

Discrete Math Unit for 3rd & 4th Graders

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Executive Summary:

The following pages include lessons that are centered around the seven principles of learning. These lessons will help students develop problem solving and critical thinking skills. In the lessons manipulatives are used to explore ways to better understand and solve the various problems presented to them. Venn Diagrams will become a mathematical tool they learn to understand and use to clarify the similarities and differences of data as they are used throughout the lessons. They will construct and explore various geometric shapes, angles, lines, line segments and rays to help them build a stronger foundation of understanding for these concepts.

These lessons will supplement our 3rd and 4th grade Everyday Math curriculum. Since students learn most effectively through the use of partner sharing, in small groups and whole group (which promotes valuable discussion opportunities for individuals), we have provided opportunities for this daily. Many of the activities have multiple solution paths. These lessons will help teachers and students attain the goals set forth in the Minnesota State Standards.

Assessments are included to continue to guide our teaching and to assess the effectiveness of our instruction. After teaching the lessons, we will analyze, reflect and modify.

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Discrete Math Unit

Venn Diagrams

Objective: Students understand that a Venn diagram is used to compare and contrast items.

Overview: Students will use Venn Diagrams in a variety of ways to classify objects.

MN Math Standards:

3.4.1.1- Collect, display and interpret data using frequency tables, bar graphs, pictures graphs and numbers line plots having a variety of scales. Use appropriate titles, labels and units.

4.4.1.1- Use tables, bar graphs, time lines, and Venn Diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.

3.3.1.2- Sketch polygons with a given number of sides or vertices, such as pentagons, hexagons and octagons.

4.3.1.2- Describe, classify and draw quadrilaterals, including squares, rectangles, trapezoids, rhombuses, parallelograms, and kites. Recognize quadrilaterals in various contexts.

Vocabulary: Venn diagrams, Union, Intersect, compare and contrast, pretest, post test, point, vertex, line segment, end point, line, ray, parallel line, intersect, parallel line segment, plane, parallel ray, edge

Materials Needed: String or yarn, Document camera, Everyday Math Teacher's Manual, 3rd & 4th grade Math Journals, white boards, geoboards, rubber bands & document camera

Day 1 Pretest

Name _____

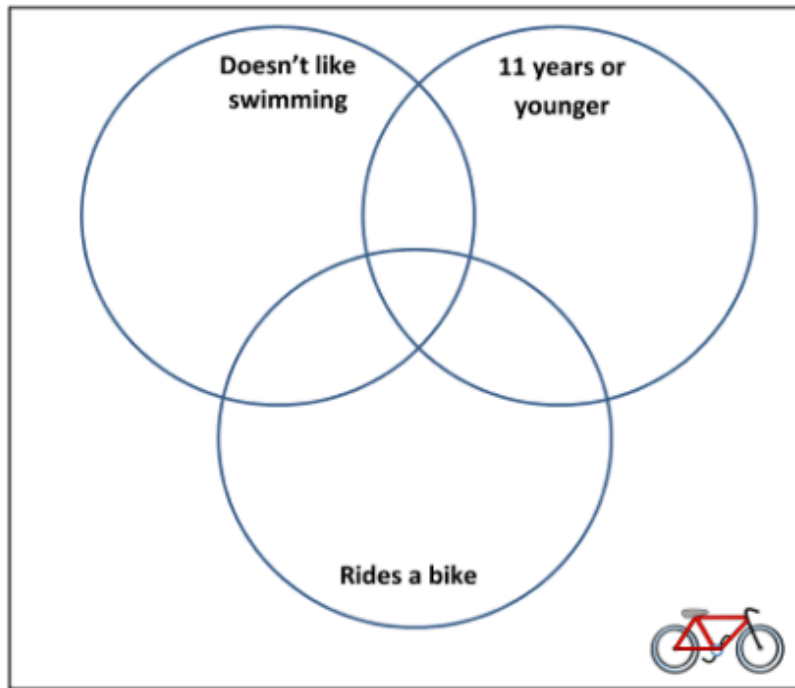
Date _____



3 CIRCLE VENN DIAGRAM SHEET 4:1

Put these people in the correct places in these Venn diagrams.

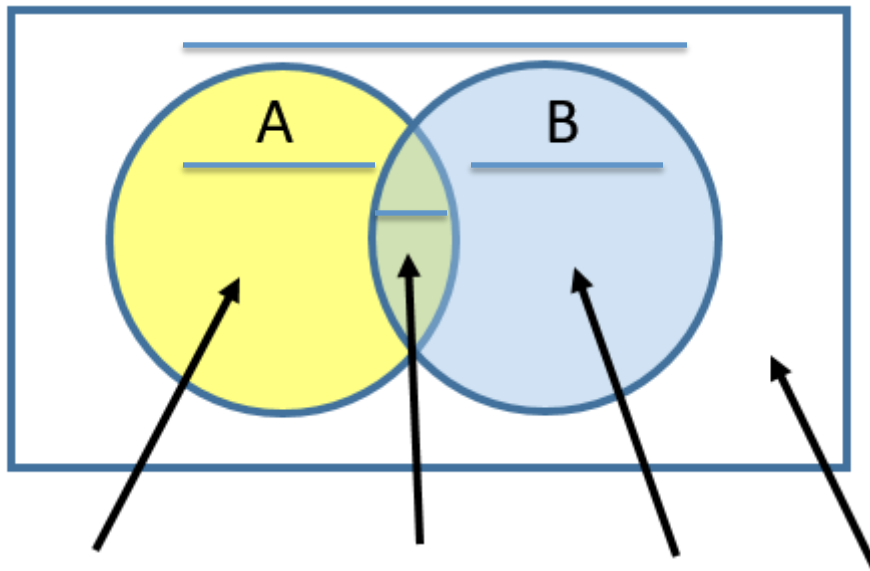
	Ethan	Noah	Emma	Olivia	James	Mia	Alex
Age	10	12	11	9	12	11	13
Can ride a bike	yes	no	no	yes	yes	no	yes
Likes swimming	no	yes	no	yes	no	yes	yes



Source: <http://www.math-salamanders.com/image-files/3-circle-venn-diagram-4-1.gif> Taken off on June 26, 2016

