

Discrete Mathematics
3rd Grade

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By

Angie Bonik

angela_bonik@bemidji.k12mn.us

Heather Anderson

heather_anderson@bemidji.k12mn.us

Executive Summary-

The unit we have created will allow teachers and students in third grade to explore the area of Discrete Mathematics through investigation, activities and discussion. The unit consists of 3 different types of problems. First, problems in which students will use a Venn Diagram to sort information and use addition and subtraction to find solutions to real-world problems. Second, the students will find and count different combinations of elements to real world problems. Third students will explore different types of graphs using a closed set of given information and values. They will collect, display, and interpret data and gain an understanding of how data can be organized. Each section consists of 5 activities that move from guided to independent exploration. Each activity allows for students to explore and work toward a solution in a group then share their findings.

This unit covers the following Minnesota State Math Standards:

Number & Operation 3.1.2.2	Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.
Data Analysis 3.4.1.1	Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.

**Standards from:

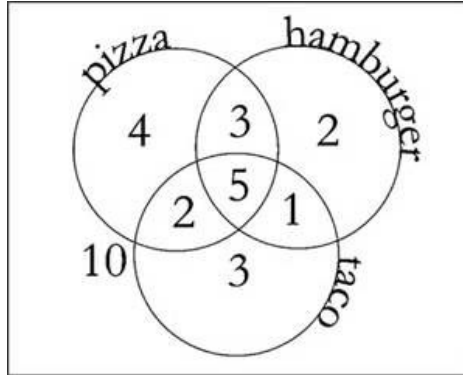
<http://education.state.mn.us/MDE/EdExc/StanCurri/K-12AcademicStandards/Math/index.html>

After completing this unit the students should be able to answer the MCA questions involving graphs and Venn Diagrams.

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Use the Venn Diagram to answer the questions.



1. How many people like only a taco? _____
2. How many people like pizza and hamburger? _____
3. How many people would like all of the choices? _____
4. How many people do not like any of the choices? _____

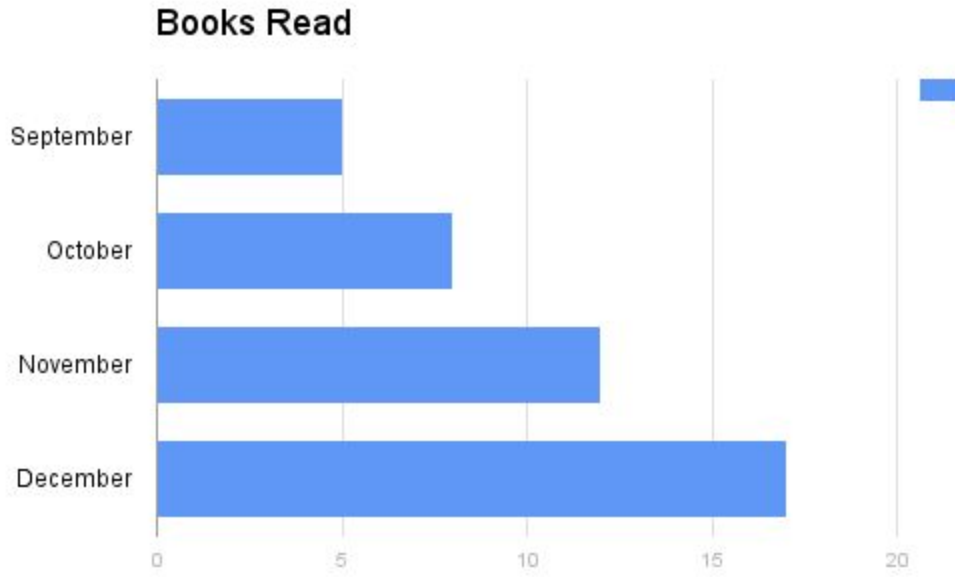
Draw a picture to solve.

How many outfits can I wear if I have

3 shirts: red, yellow, and green

3 pairs of pants: blue, black, and grey

Use the graph to answer the questions.



