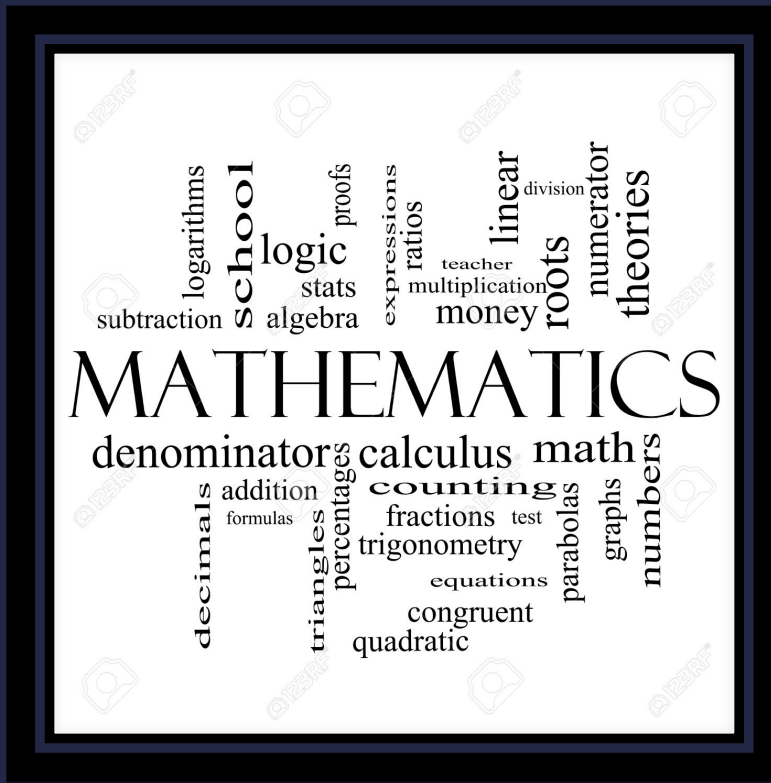


SUMMER 2016

Discrete Math



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SUMMARY

At our school a main focus is to improve problem-solving skills for our students. We found activities to be used in grade 3 and in grade 5 as an intervention. We also feel that the activities found could be made more challenging for a grade 5 level and have included some extensions. All lessons require making copies for the students to work on and some require manipulatives.

Most of these activities/problems were found at www.mathwire.com, there are many more things on this website at a variety of age levels. The Baker Problem was found at <http://www.insidemathematics.org>. The rest of the activities/problems were inspired by things we saw at www.teacherspayteachers.com but were adapted to meet our needs.

Standards according to St. Philip's School:

Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Algebra: Use single-operation input-output rules to represent patterns and relationships and to solve real-world and mathematical problems.

Data Analysis: Collect, organize, display, and interpret data. Use labels and a variety of scales and units in displays.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Algebra: Recognize and represent patterns of change; use patterns, tables, graphs, and rules to solve real-world and mathematical problems.

Data Analysis: Create and analyze double-bar graphs and line graphs by applying understanding of whole numbers, fractions, and decimals. Know how to create spreadsheet tables and graphs to display data.

MCA Questions Addressed:

Grade 3:

5. Malik has 64 marbles. He puts an equal number of marbles into each of 4 jars. How many marbles are in each jar?
A. 14 B. 15 C. 16 D. 18

Grade 5:

14. At a movie store, Erin pays a monthly fee and is charged for each movie she rents. The table shows the monthly cost when Erin rents different numbers of movies.

How much is the monthly fee that Erin pays?

- A. \$3 B. \$6 C. \$15 D. \$18

Number of Movies	Total Cost (dollars)
6	33
8	39
10	45

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Pre-test, Read “A Remainder of One” By: Elinor J. Pinczes, 3rd/5th Grade Parade Activity

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

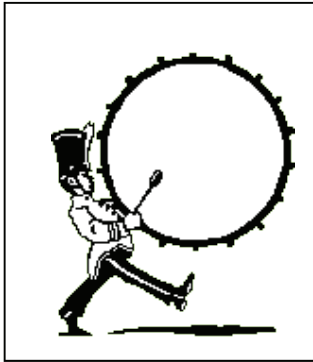
Launch- After the pre-test has been completed, launch the lesson by reading “A Remainder of One” By: Elinor J. Pinczes. Talk to the class and ask them what the problem of the story is. Why are the ants making Soldier Joe leave because he is a remainder of one? What could have been done so that Soldier Joe didn't have to wait so long to be included?

Explore- On Day two split the class into groups of 3 or 4 depending on your class size. Also depending on your grade change the name of the grade parade activity. Have enough copies so there is one per group of the Third Grade Parade hand out. Allow the groups to work on this, have some kind of manipulatives for them to make their arrays before drawing them on their paper. While they are working on this walk around and ask if they are sure they found all the ways that are possible to have them check again. Once all groups are done with the activity move onto share.

Share- Talk as a whole group about what they found about the number of ways Mrs. Long's class could march. Did they find they had some ways they tried that had remainders? (If class size is different from Mrs. Long's discuss about how many ways your class could arrange to march from your room to the playground.) What mathematical operation did we use today kids?

Summarize- Relate the different combinations to multiplication arrays, how many “groups of” they have and what the multiplication problem would look like based on the array. Make sure to use the language array! Today we used the mathematical operation of division to determine the remainder.

Extend- For 5th grade use larger numbers – instead of it being one class maybe it is the entire school.



