Discrete Math Unit Plan
Grade 3

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Executive Summary

This unit was designed to introduce students to a variety of discrete mathematics ideas with a focus on activities that are designed for third graders. The following activities all help students work on mastering at least one Minnesota Mathematics standard and they all teach valuable problem solving skills. Many activities were found in the *Navigating through Discrete Mathematics in Prekindergarten-Grade 5* book, *Pattern Block Book Grades K-3*, and Teachers Pay Teachers. The lessons are designed to be used during a normal math period or as supplemental problem solving activities throughout the school day.

Minnesota Standards Addressed:

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. For example: The calculation 117 – 83 = 34 can be checked by adding 83 and 34.

3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

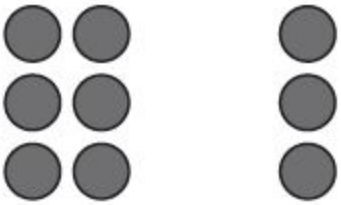
3.2.1.1 Create, describe, and apply single-operation input-output rules involving addition, subtraction and multiplication to solve problems in various contexts. For example: Describe the relationship between number of chairs and number of legs by the rule that the number of legs is four times the number of chairs.

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.

MCA Sampler Items:

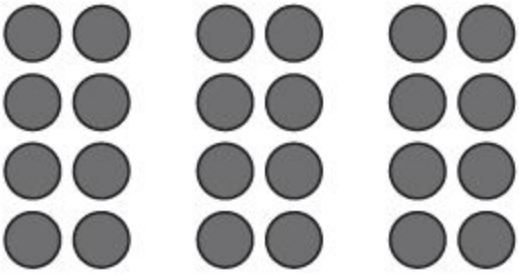
5. Which model shows 6×3?

A.

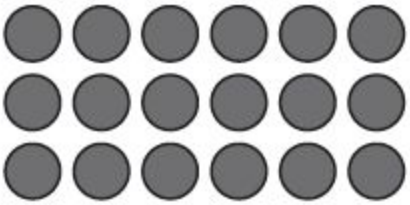


B.

C.



D.



15. A table is shown.

Input	Output
2	12
4	24
8	48

What is the output number when the input number is 12?

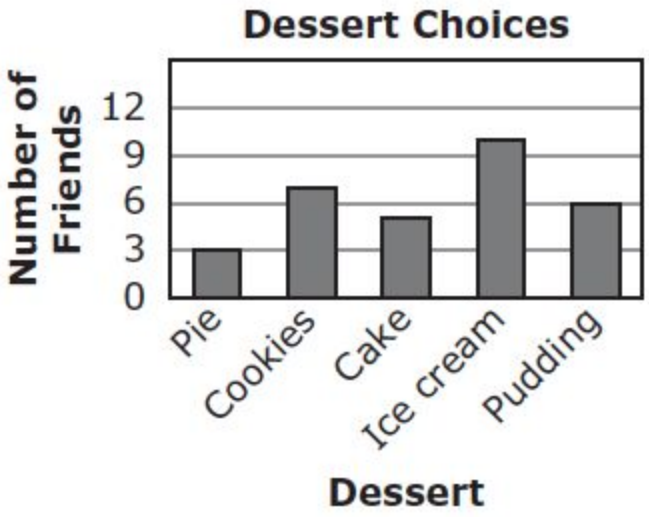
A. 2

B. 60

C. 72

D. 96

24. Leon asked his friends to choose a favorite dessert.



How many more friends chose ice cream than pie?

A. 2

B. 5

C. 7

D. 10

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Pre-Assessment

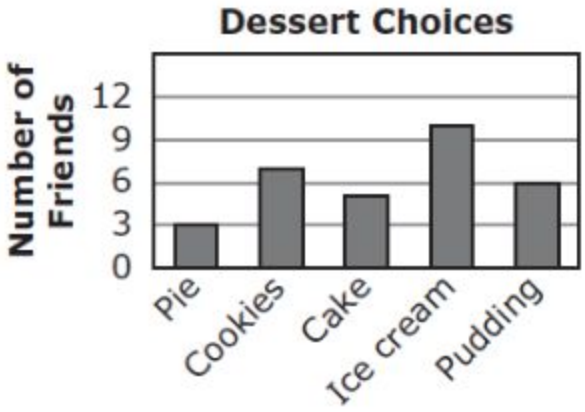
Name:_____ Date:_____

1. Kristine has 3 bikes. She has a pink, blue, and orange bike. She also has 2 helmets. They are pink and black. How many combinations of bikes and helmets can she have? Show your work and the combinations possible.

2. Todd put $10 into a machine and the machine gave him $20 back. Todd thought this was interesting, so he tried it again. This time Todd put $20 into the machine and it gave him $30 back. What is the machine doing to Todd's money?

3. Todd told Craig about this magic machine, so Craig set out to look for it. Craig found a machine, too. Craig decided he was going to put $20 into the machine right away, but the machine only gave him $5 back. From what Todd told him, this couldn't be right, so Craig put in another $30 this time, hoping it would change. This time, the machine gave Craig back $15. What does this machine do to Craig's money?

4. Using the picture below, what can you say about your friends' choice of cookies? And for pie?

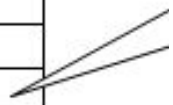


5. Show 3 x 2 as a picture.

6. Use the table below. How many students brought only one candy bar? What number of candy bars did only 3 of the students bring?

The Number of Candy Bars Students Brought to School the Day after Halloween

Number of Candy Bars	Number of Students
0	1
1	1
2	1
3	3
4	0
5	4
6	2
7	1
8	2



7. Create a table that shows how many people in the class are wearing pink, purple, or blue.

Color	Number of people

Lesson 1

Flying a Kite

Standard:

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.

Learning Target: I can collect and display data using tables and bar graphs.

Materials: Flying a Kite pages 1 (1 per student) and 2 (2 per student), pattern blocks, colored pencils.

Launch: Tell students to choose the necessary pattern blocks and use them to make the picture of the person flying a kite.Then tell them to remove all of the blocks and group them according to color, counting the number of blocks of each kind and recording in the table.

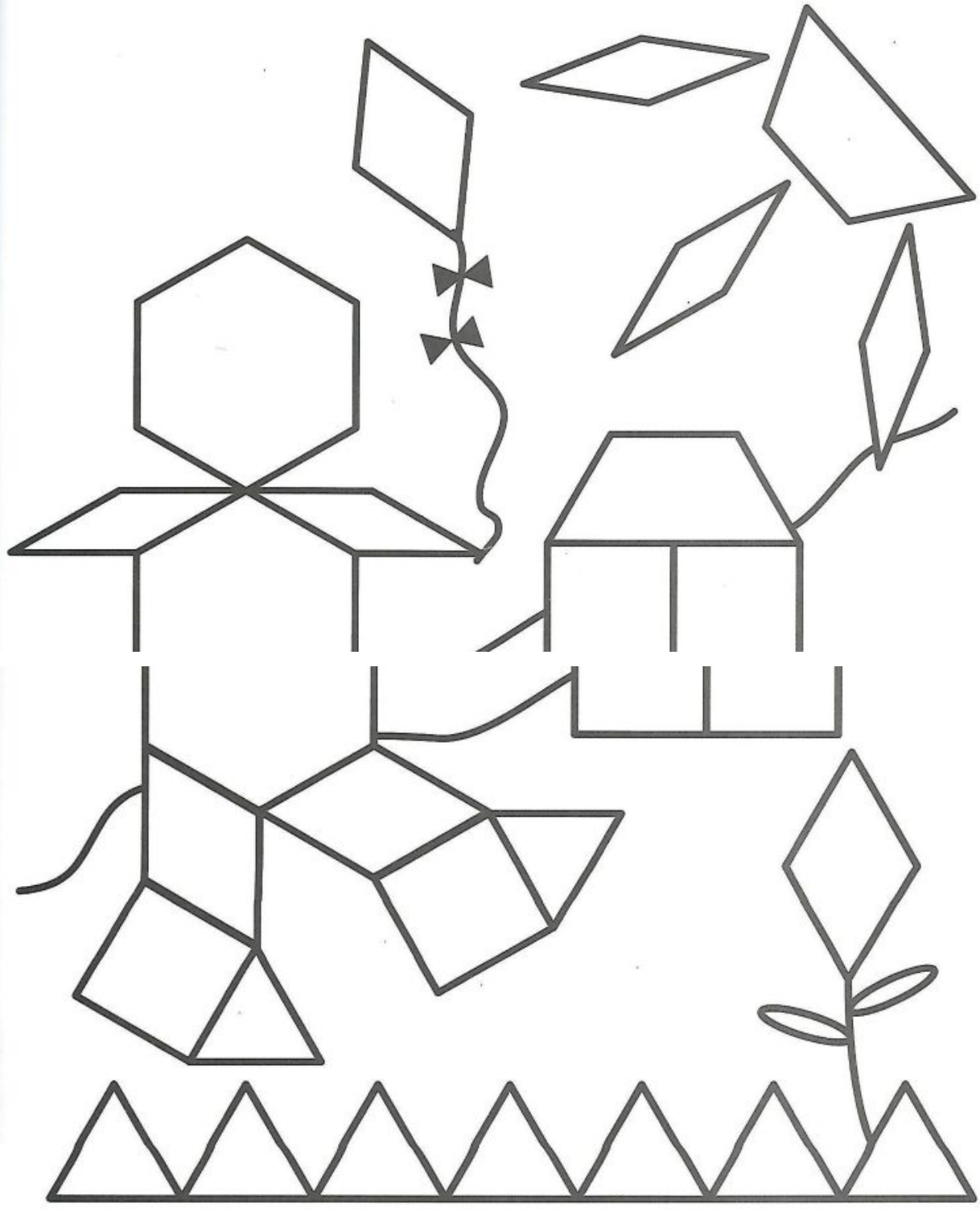
Explore: Students should work as groups of 4 to figure out how to fill in the table. Ask students to create their own picture with pattern blocks and create record it in the table and bar graph.

Share: Students should share the different ways that they filled in the table and explain why they thought that way would work best.