1. How many books did the students read in each month?

September	
October	
November	
December	

2. How many more did they read in December than October? _____

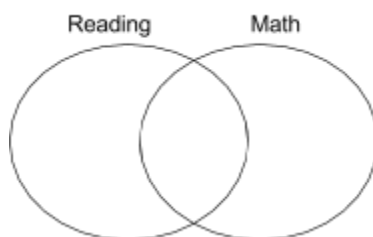
How did you find this answer:

Activity 1- Create & Explore a Venn Diagram

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results. *This is a readiness activity leading toward work on this standard	*Projectable 1 from this unit *Chart paper or other tool to save discussion points

Objective: The students will be able to answer questions using a 2 circle Venn Diagram.

Launch: This week we are going to talk about things we have in common and things that are different. We are going to get to know each other a little bit! We are also going to count how many of us like the same things. We will see how a Venn Diagram can help us solve problems! I have a Venn Diagram on our SMART board. I am going to call each team to come up and put your name in the place that shows us if you like Reading or Math better. (allow time for students to move their name to their choice) Then I will give you time to discuss what we find. What can you tell from this Venn diagram?



Explore: In groups students should look at the diagram on the board and discuss what they see. They should take notes write ideas to explain information they can get from the Venn Diagram.

Share: Students from each group should share what they talked about during their discussion. Write facts they share on the board to create a list.

Summarize: Looking at this Venn Diagram we gathered a lot of information. You should go through the list that was created by the class and have students point out where on the Venn diagram the information is found. Make sure to point out if anyone chose the union or neither reading or math.

**Make sure to save the Venn Diagram you created and the notes the students wrote.

Activity 2- Connect to Numbers

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Projectable 1 from this unit- Completed in previous lesson *Chart paper or other tool to save discussion points

Objective: The students will be able to assign a value to the information on the Venn Diagram and figure out missing values.

Launch: Yesterday we created a Venn Diagram to show whether we liked reading or math better. It was so interesting to see how many of you liked these subjects! Now I am wondering if you can help me figure out just how many 3rd graders liked each of them. How many of you said that you preferred reading? (Write the number in the diagram) How many chose math? Did anyone like both subjects equally? How about neither subject? I am wondering if you can figure out how many students are in our class using the information on our diagram?

Explore: In groups students should look at the diagram on the board and discuss what they see. They should work together to see if they can figure out the total number of 3rd graders in the class. They should show their work and be ready to tell us how they figured it out.

Share: Students from each group should share what they talked about during their discussion. Record the strategies for finding the total number of students.

Summarize: I noticed that you added up the numbers in the diagram to find the total number of students. Did we have to count the students that did not choose either reading or math? Can you figure out how many total would choose math? How about reading? How can we figure out a missing number if we know other numbers?
(part+part=total)

Activity 3- Explore 3 Choices

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Projectable 2 form this unit

Objective: The students will be able to identify the different regions of a 3 circle diagram.

Launch: We have been working with a Venn Diagram that shows whether you liked reading or math better. I am wondering what would happen if we changed that diagram just a little bit. What if I added a choice so that it would look like this: choices should be gym, reading, math. Have students make their choices and record them.

Explore: In groups students should look at the diagram on the board and discuss what they see. They should be talking about where the names are and what each space means. Can they come up with totals for each choice?

Share: Students from each group should share what they talked about during their discussion. Record their ideas and any totals they have.

Summarize: Adding the 3rd choice really changed our outcome. The spaces in between the circles area where we record more than one choice. The middle space is for anyone who really likes all 3 choices. Remember that the outside is where we put names of people who do not want to choose any of the choices.

Activity 4- Create 3 Choice Venn Diagrams

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Projectable 2 from this unit. Before class label enough diagrams so that each group will have one and the labels make sense for your students. *Poster paper for each group *Markers or other tools to create posters

Objective: The students will be able to assign values to information on a 3 circle Venn Diagram.

Launch: We have been working with Venn Diagrams to help us organize information about our new friends. Today we are going to gather more information about each other. Then your groups are going to work together to make a Venn diagram poster and share the information you learn from your diagram! On each table there is a Venn diagram with 3 choices. Using a marker go to each table and write your name on the diagram.

Explore: Students work in groups to analyze the data on the Venn Diagram. They should recreate a copy of the diagram on the poster paper with the numbers instead of names. Together they should list facts they can learn from the diagram.

Share: Students from each group should share their poster and the facts gathered from their diagram.

Summary: Look at all of the information we gathered and organized using our Venn diagrams. I love that you were thinking like mathematicians and using numbers to describe your data.

