuck to the front so that what is written on the card is not obscured. With this type of equipment, you should prepare yourself for running repairs by having sufficient masking tape available so that if a loop of tape loses its stickiness, it can be replaced on the spot. An alternative is to use a small wad of a plastic caulking compound (Rope Caulk or Mortite, for example) in place of the loop of masking tape. This material will maintain its stickiness over a much longer period of time.

Preparation for the Game

Draw two (or three, depending on which variation you are using) large, overlapping strings on the playing board using two (or three) different colors. Next to each of these strings attach one string card face-down. Draw the team board on the playing board or locate it conveniently nearby. Randomly select one-half of the game pieces and place them in the section of the team board labeled "TEAM A"; place the other pieces in the section labeled "TEAM B". Divide the class into two teams using whatever method is acceptable to your class; e.g., boys vs. girls; rows 1, 2, 3 vs. rows 4, 5, 6; etc. Call one team "TEAM A" and the other "TEAM B". Before any student takes a turn, correctly place an equal number (at least one) of each team's game pieces in the string picture.

This removes from the first players the necessity of operating on the basis of pure guesswork. You can influence how long the game will take by the number of pieces you place in the string picture before the game begins.

Object of the Game

Each team tries to place all of its game pieces correctly (according to the face-down string cards) in the string picture. The winning team is the one that first places all of its game pieces correctly and identifies the face-down cards correctly, after playing according to the rules.

Rules of the Game

1) The game is played in silence. This is to avoid one student telling another where to play a certain piece, or what the strings are for. Each student should have the opportunity to analyze the game alone. Infringement of this rule by anyone is penalized by the talker's team losing its next turn.

2) The teams alternate making plays, and the members take turns within each team. A player comes to the board and selects a piece from his or her team's collection to place in one of the regions of the string picture.

3) You are the judge. If the piece is correctly placed, say "yes". The piece remains in the string picture and the player immediately has a second turn (no player may have more than two consecutive turns). If the piece is incorrectly placed, say "no". The player returns the piece to the team's unplayed collection and play passes to the other team.

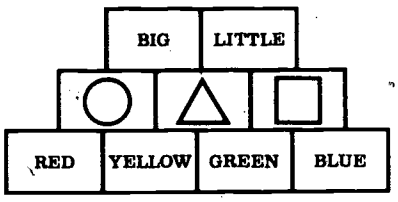
   As an aid in judging, prepare a "crib-sheet" showing the correct position of each game piece or at least reminding you of what is on the face-down cards. If at any time you discover that you have made an error, say so immediately and rectify the mistake. Either move an incorrectly placed piece whose position you had approved to its correct region or replace in the string picture a correctly placed piece that had been rejected because you had disapproved its position.

4) When a team has correctly placed all of its pieces, the player who placed the last piece may thereupon attempt to identify each of the string cards. If these are all correct, the team has won. If a mistake is made (even if it is only in the case of one of the string cards), simply indicate that the identification is incorrect and let the game continue.

5) If a team has exhausted its stock of game pieces and the strings have not been identified, that team continues on its turn to attempt to identify the strings, while the other team works to place its game pieces.

Version A: The String Game with A-Blocks

This simplest version of the game uses twenty-four A-Blocks as game pieces and only nine string cards.

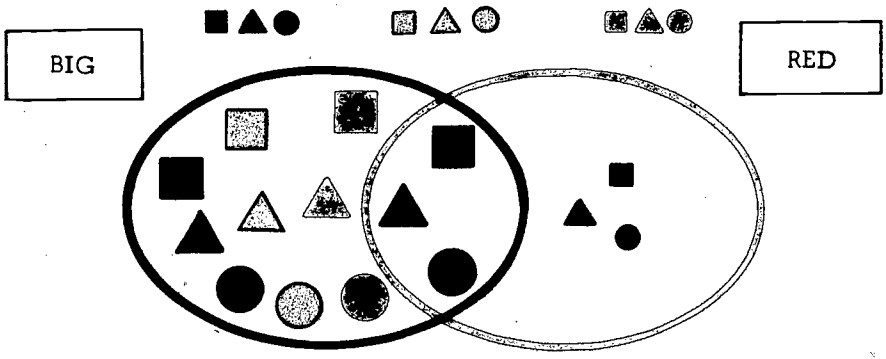


This list of string cards should be attached on or near the team board.

