Project #1

Domain: Operations and Algebraic Thinking

Standard:

4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

Directions:

1. Read the following examples:

   Examples:
   3 x 11 = 33.
   Jenny is three years old. Her aunt is eleven times older. How old is Jenny's aunt?
   7 x 8 = 56
   Jerome has 7 times as many nickels as Marcus. If Marcus has 8 nickels, how many does Jerome have? Challenge: How much money does Marcus have? How much money does Jerome have?

2. Create word problems for the multiplication equations below. Show how you would solve each.

   9 x 3 = 27 6 x 10 = 60 42 = 6 x 7 44 = 11 x 4

Project # 3

Domain: Operations and Algebraic Thinking

Standards:

4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

Directions:

1. Read the description below.
2. Complete the exercise to identify prime numbers between two and one hundred.
3. Challenge: Make a list of twenty additional prime numbers above 100. Prove that they are prime and not composite numbers.

Prime Numbers

Imagine that you are part of a class of 23 students. One day the teacher asks you to divide up into equal groups. You try to divide into 2 equal groups but find you can't do it because 23 is not evenly divisible by 2. One group is always larger than the other. Then you try to split into 3 equal groups, but that doesn't work either. And neither does 4 or 5, or any of the other numbers you try. That's because 23 is a prime number.

A prime number is a number that cannot be divided evenly by any other number except itself and the number 1. A composite number, on the other hand, it a number that can be built up by multiplying smaller numbers, called factors, together. You can make the number 4 by multiplying 2 x 2. You can make the number 6 by multiplying 2 x 3. So now we know that neither of these numbers is a prime number. Is 7 a prime number?

More than 2,000 years ago, the Greek mathematician Eratosthenes came up with a clever way of determining which numbers are prime. You can use this method, too. First, make a grid of all the numbers from 2 to 100 in rows of ten, like this:

	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20, etc.

*Continued on next page.

Project # 3 continued

Next, cross out all the composite numbers, leaving only the prime numbers. First circle the number 2. It is a prime number, evenly divisible only by 2 and 1. Then cross out all the multiples of 2. Each of these numbers is divisible by 2 and therefore not prime. Next, find the smallest number that has not been crossed out: 3. This number is prime, so circle it. Cross out all the multiples of 3 that have not already been crossed out. Continue by circling the smallest remaining number and crossing out its multiples. The circled numbers are the prime numbers. If you did everything right, there should be 25 prime numbers circled.

Use the space below to complete the exercise above if needed.

Use the space below to complete the challenge (#3) from the directions on the previous page.

Project #4

Domain: Operations and Algebraic Thinking

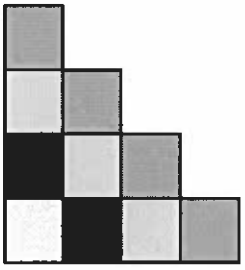
Standards:

4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Directions:

1. Read the example below and use pictures or models to answer the question.

   Stepping Up
   Study this picture. How many blocks would you need for a 20-step staircase?



2. **Challenge:** Set up a rule for a number or shape pattern equation for a parent to solve. You can create a chart or function machine (showing what goes in or comes out) or use another method of your choice.
   Study the chart below for some examples:

Pattern	Rule	Feature
3, 8, 13, 18, 23, 28, ...	Start with 3, add 5	The numbers alternately end with a 3 or 8
5, 10, 15, 20 ...	Start with 5, add 5	The numbers are multiples of 5 and end with either 0 or 5. The numbers that end with 5 are products of 5 and an odd number. The numbers that end in 0 are products of 5 and an even number.

Project #5

Domain: Operations and Algebraic Thinking

Standard:

4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Directions:

1. Read the following,

   Consecutive Numbers

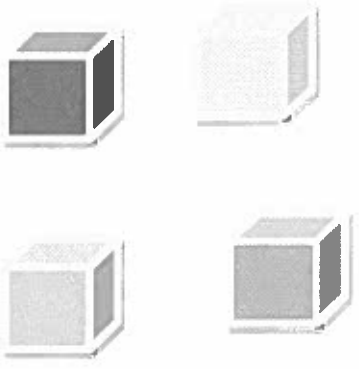
   An example of consecutive odd numbers is 23, 25, 27, and 29.

2. Now solve this problem:

   Find four consecutive odd numbers with a sum of 160. Show your work.