Summarize: Students should realize how to use a frequency table.

Flying a Kite (1)

Name: _____

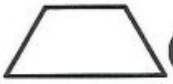


Flying a Kite (2)

Name: _____

I Used

_____  (hexagons)

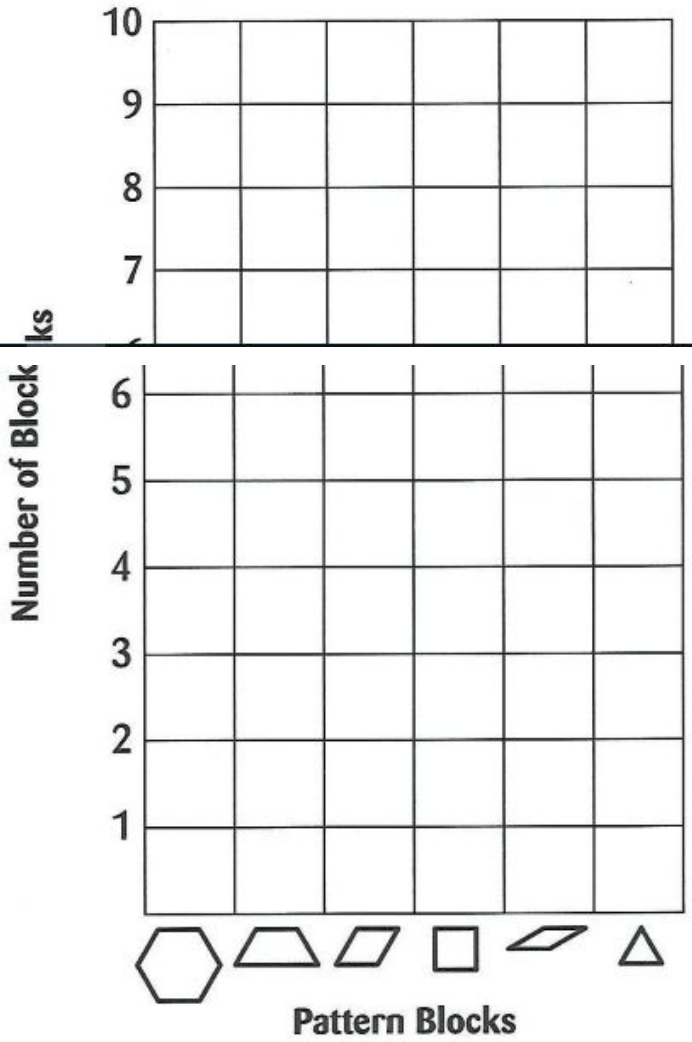
_____  (trapezoids)

_____  (blue rhombuses)

_____  (squares)

_____  (tan rhombuses)

_____  (triangles)



Lesson 2

Quite a Handful

Standard:

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.

Learning Targets: I can collect and display data in a frequency table.

Materials: Quite a Handful page 1 and page 2, colored pencils, pencils, pattern blocks.

Launch: Have Student 1 take a handful of blocks without looking. The pattern blocks are to be sorted by color and shape. Have Student 1 record the number in the table provided, under Handful A. Have the students set aside their first handful, do not replace in the bucket. Next, Student 1 does the same thing and records this in the table, under Handful B. Tell the students to put both handfuls together, sort, and record the results under "Total." Now ask Student 2 to repeat this on his/her worksheet.Ask students to use the second worksheet to record their total number of blocks.

Explore: Students explore the different data charts with their partners and discuss the different attributes they notice.

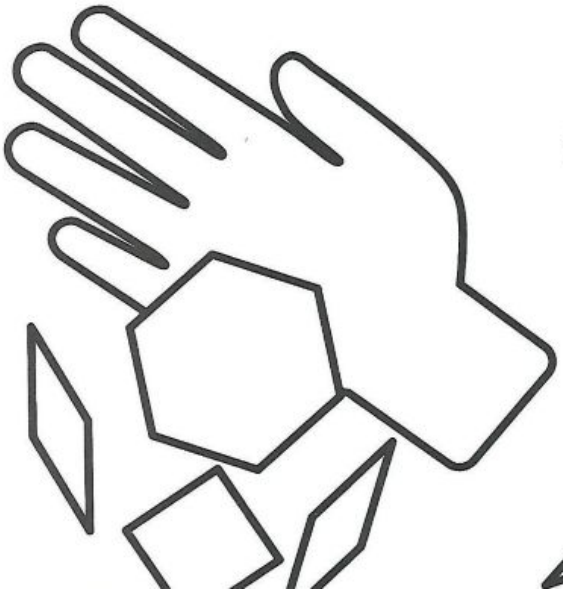
Share: Students should share what their group's results look like with the whole class. They should also share a statement of why they think it looks the way it does.

Summarize: Students should begin to interpret data from frequency tables and picture/bar graphs.

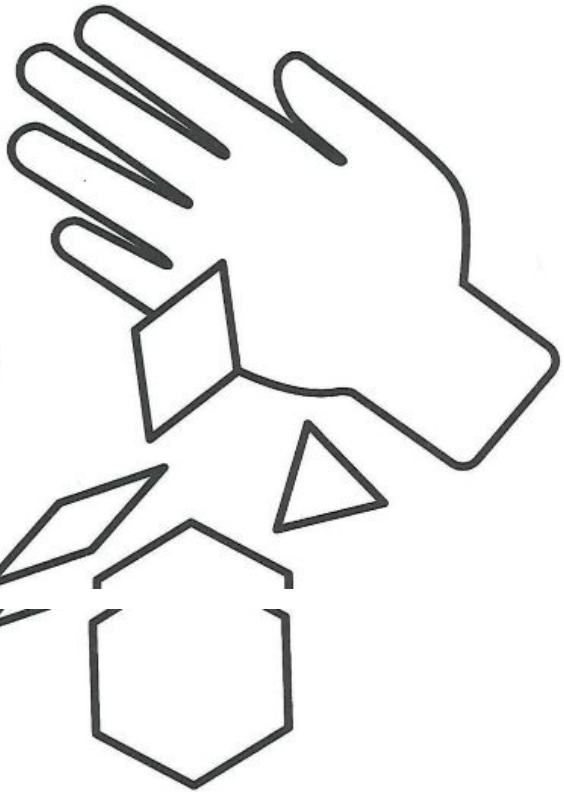
Quite a Handful (1)

Name: _____

A.



B.

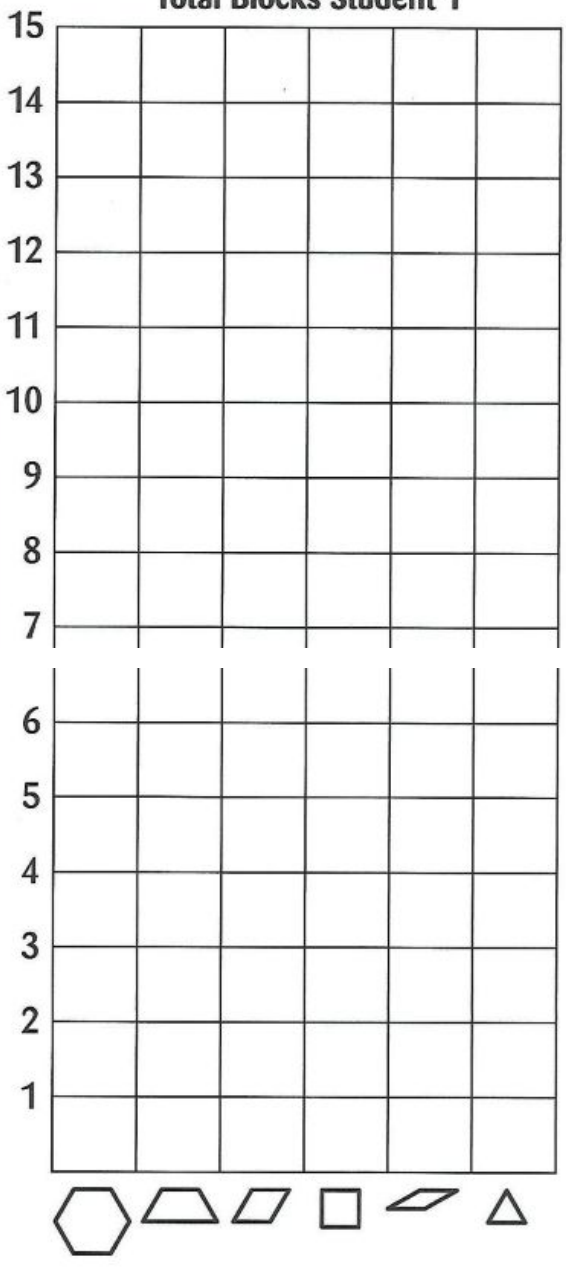


	Handful A	Handful B	Total
			
			
			
			
			
			

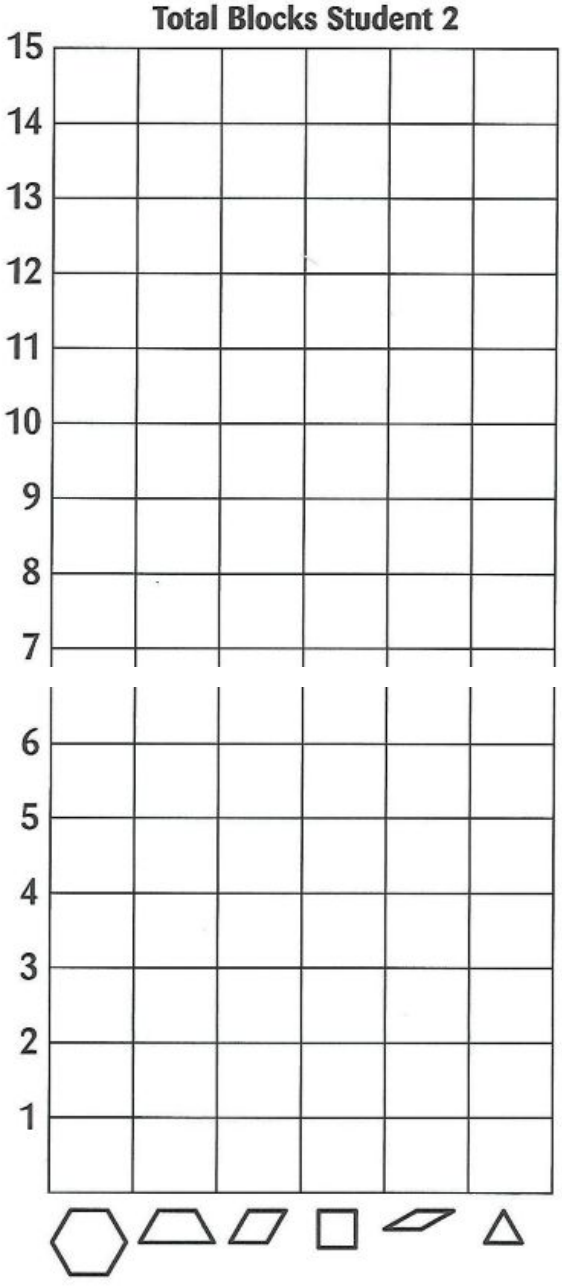
Quite a Handful (2)

Name: _____

Total Blocks Student 1



Total Blocks Student 2



Lesson 3

More Handfuls

Standard:

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.

