CAUTION: VENN DIAGRAMS AHEAD

Dovie Kimmins, Department of Mathematical Sciences

Jeremy Winters, Department of Elementary and Special Education

Middle Tennessee State University

With your help, the tables in the center of the room will become a dynamic Venn Diagram.

The tables in the green loop are to be occupied by individuals who have visited New Orleans previously.

The tables in the blue loop are to be occupied by individuals who like crawfish.

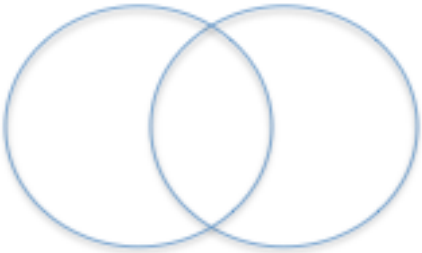
Please enter this dynamic Venn Diagram now if applicable.


BEEN TO N.O. PREVIOUSLY
LIKE CRAWFISH
People who have been to N. O. previously and who do not like crawfish
People who have been to N. O. previously and who like crawfish
People who like crawfish and who have not been to N.O. previously
People attending N.O. for first time who do not like crawfish

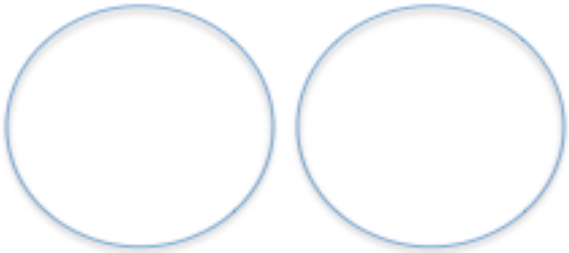
INDIVIDUALLY, TAKE ONE MINUTE TO COMMIT TO AN ANSWER AND WRITE A BRIEF EXPLANATION OF YOUR THINKING ON THE PAPER

Which of the following Venn Diagrams best represents the relationship between the set of rectangles and the set of squares? Explain your thinking.

a)

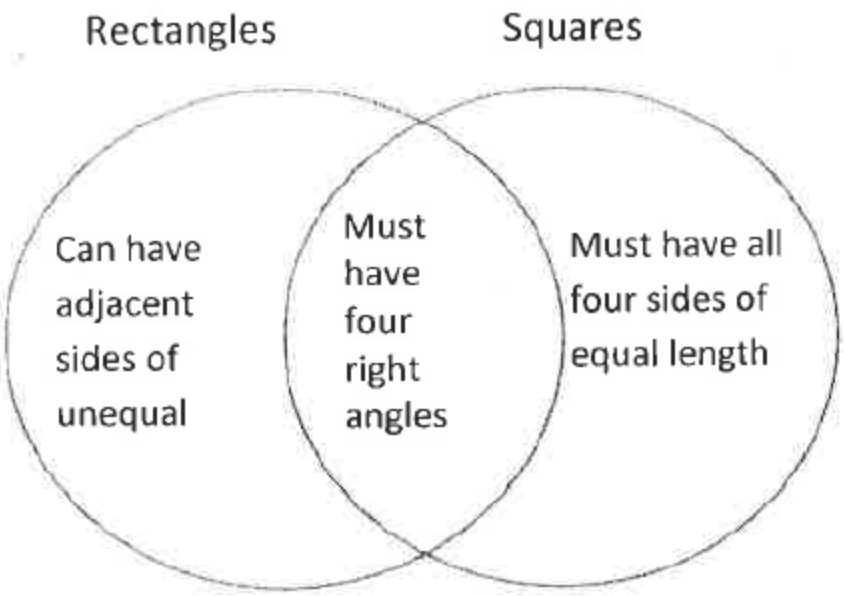


b)



c)

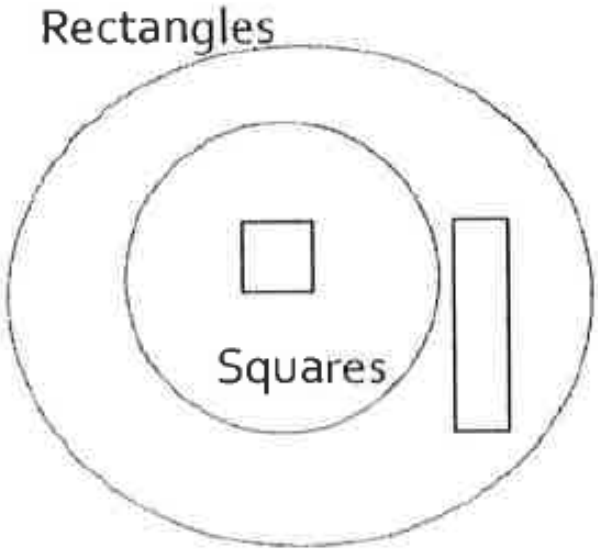
ONE VIEWPOINT



My thinking: Rectangles can have adjacent sides of unequal length while squares cannot.

Squares must have all four sides of equal length while rectangles do not have to.

A SECOND VIEWPOINT



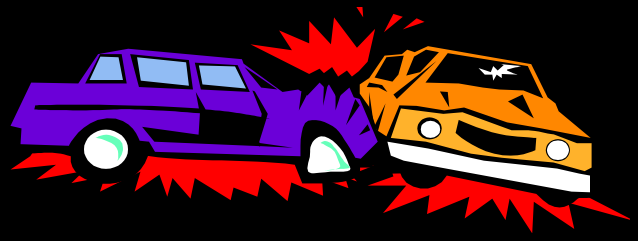
My thinking: Every square is a rectangle, but not every rectangle is a square. The set of squares is a SUBSET of the set of rectangles.