3. Create your own challenge problem for a friend or parent to solve involving consecutive numbers.

4. Use cubes to complete the following:
   - Build 5 groups of 3 to represent 15
   - Build 5 groups of 3 two times to represent 2 x (5 x 3)
   - Then count 10 groups of 3 (10 x 3) or 30 cubes total.
   - Create a drawing to show your work for each of the above groups you made when building with cubes.



Project #6

Domain: Number and Operations in Base Ten

Standard:

4.NBT.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Directions:

1. Arrange these numbers in order, beginning with the smallest.

2400	4002	2040	420	2004

2. Arrange these numbers in order, beginning with the greatest.

1470	847	710	1047	147

3. Using a newspaper or magazine, find eight 3 or 4-digit numbers and cut them out. Arrange them in order on a piece of paper or in your math journal/notebook. Keep this to turn in with your math summer challenge packet.

Project #7

Domain: Number and Operations in Base Ten

Standard:

4.NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Directions:

1. Read the following definitions to remind you of concepts you should have learned during your 4th grade math class.

Associative Property

The property which states that for all real numbers a, b, and c, their product is always the same, regardless of their grouping:

$(a \cdot b) \cdot c = a \cdot (b \cdot c)$

Example:

$(5 \cdot 6) \cdot 7 = 5 \cdot (6 \cdot 7)$

Distributive Property

The property which states that multiplying a sum by a number gives the same result as multiplying each addend by the number and then adding the products

$a(b + c) = a \times b + a \times c$

Examples:

$3(4 + 5) = 3 \times 4 + 3 \times 5$

$3(a + b) = 3a + 3b$

2. Then solve the following three problems and state which property you used to do so. Show all of your work.

1. 25 x 28=
2. 102 x 14
3. 425 divided by 12

3. Finally, create one real world problem to show you understand the associative property and one word problem to show you understand the distributive property.

Two examples for the associative property:

- Partial products method—14 x 16 = 100 (multiply 10 x 10) + 40 (multiply 10 x 4) + multiply 6 x 10 + (multiply 6 x 4)
- Multiple addition method—14 x 16 = 16 + 16 + 16 + 16 + 16 + 16 + 16 + 16 + 16 + 16 + 16 + 16 +16 + 16 + 16 + 16

Two examples for the distributive property:

- Share 25 books among 4 girls. (6 with a remainder of 1)
- Share 25 bananas among 4 girls (6 ¼).

Project #8

Domain: Number and Operations in Base Ten

Standard:

4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

Directions:

1. Use place value understanding to round numbers to solve the following problem. Show all of your work. Draw a picture and write an explanation to show how you solved the problem.

   Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 3 packs with 6 bottles in each container. Sarah wheels in 6 packs with 6 bottles in each container. About how many bottles of water still need to be collected?

2. Round the following numbers to the nearest tens and hundreds.

Number	Tens	Hundreds
876		
931		
2,365		
808		
4,099		
222		
351		
3,003		

3. Create a word problem of your own in which rounding can be used to find a reasonable solution and/or to verify your solution.

Project # 9

Domain: Number and Operations—Fractions

Standard:

4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Directions:

1. Read the following problem.

   There are two cakes on the counter that are the same size. The first cake has 1/2 of it left. The second cake has 5/12 left. Which cake has more left?

2. Create a model to show the comparison using a number line.
3. Draw a picture to represent the problem.

4. Use symbols to compare the following fractions:

   1/4 ___ 2/3 2/8 ___ 1/4 1/2 ___ 3/7

   4/8 ___ 5/6 2/3 ___4/5 7/8 ___3/4

5. Create models to show the comparisons using a number line to verify your solutions.

Project #10

Domain: Number and Operations—Fractions

Standard:

4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Directions:

1. Solve the following problem below using pictures, computations, or other strategies you have learned. Make sure to show all of your work in the space provided or on an additional piece of paper.
2. Then create your own story problem using parts of a whole (fractions).
3. Include a solution, picture and solution to your problem.

Problem:

Bill, Sally, Peter and Jen all went to Hershey Park, Pennsylvania. While on a tour at the Hershey's Factory, they got to reach into a bag and pull out a part of a bar of chocolate. When they left the factory, their teacher said they could eat their chocolate bars once they found out who had the largest piece of chocolate. Use the information below to solve the problem so Bill, Sally, Peter and Jen can enjoy their chocolate. *Make sure to follow the directions above.