Learning Targets: I can collect data.

I can display data on a frequency table.

I can interpret data on a frequency table.

Materials: More Handfuls page, pattern blocks, pencils.

Launch:Students will work in pairs. Number students in each group Student 1 and Student 2 (Student 3 if need be). Ask Student 1 to take a handful of pattern blocks from the bucket (bag) without looking. Any blocks that fall are returned to the bucket and do not count. Pattern blocks should be sorted according to color and shape and results recorded in the table provided (under Handful A). Tell students to keep each handful they grab and set it aside as they will need it later. Next, Student 2 takes a handful and repeats the same steps as Student 1, but now recording under Handful B. Students can do this at the same time, or they can help each other sort. Next, Student 1 takes another new handful and records this under Handful C. These steps should be done in this order.

Explore: Ask both students to look at their table and try to estimate how many blocks will be chosen in total for Handful D, recording their estimate on the dotted line. Finally, have Student 2 choose a handful of blocks, again without looking, and record the information under Handful D in the table. Ask students to review the count in each handful. Are all the handfuls the same in number? Now ask them to move their pattern blocks from one handful to another so that all handfuls have the same number of blocks. How many are in each handful now? How many blocks are left over? Ask, if there are no blocks left over, what can you say? (the total number of blocks is divisible by 4). If there are blocks left over, how many more blocks would you need to take from the bucket so that each handful were the same with zero blocks left over?

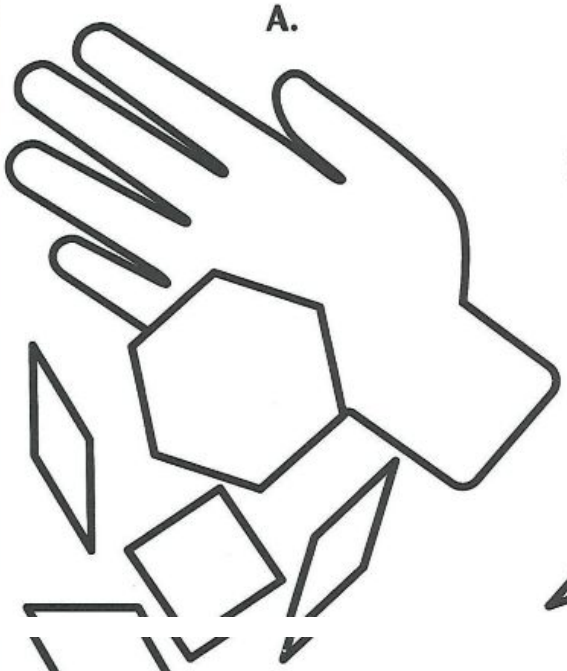
Share: Ask students what information they used to make their estimates, if their estimates were greater or less than the actual total, and what the difference is between the estimate and Handful D. Have students share their results. During this time, make a table in spreadsheets and ask the class to look closely at the table.

Summarize: Ask students if they think there is another way they could have organized their information to see all of the same information.

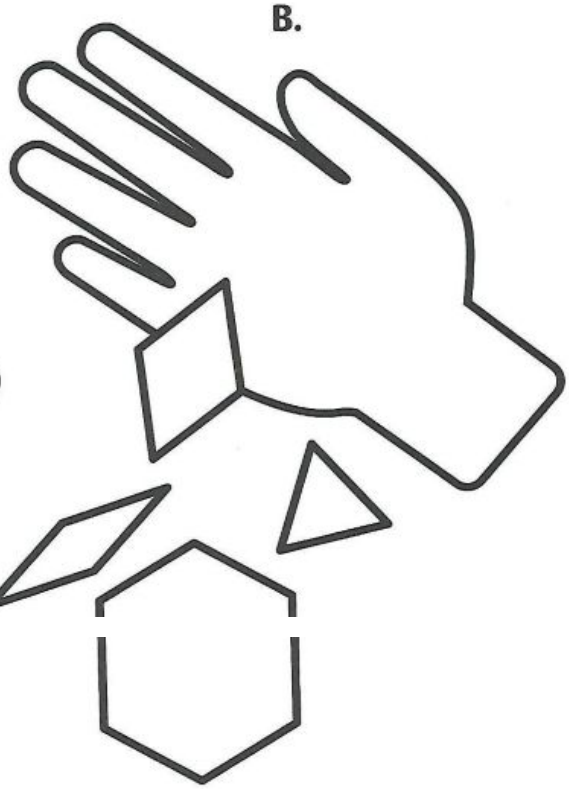
More Handfuls

Name: _____

A.



B.



							Total
Handful A							
Handful B							
Handful C							
Handful D							

Handful D estimate _____

Lesson 4

Mystery Shoebox 1

Standard:

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

Learning Targets: I can collect data.

I can display data in a variety ways.

Materials: Mystery Shoebox 1 page, pattern blocks, mystery shoebox, and pencils.

Launch: From a bucket containing only triangle and rhombuses, place 7 blocks in a mystery shoebox.

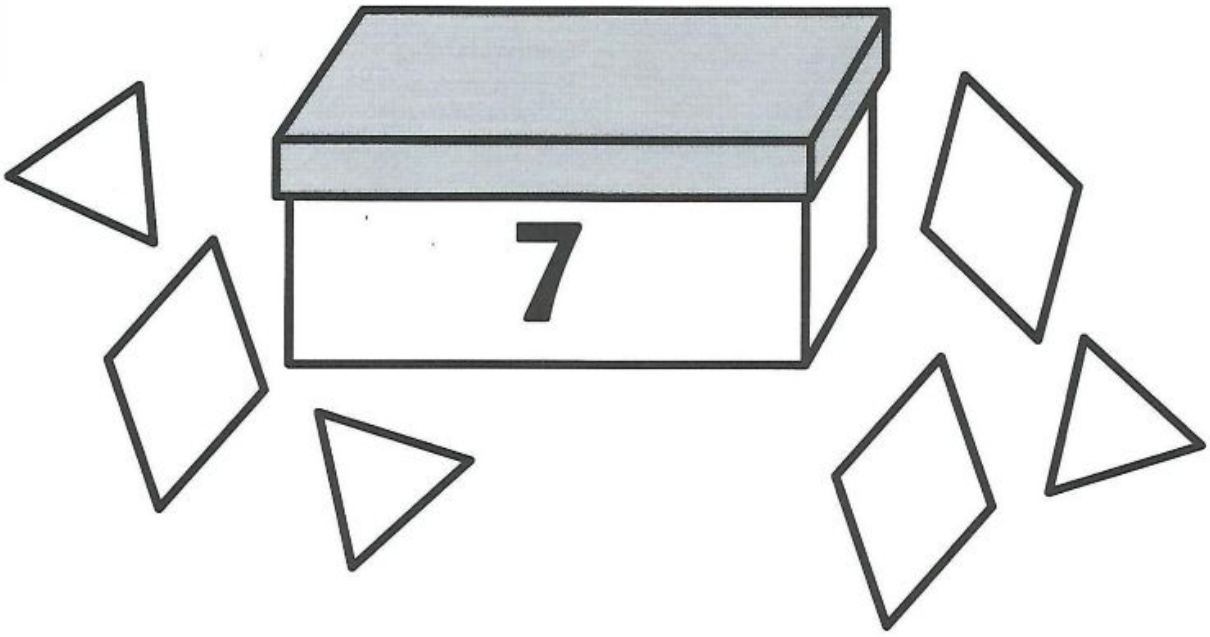
Explore: Find what possible combinations of triangles and rhombuses there can be if you have exactly 7 blocks. One possible combination is 7 triangles and 0 rhombuses. Those numbers have been recorded on your worksheet. List all possible combinations of triangles and rhombuses on your worksheet. Use your pattern blocks to help you find the combinations.

Share: Review the fact that one rhombus is equivalent to two triangles.Then say, “If I replaced all the rhombuses with an equivalent number of triangles, the shoebox would contain 9 triangles. Which of the 8 possible combinations is the correct one?” (2 rhombuses and 5 triangles).

Summarize: Students should begin to see new ways to collect data, and how it can help them make predictions.

Mystery Shoebox 1

Name: _____



1. 7 △ and 0 ◇ were selected.
2. ____ △ and ____ ◇ were selected.
3. ____ △ and ____ ◇ were selected.
4. ____ △ and ____ ◇ were selected.
5. ____ △ and ____ ◇ were selected.
6. ____ △ and ____ ◇ were selected.
7. ____ △ and ____ ◇ were selected.
8. ____ △ and ____ ◇ were selected.

Lesson 5

Mystery Shoebox 2

Standards:

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

Learning Targets: I can collect data.
I can display data.
I can interpret data.
I can translate data from one kind of display to another.

Materials: Mystery Shoebox 2 page, pattern blocks, pencils.