Third Grade Parade

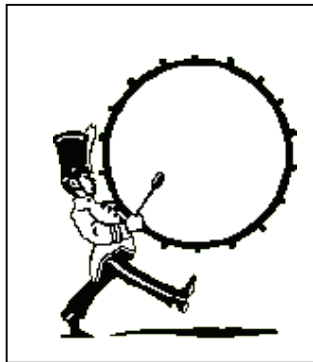
The third graders are marching in the school parade. There are 20 third graders in Mrs. Long's class. Each class must march in equal rows with no remainders. There must be more than one student in each row.

Mrs. Long's class is trying to figure out how many different ways they can march.

- Show all the different ways Mrs. Long's class can march in the parade.
- How many different ways can the class march? Explain your answer.

Answer Key

Third Grade Parade



The third graders are marching in the school parade. There are 20 third graders in Mrs. Long's class. Each class must march in equal rows with no remainders. There must be more than one student in each row.

Mrs. Long's class is trying to figure out how many different ways they can march.

- Show all the different ways Mrs. Long's class can march in the parade.
- How many different ways can the class march? Explain your answer.

These are the different ways the students can march:

X X X X X X X X X X
X X X X X X X X X X

2 rows of 10

X X
X X
X X
X X
X X
X X
X X
X X
X X
X X

10 rows of 2

X X X X X
X X X X X
X X X X X
X X X X X

4 rows of 5

X X X X
X X X X
X X X X
X X X X
X X X X

5 rows of 4

ANSWER:

There are 4 different ways the students can march in the parade.

Cheerleader Competition Activity

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Review what was discussed with the 3rd Grade Parade Activity. Talk about how math happens all around us and there are lots of different things when groups of people need to be divided equally. Sometimes there are rules to how things can be organized. Split the class into groups – try to have them be different groups than the ones used from 3rd Grade Parade. Hand out one copy of Cheerleader Competition per group.

Explore- Allow students to work on Cheerleader Competition, have some kind of manipulatives for them to make their arrays before drawing them on their paper. While they are working on it walk around and see if they are following the rules that have been given to them on the work page. See if all the groups have found all the different rectangular arrays. Once all groups are done move on to share.

Share- Talk about the different arrays they were able to find. Did have the rules make this more difficult or easier than 3rd Grade Parade? Why did it make it more difficult/easier?

Summarize- Relate the different combinations to multiplication arrays, how many “groups of” they have and what the multiplication problem would look like based on the array. Make sure to use the language array!

Extend- For 5th grade use larger number of cheerleaders, could also have two different teams of cheerleaders that need to be in the same number of rows/ cheerleaders per row for the array.

Cheerleader Competition



The cheerleaders are preparing for the county competition. They must perform on stage in a rectangular array that meets these rules:

- There must be at least 2 cheerleaders in each row or column.
- Each row must have the same number of cheerleaders.
- Each column must have the same number of cheerleaders.

There are 12 cheerleaders in the squad this year.

- How many different rectangular arrays can the cheerleaders form?
- Describe each of the ways you found using numbers, words and/or pictures.

Answer Key

The cheerleaders are preparing for the county competition. They must perform on stage in a rectangular array that meets these rules:



- There must be at least 2 cheerleaders in each row or column.
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- Each column must have the same number of cheerleaders.

There are 12 cheerleaders in the squad this year.

- How many different rectangular arrays can the cheerleaders form?
- Describe each of the ways you found using numbers, words and/or pictures.

Answer:

The cheerleaders can form any of the following arrays:

4 rows of 3 cheerleaders = 12 cheerleaders

```

X   X   X
X   X   X
X   X   X
X   X   X

```

3 rows of 4 cheerleaders = 12

```

X   X   X   X
X   X   X   X
X   X   X   X

```

6 rows of 2 cheerleaders = 12

```

X   X
X   X
X   X
X   X
X   X
X   X

```

2 rows of 6 cheerleaders = 12

```

X   X   X   X   X   X
X   X   X   X   X   X

```

The 12 cheerleaders can use any of the 4 different formations pictured above to satisfy the competition rules.

Field Trip Activity

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Explain to the class that the kids who go to Bemidji Public Schools and are in 4th grade are going on two different field trips. They want to know how many buses they will need for the two different groups. They need to solve the problem. Talk about how some problems in life and math have more than one step to find a solution. Remind them to draw a picture if it helps!

Explore- Give half the class the Science Museum and the other half the Holiday Show work pages. Give them time to work on coming to a solution. Once the class appears to be done move on to share.

Share- Have the students switch papers with someone who had a different problem to solve. Have them check to see if that person got the correct answer and explanation. Then discuss as a whole group about the answers and the different ways to come to that answer. Ask students for strategies they used in solving the multi-step problems.

Summarize- Explain to students how this is a multiple step problem. What did they have to do first, second, third, and so on until the problem was solved.

Name _____ Date _____



The fourth grade is going on a field trip to the Science Museum. There are 135 students, 8 teachers and 16 parents riding the buses to the museum. If a bus holds 45 people, how many buses must the school order for this field trip? Explain.

Name _____ Date _____



The fourth grade is going on a field trip to the Holiday Show at the State Theater. There are 178 students, 12 teachers and 24 parents riding the buses to this show. If a bus holds 48 people, how many buses must the school order for this field trip? Explain.

Spinner Game

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Data Analysis: Collect, organize, display, and interpret data. Use labels and a variety of scales and units in displays.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Data Analysis: Create and analyze double-bar graphs and line graphs by applying understanding of whole numbers, fractions, and decimals. Know how to create spreadsheet tables and graphs to display data.