**Hang the posters in the classroom for display

Activity 5- Problem solving with our Venn diagrams

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Posters created in Activity 4 *Sticky notes or other means for covering numbers on the posters

Objective: The students will be able to find missing values on a 3 circle Venn Diagram.

Launch: What do you notice about our posters from yesterday? I have covered up some of the numbers so that they are now mystery numbers. We are going to work together to see if we can figure out what the missing numbers are. Using a Venn Diagram on the SMARTboard or doc camera, lead the class to see that the whole diagram is a whole, and that each circle can be whole. Lead the class to discover how to figure out the missing numbers on the diagram.

Explore: Groups should get a poster that is not their own and work together to solve for the hidden numbers.

Share: Groups share their strategies for finding the missing numbers. Check the numbers to see if they came up with correct totals.

Summary: Review the process of the parts and totals on the Venn Diagrams. Make sure to explain the significance of the middle parts and the outside piece (union).

Activity 6- Introduction to Problem solving with Combinations- Packing Lunch

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*1 Activity sheet for each group *Scissors

Objective: The students will be able to explain how their group found the different combinations to solve the problem.

Launch: (Personalize the story to fit what your students know about you)

Today when I was packing lunch for my girls I had 3 different things to put in the lunches. My girls always tell me they are tired of the SAME lunch everyday, SO I tried to make it look different in their lunch box. We have grapes, crackers, and cheese. Their lunch box has 3 spaces in it. How many different ways can I pack the lunches? Use projectible or make a SMARTboard page to demonstrate. Model a few of the choices.

Explore: Students should work in groups to cut apart the handout and manipulate the choices to come up with different combinations.

Share: Groups share the different combinations they found. Record the answers as they share.

Summary: Lead discussion to make sure the students understand that each item can occupy each space. Talk about how many choices they have once they place an item in each space. Once the grapes are in the top left box, I can put the cheese in the top left or the bottom. Once the cheese is placed I only have my grapes left to place and only 1 more space. I can move the grapes to the top left, then I have the 2 choices for my cheese and crackers.

Grapes can be in 3 spaces with 2 remaining choices for each space. There are 6 possible combinations.

Activity 7- Combination Problem- Shirts and pants

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*1 Copy of activity sheet 2 for each group

Objective: The students will be able to explain how their group found the different combinations to solve the problem and explain how they know the number of combinations.

Launch: So... I have 3 shirts and 3 pairs of pants that I can choose from. My shirts are pink, yellow, and red. My pants are blue, black, and grey. Have you ever wondered how many different combinations of shirt and pants you can wear to school. I was thinking in my head...I wonder how many different outfits I have? Can you help me today? Remember when we solved my lunch box problem? I wonder if we can do the same with the shirt and pants?

Explore: Groups cut apart the handout so they can manipulate the options. They should record their outfits on the recording page.

Share: Groups come to the board and color in the different outfits their group found. Make sure to not repeat any outfits. Continue until all of the possible outfits are recorded. Then have groups explain how they found as many outfits as they did.

Summary: Make sure to point out the idea that once you choose a shirt you only have pants to choose from to make an outfit. How many different outfits are available with each shirt. You cannot wear pants on the top or a shirt on the bottom, so this is a bit different than the lunchbox problem. There we could put any of the choices in any place. Did that make it harder or easier? Why did we have 9 different combinations today when yesterday we had 6? We had 3 choices for 3 different shirts. So we had $3+3+3=9$.

Activity 8- Houses in a Row

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Blank work space for each group *Crayons or markers for each group

Objective: The students will be able to explain how their group found the different combinations to solve the problem and explain how they know the number of combinations.

Launch: Today we are going to work on a problem about houses. What color is your house? What if a neighborhood wanted to get really creative with their houses and have all different colors? These neighbors on the block plan to paint their houses using the same colors but they do not want any house to be exactly the same as any other house. They may use: Blue, yellow or green for the triangle part or roof, and red, orange or purple for the square house part. How many different houses can be painted? Today I am challenging you to create your own picture to solve this problem.

Explore: Groups should work to figure out how to represent the information, then work to come up with all of the different color combinations for the houses. They should record on the work space.

Share: Groups share their houses and strategies for finding the different combinations.