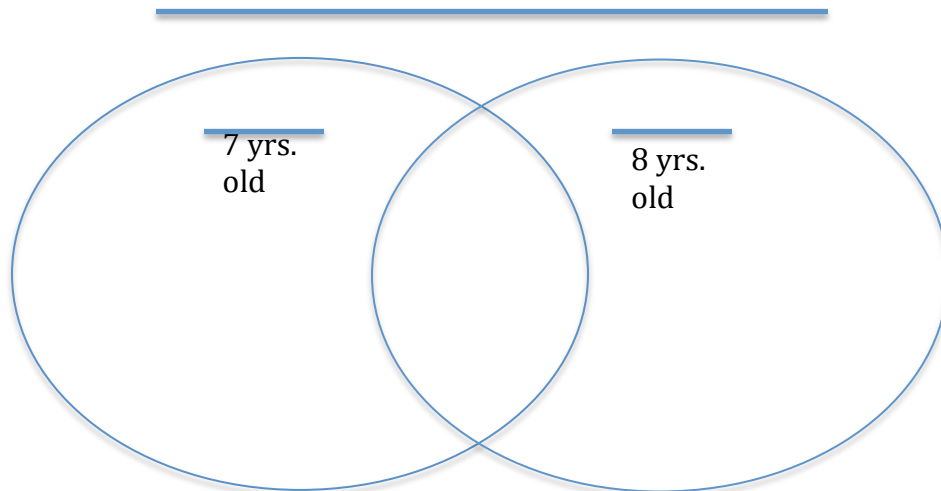
Launch/Focus: In our family we are very competitive. Korynn and I usually agree while Dusty and Jayde usually agree. This can be very frustrating, especially when trying to decide on a restaurant to eat at. Does this ever happen to you when your family is trying to decide on something like that? How do you decide where to go? Discuss and bring up how you are comparing and contrasting to figure out where you would like to eat.

Build on what student's already know regarding comparing and contrasting while reading. Discuss what graphic organizer that we have used during Language Arts. Review what compare and contrast means. Show and discuss the model/anchor poster:



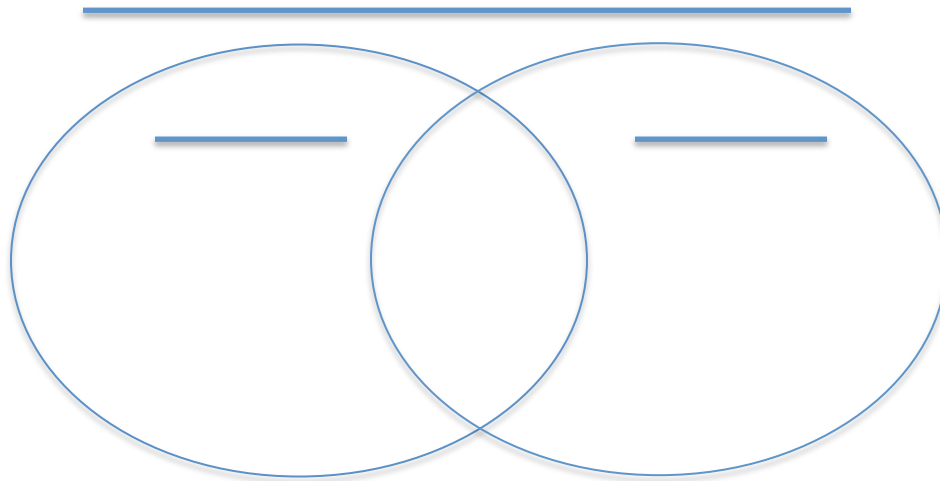
Objects here are in set A but not set B	Objects here are in both sets A and B	Objects here are in set B but not set A	Objects here are not in set A or set B.
---	---------------------------------------	---	---

Looking at this Venn diagram, in which ways could we divide our class?
 Make a list of student answers. Ex.- pets/no pets, live in town/in the country, etc.
 Discuss how there are only 2 circles so choices will be limited. The following would be displayed and students will come up and write where they would be. Analyze.



- How many boys are in the class are 7 years old?
- How many girls are 7 years old in the class?
- How many boys are in the class are 8 years old?
- How many girls are in the class are 8 years old?
- Is our total correct with the number of people in our classroom?
- What have we discovered?
- What does the Venn Diagram tell us about our class?

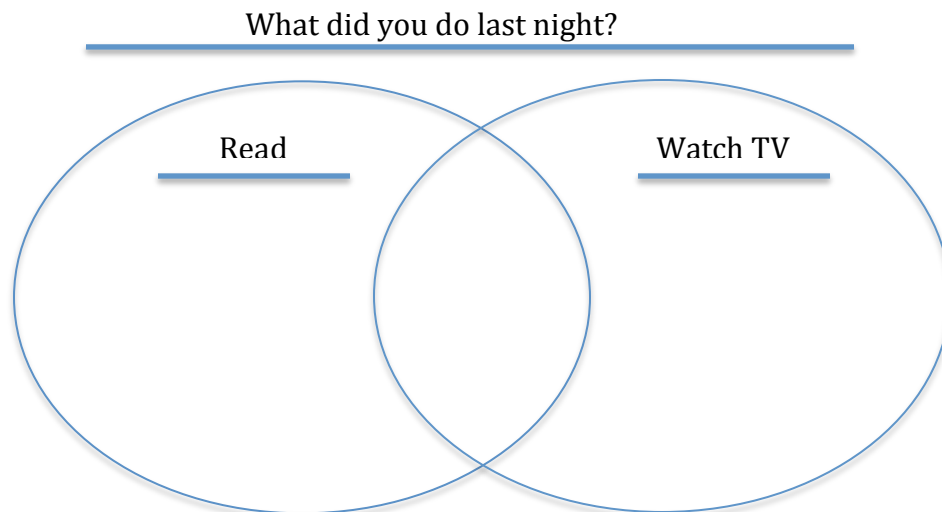
Explore: Hand out the following Venn Diagram and in small groups come up with a way that you can split the class up. Complete the Venn diagram, Discuss and be ready to share your findings with the class. Analyze and discuss all the different ways the class comes up with.