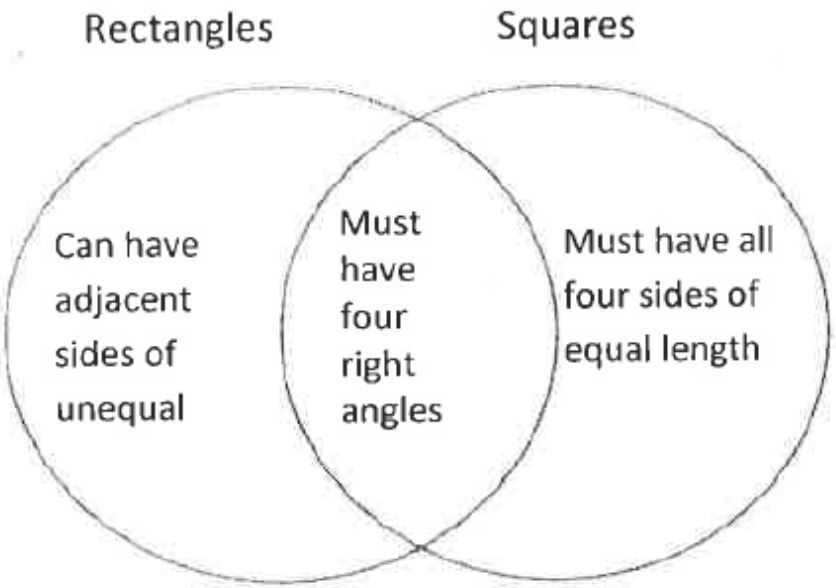
DISCUSS AT YOUR TABLES OR WITH SOMEONE NEAR YOU

- Take 3 minutes to compare and contrast your responses to the prompt. Did you have one of the previously mentioned viewpoints? Did you have another viewpoint?

- Who had viewpoint 1?
- Who had viewpoint 2?
- Who had both?
- Who had still another viewpoint?

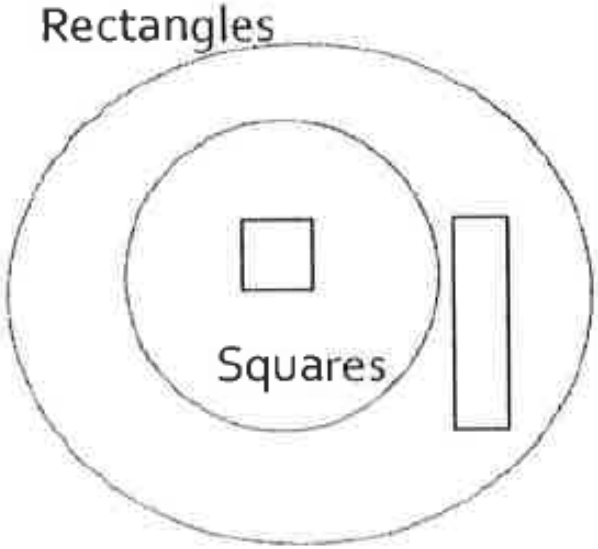
Both viewpoints have value. But if I am teaching with one in mind and you are learning with the other in mind, there is a potential for





My thinking: Rectangles can have adjacent sides of unequal length while squares cannot.

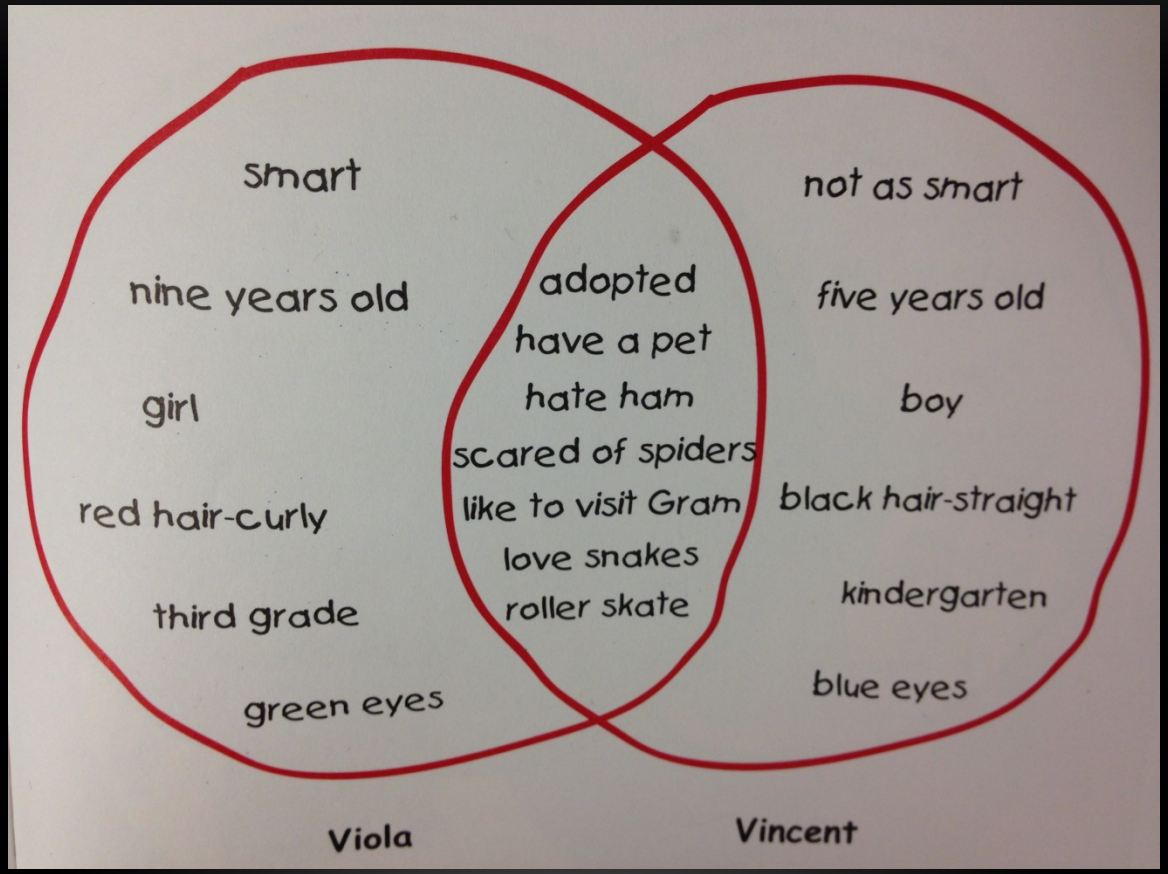
Squares must have all four sides of equal length while rectangles do not have to.