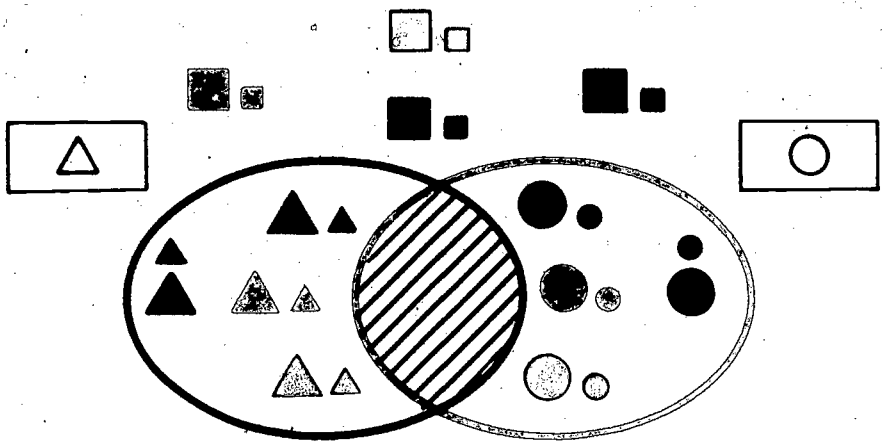
We provide here several "crib-sheets" for variations of the game with two and with three strings.

Variation #1: Two Strings

Example 1: No Empty Regions



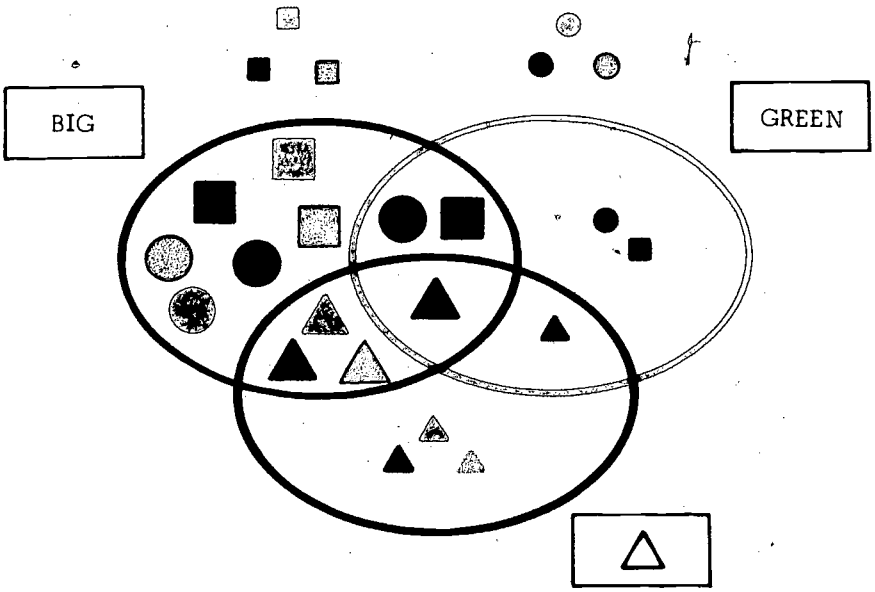
Example 2: One Empty Region



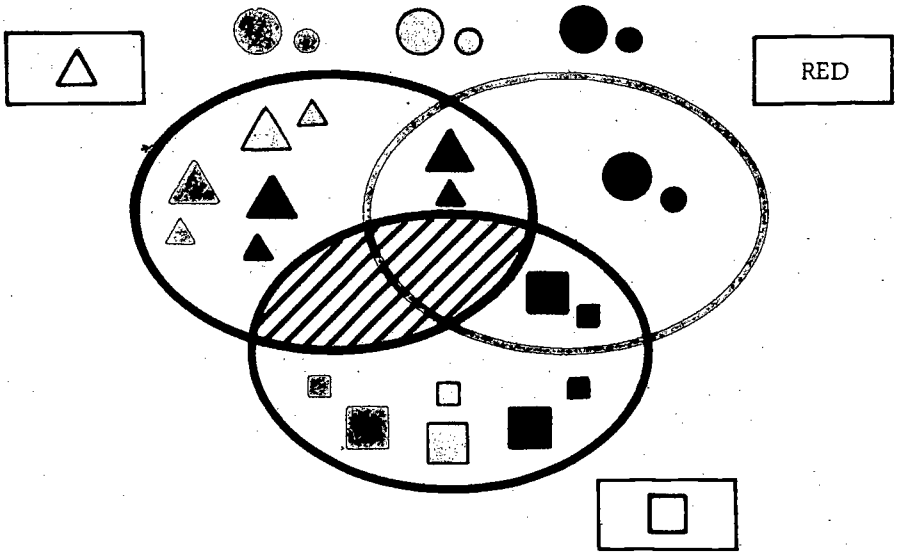
NOTE: We have indicated that the intersection of the strings is empty by drawing in that region several parallel line segments which we refer to as "hatching".