Summarize/Independent Practice: Thinking about tonight, what are you going to do? Think about this question and be ready to discuss tomorrow when you get to class.

DAY 2 & 3

Launch/Focus: Teacher share what they did last night. Turn to a partner and discuss what you did last night Yesterday we left off with the question, what did you do last night? Please write your name where you fit in on the Venn diagram. Display with document camera. Show them the anchor poster from yesterday that describes each part of the Venn diagram.



Explore: Students will discuss and analyze findings of the Venn diagram with a partner, small group and whole group. Be sure to use the vocabulary word intersect which also means the word and.

Ex. If Erica were in the middle where the 2 circles intersect, Erica read and watched TV.

If Erica were in A, Erica read.

If Erica were in B, Erica watched TV

Discuss how to label a Venn diagram and their importance.

How many students read?

How many students watched TV?

How many students read and watched TV?

Is our total correct with the number of people in our classroom?

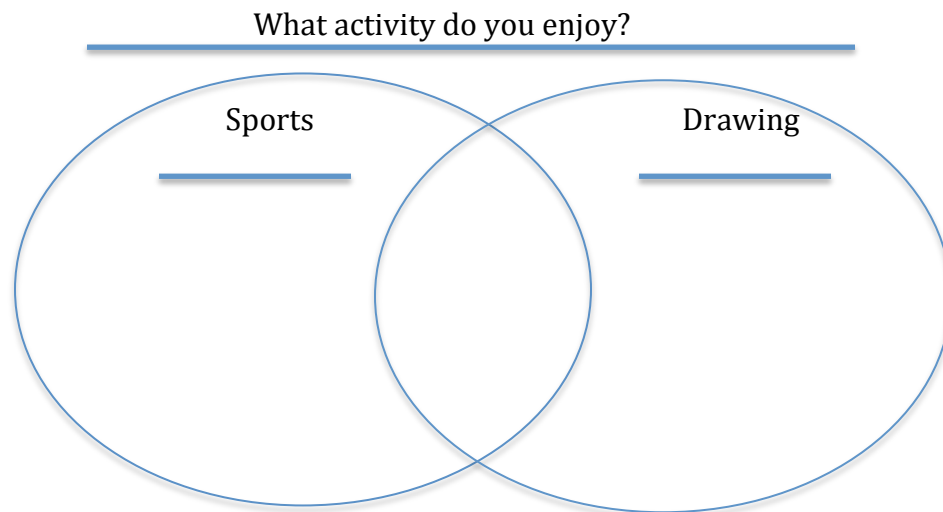
What have we discovered?

What does the Venn Diagram tell us about our class?

Show Video: <https://www.youtube.com/watch?v=yTFoprO5fgM>

Reflect...

Lets try another one as a class:



How many students enjoy sports?

How many students enjoy drawing?

How many students enjoy sports and drawing?

How many students include drawing but not sports?

Is our total correct with the number of people in our classroom?

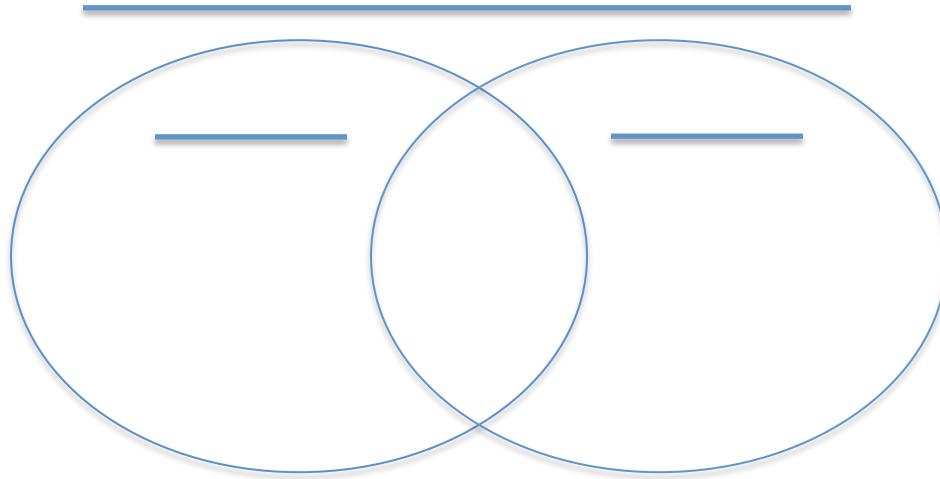
What have we discovered?

What does the Venn Diagram tell us about our class?

Discuss and analyze. Check to be sure that the quantities of students in the class have responded to the question by totaling numbers in each set.

Summarize/Independent Practice:

Pair students up and distribute pattern blocks. Have pairs come up with different ways to sort the blocks using a 2 circle Venn diagram. Record, label & share their findings on the Venn diagram.



Pose the following:

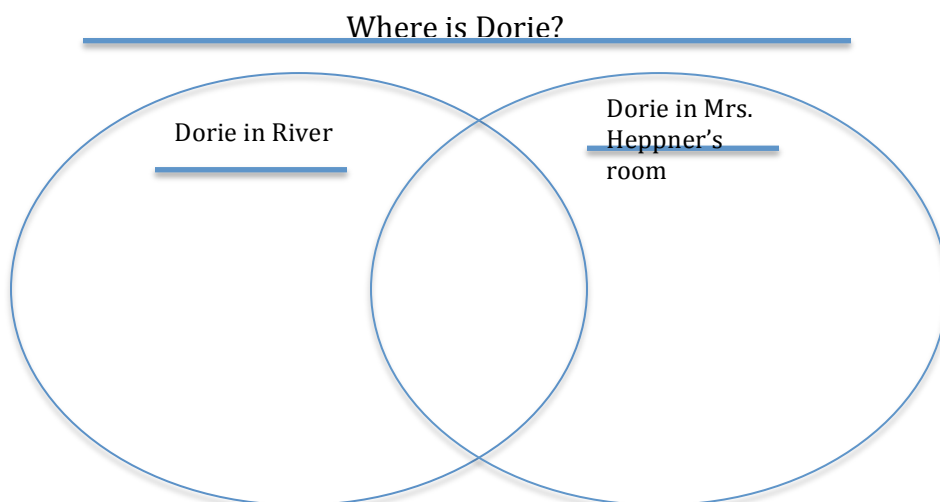
A survey of 50 informed voters revealed the following information:

- 25 believe that Dorie was spotted at the Red Lake River here in Crookston.
- 15 believe that Dorie is in Mrs. Heppner's room
- 5 believe both of these things.