Launch: Ask students to find what possible combinations there ccan be of triangles and trapezoids out of 8 blocks. One possible combination is 8 triangles and 0 trapezoids. Another combination is 1 triangle and 7 trapezoids. Those numbers have been recorded on the worksheet. Have students complete filling in the blanks, listing all 9 possiblw combinations.

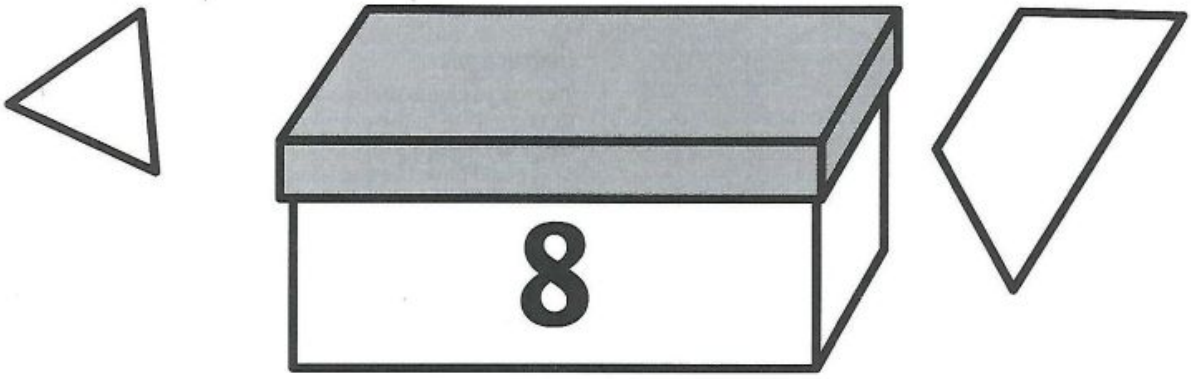
Explore: When they are done with this, ask students to transfer the data into Table A as shown. When Table A is complete, they will copy the first two columns from Table A into Table B. Then tell the to complete Table B showing the correct exchange of triangles for trapezoids (3 triangles per trapezoid).

Share: Have students share their tables and how they came up with them. Students should share their thoughts about what each table is representing.

Summarize: Students should realize that tables can help them organize data in numerous ways. They should see the different meanings of tables as the labels change.

Mystery Shoebox 2

Name: _____



8 △ and ⏢

1. 0 △ and 8 ⏢
2. 1 △ and 7 ⏢
3. ____ △ and ____ ⏢
4. ____ △ and ____ ⏢
5. ____ △ and ____ ⏢
6. ____ △ and ____ ⏢
7. ____ △ and ____ ⏢
8. ____ △ and ____ ⏢
9. ____ △ and ____ ⏢

TABLE A

△	⏢	Total
0	8	8
1	7	8

TABLE B

△	⏢	⏢	Total △
0	8	24	24
1	7	21	22
2	6	18	
	5	15	18

Lesson 6

Reviewing Addition Patterns

Adapted from Navigating through Discrete Mathematics

Standards: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. For example: The calculation 117 – 83 = 34 can be checked by adding 83 and 34.

Learning Targets: I can describe the pattern needed to find the number of squares in a 3x3 square.

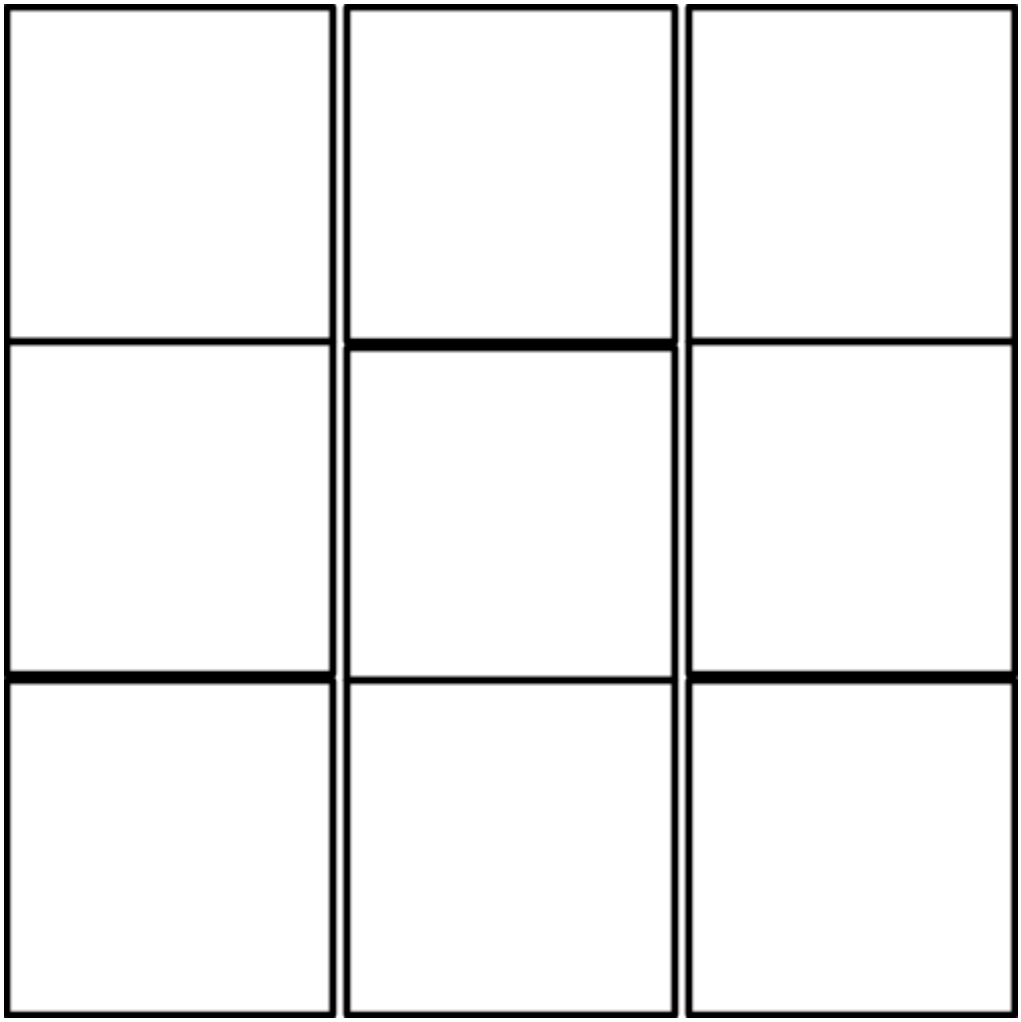
Materials: 3x3 Square

Launch: Draw a 3x3 grid on the board. Ask the students how many squares they can find.

Explore: Give each pair of students a copy of a 3x3 grid. Encourage students to find all the possible squares. Give students time to investigate ALL possible squares they can find.

Share: Which squares did you find. Call on pairs of students to come outline a square they found until all of the squares have been found. When all the squares have been found ask “how many small squares did we find? How many medium squares? How many large squares?” Record the numbers on the board as students say them. Ask them “How can we find the total number of squares in our grid?”

Summarize: Students should see that they should **add** them all up to get a total of 14 squares.



Lesson 7

Organizing Outfits for the First Week

Adapted from Navigating through Discrete Mathematics

Standards: 3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

Learning Target: I can determine the number of outfit combinations for the bear.

Materials: "Outfits at Bindu Bear's Boutique" activity sheet, paper, purple, yellow, and green crayons, pencils

Launch: Introduce students to Bindu Bear. She owns Bindu Bear's Boutique and wants to display outfits in the front window of her store. Every week, she wants to display a different outfit and wants to know how how many outfits she should plan on displaying. She has a green, purple, or yellow shirt to display and either dark gray dots or dark gray stripes pants. Pass out the "Outfits at Bindu Bear's Boutique" activity sheet to each student. Tell students, "Your job is to color in the bears with all of the possible outfit combinations. You can work with your group, but everyone needs to color the outfits on the sheet.

Explore: Students will work on coloring in all of the outfit combinations until they can not find any more. When they think they have gotten them all they should check with their group to make sure there are no more.

Share: Ask students, "How many outfit combinations did you find?" Students should have found 6 combinations, but don't tell them that that is the correct number. Ask, "How do you know that is all of the possible outfits?"