Launch- Day 1: Start the lesson by a spinner on the overhead. Use a spinner that shows only two equal choices. Ask the class which option would be more likely to get spun? Answers should be they are both equally likely. Then ask them what they think the best way to keep track of what you had spun would be? (Hopefully having already taught about tally charts that would be the answer.) Spin the spinner and show them how to collect the data on the tally chart. Tell them that today they are going to look at a tally chart in a group and decide what the spinner would have looked like, and then they are to make a bar graph. (Hopefully they will have been reading bar graphs before this lesson – this would be the first time making a bar graph.)

Day 2: Review what was talked about the previous day by doing another whole group lesson with a spinner that has unequal pieces (2 or 3 pieces). This time do the spinning with the class watching and predicting what will happen when the pieces are not equal. Remind the class importance of correctly labeling a bar graph with a title and the two sides. Tell them that today they are going to be working with a different group and new information.

Day 3: Discuss all the important information learned in the past two days let them know that today they are going to take what they have learned about tally charts, spinners, and bar graphs and work on in independently. (Grade 5- Make their bar graph into a double bar graph showing the comparison from Day 1's group work.)

Explore- Day 1: Group the class in groups of 3 to 4. Hand out 1st spinner game and have them complete using the tally chart, spinner circle, and making a bar graph.

Day 2: Group the class into new groups of 3 to 4. Tell them that they are going to use a tally chart to make a bar graph and a spinner circle using different information than the day before.

Day 3: Today the class will be working on a page by themselves to show understanding of what was worked on the previous days. (Grade 5- Make their bar graph into a double bar graph showing the comparison from Day 1's group work.)

Share- Day 1: Have different groups share what they had made for a bar graph and spinner circle. Discuss the different ways of bar graphs and talk about things that maybe were forgotten and need to be included next time.

Day 2: Have the groups swap with another group and look over each other's to see if they notice anything different. Then discuss as whole group.

Day 3: Ask students how they translated the tally marks into a spinner and graph. Discuss what was easier working independently versus working as a group.

Summarize- The TOTAL number of tally marks is how many partitions are on the spinner and the number of tally marks for each category is how many sections of the spinner represent that event. Each day talk about why these things are important. How tally charts are helpful for keeping track of things that have happened. How bar graphs are helpful in showing what happened in another way.

Extend- In grade 3 or 5 have them spin a spinner and collect data on a tally chart and then make a graph.

In grade 5 have them make a double bar graph with correct labels to compare Day 1 and Day 3.

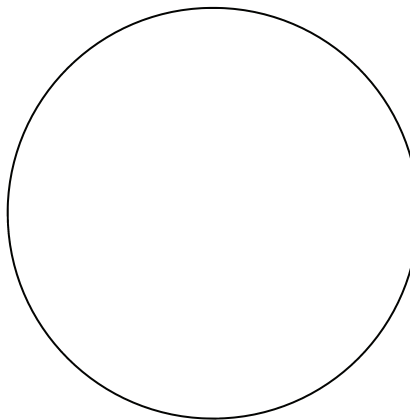
Name: _____ Date: _____

Spinner Game

Tom and Eddy played a spinner game in math class. They kept track of how often they spun each color.

- Complete the tally chart.
- Create a bar graph of their spinner results.
- Use the circle to create a spinner that Tom and Eddy might have used to get these results.
- Explain how you know your spinner fits the results.

Color	Tally	Total
red		
yellow		
blue		
green		



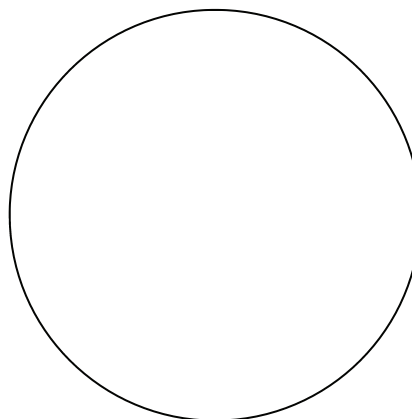
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Spinner Game

Fourth graders in Ms. Connor's class participated in a color spinner activity to study probability. Jenna and Jamie made a tally chart to show the results of 20 spins.

- Complete the tally chart.
- Create a bar graph of their spinner results.
- Use the circle to create a spinner that Jenna and Jamie might have used to get these results.
- Explain how you know your spinner fits the results.

Color	Tally	Total
red		
yellow		
blue		



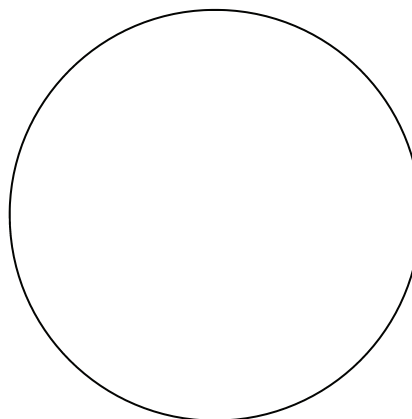
Name: _____ Date: _____

Spinner Game

May and John played a spinner game to study probability. They made a tally chart to show the results of 30 spins.

- Complete the tally chart.
- Create a bar graph of their spinner results.
- Use the circle to create a spinner that May and John might have used to get these results.
- Explain how you know your spinner fits the results.

Color	Tally	Total
red		
yellow		
blue		
green		



Number Draw Activity

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Tell the students there is a game called number draw and let them know the rules. Show them by having a bag with numbers 0-9. Pull out 2 numbers. Let's say they were 5 and 9. Ask your students how many 2-digit numbers they could make with 5 and 9? Answer should be 2. Tell them that they would then earn 10 points for making two 2-digit numbers. Tell them that another 3rd grade class was playing this game to make 2-digit numbers, and wanted to know how many points they would get.