Questions:

1. How many believe neither of these things?
2. How many believe Dorie was spotted at the Red Lake River here in Crookston but don't believe that Dorie is in Mrs. Heppner's room.

Write what you know about the Venn diagram including the words and, or and not.



Day 4:

Launch: Last night we went to the Dairy Queen to get ice cream and all of us in the car wanted something different. How many of you go to the DQ with your family and every wants something different. What do you do? How many of you get different things?

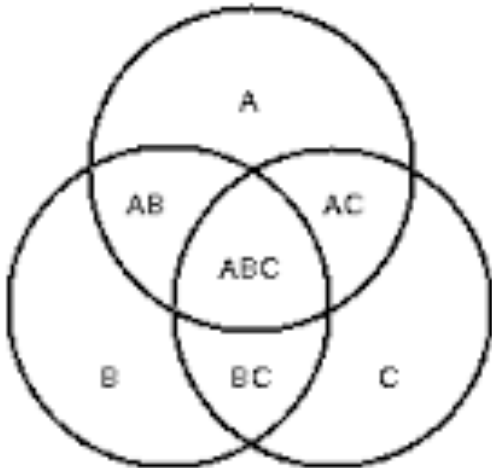
This week we have been looking at Venn Diagrams with 2 circles. What happens if we had a third circle? What does that mean?

Show a 3 circle Venn diagram.

This week we have been looking at Venn Diagrams with 2 circles. What happens if we had a third circle? What does that mean?

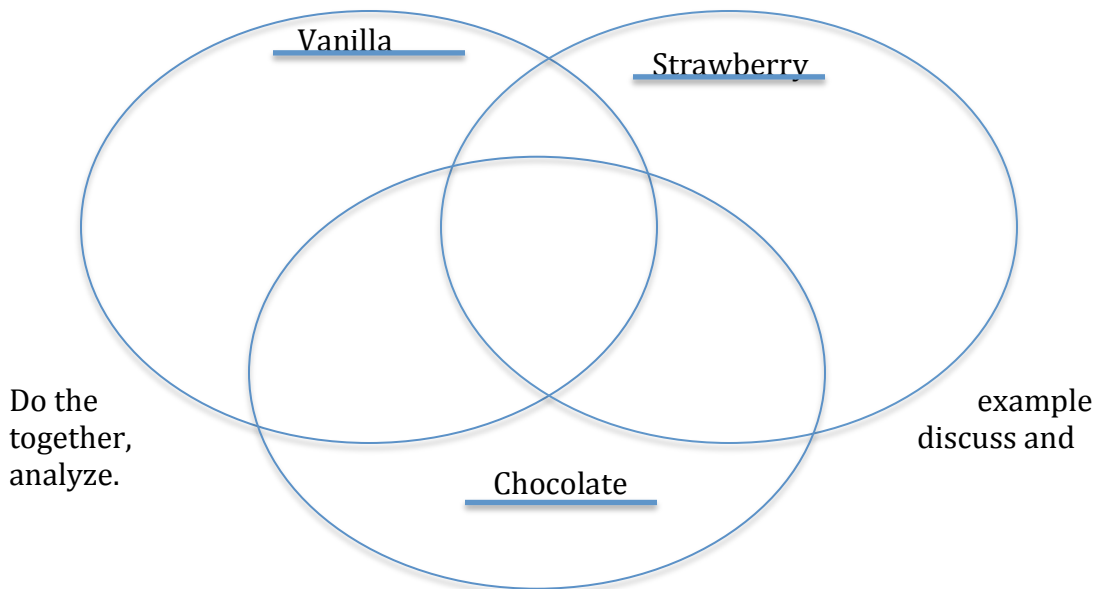
Show a 3 circle Venn diagram.

Explore: Introduction of 3 circle Venn Diagrams : Analyze and discuss what they notice now that there are 3 circles.



Pose the following question and have students write their name in the correct spot :


What kind of ice cream do you like?



- How many students like only vanilla?
- How many students like only chocolate?
- How many students like only strawberry?
- How many students like vanilla and chocolate?
- How many students like strawberry and chocolate?
- How many students like vanilla and strawberry?
- How many like strawberry but not vanilla?
- How many students like all of the choices?
- Is our total correct with the number of people in our classroom?
- What have we discovered?
- What does the Venn Diagram tell us about our class?
- What happens to a person who doesn't like these types of ice cream?

Summarize/Independent Practice: Pass out the following sheet and have students work in small groups to complete it.

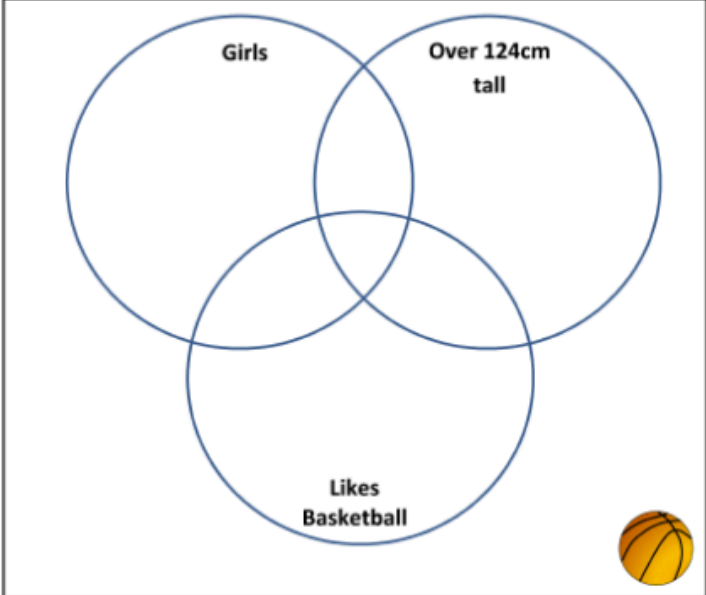
Name _____ Date _____



3 CIRCLE VENN DIAGRAM SHEET 3:1

Put these people in the correct places in these Venn diagrams.