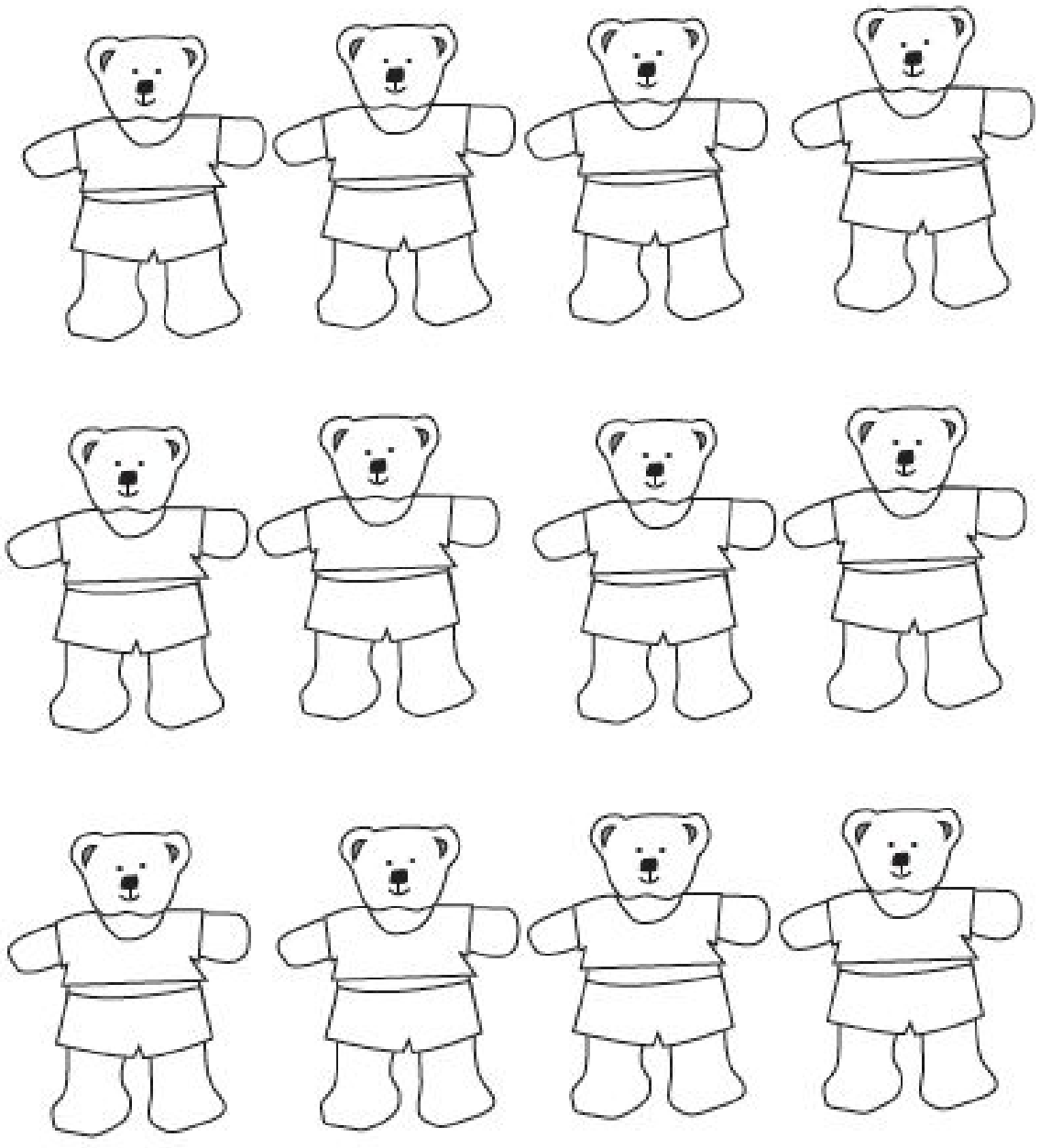
Summarize: Students should come to the understanding that it is hard to know the total number of possible outfits, and that there might be a better way.

Outfits at Bindu Bear's Boutique

Name _____

Bindu Bear's Boutique–Activity 1

How many different outfits can you show on the bear mannequins?



Lesson 8

Using Arrays to Determine Outfits

Adapted from Navigating through Discrete Mathematics

Standards: Standards: 3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

Learning Target: I can determine the number of outfit combinations for the bear. I can organize the outfit combinations using an array.

Materials: "Outfits at Bindu Bear's Boutique" from yesterday, "Outfits for the First Week" activity sheet, yellow, purple, green crayons, pencils, scissors

Launch: Remind students that yesterday they found outfits for the bears at Bindu's Boutique. There were 3 kinds of shirts and 2 kinds of pants. Have students look at their recording from yesterday of the outfits. Remind them that we found 6 outfit combinations, but it was hard to tell if we had found them all. Tell students that one way to make sure you find all the outfits is to organize them into a chart or array. Hand out the "Outfits for the First Week" activity sheet to each student. Explain that this chart has columns (up and down) and rows (horizontal). "Our chart has three rows and 2 columns because we have 3 kinds of shirts and 2 kinds of pants. The bear in each cell or spot will show that combination. Your job is to color in the bears for the correct outfit combination." Fill in the green shirt and dotted pants cell with students.

Explore: Students should fill in the cells to match the categories listed in their groups, but each person needs to record for themselves.

Share: Have some students help you fill in the class chart then compare it with the Outfits worksheet from yesterday. "Do we have the same combinations on both sheets?" "Did we miss any?"

Summarize: Finish this lesson by making an organized list off all combinations as a class. Emphasize that this has all the combinations and the chart helped us organize our bears.

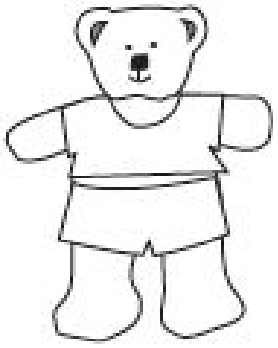
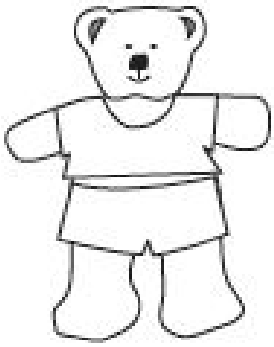
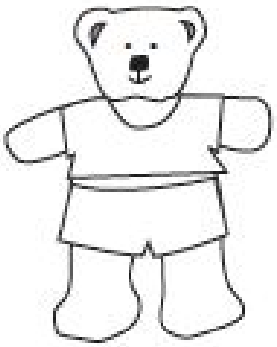
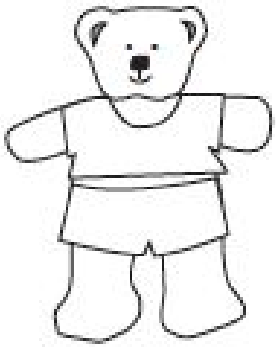
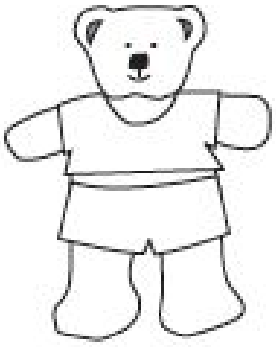
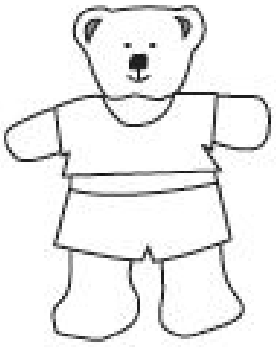
Extend: Have students work in their groups to make a 2x3 chart (the first was a 3x2) by cutting out their bears fromt the bears worksheet. Have the students list their combinations. They should see that they have the same combinations just in a different order. You can then talk about 4x7 charts and what they would look like and the number of cells in each.

Outfits for the First Week

Name _____

Bindu Bear's Boutique–Activity 1

Use crayons and a pencil to complete the chart.

	Dotted Pants	Striped Pants
Green Shirt		
Purple Shirt		
Yellow Shirt		

Lesson 9

Organizing Outfits for the Second Week

Adapted from Navigating through Discrete Mathematics

Standards: Standards: 3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

Learning Target: I can determine the number of outfit combinations for the bear. I can organize the outfit combinations using an array.

Materials: "Bear Cutouts" and "Shoe Cutouts" student pages, scissors, crayons, pencils, glue

Launch: "Bindu Bear got a new shipment of shoes in this week that she wants to display with the outfits. There are boots, loafers, and sneakers. Can you help her find out how many outfits will she have now? You should work by yourself for now until I give you more directions."

Explore: Hand out the "Bear Cutouts" and "Shoe Cutouts" sheets to each student. They will also need crayons, pencils, scissors, and a gluestick. After students have around 10 outfits completed, have them get in their groups of 4. Explain that they should now work together and try to find all the possibilities. Hand out a big sheet of construction paper to each group. Tell them to put one example of each bear on the sheet and to organize them in some way (without gluing).

Share: When all groups think they found all the possibilities and have them organized in some way ask them, "How many outfits are possible now?" They should have found 18 if they found them all. "How do you know you found all the possibilities?" Have students share their strategies for finding all the outfits this time.

Summarize: Students should find that with more possibilities it becomes harder to organize the outfits. They should also see that a system is needed to find them all.

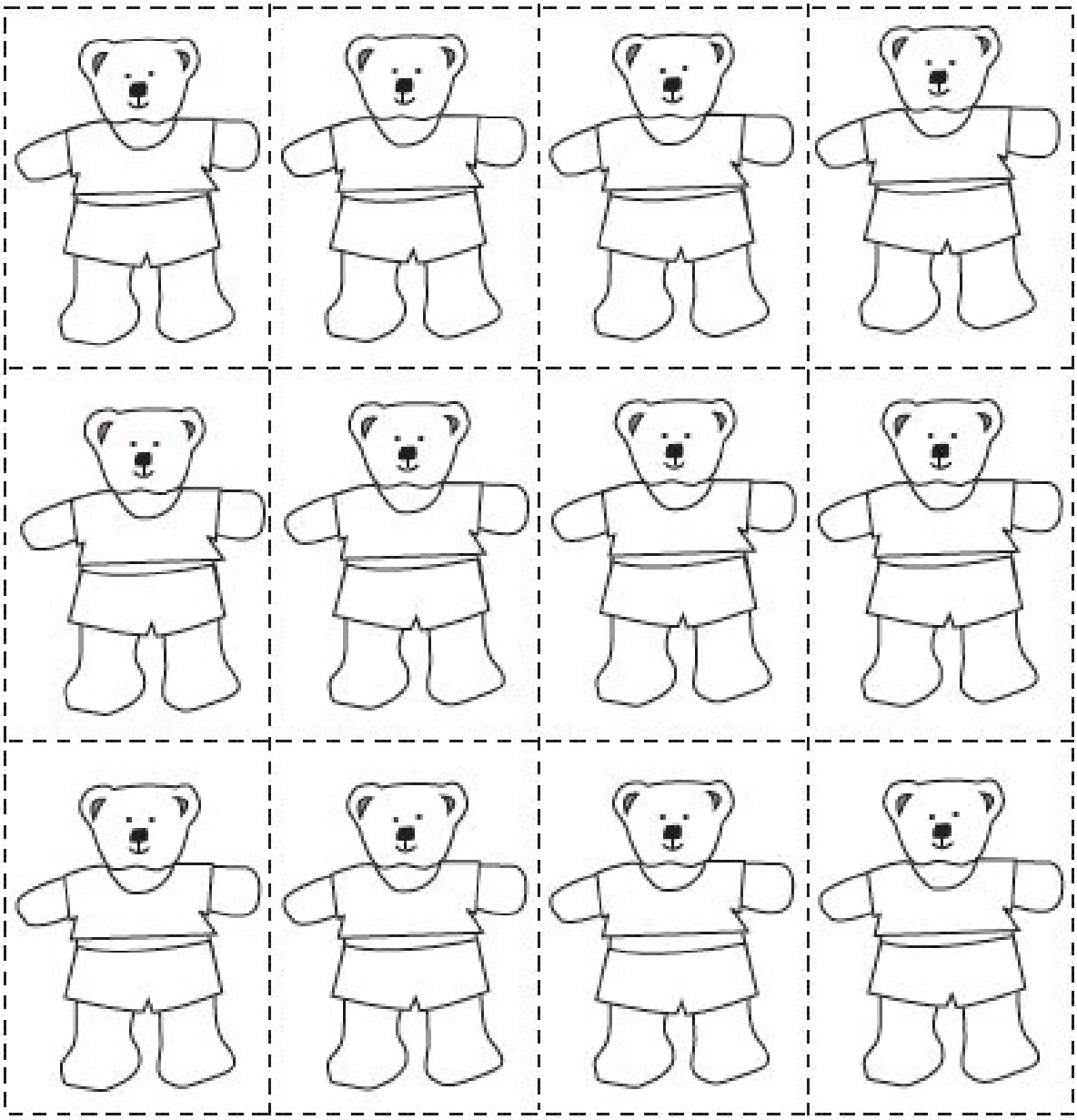
Extend: Have students get back into their groups and organize them in a systematic way. They should work together to make a strategy and make sure that they have all the possibilities. When the group has all 18 tell them to glue down the bears how they are organized and to think of a way to share their strategy. Have all groups present and record their strategies on chart paper to use in the future.