Variation #2: Three Strings

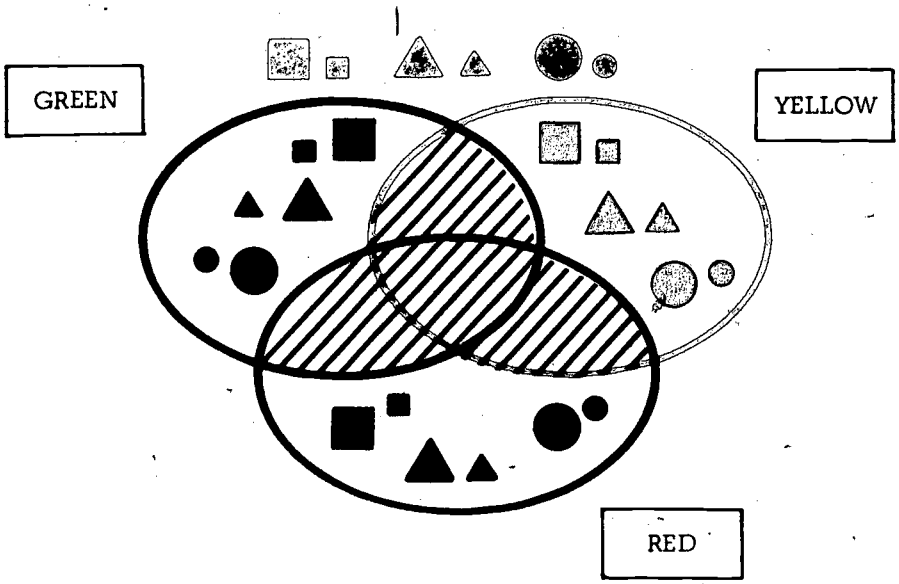
Example 1: No Empty Regions



Example 2 : Two Empty Regions



Example 3 : Four Empty Regions



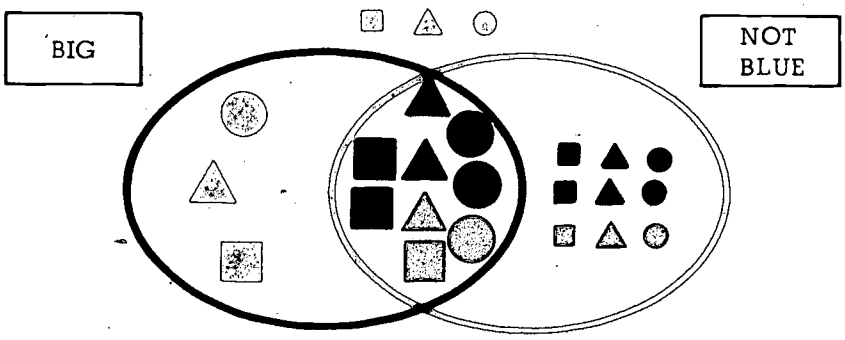
Version B: The String Game with A-Blocks, using "Not" Cards

A more complicated version of the game with A-Blocks uses all sixteen of the string cards. A list of all sixteen string cards should be posted above the team board.