	Ben	Ayesha	Kate	Max	Kyle	Holly
Boy/Girl	boy	girl	girl	boy	boy	girl
Age	7	9	8	6	8	8
Height (cm)	116	132	135	114	121	122
Likes basketball	no	yes	no	yes	yes	no



Source: <http://www.math-salamanders.com/image-files/venn-diagram-worksheet-3-circle-venn-diagram-3-1.gif>

Analyze and discuss the findings from the 3 circle Venn diagram Sheet 3:1. Have students journal in their Math Notebook.

Day 5 & 6-

Launch: How many of you have pets at home? As many of you know, we have Mia who is a golden retriever that is Gracie's sister (therapy dog in our building). What kind of animals do you have at your house? Make a list of pets in our room and do a Venn diagram with the 3 pets that are most common.

Explore:

Do the following as a class for 3rd graders, 4th graders do on their own.

A Class of 40 students completed a survey on what pets they like. The choices were:

Cats, Dogs, and Birds. Everyone liked at least one pet.

10 students liked Cats and Birds but not dogs

6 students liked Cats and Dogs but not birds

2 students liked Dogs and Birds but not Cats

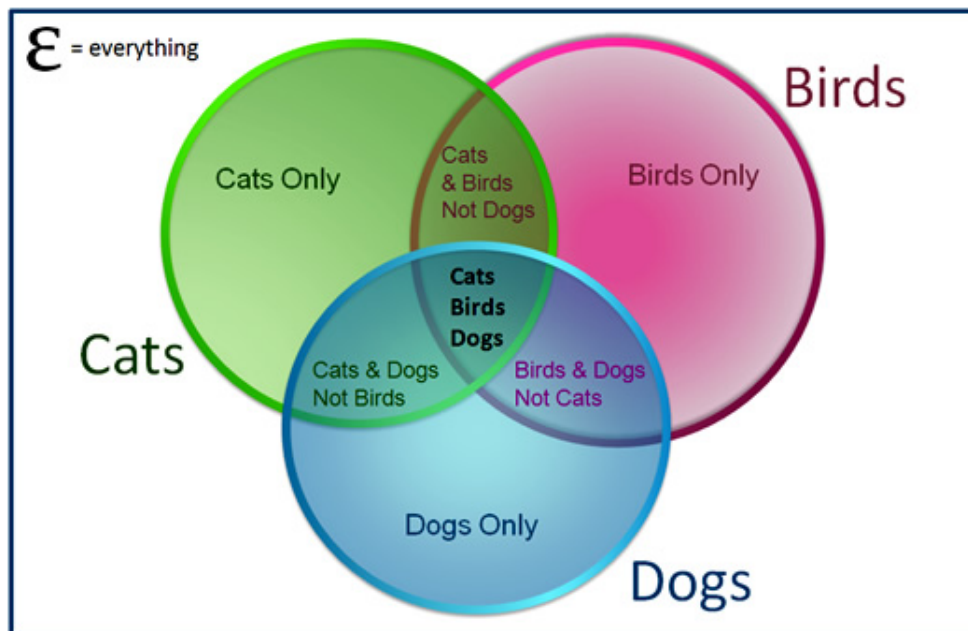
2 students liked all three pets

10 students liked Cats only

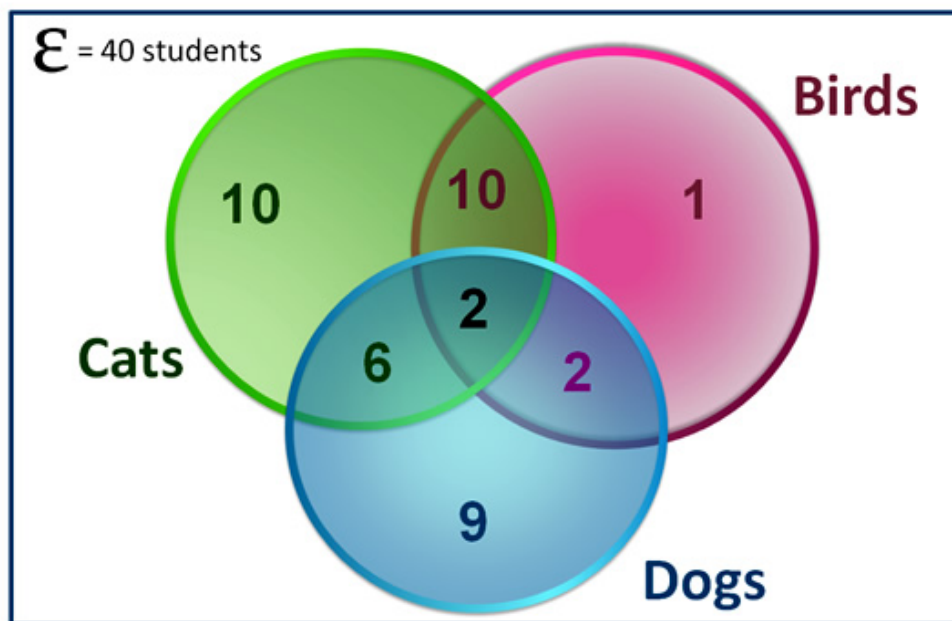
9 students liked Dogs only

1 student liked Birds only

Three Circle Venn Diagram

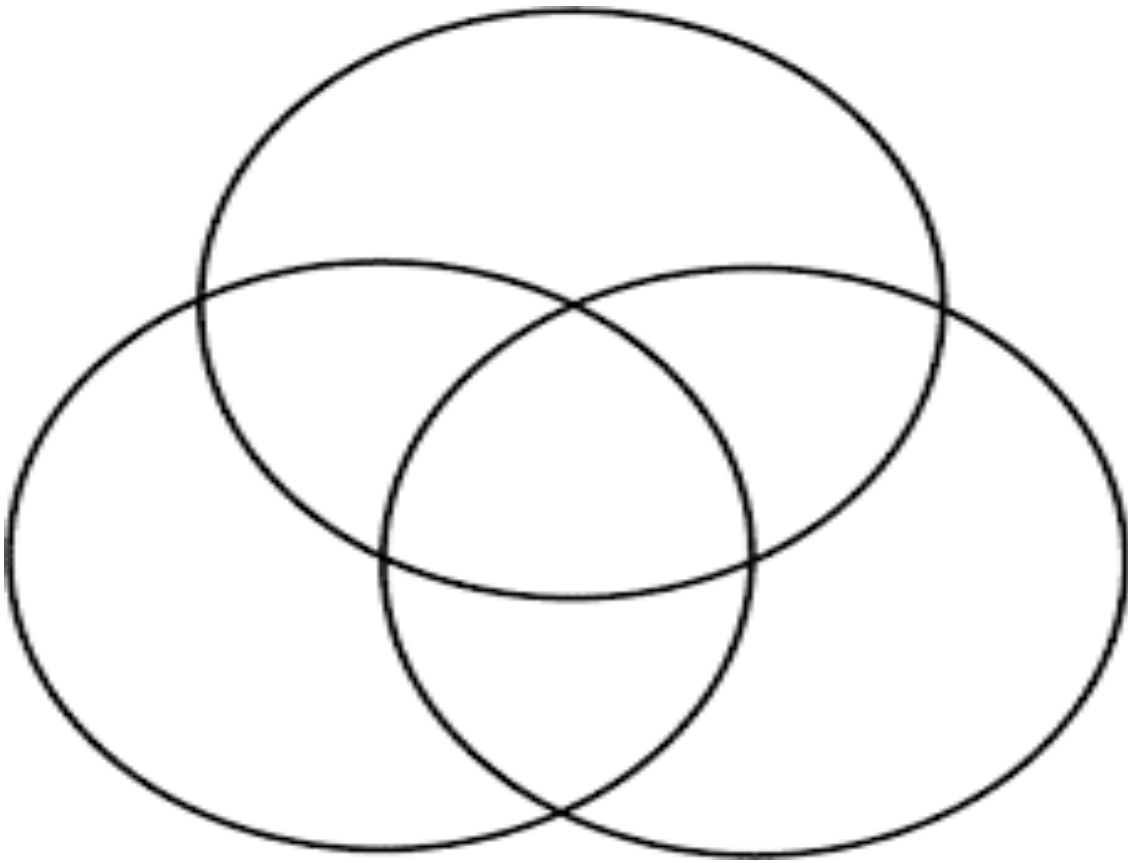


Venn Diagrams – Problem 1 - ANSWER



A survey completed by students and teachers at Highland School revealed the following information:

- 30 like America's Got Talent
- 20 like Girl Meets World
- 10 like Full House
- 10 like America's Got Talent and Full House
- 5 like Girl Meets World and Full House
- 5 like America's Got Talent and Girl Meets World
- 15 like to watch all of them
- 5 do not watch TV



Have students label and complete the Venn diagram.

Discuss the following questions: Calculators allowed

1. How many people were surveyed?
2. How many people like America's Got Talent but not Full House nor Girl Meets World?
3. How many like Girl Meets World and Full House?
4. How many like exactly one of the shows?
5. How many like all 3 of the shows?
6. How many are not inside any of the circles?

Day 8

Summarize/Analyze- Discuss and Analyze. Have a discussion with students about what they are learning regarding Venn Diagrams and their importance. Make a list of questions that students may want to use to create their own Venn diagram.

Have students create a 3 circle Venn diagram with a question on their own and ask classmates. Find out the results. Share with a partner and pick a few to share with the whole group.

Day 9-14

Launch: Looking around the room, what quadrilaterals do you see? Review what the word quadrilateral means. Let students know that today, we are going to be looking at different quadrilaterals, classifying them and looking at their similarities and differences.