Bear Cutouts

Name _____

Bindu Bear's Boutique—Activity 2

Cut along the dashed lines.

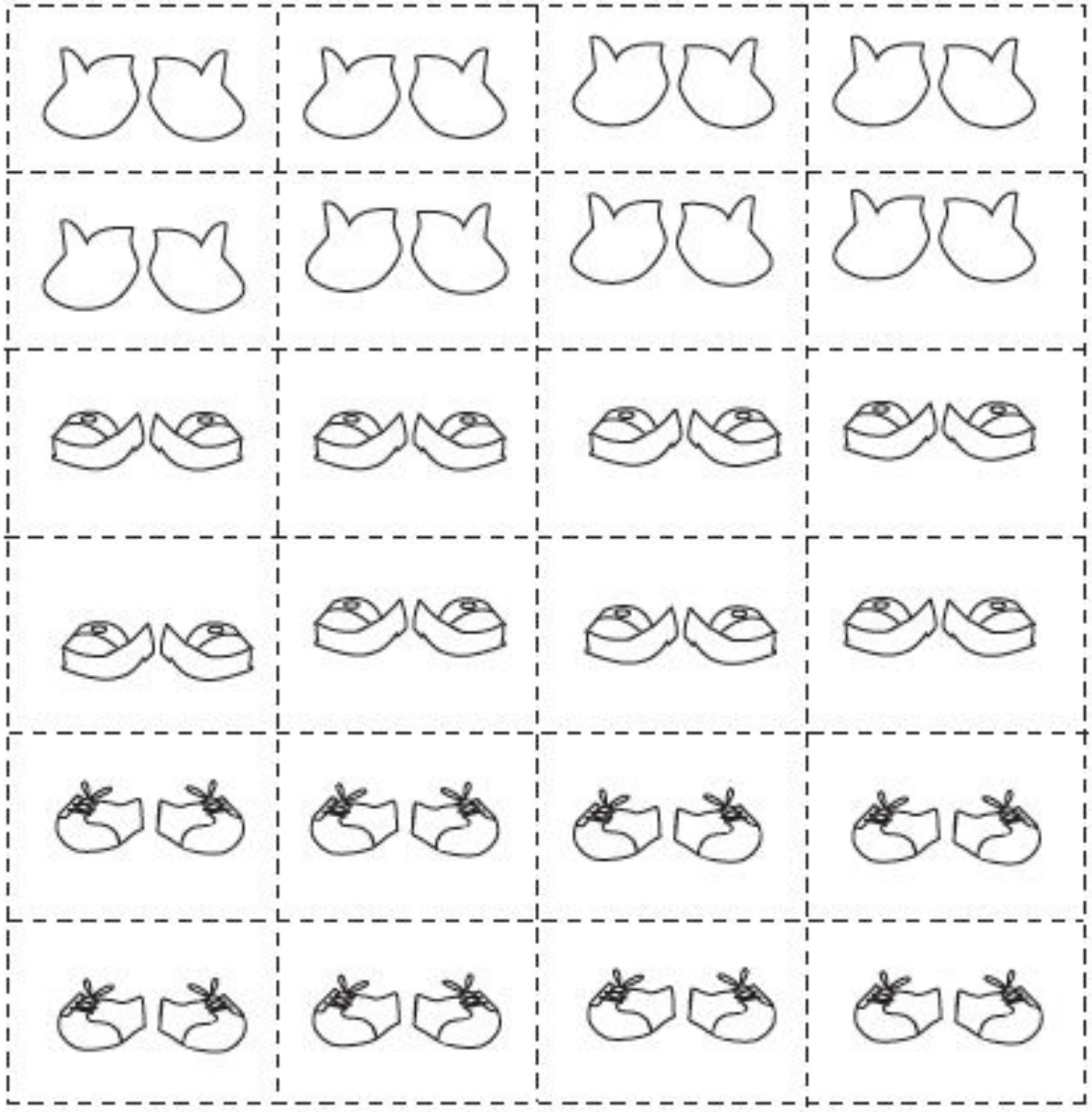


Shoe Cutouts

Name _____

Bindu Bear's Boutique–Activity 2

Cut along the dashed lines.



Lesson 10

Creating a Systematic List

Adapted from Navigating through Discrete Mathematics

Standards: Standards: 3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

Learning Target: I can determine the number of outfit combinations for the bear. I can organize the outfit combinations using a systematic list.

Materials: Pages from the last 3 lessons, paper, pencils

Launch: Remind students that yesterday they found that with 3 shirts, 2 pants, and 3 shoes there are 18 possibilities of outfits for the bears. They also organized the bears in some way on a piece of paper.

Explore: Students should write the numbers 1-18 on a piece of paper. Tell them that today we are going to work on making a systematic list, and that they need to record all of the outfits they found. Give students time to work on this while noting different methods of organization.

Share: Have students first share their method of organizing the outfits with their groups. Listen for certain strategies that will emphasis different ways of organization. Have at least one student from each group share how they organized their list.

Summarize: Students should find that there are many different ways to organize the outfit combinations.

Lesson 11

Creating a Systematic List Continued

Adapted from Navigating through Discrete Mathematics

Standards: Standards: 3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

Learning Target: I can determine the number of outfit combinations for the bear. I can organize the outfit combinations using a systematic list.

Materials: examples of different list organizations

Launch: Start by having the students examine a list where the outfits are sorted by color of the shirt and then by pants, but the pants are not organized. Ask, “how did this person organize their list?” Students should share that they organized it by the color of the shirt then pants and shoes. Ask, “Did they organize the pants in a certain way?” Students should notice that it does dots then stripes then some dots and stripes mix, but there is not a specific way in order they went. Have students work on organizing the list by shirts and a systematic way for pants. After the students have completed this, show them the next list where shirts and pants are organized systematically, but the shoes are not. Have some students share their notices for this list. They should see that the first two options are organized systematically, but the shoes are not in order yet. Have students either change their second list and organize the shoes or make another list where all three things are organized systematically.

Explore: Now, have all students go back to their first list and organize all of the different choices systematically. Make sure students know that they can start with any choice and it doesn’t have to start with shirts.

Share: Have students put their lists on their desks and do a silent gallery walk around the room to notice how others organized their information. After they have had a chance to see most of the lists gather everyone together and ask if there are any other ways to organize the list so that you can all have the same systematic list.

Summarize: Guide students to the understanding that organizing alphabetically would help everyone get the same list and it would be easier to compare. Have students help to make a class alphabetical systematic list.

Lesson 12

Introduction to Tree Diagrams

Adapted from Navigating through Discrete Mathematics

Standards: Standards: 3.1.2.4 Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. For example: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? Another example: If you have 27 people and tables that will hold 9 people, how many tables will you need?

Learning Target: I can determine the number of outfit combinations for the bear. I can organize the outfit combinations using a systematic list. I can determine the total number of outfits using a tree diagram.

Materials: note cards with the possibilities for a tree diagram, blank sentence strips for the branches

Launch: Have students get their systematic list out to refer to from yesterday. Remind them of the process they went through to get to their lists, and that it took a lot of work. Ask, “Can we make a chart like we did with shirts and pants?” Students should notice that it would be a lot harder to make a chart with shirts, pants, and shoes. Tell them that today they are going to learn a new way to organize their data.

Explore: On the board show that you are going to look for all the possibilities of outfits. Place a paper plate in the center of the rug to represent the start of the tree diagram. Then, ask “What is the first choice we have to make?” Students should say that you can wear a yellow, purple, or green shirt. Place 3 sentence strips as branches off the plate and put the yellow, purple, and green note cards at the end of each one. Ask, “What is the next choice I have?” Have students turn and talk with their partner about what the next choices would be. Have a student come and add a branch to the tree. Make sure that the tree diagram is alphabetical like the systematic lists so that they are easily comparable. Have students come and each put a branch and card to add the pant choices to the tree. Do the same with the shoe choices and finish building the tree diagram with the cards and branches. Finally, show students how this transfers to paper.

Share: Have students look at the tree diagram and the systematic lists. They should talk with a partner about the similarities between the two. Finally, have some students share what they noticed about the two representations.

Summarize: Students should notice that if you follow the branches you can find the rows in the list.

Lesson 13
Guess the Robot's Secret!

Standard:

3.2.1.1 Create, describe, and apply single-operation input-output rules involving addition, subtraction and multiplication to solve problems in various contexts. For example: Describe the relationship between number of chairs and number of legs by the rule that the number of legs is four times the number of chairs.

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.

Learning Target: I can describe single-operation input-output rules.
I can create tables using appropriate titles, labels, and units.

Materials: Guess the Robots' Secret Rule page, pattern blocks, paper, and pencils.