Bill has 1/3 of a bar, Sally has 4/6 of a bar, Peter has 9/12 of a bar, Jen has 13/18 of a bar. Show how you know the answer.

Project #11

Domain: Number and Operations—Fractions

Standard:

4.NF.3a Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

Directions: Solve the following problems. Show how you reached your solution.

1. Mary and Lacey decide to share a pizza. Mary ate 3/6 and Lacey ate 2/6 of the pizza. How much of the pizza did the girls eat together?

2. What part of the M&M'S are not orange?

Pack of M&M's

Color	Number of M&Ms
Red	3
Orange	12
Green	5
Yellow	9
Blue	6
Brown	12
Light brown	2

Answer: _____ out of _____ are not orange.

3. Challenge:
   - Get a snack size or King Size bag of M&Ms. Complete your own investigation to see what part of the M&Ms are not orange.
   - Create a chart to record the color of M&Ms and the number of each.
   - Compare your results with the ones above and write any observations you come to below.

Project #12

Domain: Number and Operations—Fractions

Standard:

4.NF.6 Use decimal notation for fractions with denominators 10 or 100.

Directions:

1. Design a chart to display the equivalent relationships of fractions and decimals.
2. Then create a number line with a piece of string and use index cards to write these numbers on, and place these numbers and other numbers on your number line (string).
   *Be sure to include the following fractions and decimals:

$\frac{3}{10}$	$\frac{85}{100}$	$\frac{70}{100}$	$\frac{34}{100}$	$\frac{6}{10}$	$\frac{49}{100}$
.40	.06	.50	.83	.75	.009

3. Include at least three fractions and their equivalent decimals of your choice.

Project #13

Domain: Number and Operations—Fractions

Standards:

4.NF.4 Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

4NF.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100

Directions:

Complete the following problems. Then create three problems of your own involving fractions.

1. Masha had 120 stamps. She gave her sister half of the stamps and three more. How many stamps does Masha have left?

2. Create a circle model divided into 10 equal sections. Create a second circle model divided into 100 equal sections. Represent 3 tenths and 30 hundredths on the circle models below.

3 tenths

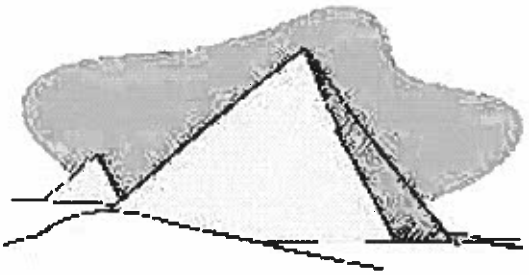
3 hundredths

Project #14

Domain: Measurement and Data

Standards:

4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.



Directions:

1. Read the background information about cubits used in building pyramids.

Cubit Craze!

The ancient Egyptians used a measurement called a cubit to build the pyramids. A cubit was the distance from the bent elbow to the end of the middle finger.

Using your own self as a measurement, find out how many inches in a cubit.

2. Use the internet (with supervision), math text book, or reference book for help to find out how to convert cubits to inches. Then, use the information you found to solve the second part of the problem below.

If a pyramid is 100 cubits long, about how many inches is that?
How many feet?

Project # 15

Domain: Measurement and Data

Standards:

4.MD.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Directions:

1. Read the problem below.

2. Read it again and draw a picture paying attention to details as you go.

> The third grade students at Westview Elementary School built a nature trail behind their school. The trail started and ended at the same place. It had five sides. Two were 60 feet long and the remaining three were 30 feet long.

3. Draw a picture to scale using inches instead of feet (1 inch = 1 foot).
   *Be sure to include a key that shows the scale you used.

4. Next, answer the following questions.

   What is the name of the shape of the nature trail? _____
   How long is the nature trail (in feet)? _____
   How long is the nature trail (in yards)? _____

5. Find the area of the ground covered inside the nature trail. Use the space below and show all of your work.

Project #16

Domain: Measurement and Data

Standards:

4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

Directions:

1. Solve the following:

> Charlie and 10 friends are planning for a pizza party. They purchased 3 quarts of milk. If each glass holds 8oz will everyone get at least one glass of milk?