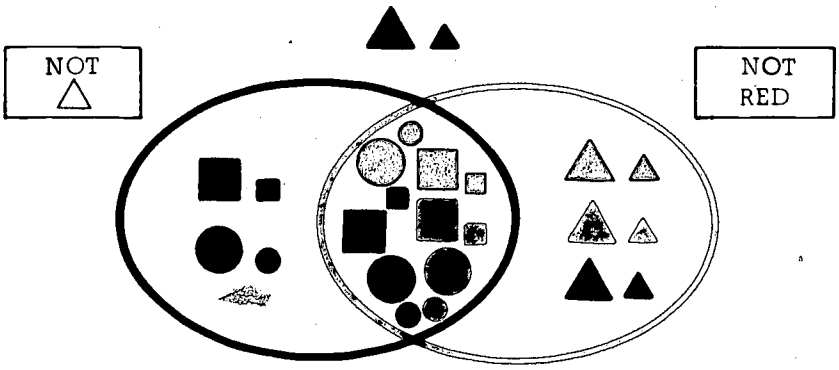
NOTE: Since NOT BIG and LITTLE describe exactly the same A-Blocks (and similarly for NOT LITTLE and BIG), such a "not" card is redundant. If a student questions why we do not include these possibilities, let the class discuss why they are unnecessary.

We provide here several example "crib-sheets" for this version of the String Game played with two strings.

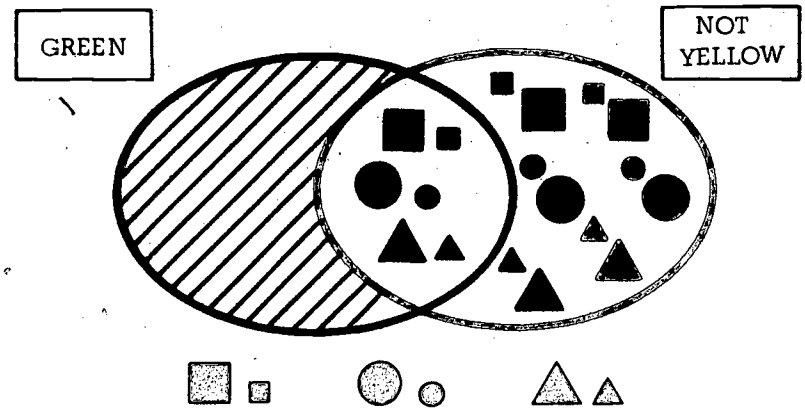
Example 1: No Empty Regions



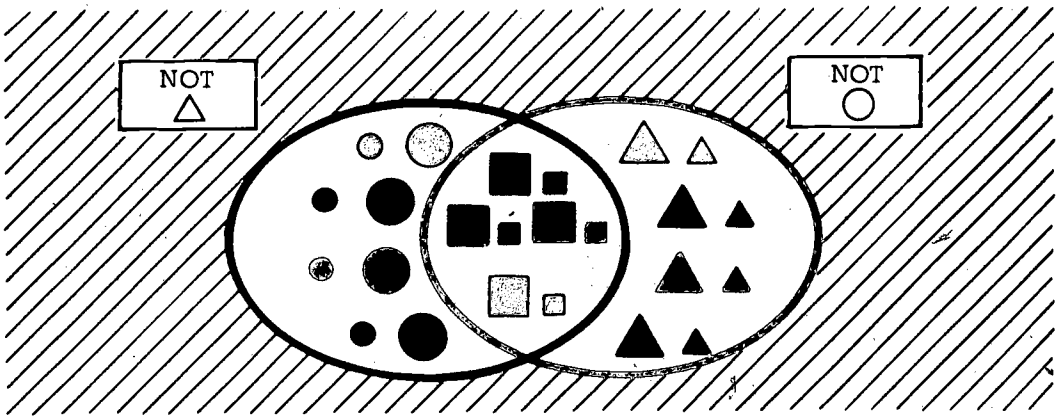
Example 2: No Empty Regions



Example 3: One Empty Region



Example 4: One Empty Region



Of course, by hatching the "outside" region of the diagram we mean to indicate that no game pieces can be placed there correctly. Strictly speaking, that region is not empty because, for example, the number 50 is in the outside region.

You should be warned that the "NOT' version of the game played with three strings is almost impossible to judge without a "crib-sheet" and is correspondingly difficult to play. Hence you would be well-advised to avoid it until such time as you think the two-string version is no longer challenging enough for the majority of your students.

A-BLOCKS STRING GAME

Dear CSMP,

Please send further information about CSMP and its elementary school curriculum (no charge).

NAME _____

SCHOOL _____

ADDRESS _____

CITY/STATE/ZIP _____

Send this sheet to:

DIRECTOR: CSMP/CEMREL, Inc./3120 59th Street/St. Louis, MO 63139

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