Launch:A robot is changing the number of pattern blocks. Sometimes it adds blocks and sometimes it takes them away. The robot is following some kind of secret rule. Look at line A. How many triangles go into Robot #1? How many come out? What happens on line B? Since the robot is doing the same thing, if 3 triangles go into the robot on line C, how many come out? What is the rule? Students can use pattern blocks to help them come to a conclusion.

Explore: Students should use this same process for looking at Robots #2, 3, and 4.They will work in groups of 4. Ask students to create a table for the number of things that went in, and the number of things that went out for machine 4.

Share: Each group should share their findings and their processes used to get there. Students should share why they made their tables the way they did for machine 4.

Summarize: Students should begin to see how to find rules in input and output tables. Students should be able to find a relationship in the pattern before going into the robot, and when it comes out.

Guess the Robot's Secret

Name: _____

1. IN → OUT

A. △ → → △△

B. △△ → → △△△△

C. △△△ → → ?

2. IN → OUT

A. □△ → → □△△

B. □△△ → → □△△△

C. □△△△ → → ?

IN → OUT

3.

A. □□ △△ □□ △△ → → □□ △△ □ △

B. □□□ △△△ → → □□ △△

C. □□ △△ → → ?

4.

A. ⏢⏢⏢⏢ → → ⏢⏢⏢⏢

B. ⏢⏢⏢⏢ → → ⏢⏢

C. ⏢⏢ → → ?

Lesson 14

Input-Output Scoot!

Stephanie Ann-

https://www.teacherspayteachers.com/Product/Input-Output-to-100-Task-Cards-and-Scoot-Game-Freebie-1246311

Standards:

3.2.1.1 Create, describe, and apply single-operation input-output rules involving addition, subtraction and multiplication to solve problems in various contexts. For example: Describe the relationship between number of chairs and number of legs by the rule that the number of legs is four times the number of chairs.

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.

Learning Targets:

I can describe input-output rules.

I can interpret data from tables.

Materials: Input-Output Table Task Cards, Recording Sheet, pencils.

Launch: This is a whole group activity. There should be a task card on each student's desk. Students should sit in their seats to begin. The teacher will give the instructions: At each desk is a new input/output table, As you solve one rule, you need to write the rule with its corresponding number on the recording sheet, you are only allowed to move to the next card when you hear the word "Scoot" from the teacher. Determine which way you want the students to move.

Explore: Students will get the chance to explore up to 28 different ways of using input/output tables as they move around the room.

Share: Students will share results with the entire class in order to check for understanding. Each student should be able to share at least one rule and how they came up with it.

Summarize: Students should connect the in and out pictures from the previous activity to the input/output tables in this activity.

Input-Output Task Card 1

In	Out
3	56
26	79
44	97

Rule: _____

Input-Output Task Card 2

In	Out
2	93
5	96
6	97

Rule: _____

Input-Output Task Card 3

In	Out
15	23
38	46
88	96

Rule: _____

Input-Output Task Card 4

In	Out
23	24
57	58
81	82

Rule: _____

Input-Output Task Card 5

In	Out
4	44
11	51
55	95

Rule: _____

Input-Output Task Card 6

In	Out
22	40
54	72
64	82

Rule: _____

Input-Output Task Card 7

In	Out
24	20
64	60
73	69

Rule: _____

Input-Output Task Card 8

In	Out
12	55
29	72
40	83

Rule: _____

Input-Output Task Card 9

In	Out
2	75
15	88
16	89

Rule: _____

Input-Output Task Card 10

In	Out
69	62
71	64
95	88

Rule: _____

Input-Output Task Card 11

In	Out
66	19
74	27
91	44

Rule: _____

Input-Output Task Card 12

In	Out
72	10
73	11
91	29

Rule: _____

Input-Output Task Card 13

In	Out
83	8
85	10
87	12

Rule: _____

Input-Output Task Card 14

In	Out
23	28
82	87
91	96

Rule: _____

Input-Output Task Card 15

In	Out
23	47
41	65
70	94

Rule: _____

Input-Output Task Card 16

In	Out
4	8
40	44
94	98

Rule: _____

Input-Output Task Card 17

In	Out
47	64
64	81
78	95

Rule: _____

Input-Output Task Card 18

In	Out
87	11
96	20
99	23

Rule: _____

Input-Output Task Card 19

In	Out
89	3
93	7
98	12

Rule: _____

Input-Output Task Card 20

In	Out
11	13
35	37
79	81

Rule: _____

Input-Output Task Card 21

In	Out
0	75
1	76
15	90

Rule: _____

Input-Output Task Card 22

In	Out
21	27
61	67
67	73

Rule: _____

Input-Output Task Card 23

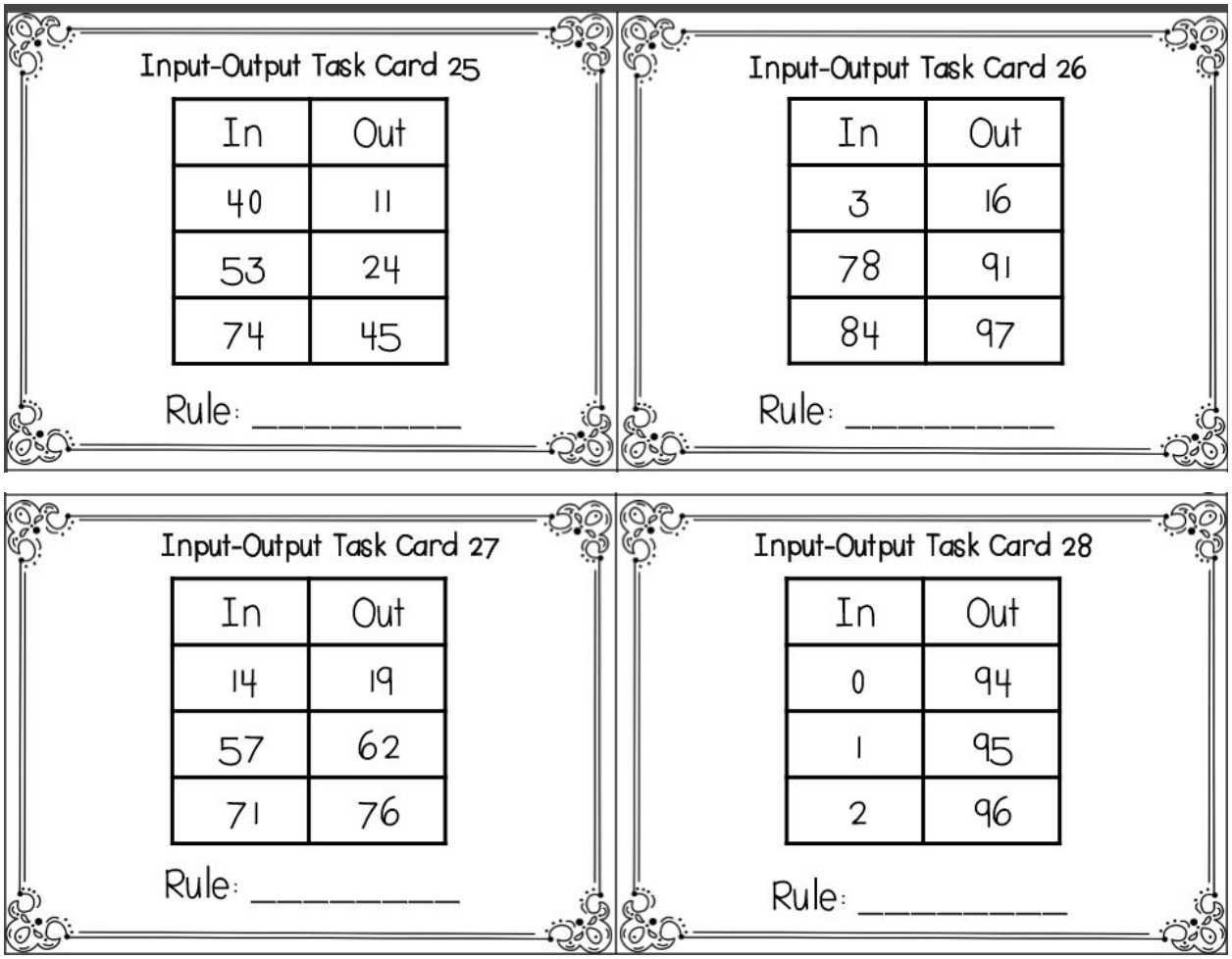
In	Out
57	11
59	13
81	35

Rule: _____

Input-Output Task Card 24

In	Out
59	28
64	33
90	59

Rule: _____



Input-Output Task Card 25

In	Out
40	11
53	24
74	45

Rule: _____

Input-Output Task Card 26

In	Out
3	16
78	91
84	97

Rule: _____

Input-Output Task Card 27

In	Out
14	19
57	62
71	76

Rule: _____

Input-Output Task Card 28

In	Out
0	94
1	95
2	96

Rule: _____

Name _____ Input-Output Task Cards Recording Sheet

Task Card 1	Task Card 2	Task Card 3	Task Card 4	Task Card 5	Task Card 6	Task Card 7
Rule: _____	Rule: _____	Rule: _____	Rule: _____	Rule: _____	Rule: _____	Rule: _____
Task Card 8	Task Card 9	Task Card 10	Task Card 11	Task Card 12	Task Card 13	Task Card 14
Rule: _____	Rule: _____	Rule: _____	Rule: _____	Rule: _____	Rule: _____	Rule: _____

Task Card 15 Rule: _____	Task Card 16 Rule: _____	Task Card 17 Rule: _____	Task Card 18 Rule: _____	Task Card 19 Rule: _____	Task Card 20 Rule: _____	Task Card 21 Rule: _____
Task Card 22 Rule: _____	Task Card 23 Rule: _____	Task Card 24 Rule: _____	Task Card 25 Rule: _____	Task Card 26 Rule: _____	Task Card 27 Rule: _____	Task Card 28 Rule: _____

How to Play Scoot Using Task Cards

Scoot is a fun and fast paced game that can be played with the whole class. Here is how it is played:

1. Put a task card on each desk or at each student's seat at a table. All the cards are numbered. I like to put the cards on the desk in the order that you want the students to move around (students will move from seat to seat and rotate through all the cards).
2. All students start at their own seat. They need to take note of the card at the seat where they are sitting. The child sitting at the seat with #3 card will answer that and record it in the space for number 3, then move to the seat with card #4 when the teacher says "Scoot." For example, if they are at seat #7, when you say "Scoot" they move to seat #8 and start to work on that card.
3. Students use the recording sheet to record their answers from each task card. They don't write on the task cart itself.
4. One key is to go over the way to move through the classroom. It REALLY helps to have a few trial runs of how to move to the next card and where the next card is located. This is a must! If you don't it can be chaotic. If they have practiced, it goes much more smoothly!! Make sure you train your students that the number on the recording sheet goes with the number on the card.
5. Play the game until the students make it back to their original seat.
6. You can either go over them as class by projecting them or writing the question on the board or you can collect the papers and grade them yourself as a quick assessment piece.
7. **Answer keys are included with all the task cards!**

Lesson 15

In-Bot/Out-Bot Ro-bot

Zephyr -

https://www.teacherspayteachers.com/Product/FREEBIE-In-BotOut-Bot-Robot-Input-Output-Tables-1091432

Standard:

3.2.1.1 Create, describe, and apply single-operation input-output rules involving addition, subtraction and multiplication to solve problems in various contexts. For example: Describe the relationship between number of chairs and number of legs by the rule that the number of legs is four times the number of chairs.

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.

Learning Target: I can display data.
I can interpret data.
I can apply addition, subtraction, and multiplication to solve input-output tables.
I can create input-output tables.

Materials: Blank input-output table templates, pencils, pattern blocks.

Launch: Begin with a few of your own filled in input-output tables with missing outputs. Work through a few with the class, as a whole. Once there is a good general understanding, have students go to different centers.

Explore: At one center, there will be input-output tables without a rule, at another there will be input-output tables without an output, at another there will be input-output tables without an input, and at a fourth there will be blank tables in which the students will create their own rule and choose one thing to leave out (these will be placed at the other centers for the rest of the class to figure out). There will be pattern blocks to help students create or solve rules.

Share: In the end, students will share which rules they came up with, and the students who solved each one will stand up and tell how they figured it out.

Summarize: Students should realize that they have now created their very own input-output tables and are able to display and interpret data in tables. Students are able to apply their knowledge of single-operation addition, subtraction, and multiplication.

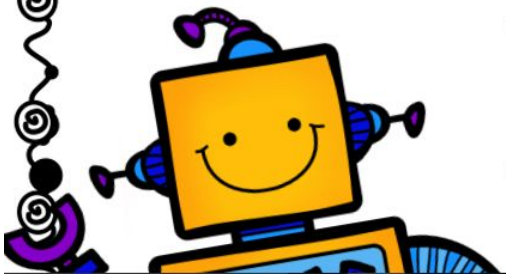
In-Bot/Out-Bot Ro-Bot

Input/Output Tables

*I like to laminate a set of work mats to use with dry erase markers. Alternatively, slip them into a sleeve protector. (Dollar Tree has 16 for a $1.)

Some of my favorite uses:

- Whole Group Instruction - Have students create a rule & fill in the table. Then have a classmate check it.
- Small Group Instruction – Have students copy either the numbers or the rule and fill in the other section as you check.



- Centers – Have students create problems for classmates & record them on the included worksheet.
- Stations – Have students move around the room to solve problems you've prepared on the mats. They can record their answers on the

Name _____ Date _____

Input-Output Tables

Rule				Card
Input x				
Output y				

Rule				Card
Input x				
Output y				

Rule				Card
Input x				
Output y				

Rule				Card
Input x				
Output y				

Rule				Card
Input x				
Output y				

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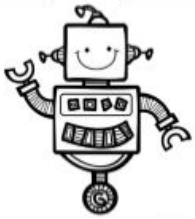
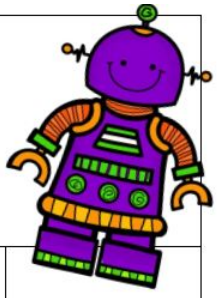
Output y				

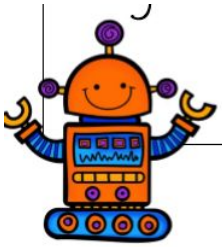
Rule				Card
Input x				
Output y				

Rule				Card
Input x				
Output y				

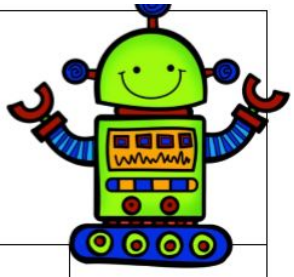


Rule					
Input x					
Output y					





Rule

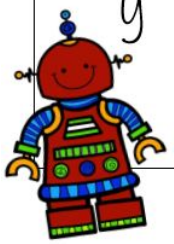


Input

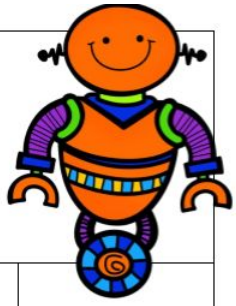
x

Output

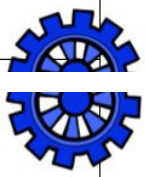
y

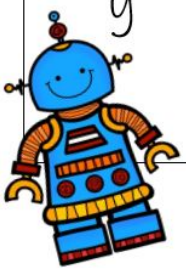


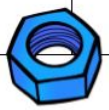
Rule



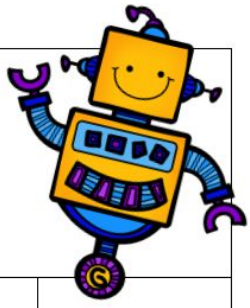
Input x					
Output y					





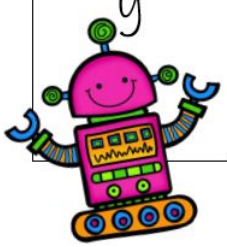


Rule

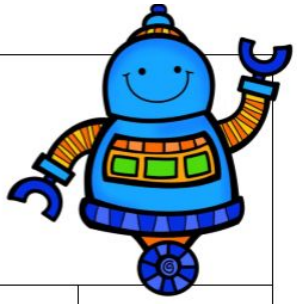


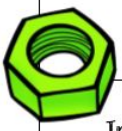
Input x					

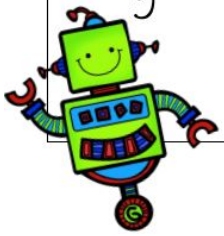
Output y					



Rule					
Input x					
Output y					







End-of-Unit Assessment

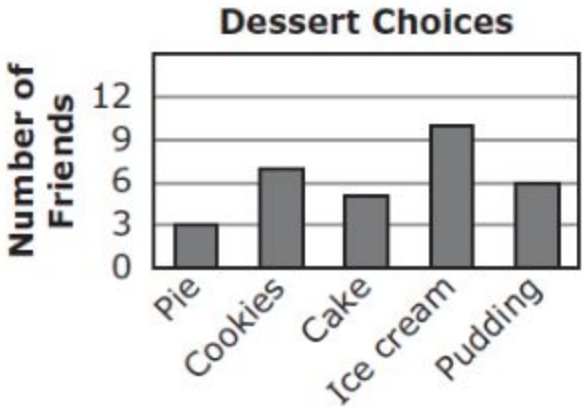
Name:_____ Date:_____

1. Kristine has 3 bikes. She has a pink, blue, and orange bike. She also has 2 helmets. They are pink and black. How many combinations of bikes and helmets can she have? Show your work and the combinations possible.

2. Craig put $5 into a machine and the machine gave him $20 back. Craig thought this was interesting, so he tried it again. This time Craig put $20 into the machine and it gave him $80 back. What is the machine doing to Craig's money? What would it do if Craig put $3 into the machine?

3. Craig told Todd about this magic machine, so Todd set out to look for it. Todd found a machine, too. Todd decided he was going to put $5 into the machine right away, but the machine only gave him $1 back. From what Craig told him, this couldn't be right, so Todd put in another $30 this time, hoping it would change. This time, the machine gave Todd back $26. What does this machine do to Todd's money? What would happen if he were to put $100 into the machine? Show how you know by using a table.

4. Using the picture below, what can you tell about your friends?



5. Show 6 x 3 as a picture.

6. Use the table below. What can you tell about the number of people who brought in 0-5 candy bars?

The Number of Candy Bars Students Brought to School the Day after Halloween

Number of Candy Bars	Number of Students
0	1
1	1
2	1
3	3
4	0
5	4
6	2
7	1
8	2

7. Create a table that shows how many people in the class have blonde, brown, or black hair.

References

Works Cited

Ann, Stephanie. "Input-Output Task Cards." *Teachers Pay Teachers*. N.p., n.d. Web. 29 June 2016. <https://www.teacherspayteachers.com/Product/Input-Output-to-100-Task-Cards-and-Scoot-Game-Freebie-1246311>.

Clarkson, Sandra Pryor., and Vincent J. Altamuro. "Guess the Robot's Secret." *Pattern Block Book:*. Rowley, Ma: Didax, 2007. 108-09. Print.

Clarkson, Sandra Pryor., and Vincent J. Altamuro. "Probability & Statistics." *Pattern Block Book:*. Rowley, Ma: Didax, 2007. 112+. Print.

DeBellis, Valerie A., Joseph G. Rosenstein, Eric W. Hart, and Margaret J. Kenney. "Systematic Listing and Counting in Grades 3-5." *Navigating Through Discrete Mathematics in Prekindergarten-Grade 5*. Ed. Peggy House. Reston, VA: National Council of Teachers of Mathematics, 2009. 33-50. Print.

Zephyr. "In-Bot/Out-Bot." *Teachers Pay Teachers*. N.p., n.d. Web. 29 June 2016. <https://www.teacherspayteachers.com/Product/FREEBIE-In-BotOut-Bot-Robot-Input-Output-Tables-1091432>.