My thinking: Every square is a rectangle, but not every rectangle is a square. The set of squares is a SUBSET of the set of rectangles.

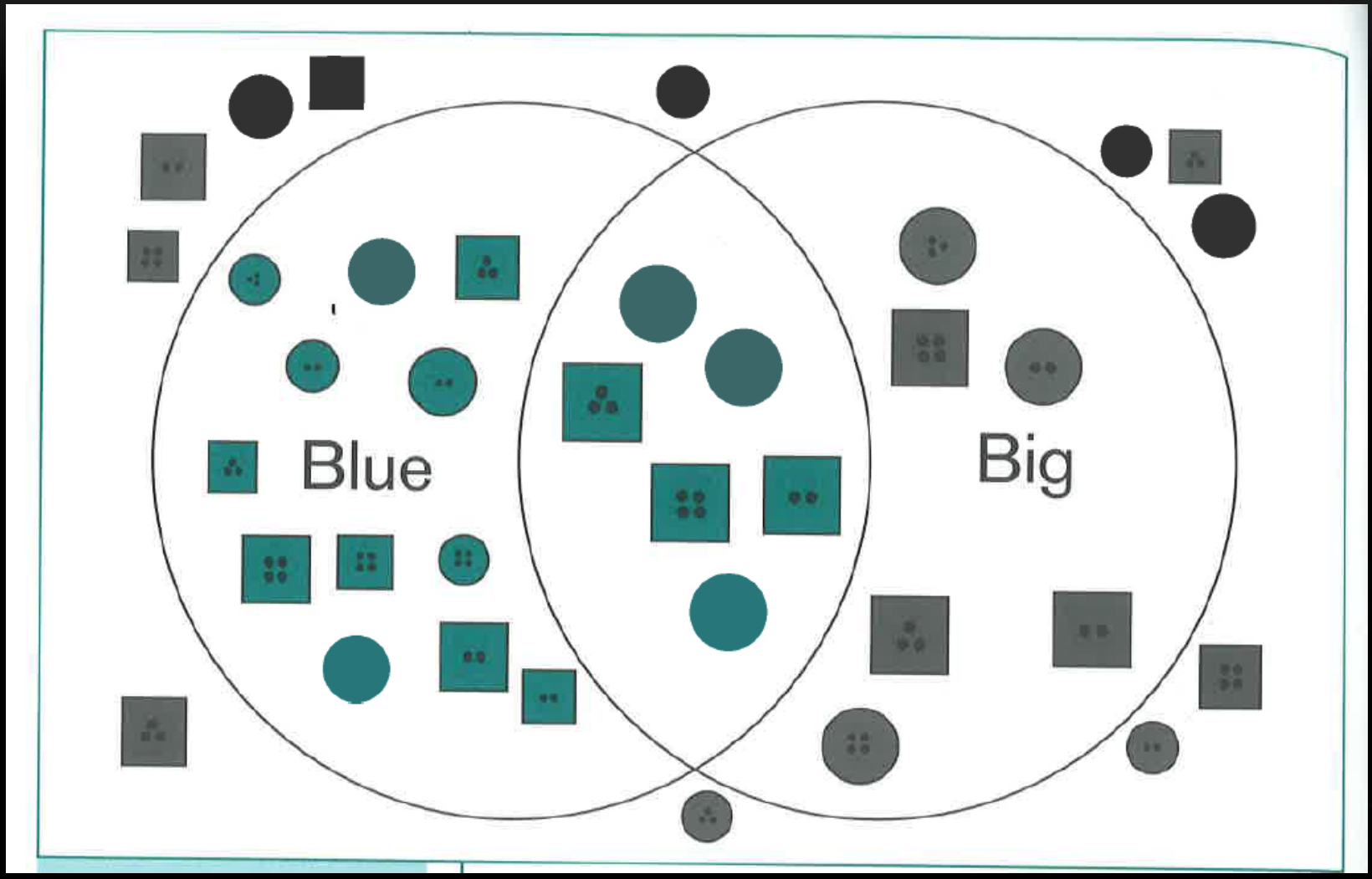
EXAMPLES OF TYPICAL USAGE OF VENN DIAGRAMS IN THE ELEMENTARY SCHOOL CURRICULUM

CHILDREN'S LITERATURE BOOK *VINCENT & VIOLA* –PAGE 23



Colarusso, Sherry. 2006. *Vincent and Viola*. Lewisville, NC: Kaplan Early Learning.

NAVIGATING THROUGH DISCRETE MATH IN PK-5 – SORTING BUTTONS - PAGE 28



National Council of Teachers of Mathematics (NCTM). 2009. *Navigating Through Discrete Mathematics in PreKindergarten-Grade 5.* Reston, VA: NCTM.

THESE TWO EXAMPLES ILLUSTRATE TWO DIFFERENT DEFINITIONS OF VENN DIAGRAMS

- Language Arts

Definition (Camp, 2000, p. 402)
"a graphic organizer constructed by 'overlapping circles to indicate features common or unique to two or more concepts' (Harris & Hodges, 1995, p. 271).....The nonintersecting parts of the circles are used to record information unique to each concept."