Summary: Wow a very colorful neighborhood! How many different ways could we paint the house? (9) How many colors did we have for the triangle or top of the house? (3) How many different ways did we have for the bottom of the house? (3) When I look at our numbers 9-3-3 what do we know about these numbers? They are a fact family for multiplication. $3 \times 3 = 9$. So I am wondering if I can tell how many combinations I am possible in a problem by using multiplication. Look back at the shirt/pants problem and see if our idea is true for that problem. Is it helpful to know how many combinations are possible when solving a problem?

Source: Kwas@mathwire.com

Activity 9- Stop Lights

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Blank workspace for each group *Crayons or markers for each group *Unifix cubes or color tiles- Red, Yellow, Green for each group

Objective: The students will be able to explain how their group found the different combinations to solve the problem and explain how they know the number of combinations.

Launch: Have you ever looked at a stop light and wondered if the colors are always in the same order? What color do you think is on top? Middle? Bottom? What if we mixed the colors up? Could we put them in different orders? How many different stoplights can we come up with.

Explore: Groups should work together using the unifix cubes or tiles to create the different combinations. They should record their findings on the work space.

Share: Groups will share their findings and strategies they used to find the combinations.

Summary: So what I see is that if the red is on top there are 2 other possible combinations. Same if the yellow is on top, and the green on top. Good thinking! So we have 6 possible stoplights. Was this more like the outfits problem or the lunch box problem? Why?

Source: kwas@mathwire.com

Activity 10- Football uniforms:

MN State Standard	Materials
Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Use various strategies, including the relationship between addition and subtraction, the use of technology, and the context of the problem to assess the reasonableness of results.	*Blank workspace for each group *Crayons or markers for each group

Objective: The students will be able to explain how their group found the different combinations to solve the problem and explain how they know the number of combinations.

Launch: Our football team needs to buy new uniforms. We can order pants in Grey, Blue, or White. The Jerseys are available in Silver, Navy, or Black. How many different uniforms do we have to choose from. Work with your group to see if you can create the different looks for our team.

Explore: Students should work in groups to create the different combinations of uniforms. They should record their work on a blank workspace.

Share: Groups share their work and the strategies they used to find their answers.

Summary: Today I did not give you pictures to color in as you were working. What was the challenge in working on a blank workspace. Did we all use the same strategy? Did our different strategies get us the same answer? Could anyone predict how many uniforms we could make before you started working?

Activity 11- Graphing Introduction: Comparing Graphs

MN State Standard	Materials
Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.	*Projectable 3 *Chart paper or other way to record class ideas

Objective: The students will be able to explain the differences between the different graphs and gather information using the graphs.

Launch: Display the horizontal bar graph on projectable 3 attached. Guide students to recognize the parts of the graph and answer questions based on the graph. Continue with the vertical bar graph, picto-graph, and line-plot graph. Guide students to notice the differences and similarities in the graphs. Are the graphs all giving us the same information?

Explore: Students should work in groups to read and interpret and discuss the information on the graphs at each table.

Share: Groups share their findings and compare their answers with others. Students should share their strategies for finding their answers.

Summary: Point out that all of the graphs gave us the same information. I notice that they all look different. How can that be? What are the parts of the graph are helpful to us? (title, labels, data, numbers)

Activity 12- Bar Graph- M&Ms

MN State Standard	Materials
Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.	*Snack size M&Ms bag for each student *M&M graph sheet- many available online choose one that fits your students' levels *Crayons or markers for each student

Objective: The students will create a pictograph using the M7Ms in their bag as data.

Launch: Today we are going to have a treat...but you can't snack until our work is done! We are going to graph the M&Ms we have in our bags. You have a workspace to use. You need to graph the M&Ms in your bag and have a have a group member check your work before you can eat your M&Ms.

Explore: Students should work to graph the candies in their bag. They should be asking others in their group to check their work and compare their graphs.






Share: Students should share their graphs and as a class discuss the strategies they used to create the graph.

Summary: Question and guide students to compare their graphs and interpret information on each graph.

Sample picture of a graph found online:

Name: _____

Hypothesis
 Red _____ Yellow _____ Green _____ Brown _____ Blue _____

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Graph found at: <https://www.pinterest.com/pin/123849058477284545/>

Activity 13- Bar Graph: Playground Fun

MN State Standard	Materials
Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.	*Provide a basic graph template with the labels or other elements to support the level of your students

Objective: The students will create a bar graph and interpret information on their graph.