Explore- Assign groups of 3 or 4. Split the groups in half so half the class will get Julia and the other half will get Mark. You could have actual number tiles for the groups to have to move around and see the different combinations they can make. Have them figure out how many points each student will get.

Share- First have the groups who had Julia share how many points she would get and how they know that. Then have the groups who had Mark share how many points he would get and how they know that. Ask how is that possible? Both Julia and Mark pulled different numbers out of their bags.

Summarize- Discuss that because of the way the game was scored it didn't matter what numbers you pulled out of the bag, but if **you knew that by pulling 3 numbers out you could get 6 combinations** all you had to do was take 6 combinations x 5 points = 30 points all together. Talk about a way to make the game more challenging so that not everyone would get the same number of points each round.

Extend- Grade 3- Have them play the game with the new rules to make it more challenging.

Grade 5 – Have them actually play the game and pull out two 3-digit numbers and find who has the highest sum, product, or difference.

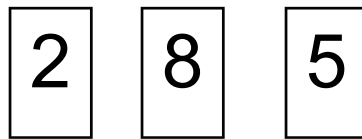
Name: _____ Date: _____



Number Draw

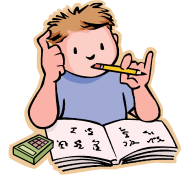
Third graders are playing the Number Draw game. Each partner pulls three cards with the digits 0-9. Students use the cards to make as many different 3-digit numbers as possible. Student score 5 points for each different number they can make with their cards.

Julia pulls these cards:



- List all of the different numbers Julia can make with these cards. Explain how you know that you have found all of the numbers.
- Julia earns 5 points for each number she makes. How many points should Julia earn for this round of the game? Explain.

Name: _____ Date: _____



Number Draw Game

Third graders are playing the Number Draw game. Each partner pulls three cards with the digits 0-9. Students use the cards to make as many different 3-digit numbers as possible. Student score 5 points for each different number they can make with their cards.

Mark pulls these cards:



- List all of the different numbers Mark can make with these cards. Explain how you know that you have found all of the numbers.
- Mark earns 5 points for each number he makes. How many points should Mark earn for this round of the game? Explain.

Houses in a Row Activity

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Have a bag with the letters A and T in it. (The students should know what letters are in the bag before beginning.) Ask them if I were to pull out an A first and put it back in the bag what could I pull out next? Answer should be "A" or "T". So how many different ways can I pull out A and T? Make a list on the board so they can see the different ways they can be pulled out. Now we're going to do houses... Tell them they are going to need blue, yellow, green, red, orange, and purple markers, crayons, or colored pencils. Then give each student page 1 and 2 of Houses in a Row work page.

Explore- Before having them color the houses you could have colored shapes that go with the activity so they could make the different combinations. Then have them color all the different ways the houses can be painted.

Share- Come together and share different ways that were found. Talk about if there would have been an easier way to figure this out without having to color the pictures. (Answer should be to multiply $3 \times 3 = 9$.) In the number tiles we had to multiply $3 \times 2 \times 1$ and today we had to multiply 3×3 – why are these different?

Summarize- Discuss what would happen if you had 4 colors for the triangle and only 2 colors for the square part. Discuss a couple different variations to check for understanding. In the number tiles we had to multiply $3 \times 2 \times 1$ and today we had to multiply 3×3 – these are different because the colors could repeat but the number tiles could not repeat.

Houses in a Row



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:

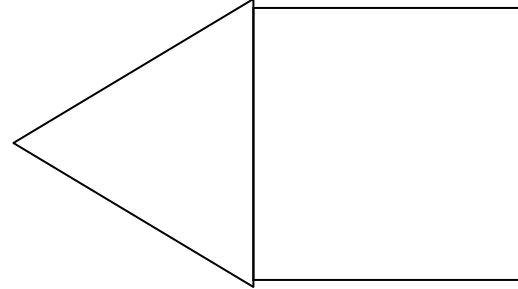
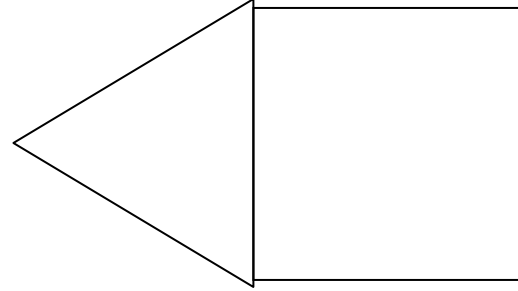
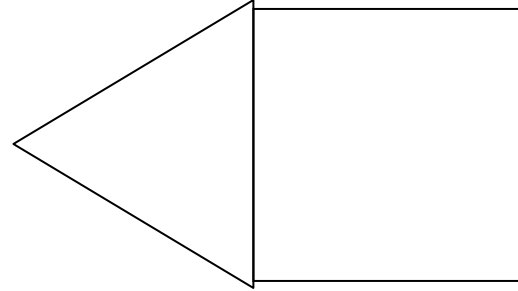
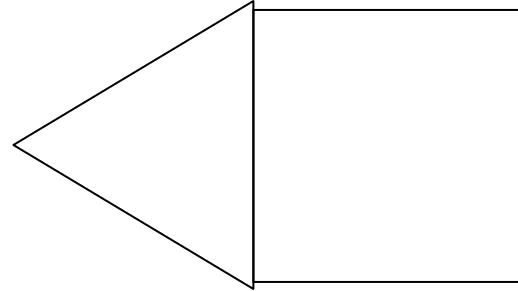
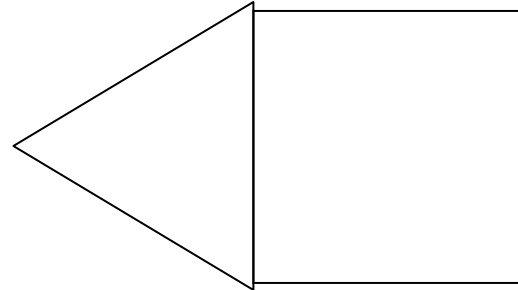
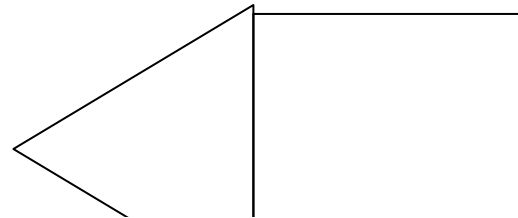
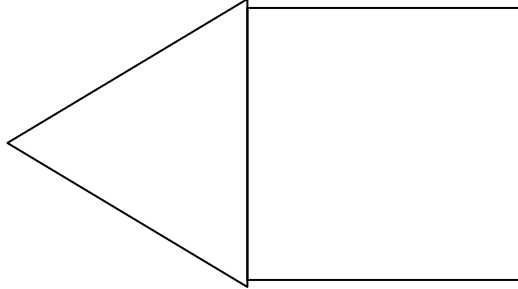
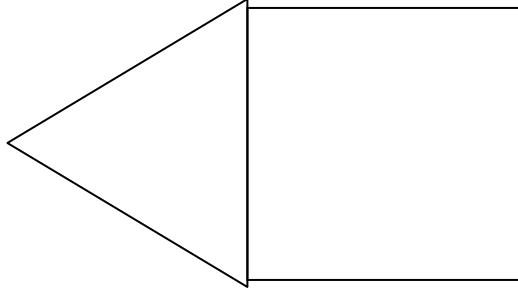
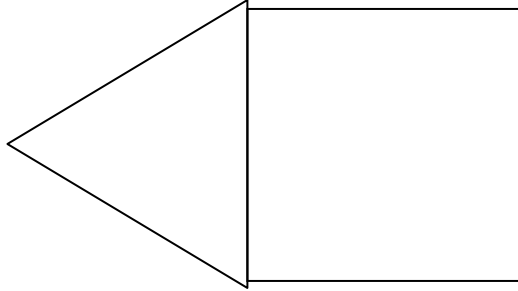
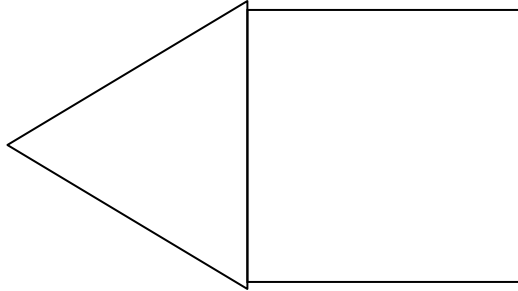
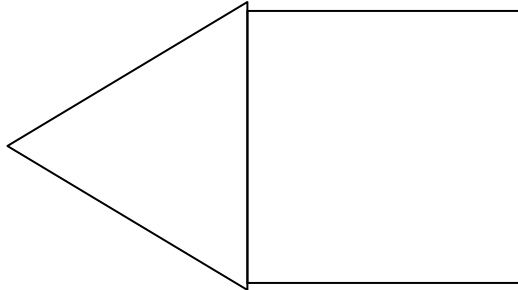
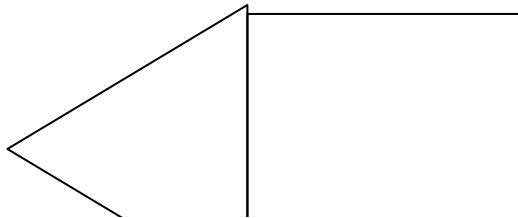
- Blue, yellow or green for the triangle part
- Red, orange or purple for the square part.

How many different houses can be painted?