Comparing and Contrasting

- Mathematics

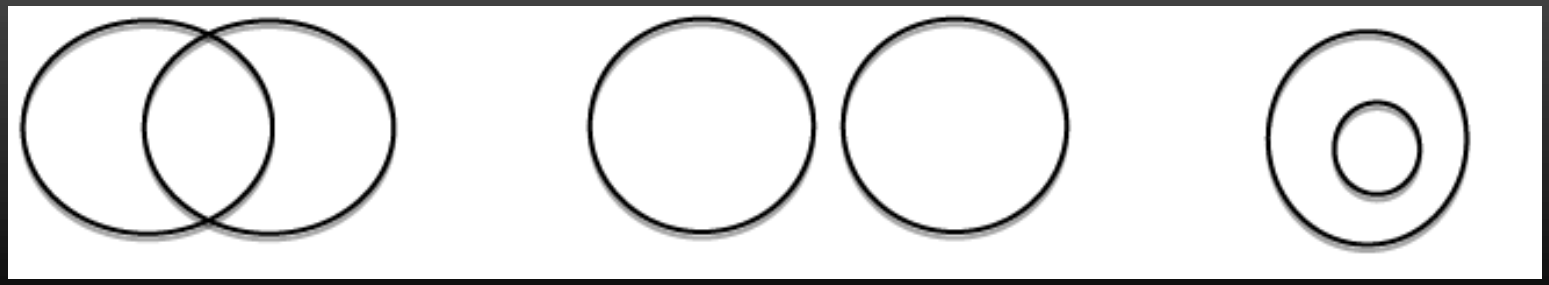
Definition (Wolfram Mathworld)
"a schematic diagram…to depict collections of sets and represent their relationships." (Weisstein, http://mathworld.wolfram.com/VennDiagram.html)

Classifying

Camp, Deanne. 2000. "It Takes Two: Teaching With Twin Texts of Fact and Fiction." *The Reading Teacher* 53 (5): 400-8.

Harris, Theodore Lester, and Richard E. Hodges. 1995. *The Literacy Dictionary: The Vocabulary of Reading and Writing*. Newark, DE: I International Reading Association.

Weisstein, Eric W. "Venn Diagram." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/VennDiagram.html



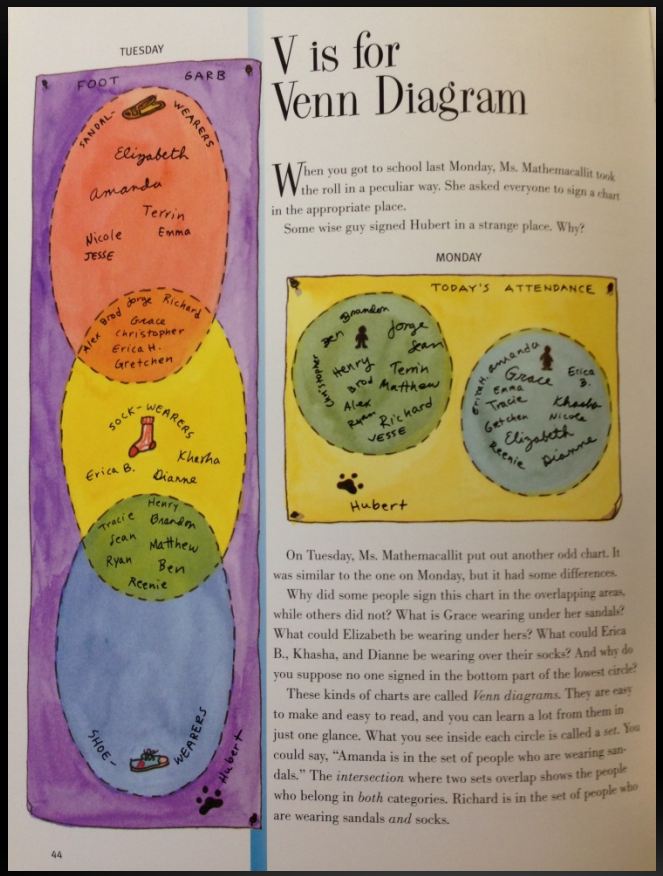
Overlapping Circles Disjoint Circles Concentric Circles

In viewpoint 1 (comparing and contrasting), only overlapping circles are used.

In viewpoint 2 (classifying)

- If one circle represents the people in this room who like crawfish and the other represents those who have visited New Orleans previously, then overlapping circles apply.
- If one circle represents works of fiction and the other works of non-fiction, then disjoint circles apply.
- If one circle represents giraffes and the other animal, then concentric circles apply.

G IS FOR GOOGOL: A MATH ALPHABET BOOK – PAGE 44



TUESDAY

FOOT GARB

SANDAL-WEARERS

Elizabeth
Amanda
Terrin
Emma
Nicole
JESSE

Brad Jorge Richard
Grace
Christopher
Erica H.
Gretchen

SOCK-WEARERS

Khesha
Erica B.
Dianne

Henry
Tracie
Brandon
Jean
Matthew
Ryan
Ben
Rcenie

SHOE-WEARERS

Hubert

44

V is for Venn Diagram

When you got to school last Monday, Ms. Mathemacallit took the roll in a peculiar way. She asked everyone to sign a chart in the appropriate place.

Some wise guy signed Hubert in a strange place. Why?

MONDAY

On Tuesday, Ms. Mathemacallit put out another odd chart. It was similar to the one on Monday, but it had some differences.