Explore:

Using Everyday Math Grade 4, hand out Lesson 1-12- Math Masters pg. 41 –Sorting Pattern blocks. Have students sort according to rules on the page. Students should complete with blocks and then use the shape template to draw the shapes on their math masters page. Once finished, they will create their own Venn diagram of their findings. Students will share in small groups and a few will share with the whole group.

***** Work Pages were taken from the 4th grade Everyday Math, Math Masters

Using geoboards and rubber bands, have students make line segments that are made up of 2 endpoints and have a straight path. Have students make a line segment that touches 4 pins and record on the lesson 1-11 4th grade Math masters,

Source: Taken from the 4th grade Everyday Math, Math Masters

continue by making a line segment that touches 4 different pins, make the shortest line segment possible, and the longest line segment possible.

How many line segments can you create on the geoboard? What is it called when 2 line segments meet? (vertex) Discuss how a line segment can also be considered an edge of a shape.

Source: Taken from the 4th grade Everyday Math, Math Masters

In small groups, have them discuss what they notice and share as a whole group. Pose the following question: Is it possible to make a line on your geoboard? Explain

Using geoboards, have students create shapes using line segments. Give 5-10 minutes. Turn and talk to a partner. Share and discuss as a class.

Share:

Have students draw a line segment on their white board. Have a student come to the white board and draw a correct example and discuss why it is correct. Ensure that the vocabulary point, line segment, and end point are discussed.

Then draw a line, and discuss how line segments can be a part of a line and how a line is different from a line segment.

Draw a ray, discuss the vocabulary and how a ray has one end point and a line. Define, have students draw on their whiteboard. Use points on the ray.

Discussion questions:

- How is a line different than a line segment?
- Is it ever possible to draw all of a line? All of a line segment? All of a ray?
- What is the point called where 2 line segments meet?

Have students draw a line with the points X, Y, and Z. Ask: How many line segments can you name using the points marked on the line? Write them. How many rays can you name?

Summarize/Independent Practice:

- With partners compare a line, line segment & ray, analyze & discuss. Discuss as whole group.
- Students complete Math Journal pg. 28- Math boxes 1-11. When students finish, check in with teacher to look over and discuss as a class.