Launch: I am wondering what you like to do when you are on the playground! I know that some people like to play sports, others like to swing, some like to play on the slides, and some just visit with their friends. Let's gather some data. I have a table to organize our data. Then you are going to work with you group to create a graph!

Play Sports	
Slide	
Swing	
Visit with friends	

Explore: Students should work in groups using the workspace provided to graph the the information from the table.

Share: Groups share their graphs and discuss their strategies for creating the graph.

Summary: So I see that our graphs all look a bit different. How do we know that we still have the same information. Graphs can look different but the information still has to be accurate and the labels have to tell what information is in the graph.

Activity 14- Bar Graph: Pets

MN State Standard	Materials
Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.	*Provide a basic graph template with the labels or other elements to support the level of your students

Objective: The students will create a bar graph and interpret information on their graph.

Launch: For some families a pet is a pretty important part of the family. Some families have pets and others do not. What are the most common pets that you can think of? I today we are going to collect and graph data about our pets. Some families do not have a pet, some have dogs, or cats, or fish, or another kind of pet. This is the table we are going to use to collect our data. Then you will work in groups to create a graph of our data.

No pet	
Dog	
Cat	
Fish	
Other type of pet	

Explore: Groups should work together on the workspace provided to create a bar graph of the data.

Share: Groups share their graphs and discuss their strategies for creating the graph.

Summary: Today your workspace did not have any labels or a title for you. How did you decide what to use for your labels and title. It is important as a mathematician to make sure it is clear what your graph is reporting.

Activity 15- Line Plot Graph: MCAs

MN State Standard	Materials
Collect, display and interpret data using frequency tables, bar graphs, picture graphs and number line plots having a variety of scales. Use appropriate titles, labels and units.	*Provide a basic graph template with the labels or other elements to support the level of your students

Objective: The students will create a line graph and interpret information on their graph.

Launch: I am SO proud of how you did on your MCA tests this year! EVERYONE of you showed growth and got a better score than you did on the practice test. The table shows how our class did. I want you to work in groups to create a Line graph of our data!

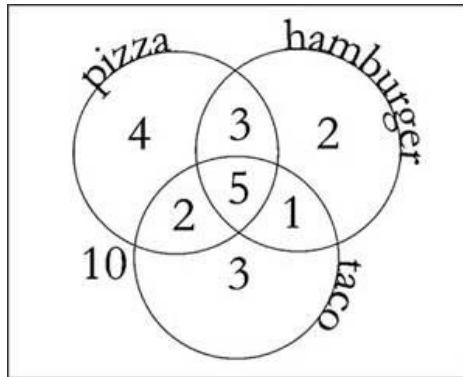
Exceed	7
Meet	12
Partially Meet	6
Did not meet	2

Explore: Groups should work together on the workspace provided to create a bar graph of the data.

Share: Groups share their graphs and discuss their strategies for creating the graph.

Summary: When you create a line graph it is important to have all of the information labeled. A line graph is a good picture of the differences in each data point.

Use the Venn Diagram to answer the questions.



5. How many people like only a taco? _____
6. How many people like pizza and hamburger? _____
7. How many people would like all of the choices? _____
8. How many people do not like any of the choices? _____