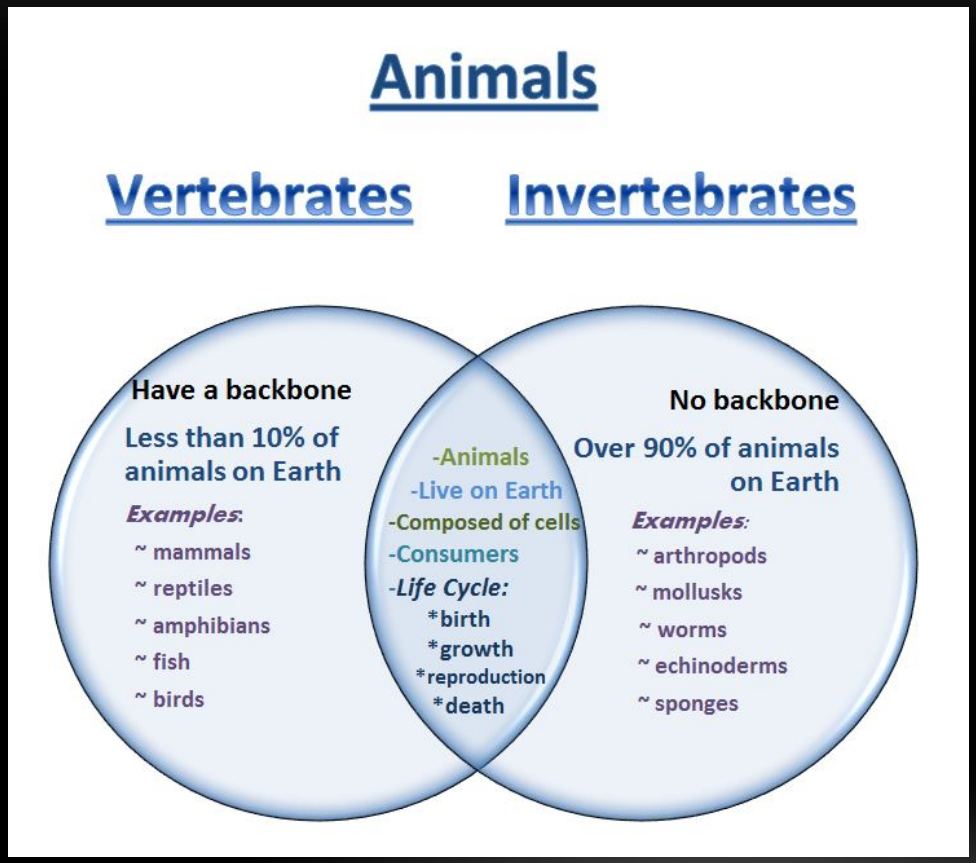
Why did some people sign this chart in the overlapping areas, while others did not? What is Grace wearing under her sandals? What could Elizabeth be wearing under hers? What could Erica B., Khasha, and Dianne be wearing over their socks? And why do you suppose no one signed in the bottom part of the lowest circle?

These kinds of charts are called *Venn diagrams*. They are easy to make and easy to read, and you can learn a lot from them in just one glance. What you see inside each circle is called a *set*. You could say, "Amanda is in the set of people who are wearing sandals." The *intersection* where two sets overlap shows the people who belong in *both* categories. Richard is in the set of people who are wearing sandals *and* socks.

Which definition (viewpoint) is being used?

Schwartz, David M., and Marissa Moss. 1998. *G Is for Googol: A Math Alphabet Book*. Berkeley, CA: Tricycle.

FROM A SCIENCE WEBSITE



Which definition (viewpoint) is being used?