2. Create a conversion chart to use as a tool to solve.

3. Show how you arrived at your answer.

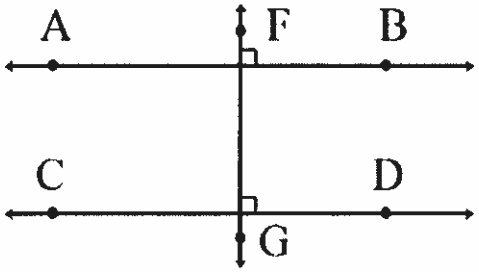
Project #19

Domain: Geometry

Standard:

4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

Directions: Answer the questions below using the line segment picture.



1) Which line segment is longer AB or FG? How do you know?

2) Which lines in the figure are parallel?

3) Using a ruler, draw the parallel and intersecting lines that you see in the above diagram.

4) Create a line segment parallel to FG? Name the line segment.

5) Which line segment(s) intersect AB?

6) What is the measure of the angle formed by the intersection of these lines?

7) What is the name we use to describe lines CD and FG? _____lines.

Project #20

Domain: Geometry

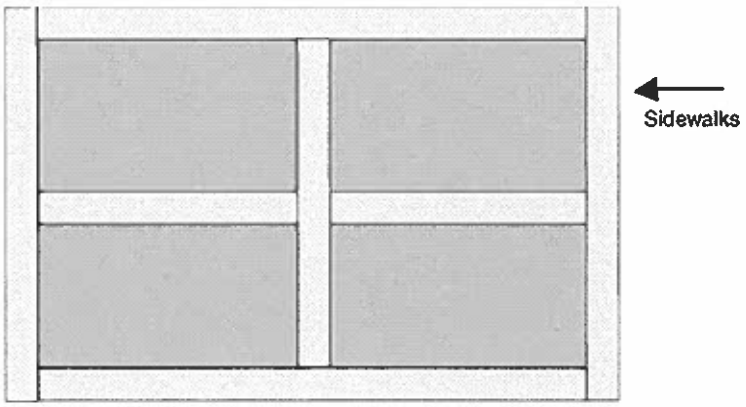
Standards:

4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

Directions:

Study the sketch below, then read the story problem and use your knowledge of measurement to solve.

Surface Area



Here is a sketch of a city park. It is 400 ' long and 300 ' wide.
The sidewalks are 6 ' wide. What is the surface area of the sidewalk?

Project #25

Domain: Measurement and Data

Directions:

1. Read the problem below.
2. Read it a second time through to make sure you understand what you are being asked to do.

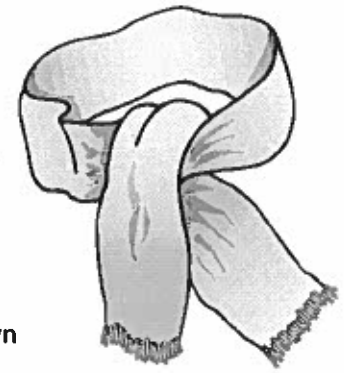
   Regina has received a pet rabbit from her neighbor Rodney who is about to move to an apartment that does not allow pets. Her father is going to help her build a run for the rabbit in their back yard, but he wants Regina to design it.

   Regina sits down to think about the possibilities. Her father says that the run must be rectangular with whole number dimensions. If they want to enclose 48 square feet, how many options do they have?

3. Using a ruler and pencil on graph paper (if available) to draw out all of the possibilities that might work for the rabbit run.

*Hint: Use your knowledge of multiplication and factors to help you solve this problem.

Project # 2



Domain: Operations and Algebraic Thinking

Standard:

4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

Directions:

1. Create two problems for each of the given types of problems below. Examples are provided for each.
2. Provide an answer and explanation for how you solved each of your own original problems.

A. Unknown Product:
Example: A green scarf costs $3. A red scarf costs 6 times as much. How much does the red scarf cost? (3 x 6 = p).

B. Group Size Unknown:
Example: A book costs $18. That is 3 times more than a DVD. How much does a DVD cost? (18 ÷ p = 3 or 3 x p = 18).

C. Number of Groups Unknown:
Example: A red scarf costs $18. A blue scarf costs $6. How many times as much does the red scarf cost compared to the blue scarf? (18 ÷ 6 = p or 6 x p = 18).