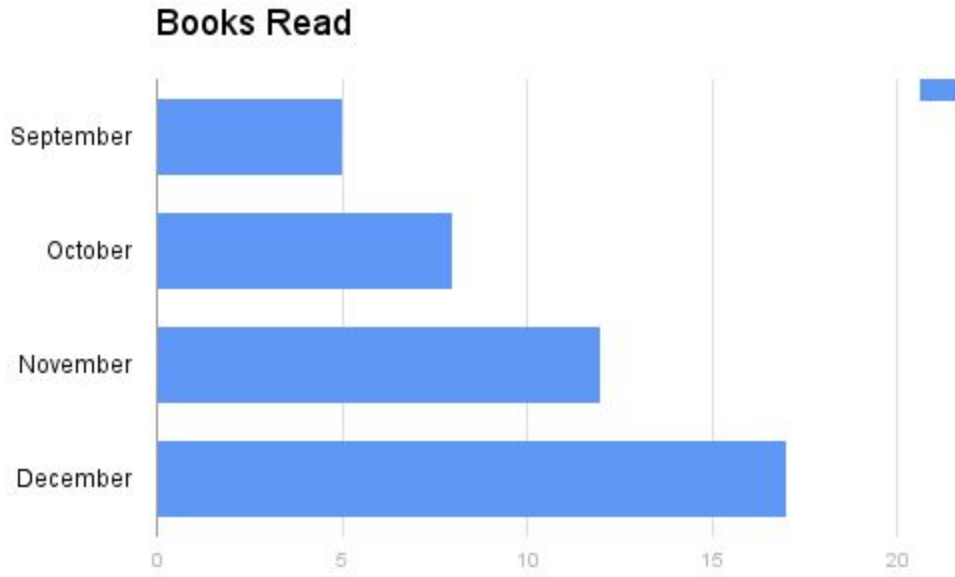
Draw a picture to solve.

How many outfits can I wear if I have

3 shirts: red, yellow, and green

3 pairs of pants: blue, black, and grey

Use the graph to answer the questions.



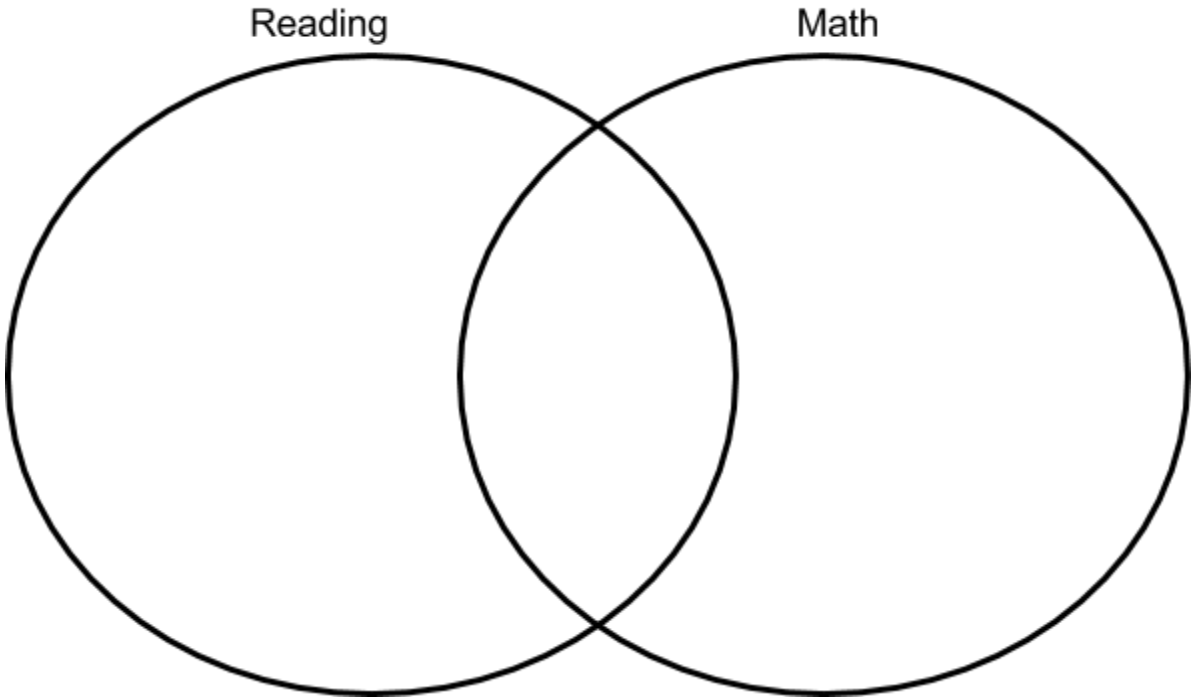
2. How many books did the students read in each month?