HOW TO USE CHILDREN'S LITERATURE TO TEACH MATHEMATICS – FROM PAGE 69

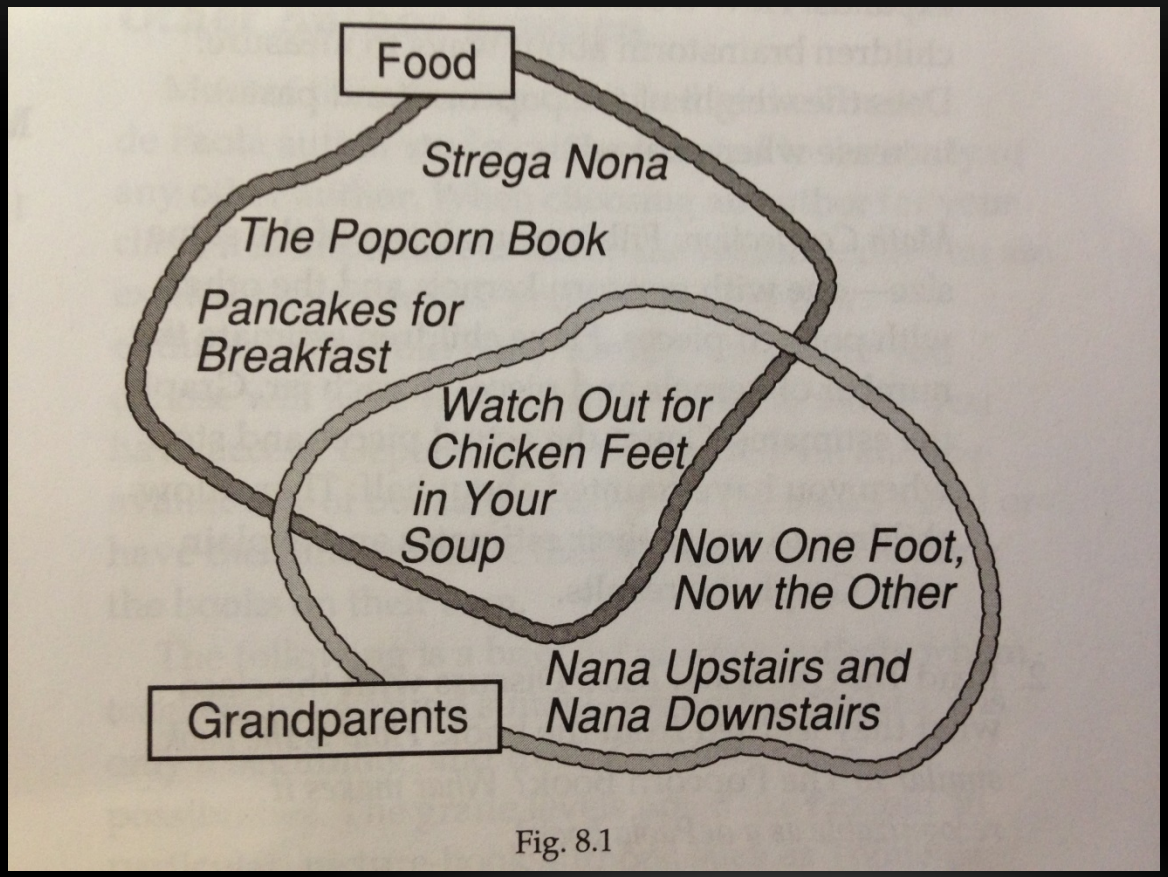
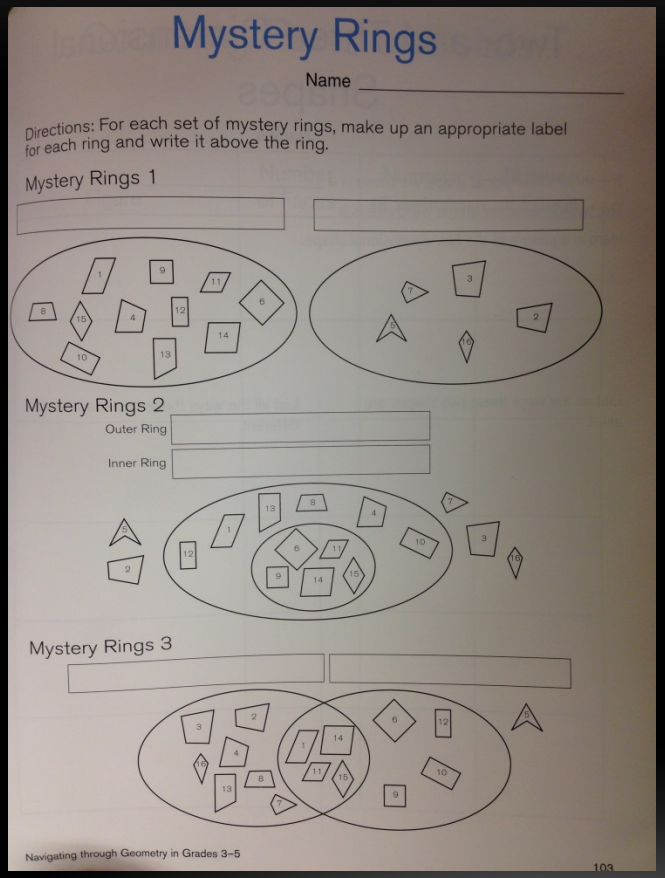


Fig. 8.1

Which definition (viewpoint) is being used?

Welchman-Tischler, Rosamond. 1992. *How to Use Children's Literature to Teach Mathematics*. Reston, VA: National Council of Teachers of Mathematics.

NAVIGATING THROUGH GEOMETRY IN GRADES 3-5 – PAGE 103



Mystery Rings

Name _____

Directions: For each set of mystery rings, make up an appropriate label for each ring and write it above the ring.

Mystery Rings 1

Mystery Rings 2

Outer Ring

Inner Ring

Mystery Rings 3

Navigating through Geometry in Grades 3–5

103

Which definition (viewpoint) is being used?

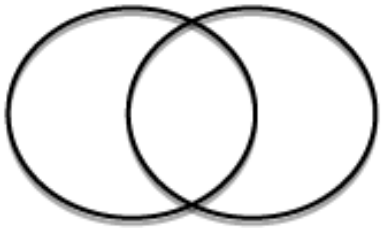
STUDENT UNDERSTANDING OF VENN DIAGRAMS

4TH GRADE CLASS

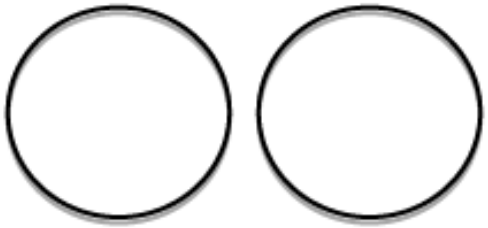
QUESTION POSED TO 4TH GRADE CLASS

Which of the following three Venn diagrams best represents the relationship between the set of giraffes and the set of animals?

A)



B)



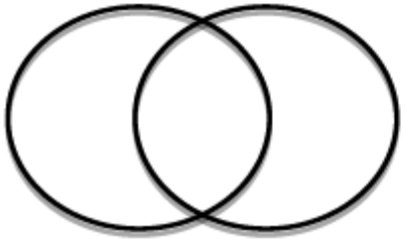
C)

Explain your choice.

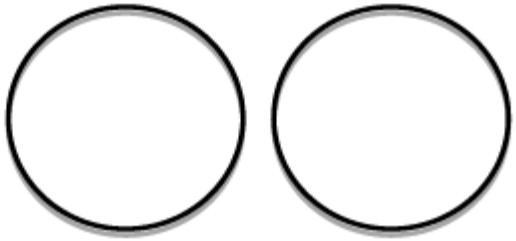
QUESTION POSED TO 4TH GRADE CLASS

Which of the following three Venn diagrams best represents the relationship between the set of squares and the set of rectangles?

A)



B)



C)

Explain your choice.