Source: Taken from the 4th grade Everyday Math, Math Masters

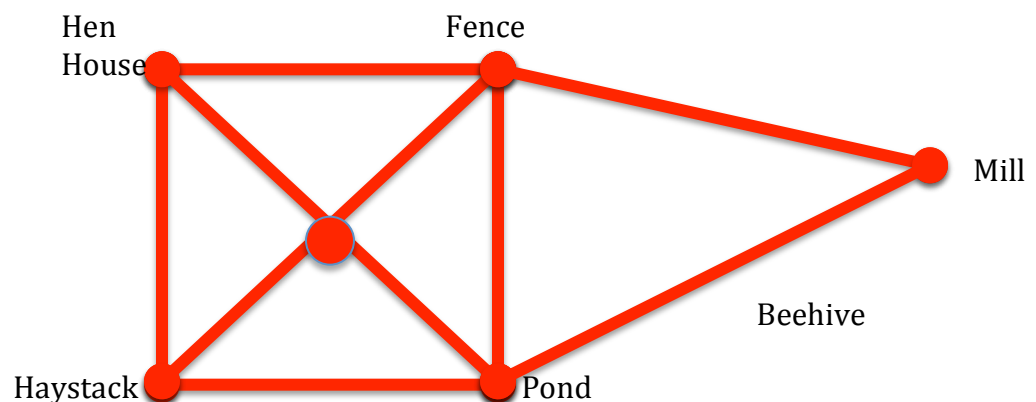
Launch:

Rosie's Walk & Lost Adapted from Arizona Department of Education. Listen and watch the video of the book, Rosie's Walk by Pat Hutchins. <https://www.youtube.com/watch?v=73-y8EDmrAE>

Do as a whole class:

Discuss what happens in the story. What do students notice about the fox? Let students know that Rosie would like to take a walk around the farm yard. The farmer is very worried about Rosie though because of how the fox always is following her and he sees fox tracks. The farmer decides to go and find Rosie. The farmer must visit each vertex only once when looking for Rosie. What paths can he take? He will start and end at the Hen House.

Rosie's Walk



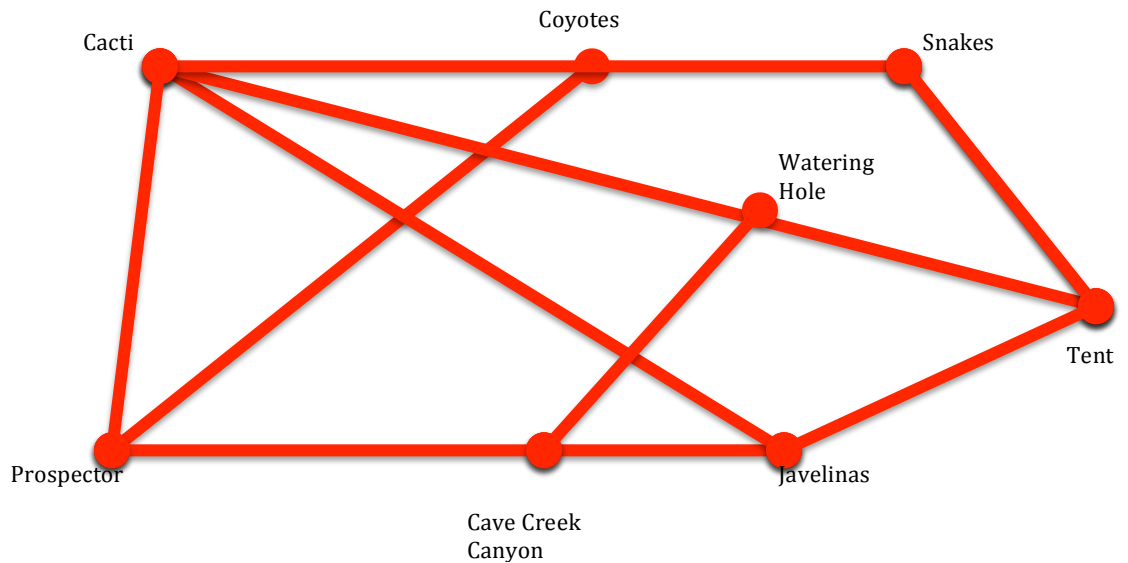
Rosie's Walk Discussion Questions:

1. How many different paths can the farmer take when starting and ending at the Hen House?
2. What are the paths?
3. How many line segments are in the picture?
4. How many vertices are in the picture?
5. Is there a relationship between the line segments and the vertices? If so, what is it?

Explore:

Read the Story Lost by Paul Brett Johnson & Celeste Lewis

Hand out the vertex edge graph.



The vertex edge graph represents the desert area where you can find the Flag who is lost. It may be hard to him since he has been missing for about a month. Celeste and her father want to be efficient when searching all the locations on the map.

Pose these questions:

1. Can they start and end at the same location?
2. Where would be the best location to start?
3. Is there more than one path? If so, how many possibilities can you come up with?

Students can complete this with a partner or small group.

Discuss in partner/small group and as a whole group.

Shapes are all around us. Read **Grandfather Tang's Story** by Ann Tompert using tangram pieces. Discuss what the message is in the story, (shape changing characters.) Discuss what certain quadrilaterals work well in the designs and solving one of the books puzzles? Why? Discuss quadrilateral relationships.

Source: Use 3rd Grade Everyday Math, Math Masters pg. 128

Using tangram pieces students will make pictures and patterns.

Hand out geometry kits that have already been made out of 4 straws all 1 length have 2 straws that are $\frac{1}{2}$ the size and 2 that $\frac{3}{4}$ length and twist ties. Have the students take out the straws and twist ties. Pose the question, how many quadrilaterals can you create?

Students will create a design or geometric shape without bending the straws. Under the document camera, students will share their creations.

As a class, discuss how it is possible to create 2 dimensional shapes in different ways- manipulatives, pictures and verbal descriptions.

Have students show using straws and twist ties how it is possible to form different angles.

