**Before Investigation 1**

**Pre-Test:**

* [Investigation 1 Pre-Test](Investigation%201%20Pre%20Test.docx) for each student

**Investigation 1.1 ~ Building and Using Arrays**

**Objectives:**

* Given some dots arranged in groups of the same number, students will demonstrate **application** of multiplication by finding a speedy way to count the numbers 100% of the time.
* Given 24 tile manipulatives, students will demonstrate **evaluation** of multiplication by working together to make various arrays and find all factors of 24.
* Given a number puzzle with one clue, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* [Quick Images (T1)](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Transparencies%201\T1.pdf) for the teacher
* [Introduction to Arrays](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Introduction%20to%20Arrays.docx) F 🡪 B with [Centimeter Grid Paper](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M15.pdf) (M15) for each child.
* [Number Puzzle 1](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Number%20Puzzle%201.docx) F 🡪 B with [Centimeter Grid Paper](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M15.pdf) (M15) for each child.

**Materials to Gather:**

* Have student get out markers to make their arrays or provide markers.
* You could also use blocks if you would rather have students build arrays rather than draw them.

**Vocabulary**

* Factor
* Multiple
* Product
* Array
* Multiplication

**Lesson 1.1: Building and Using Arrays**

**Introduction**

* Introduce math procedures to students.
* This unit focuses on multiplication and division.
* I’m going to show you some pictures of dots. Think creatively to find a quick way to figure out how many. I am looking for good strategies.
* \*[Show T1](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Transparencies%201\T1.pdf)\*
* How were the dots arranged? How many in all? What strategies did you use to find the answer?
* What factors do you see? What is the product?

**Activity**

* Show the “[Introduction to Arrays](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Introduction%20to%20Arrays.docx)” sheet to the students and discuss them.
* Hand the “[Introduction to Arrays](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Introduction%20to%20Arrays.docx)” sheet to each child and have them find as many other arrays they can make using 24 tiles.
* What do you notice about all the numbers we are using to make the arrays? (factors of 24).
* Discuss factors of 24 (1, 2, 3, 4, 6, 8, 12, 24) and multiples (24, 48, 72…)

**Number Puzzle**

* Introduce number puzzles by having students think about the following question “This number of tiles will make a rectangle that is 10 tiles wide”.
* Have students find some arrays that would work using the [Number Puzzle 1](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Number%20Puzzle%201.docx) handout.
* Discuss

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.2 ~ Identifying Properties of Numbers**

**Objectives:**

* Given some dots arranged in groups of the same number, students will demonstrate **application** of multiplication by finding a speedy way to count the numbers 100% of the time.
* Given tile manipulatives, students will demonstrate **evaluation** of multiplication by working together to find numbers that only have one possible array.
* Given a number puzzle with two clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* [Quick Images (T2)](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Transparencies%201\T2.pdf) for the teacher
* [Identifying Properties of Numbers](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Identifying%20Properties%20of%20Numbers.docx) F 🡪 B with [Centimeter Grid Paper](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M15.pdf) (M15) for each child.
* [Number Puzzle 2](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Number%20Puzzle%202.docx) F 🡪 B with [Centimeter Grid Paper](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M15.pdf) (M15) for each child.

**Materials to Gather:**

* Have student get out markers to make their arrays or provide markers.
* You could also use blocks if you would rather have students build arrays rather than draw them.
* Learning About Math (Prime and Composite Number Sort)

**Vocabulary**

* Prime Numbers
* Composite Numbers

**Lesson 1.2: Identifying Properties of Numbers**

**Introduction**

* Remind students of math procedures.
* What did we learn yesterday?
* I’m going to show you some pictures of dots. Think creatively to find a quick way to figure out how many. I am looking for good strategies.
* \*[Show T2](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Transparencies%201\T2.pdf)\*
* How were the dots arranged? How many in all? What strategies did you use to find the answer?

**Discussion**

* Yesterday we found a lot of ways to make an array using 24 tiles. How many ways did we find?
* Today I have an important question for you. Are there any examples of arrays that have only one array. Your job is to find as many numbers as you can that have only one array.
* \*pass out [Identifying Properties of Numbers](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Identifying%20Properties%20of%20Numbers.docx)\*
* Discuss student results
* Tell students that the numbers that only have two factors are called prime numbers.
* If prime numbers are numbers that only have two factors, what do you think composite numbers are?
* Explain composite numbers are numbers that have more than 2 factors. What numbers can you think of that are composite?
* Model prime and composite sort for the “learning about numbers” center.

**Number Puzzle**

* Yesterday we solved a number puzzle with 1 clue, but today we are going to solve one with 2 clues! This is much more difficult so let’s see who can think like a true puzzler!
* “This number of tiles will make a rectangle that is 2 tiles wide. This number of tiles will make a rectangle that is 3 tiles wide.”
* Pass out [Number Puzzle 2](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Number%20Puzzle%202.docx) and give students time to think.
* Discuss what strategies they used.