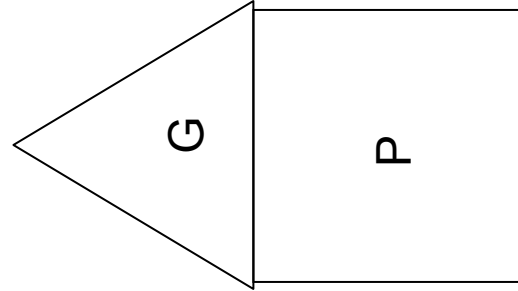
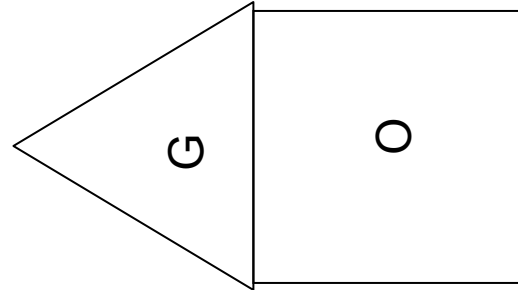
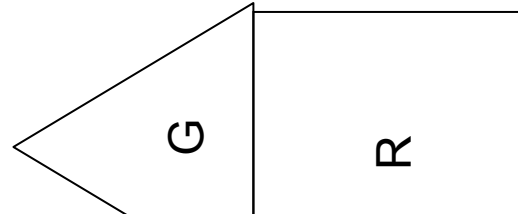
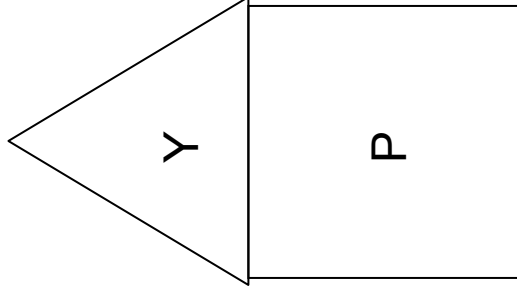
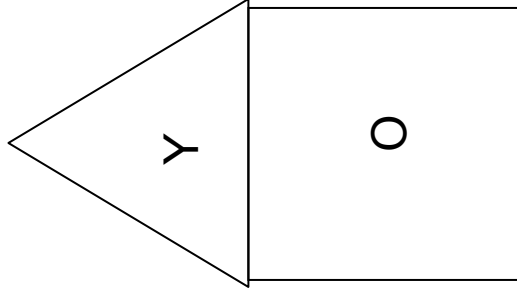
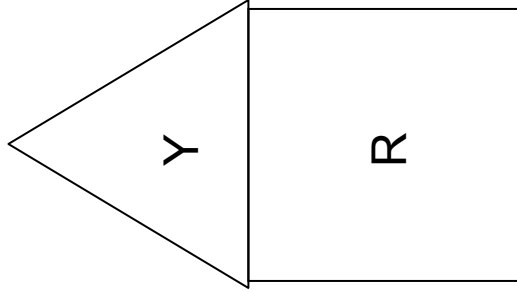
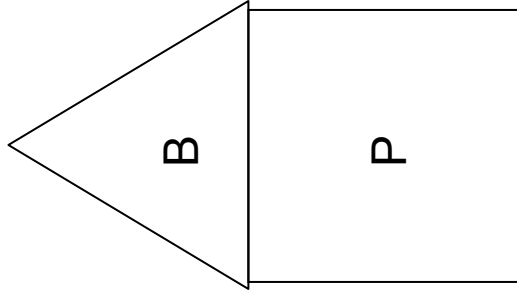
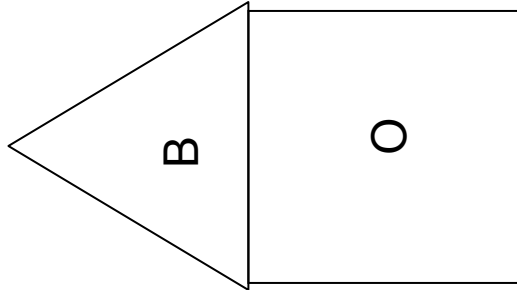
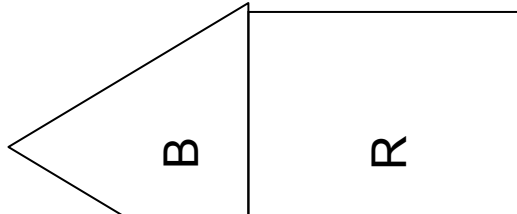
 Five identical house templates arranged in a horizontal row. Each house consists of a triangle on top and a square on the bottom. The templates are intended for coloring according to the rules provided.

Houses in a Row

Houses in a Row Worksheet



Houses in a Row Answer Key

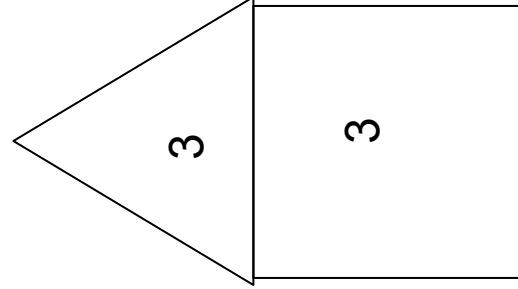


ANSWER:

9 different houses can be painted using these colors.

There are 3 choices for the triangle part and 3 choices for the square part.

$3 \times 3 = 9$ different combinations



Annual Fall Parade Problem

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Algebra: Use single-operation input-output rules to represent patterns and relationships and to solve real-world and mathematical problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Algebra: Recognize and represent patterns of change; use patterns, tables, graphs, and rules to solve real-world and mathematical problems.

Launch- Ask if anyone has ever been to a parade? (Hopefully almost all will have been.) Ask what kinds of different ways they have seen people marching? (Rows, all over the place...etc.) Tell them that a fourth grade class is going to be in a parade and decided they wanted to walk in a special formation and they have to solve how many kids are in the whole fourth grade.

Explore- Assign groups of 3 or 4. Give each group an Annual Fall Parade sheet. Have them solve the question. They could have some kind of manipulatives to use so they could see the pattern with blocks, bear counters,...

Share- Have different groups come up and draw their picture, table, or whatever they used to find the answer up on the board. See if everyone came up with the same answer.

Summarize- Talk about how everyone (hopefully) came up with the same answer but maybe they didn't all solve it the same way and that is okay. There are many different ways to find an answer.

Extend- How many rows would there be if there were 325 students in the school and they wanted to keep to the same pattern? (25 rows)

Annual Fall Parade



It's time for the annual school fall parade. The fourth grade decides to march in a special formation this year. One person walks in the first row, two people walk in the second row and three people walk in the third row. This pattern continues on and on.

- If the whole fourth grade marches in 10 full rows, how many students are in fourth grade?
- Use numbers, words, tables and/or pictures to explain how you know your answer is correct.