September	
October	
November	
December	

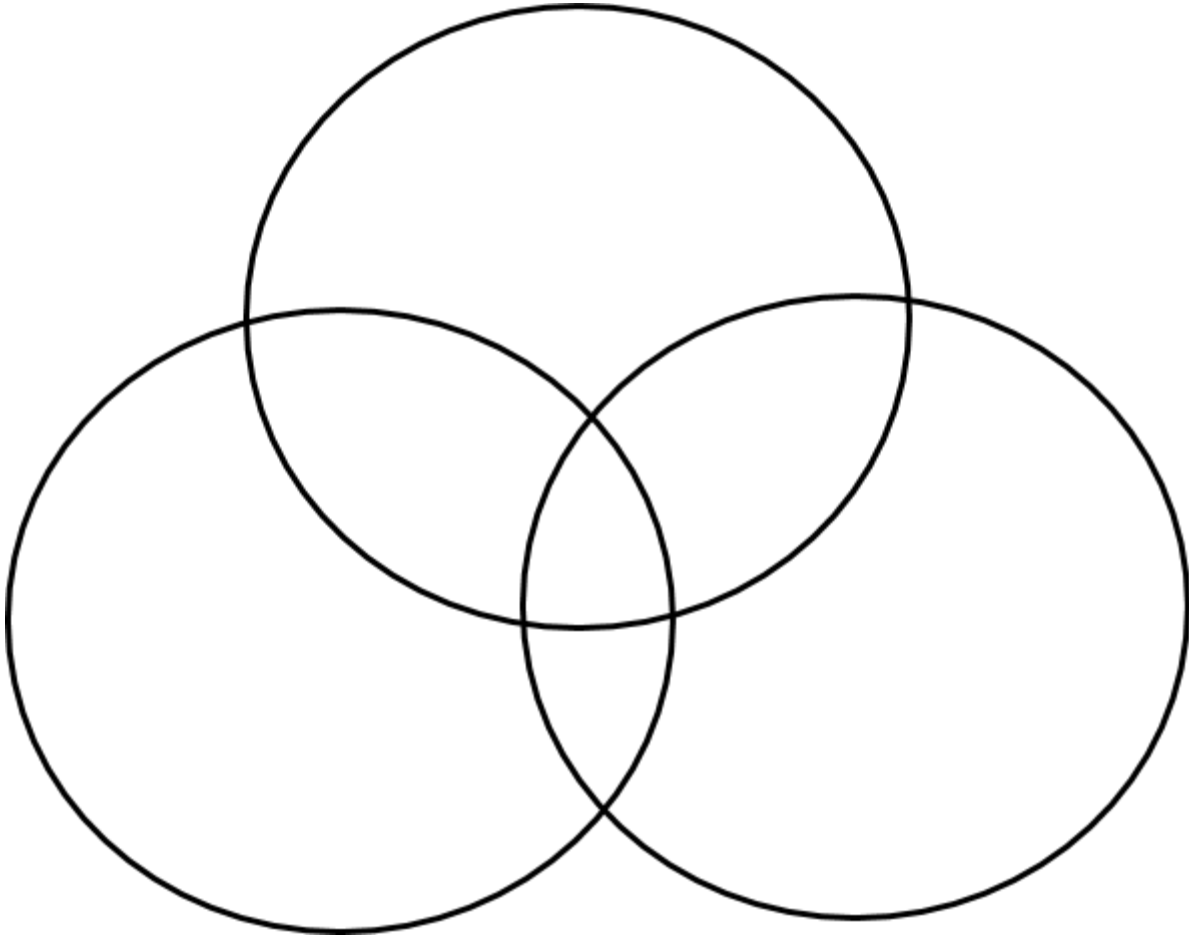
2. How many more did they read in December than October? _____

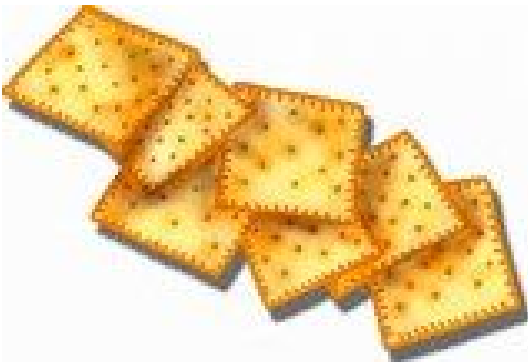
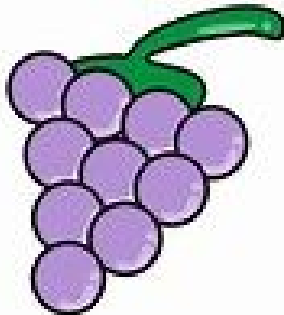
How did you find this answer:

Projectable 1

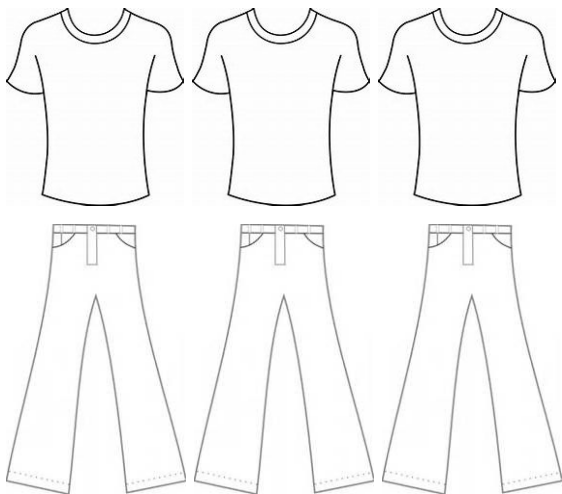
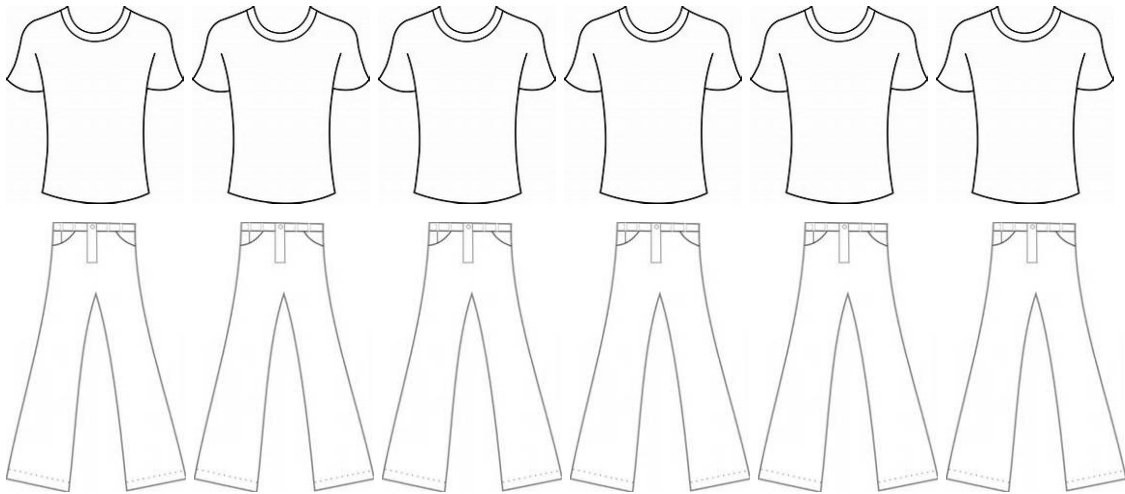
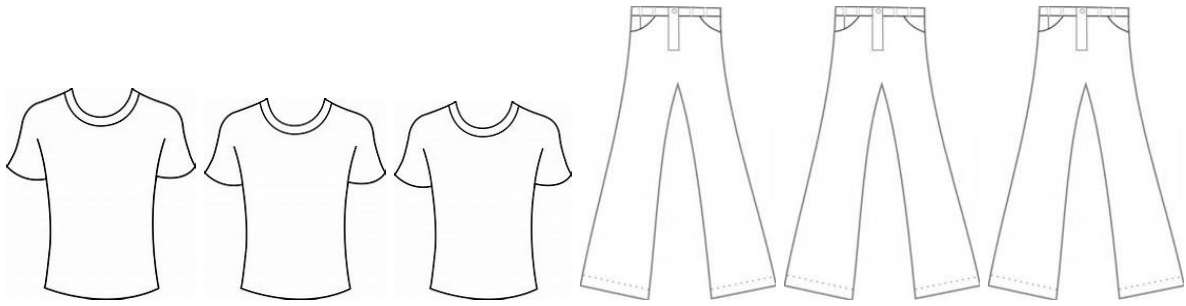


Projectable 2





Activity Sheet 2



Projectable 3