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.2 ~ Extra Lesson**

**Objectives:**

* Given some dots arranged in groups of the same number, students will demonstrate **application** of multiplication by finding a speedy way to count the numbers 100% of the time.
* Given tile manipulatives, students will demonstrate **evaluation** of multiplication by working together to find numbers that make square arrays.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* [Quick Images (T3)](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Transparencies%201\T3.pdf) for the teacher
* [Identifying Properties of Numbers2](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Identifying%20Properties%20of%20Numbers2.docx) F 🡪 B with [Centimeter Grid Paper](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M15.pdf) (M15) for each child.

**Materials to Gather:**

* Have student get out markers to make their arrays or provide markers.
* You could also use blocks if you would rather have students build arrays rather than draw them.

**Vocabulary**

* Square numbers

**Lesson 1.2: Identifying Properties of Numbers**

**Introduction**

* Remind students of math procedures.
* What did we learn yesterday?
* I’m going to show you some pictures of dots. Think creatively to find a quick way to figure out how many. I am looking for good strategies.
* \*[Show T4](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Transparencies%201\T4.pdf)\*
* How were the dots arranged? How many in all? What strategies did you use to find the answer?

**Discussion**

* Yesterday we found a lot of ways to make lots of arrays with one number. What is that number called? (composite)
* We also found some numbers that only had one array. What are those numbers called? (prime)
* Today I have an important question for you. Are there any examples of arrays that are squares. Your job is to find as many numbers as you can that can only make squares.
* \*pass out [Identifying Properties of Numbers 2](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Teacher%20Created%201\Identifying%20Properties%20of%20Numbers2.docx)\*
* Discuss student results
* Tell students that the numbers that only make squares are called square numbers.
* What do you notice is the same about these numbers? What math do we use to get them? (times a number by itself).

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.3 ~ What Numbers Have Which Properties?**

**Objectives:**

* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* [Number Puzzle (M16)](../../../../../../Public/Documents/Teaching%20Strategies/Math/Investigations/5th%20Grade/Resource%20Masters%201/M16.pdf)
* [300 Chart (M31)](../../../../../../Public/Documents/Teaching%20Strategies/Math/Investigations/5th%20Grade/Resource%20Masters%201/M31.pdf)

**Materials to Gather:**

* Markers or crayons.

**Vocabulary**

* No new vocabulary

**Lesson 1.3: Which Numbers Have Which Properties**

**Introduction**

* Review Prime numbers, composite numbers, and square numbers.
* Introduce math procedures to students for working on challenging puzzles. Tell them to use their strategies and work through it.

**Number Puzzle**

* Tell students you are giving them another number puzzle but this time there are 4 clues! I want you to work together as a team to figure out the answer to the puzzle.
* I’m going to give you each one clue but all 4 clues go together. I will also give you a chart of all numbers 1-300 if you want to use it. Some people find it helpful.
* Give students 10 minutes to work through the problem using the [number puzzle](Resource%20Masters%201/M16.pdf) and the [300 chart](Resource%20Masters%201/M31.pdf)

**Discussion**

* After you read all the clues, how did you start?
* What clue did you use first?
* What clue did you use next?
* How did that help you eliminate some numbers?
* How would your answer change if the clue “my number is odd” was not there?
* How would the answer change if one of the other clues were missing?

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.3 ~ Extra Lesson**

**Objectives:**

* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* Number Puzzle Packet [M32](Resource%20Masters%201/M32.pdf) and 14 copies of [300 Chart (M31)](file:///C:\Users\Public\Documents\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M31.pdf) for each child
* [M17](Resource%20Masters%201/M17.pdf)
* [M18](Resource%20Masters%201/M18.pdf)
* [M19](Resource%20Masters%201/M19.pdf)
* [M20](Resource%20Masters%201/M20.pdf)
* [M21](Resource%20Masters%201/M21.pdf)
* [M22](Resource%20Masters%201/M22.pdf)
* [Multiplication Combinations 1](file:///C:\Users\Karen\Desktop\Teaching%20Strategies\Math\Investigations\5th%20Grade\Resource%20Masters%201\M29.pdf) (M29) for each child

**Materials to Gather:**

* Markers or crayons.
* Cut apart number puzzles and put in envelopes. Label each envelop with a number 1-14.

**Vocabulary**

* No new vocabulary

**Lesson 1.3: Extra Lesson**

**Introduction**

* Review Prime numbers, composite numbers, and square numbers.
* Introduce math procedures to students for working on challenging puzzles. Tell them to use their strategies and work through it.

**Number Puzzle**

* Tell students you are giving them another number puzzle with 4 clues, but this time they are going to do it by yourself!
* I want you to select 1 number puzzle at a time and solve it. Then record your answer on the front page of your packet. There are 300 charts to use if those help you.
* You do not have to finish today.