RESULTS FROM A CLASS OF 19 4TH GRADERS

- Rectangle Question: Which of the following 3 Venn Diagrams best represents the relationship between the set of squares and the set of rectangles?
- Animal Question: Which of the following 3 Venn Diagrams best represents the relationship between the set of giraffes and the set of animals?
- 8 answered both questions by choosing overlapping circles and giving explanations that involved comparing and contrasting.
- 5 picked overlapping circles for the animal question but switched to concentric circles for the rectangle question.
- 3 chose disjoint circles for the animal question and overlapping circles for the rectangle
- 2 chose disjoint circles for the animal question and concentric circles for the rectangle
- 1 chose concentric circles for the animal question and overlapping for the rectangle

STUDENT WORK SAMPLE….

- Rectangle Question: *"I choose A (*overlapping circles*) because a square is a rectangle so they are partly the same. But a rectangle is not a square so they also have differences."*
- Animal Question: *"I chose A (*overlapping circles*) because giraffes are animals yet they have lots of differences. B (*disjoint circles*) shows that they have only differences. As for C (*concentric circles*) well I don't know what C means."*

5 PICKED OVERLAPPING FOR ANIMAL BUT SWITCHED TO CONCENTRIC FOR RECTANGLE

- Student Work Sample:
  - Rectangle Question: "*Because a square is a rectangle. I also know a rectangle isn't a square though. So the square would be the little circle and the rectangle would be the big one. The rectangle is a little different from the square so you would have both similarities and differences.*"
  - Animal Question: "*Because to compare and contrast animals and giraffes you need a place to put the similarities and differences. On A (*overlapping circles*) you have places to compare and contrast animals and giraffes.*"

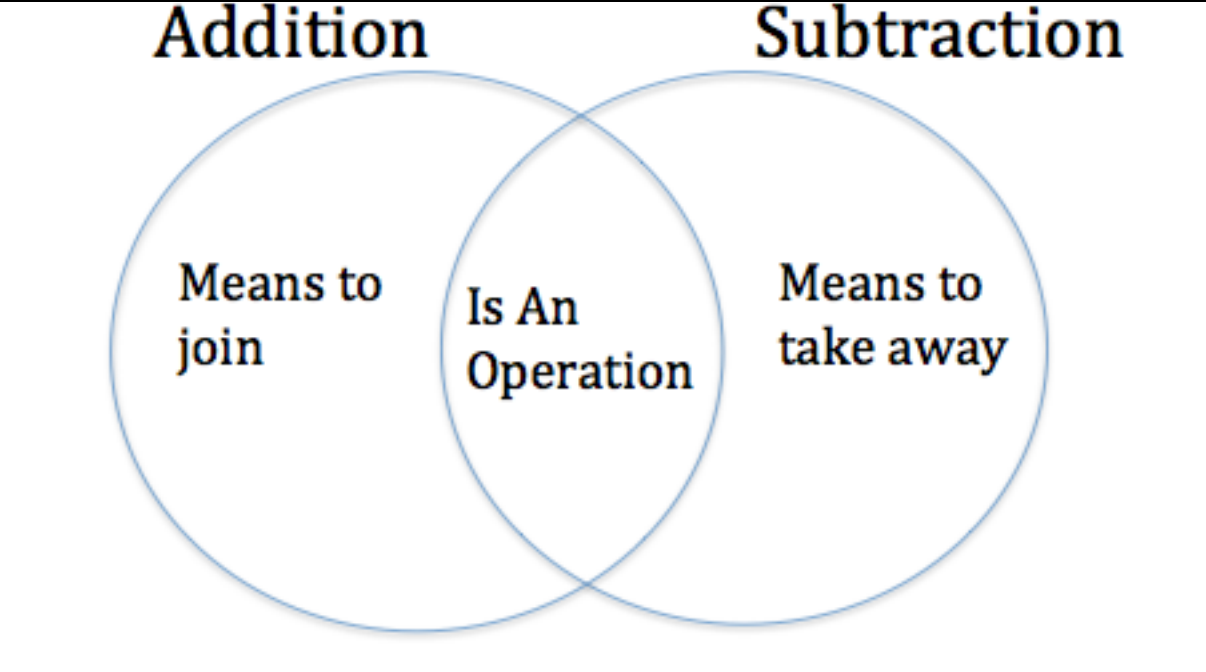
OF THE 5 STUDENTS WHO CHOOSE DISJOINT CIRCLES FOR THE GIRAFFES QUESTION….EXPLANATIONS INCLUDED

- “because they are two different things”
- “because they are exactly the same”
- “because you are just contrasting,not comparing”
- “you would be comparing”
- “Because there was two sets and you could think of two sets separate and why would you “mash” a set of animals and a set of giraffes together?”

IMPLICATIONS FOR THE ELEMENTARY SCHOOL CLASSROOM AND FOR TEACHER EDUCATION

- Children should be given multiple opportunities to experience all three types of Venn diagrams - overlapping, concentric, and disjoint - and both uses of Venn diagrams across subject areas.