Answer Key

Annual Fall Parade



It's time for the annual school fall parade. The fourth grade decides to march in a special formation this year. One person walks in the first row, two people walk in the second row and three people walk in the third row. This pattern continues on and on.

- If the whole fourth grade marches in 10 rows, how many students are in fourth grade?
- Use numbers, words, tables and/or pictures to explain how you know your answer is correct.

Row	No. students in row	Total students
1	1	1
2	2	3
3	3	6
4	4	10
5	5	15
6	6	21
7	7	28
8	8	36
9	9	45
10	10	55

ANSWER: The table clearly shows that if the whole fourth grade marches in 10 rows following this pattern, then there must be 55 students in the fourth grade.

Basketball Problem

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Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Algebra: Use single-operation input-output rules to represent patterns and relationships and to solve real-world and mathematical problems.

Launch- Ask how many students play sports? Talk about the different ways in different sports that people can score points and how many points things are worth. Make a table on the board that shows this for the students to visually see.

Explore- In groups of 3 or 4 hand out the basketball problem. Have them work on it as a group and walk around and see how they are solving the problem while asking questions about their process.

Share- Bring them back together and as a whole group to discuss the answer to the first question and how everyone arrived at that answer. Share different strategies. Then discuss the answer to the second question. Was there more than one other combination to make the same total number of points?

Summarize- Relate how some problems are going to have more than one step. Relate this to a multiplication and adding problem if it wasn't discussed during share.

Extend- For 5th grade ask if Mr. Hougen scored 96 points, what are the different combinations of throws he could have made?

A decorative border of basketballs surrounds the text. The top and right sides feature a full basketball, while the bottom and left sides feature a half basketball.

Basketball Problem

Mr. Hougen is a great basketball player. During one tournament he scored a bunch! He made 19 free throws (one point each), 12 baskets (two points each), and he even made 4 three-point shots!

How many points did he score in all?

Is there another combination of shots he could have made to score the same amount of points?

Pumpkin Patch Problem

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- If I have \$10 how many different combinations of money could I have. Have the students use a dry erase marker and draw some different combinations on their desk to make \$10. Use this to warm them up with using money.

Explore- Split into groups of 3 or 4. Each group should have a Pumpkin Patch Problem work page and some money manipulatives for them to use to solve the problem (a range of dollars and quarters).

Share- Come together in whole group and share the different answers for number 1. How they came to that answer and show the different ways that people arrived at the answer. Then discuss number 2.

Summarize- Relate this to multiplication if it wasn't discussed during the share time. Remind students again that problem solving can be multi-step with more than one operation.

Extend- Grade 5 – Give them the total amount spent and have them determine how much was spent on each item.

The worksheet is framed by a decorative border of orange pumpkins with green stems. The pumpkins are arranged in a grid: 10 along the top, 10 along the bottom, and 10 on each of the two sides. In the center, there is a white rectangular area with a black border containing the text and math problems.

Pumpkin Patch Problem

Mrs. Hengel's family went to the pumpkin patch to buy fall decorations.

They bought 5 corn stalks for \$3.50 each and 4 pumpkins for \$4.25 each.

1. How much did they spend in all? (Show your work) What different money combinations could have been used to pay?

2. If bales of hay cost \$5.50 each, how many could they buy if they had \$30 more to spend? What would their total bill be? (Show your work)

Baker Problem

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Have 4 boxes one that would hold 12 cookies, 4 donuts, 2 muffins, and 6 bagels. First ask the students if there would be enough choices for everyone to have 1 item. Then ask if they would have enough to have 2 items and so on until you get a no. Talk about if you have one of each of these boxes full how many items would they have baked altogether?

Explore- In groups of 3 or 4 have them work on The Baker work page. Remind them that there are many different ways to solve a problem.

Share- In whole group discussion have each group write on the board how they solved number 1, 2, 3 and 4. Talk about the different ways that everyone arrived at a solution. Did any of the problems have more than one step? What operation was used the most? (adding, subtracting, multiplying)

Summarize- Relate back to multiplication, and multiple ways to come to a solution.

The Baker

This problem gives you the chance to:

- choose and perform number operations in a practical context
-

The baker uses boxes of different sizes to carry her goods.



Cookie boxes hold 12 cookies.

Donut boxes hold 4 donuts.

Muffin boxes hold 2 muffins.

Bagel boxes hold 6 bagels.

1. On Monday she baked 24 of everything.

How many boxes did she need? Fill in the empty spaces.

cookie boxes _____

donut boxes _____

muffin boxes _____

bagel boxes _____

2. On Tuesday she baked just bagels. She filled 7 boxes.

How many bagels did she make? _____

Show your calculations.

3. On Wednesday she baked 42 cookies.

How many boxes did she fill? _____

How many cookies were left over? _____

Explain how you figured this out.

4. On Thursday she baked 32 of just one item and she filled 8 boxes.

What did she bake on Thursday? _____

Show how you figured this out.

Back To School Shopping Problem

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Day 1: Have cut outs of shirts and pants for the students to use as manipulatives in groups of 3 or 4. Tell them that Ben has 3 shirts and 4 pairs of pants. He wants to know how many outfits he can make.

Day 2: Remind students that Ben did not want to have a repeated outfit. Today, in the same groups, they are going to be given a budget because Ben's parents want him to learn how manage his money carefully.