**Multiplication Combinations**

* Pass out [Multiplication Combinations 1](Resource%20Masters%201/M29.pdf)
* Quickly look through the numbers in the multiply by 7 table. Tell me one you know the answer to without using a calculator.
* This work is going to be in the Doing Math center of BUILD starting next week. When you do it, first do the combinations you know quickly. Then circle the ones you don’t know.
* Is there a way to use something you already know to figure these out?
* Discuss

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.3 ~ Extra Lesson 2**

**Objectives:**

* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* None ☺

**Materials to Gather:**

* Markers or crayons.
* Cut apart number puzzles and put in envelopes. Label each envelop with a number 1-14.
* Set out BUILD Centers that correspond with investigation 1. See list in front of lesson plans

**Vocabulary**

* No new vocabulary

**Lesson 1.3: Extra Lesson**

**Introduction**

* Review Prime numbers, composite numbers, and square numbers.
* Introduce math procedures to students for working on challenging puzzles. Tell them to use their strategies and work through it.

**Number Puzzle**

* Tell students you are giving them another number puzzle with 4 clues, but this time they are going to do it by yourself!
* I want you to select 1 number puzzle at a time and solve it. Then record your answer on the front page of your packet. There are 300 charts to use if those help you.
* We will work on these for a few more days so you do not need to rush or finish today.
* Walk around and conference with students.

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.4 ~ Multiplying with More than Two Numbers**

**Objectives:**

* Given a number, students will demonstrate **evaluation** by using two factor combinations to make three factor combinations for the number with 100% accuracy.
* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* [More Number Puzzles](Teacher%20Created%201/More%20Number%20Puzzles.docx) one for each child.

**Materials to Gather:**

* None.

**Vocabulary**

* No new vocabulary

**Lesson 1.4: Multiplying with More than Two Numbers**

**Introduction**

* Review Prime numbers, composite numbers, and square numbers.
* Introduce math procedures to students for working on challenging puzzles. Tell them to use their strategies and work through it.

**Number Puzzle**

* Tell students you are giving them another type of number puzzle today.
* To start out with, what numbers can you multiply to make 18?
* Pass out more puzzle sheet
* Discuss
* What numbers can you multiply to make 180?
* Did you find all the combinations with two factors? How do you know?
* Can any of these combinations be broken down into smaller factors?
* How do the combinations with two factors help you find combinations with more than two factors?
* Did you find all the combinations with three factors? How do you know?

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.5 ~ Assessment: Number Puzzles and Finding Factors**

**Objectives:**

* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

(Just one copy for the teacher)

* [M34](Resource%20Masters%201/M34.pdf)

**Materials to Gather:**

* None.

**Vocabulary**

* No new vocabulary

**Lesson 1.5: Number Puzzles and Finding Factors**

**Introduction**

* Tell students that they are going to have a work day today for
  + 1) their number puzzles
  + 2) their work packets (in BUILD bin “D”)
* They do not need to finish.
* While students are working, please observe and fill out M34.

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.6 ~ Assessment: Number Puzzles and Finding Factors**

**Objectives:**

* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

(Just one copy for the teacher)

* [M34](Resource%20Masters%201/M34.pdf)

**Materials to Gather:**

* None.
* Copies of the More Puzzles sheet that students already completed.

**Vocabulary**

* No new vocabulary

**Lesson 1.6: Number Puzzles and Finding Factors**

**Introduction**

* Tell students that they are going to have a work day today to finish up
  + 1) their number puzzles
  + 2) their work packets (in BUILD bin “D”)
* While students are working, please observe and fill out M34.

**Discussion**

* I want to review a difficult problem we did a few days ago.
* To start out with, what numbers can you multiply to make 18?
* Pass out more puzzle sheet
* Discuss
* What numbers can you multiply to make 180?
* Did you find all the combinations with two factors? How do you know?
* Can any of these combinations be broken down into smaller factors?
* How do the combinations with two factors help you find combinations with more than two factors?
* Did you find all the combinations with three factors? How do you know?

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**Investigation 1.7 ~ Number Puzzles and Finding Factors**

**Objectives:**

* Given a number puzzle with four clues, students will demonstrate **application** of math skills by figuring out what number is being described with 100% accuracy.
* Given a vocabulary word (factor, multiple, product, array, multiplication, prime, composite, square) students will demonstrate **comprehension** of vocabulary by saying the word, doing the action, and stating the definition with 100% accuracy.

**Copies to Make:**

* Page 20 in student book for each student
* [Practice Test](Investigation%201%20Practice%20Test.docx)

**Materials to Gather:**

* None.

**Vocabulary**

* No new vocabulary

**Lesson 1.7: Number Puzzles and Finding Factors**

**Introduction**

* Tell students that this is our last day before our test. We are going to spend today reviewing what we know.

**Discussion**

* Do student page 20 together. How do you know that you found all the factors of a number?
* Pass out practice quiz and have students work on it independently.
* Review practice quiz answers.

**Review**

* Review vocab cards from “independent reading and writing center”
* What did you learn today?

**After Investigation 1**

**Post-Test:**

* Investigation 1 Post-Test for each student (R1)
* Review Post Test with Students after completion and allow corrections