- Using the language arts definition in math
  - Comparing and contrasting mathematical concepts, procedures, operations, etc



- Using the math definition in language arts
  - Classifying stories for example

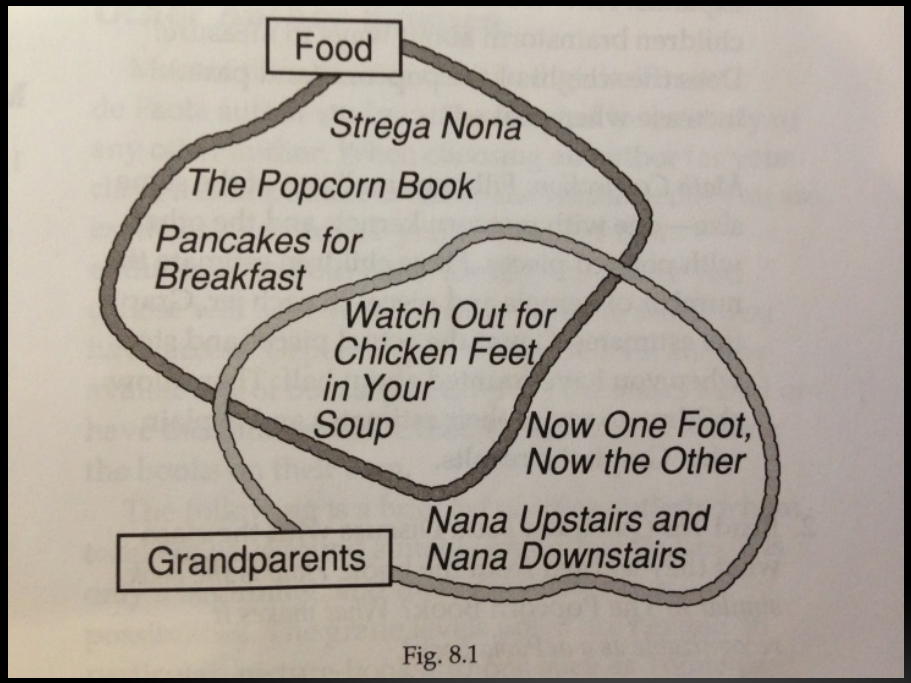
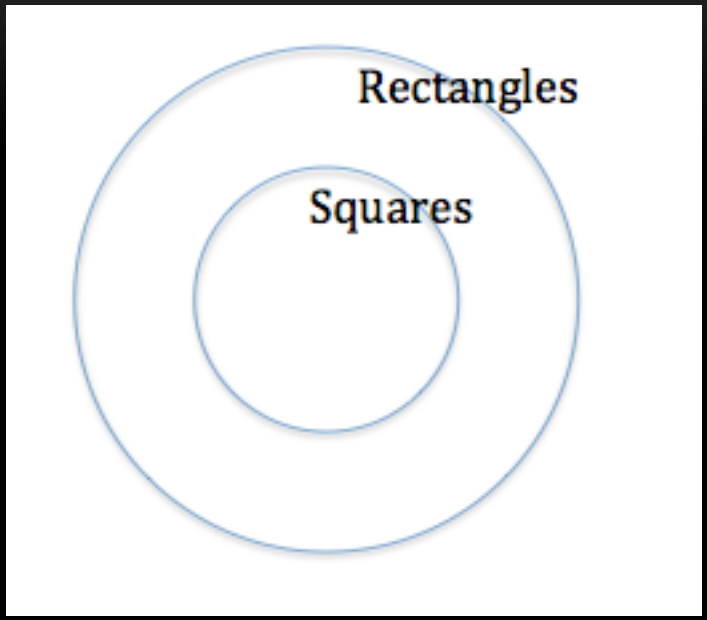


Fig. 8.1

- Teachers should provide adequate directions, context and examples to help illuminate the intended use of Venn diagrams. However many students will still need instruction as to the meaning of the concentric circles and disjoint circles diagrams.

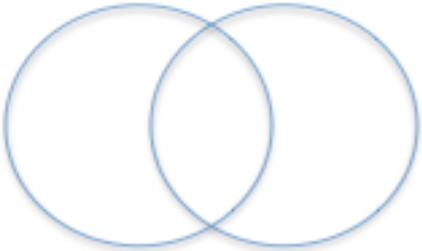
- For example a concentric circle Venn diagram intended to illustrate that every square is a rectangle may not actually help students to understand these relationships if they are viewing the diagram in a compare and contrast mode.



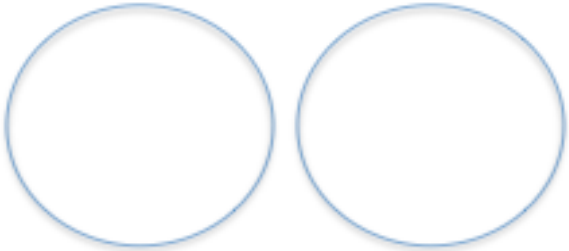
- What problems could arise with using the following question as it appears below as a summative assessment item?

Which of the following Venn Diagrams best represents the relationship between the set of rectangles and the set of squares?

a)



b)



c)

- The Venn diagram picture should be used as one of several representations not in isolation.
- Much can be learned by having students write about their thinking.

REFERENCES

Camp, Deanne. 2000. "It Takes Two: Teaching With Twin Texts of Fact and Fiction." *The Reading Teacher* 53 (5): 400-8.

Colarusso, Sherry. 2006. *Vincent and Viola*. Lewisville, NC: Kaplan Early Learning.

Harris, Theodore Lester, and Richard E. Hodges. 1995. *The Literacy Dictionary: The Vocabulary of Reading and Writing*. Newark, DE: International Reading Association.

National Council of Teachers of Mathematics (NCTM). 2009. *Navigating Through Discrete Mathematics in PreKindergarten-Grade 5*. Reston, VA: NCTM.

National Council of Teachers of Mathematics (NCTM). 2001. *Navigating Through Geometry in Grades 3-5*. Reston, VA: NCTM.

Schwartz, David M., and Marissa Moss. 1998. *G Is for Googol: A Math Alphabet Book*. Berkeley, CA: Tricycle.

Weisstein, Eric W. "Venn Diagram." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/VennDiagram.html

Welchman-Tischler, Rosamond. 1992. *How to Use Children's Literature to Teach Mathematics*. Reston, VA: National Council of Teachers of Mathematics.

Rate this presentation on the conference app! **www.nctm.org/confapp**

Download available presentation handouts from the Online Planner! **www.nctm.org/planner**

Join the conversation! Tweet us using the hashtag **#NCTMNOLA**