Explore- Day 1: Have the groups explore with the manipulatives how many outfits Ben can make. Have them record this on a paper by drawing what they did. Then ask how many days could Ben wear these items before having to repeat an outfit? (Answer should be same number of days as number of outfits.) Either add pants or shirts to their pile of manipulatives (try to make it different for each group – could even add shoes or socks into the mix instead of more pants or shirts.) Allow them time to come up with a new answer reflecting that change.

Day 2: Give each group the Back to School Shopping Problem. Remind them before they get started to organize their information and that some problems are multiple steps to solve. Allow the groups to have the manipulatives of clothing if they would like to, also you could have money for them to see how much they have left after they buy something (100's, 50's, 20's, 10's, 5's, and 1's – Monopoly money would work great!).

Share- Day 1: After the change, allow each group to share what their conclusion was. How many days could Ben go without repeating an outfit? How many items of clothes did he have?

Day 2: Come together as a whole group and have each group write how they decided Ben should spend his clothing money.

Summarize- Day 1: Show that work can be organized in a tree diagram (if no one did), or reinforce the idea of a tree diagram for organizing the combinations.

Day 2: Relate this to real-world problem solving that this is something they would use math for when they are older.







Extend- In grade 5 you could make the dollar amounts using change instead of using whole numbers.

Back to School Shopping Problem

Ben's parents want him to learn how to manage his money carefully so they have put him in charge of his own back to school shopping!

They are giving him \$350 to buy all his clothes and shoes for the school year. His parents told him he needed to have enough clothes to get through one week without doing laundry. He will need a clean shirt for each day and at least 4 pair of pants. He will need something to wear on cool days as well.

Here is what Ben found at the mall:

-  Shirts at his favorite store cost \$25. Similar shirts at the discount store cost \$4.
-  Plain T-shirts cost \$10 each or he can buy a 3 pack for \$25.
-  Jeans at his favorite store cost \$68 each. Similar jeans at the discount store were \$28.
-  Basketball pants at the sports store cost \$28 a pair. He saw the same pants online for \$5.
-  Name brand sweatshirts cost \$45. At the discount store they cost \$18.
-  The new style basketball shoes he saw on TV were \$85 a pair. If he buys last years style they cost \$48.

Help Ben decide what he should spend his money on! Use the back of this page to solve the problem and explain your thinking.

Vacation Problem

Standard(s): Grade 3: Number and Operation: Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world problems.

Grade 5: Number and Operation: Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers using various strategies.

Launch- Ask the class if anyone has ever gone on a vacation before. Ask how they went on vacation by car or airplane. What is a difference between the two? (Hopefully someone would say that by car it takes longer.) Tell them that they are going to help some teachers plan a vacation! Split into groups of 3 or 4 and give each group a copy of Vacation Problem.

Explore- Before they begin, remind them everything they have learned about problem solving – multiple steps to find an answer, organizing their information (using a table, tree diagram...), drawing pictures to help them. Have money available for them to use as manipulatives (100's, 50's, 20's, 10's, 5's, and 1's – Monopoly money would work great!).

Share- After they have had time to work on it, have each group put their answer on the board. Have someone from each group or they can share together how they decided on this plan for the teacher's trip.








Summarize- Again reinforce that not all problems can be solved in one step, that there can be more than one answer to a problem, and that not everyone has to do the problem the same way to find the right answer.

Extend- In grade 5 you could make the dollar amounts using change instead of using whole numbers.

Vacation Problem

Ms. Zimmermann and Mrs. Graham are excited to go on a vacation together at the beach! They decided to bring Mrs. Hunsberger and Mrs. Hiscock along too. They need some help planning their vacation. Their goal is to spend less than \$2,500 on their trip.

Use the following information to help them plan their trip.

-  4 People are going on the trip.
-  They want to be gone for 5 days and nights.
-  If they fly each ticket will cost \$370. If they drive, the bill for gas will be \$350, but it will take away one day spent at the beach.
-  They can stay at an inexpensive hotel for \$79 a night, but this hotel doesn't have a pool. They can stay at a more expensive hotel with a pool for \$129 a night.
-  They will need 3 meals a day. Each meal will cost \$6 per person.
-  They would like money left over to buy souvenirs.
-  They would like to try one new activity while they are at the beach. They could go sail boating for \$45 a day, hot air balloon ride for \$19, or snorkeling for \$8 a person per day.

It is up to you to plan their trip using the information above! Use the back of the page to show your work and explain your answer.

Pre-Test/Post-Test

Name: _____ Date: _____

1. Circle the number of groups.
6 X 3

2. Draw an array for number 1.

3. The ants are marching in the annual parade. There are 12 ants. They must march in equal rows and each row must have more than one ant. Show all the ways the ants could march.

4. George asked his third grade class about their favorite pets. He made a tally chart to show the results.

Pet	Tally	Number of Students
Cat		
Dog		
Bird		
Fish		
Hamster		
Iguana		
Total		

- Complete the table above.
- On the back of this page, make a bar graph of the results of George's favorite pet survey. Make sure you label everything.
- How many students are in George's class?

- Which pet is the most favorite?

- Which pet is the least favorite?

5. Anthony earns an allowance by doing chores around the house. His mom pays him \$1 on the first day. Then next two days she pays him \$2. After that, she pays him \$3 for the next three days. If she keeps paying him this way on what day will he first earn \$6? (Show your work)
6. Laura looks for her favorite shells on the beach every morning. The first day, she finds 3 shells. The next day, she finds 8 shells. On the third day, she finds 13 shells in the cove. On the fourth day, she finds 18 shells as she walks by the water. If Laura keeps finding shells in this way, how many will she find on the eighth day?

Explain how you got your answer and how you know your answer is correct.