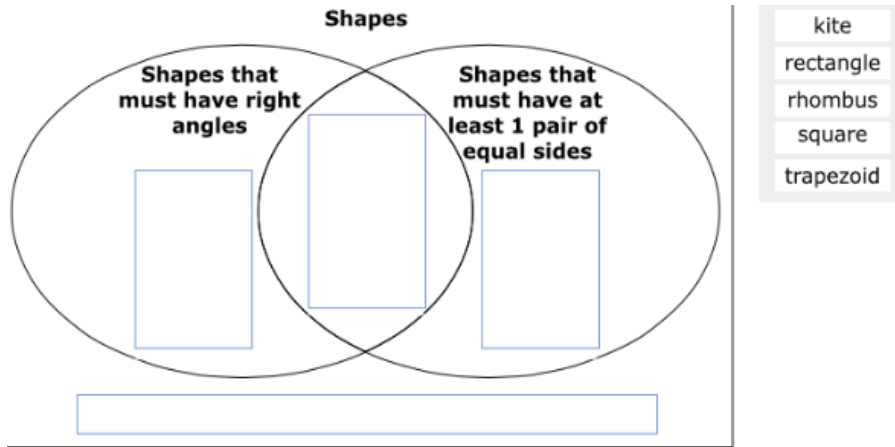
- Define the vocabulary angle, vertex, right angle, perpendicular lines, obtuse angle and acute angle. Have students add these definitions with pictures into their Interactive Math Notebooks.
- Go on a scavenger hunt to find examples of vocabulary words.
- Using the straws and twist ties form a right angle, perpendicular lines, obtuse angles & acute angles. Once angles have been created, discuss the reasoning behind each angle.
- Explain that angles are made up of 2 rays and a vertex and that an angle can be made up of 2 line segments that share the same endpoint.
- Have students join 3 straws together to make a triangle. Once they have done so, discuss what they notice and share the different ways in which they created them.
- Ask the following questions:
 - How many right angles can a triangle have?
 - What are the perpendicular sides?
 - What is a 4 sided shape called?
- Using the straws/twist ties have students create quadrilaterals and share with a neighbor. Have students bring their different quadrilaterals and show them under the document camera. Have students then create a quadrilateral that has 4 equal sides. .
 - How many right angles?
- Then have students pull 2 of the opposite corners outward.
 - Are all the angles still right angles? Are all the sides the same length? What is the quadrilateral called?
- Use 2 straws of one length and 2 of another and create a quadrilateral.
 - What shape did you make? Are there any right angles?
- Then have students make a trapezoid and a kite.
 - Then pose the questions: Is it possible to make a quadrilateral with exactly 3 right angles? Why or why not?
- Have students draw the different quadrilaterals in their math notebooks- square, rhombus, rectangle, parallelogram, trapezoid & kite.

Summarize/Independent Practice:

- Have students get out their Everyday 4th grade Math Journal and open to page #29 Lesson 1-12 and walk around as students are complete it. Review answers when everyone is finished.
 - Assessment check in- Look at #5a and that will be a good way to see if students are able to identify right angles.
- Discuss what they learned. Have students use their arms, the elbow being the vertex, to demonstrate acute, obtuse and right angles.
- Assign students to complete Math Journal pg. 30 for Lesson 1-12 and the Homelink 1-12 pg. 43

Day 15-

Launch: Now that you are experts when it comes to comparing and contrasting, you are going to be making money today by being my teacher today. Tell me what you have learned about 2 and 3 circle Venn Diagrams. Complete the following Venn diagram together and have students complete the post test.



Source: MN MCA Item Sampler- Grade 4

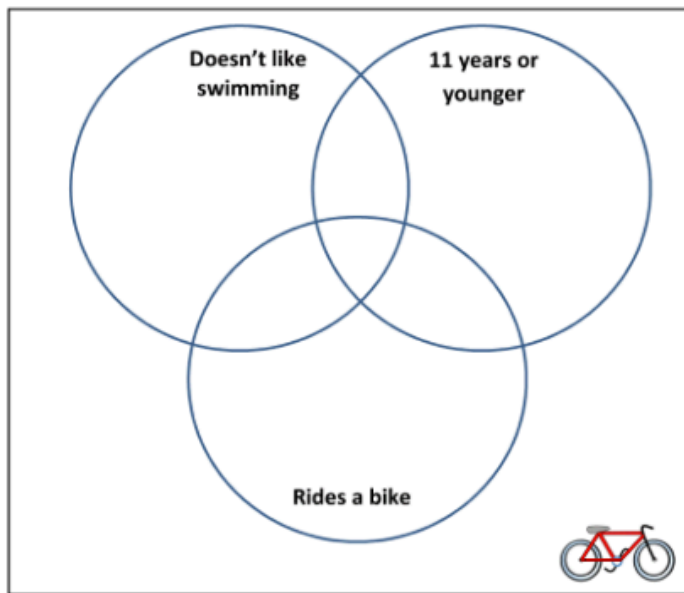
Post Test:

Name _____ Date _____

3 CIRCLE VENN DIAGRAM SHEET 4:1

Put these people in the correct places in these Venn diagrams.

	Ethan	Noah	Emma	Olivia	James	Mia	Alex
Age	10	12	11	9	12	11	13
Can ride a bike	yes	no	no	yes	yes	no	yes
Likes swimming	no	yes	no	yes	no	yes	yes



Source: <http://www.math-salamanders.com/image-files/3-circle-venn-diagram-4-1.gif> Taken off on June 26, 2016

If there is extra time, students can explore on the geoboards creating different shapes/pictures or create their own Venn diagram with questions for others to complete.

Reflection

Thoughts regarding the Venn Diagram Lessons

A reflection is a detailed analysis of the strengths and weaknesses of a lesson. To get the most from the process, it should be done within an hour of the teaching of the lesson, while the teaching experience is still fresh in your mind. Include the following in your reflection:

1. Provide a brief, but thorough synopsis of the lesson. What happened?
2. What went well and what did not go as you expected?
3. What surprised you?
4. What do you believe your students learned and how does that connect to your goals for them?
5. What would you do differently if you taught the lesson again?
6. Briefly describe to follow up lessons. What should happen next? (Remediation? Enrichment?)

Suggestions for Revision

Complete after teaching your lesson.

Planning Ahead/Get Ready: