Learning Experience:

<u>Multiplicative Comparison with Explorers (Christopher Columbus)</u>

When planning, include the following:

Models (Concrete—Semi-Concrete—Semi-Abstract—Abstract)

Problems/Situations

Questions

<u>AKS</u>:

2.OA.2 Solve multiplication and division word problems involving multiplicative comparison using drawings and equations (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison)

Social Studies - (GPS) (4SS_D2008-33) Compare and contrast examples of cooperation and conflict between Europeans and Native Americans [33a - examine how the exchange of ideas and goods between Native Americans and Europeans affected each group]

Social Studies - (GPS) (4SS_D2008- 35) Use the basic economics concepts of trade, opportunity cost, specialization, voluntary exchange, productivity and price incentives to illustrate historical events [35a - describe opportunity costs and their relationship to decision-making across time such as decisions to send expeditions to the New World]

<u>Vertical Alignment:</u>

Third grade - 3.OA.3 Apply multiplication and division (products or dividends 0-100) to solve word problems in situations involving equal groups, arrays and measurement quantities

Third grade - 4.OA.4 Use a symbol to represent an unknown and determine the value of the unknown in a multiplication or division equation relating three whole numbers

Third grade - 9.OA.8 Solve and represent two-step word problems using the four operations, and represent with a letter standing for the unknown quantity

Fifth grade - 2.OA.2 Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them (e.g., express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7)) and recognize that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product

Fifth grade - 9.NBT.5 Multiply multi-digit whole numbers fluently using the standard algorithm

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Materials:

markers
chart paper (poster board or other larger paper surface)
manipulatives (blocks, counters, cubes)
number lines
poems/songs/texts (teacher choice, options listed below)

Vocabulary:

product, dividend, divisor, quotient, equation, multiple, multiplicative comparison, multiplier, multiply, divide, unknown, remainders, array

Essential Question:

How do we solve multiplication and division word problems involving multiplicative comparison using drawings and equations?

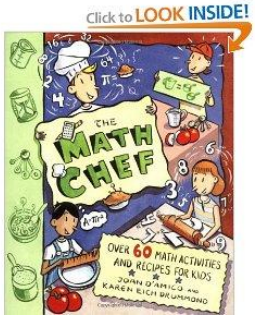
Activating Strategy:

Choices (choose one from all items listed below):

* YouTube video "Miss Russ 2nd Grade Christopher Columbus Song"
* Christopher Columbus song (attached at end of lesson)
* Christopher Columbus poem (attached at end of lesson)

Additional Choices that are not related to Social Studies:

* The Math Chef, by Joan D'Amico (recipe activities to choose from to connect with upcoming lesson, Chapter 9 "How Much Lettuce Do You Need for 6 Salads?")

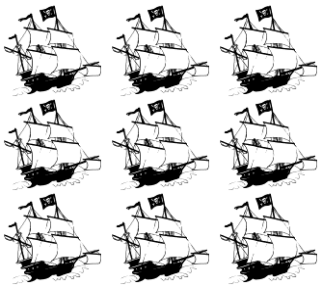


* Dinosaur Deals, by Stuart J. Murphy
* Safari Park, by Stuart J. Murphy

Instructional Activity:

Whole Group Introduction:

After referencing Christopher Columbus' three ships have three girls come up to the front of the room to represent the ships: Nina, Pinta, and Santa Maria (you could have them wear labels for the ships). "If Christopher Columbus had three times as many ships he could have brought more supplies with him on his journey. How can we find out how many ships that would be? Let's make three groups of ships that each have three in them. We already have the first group, so now we only need two more groups." Teacher pulls up three students to make the second group and three students to make the third group. Show and explain that this is three groups with three in each group. Three times as many ships as the initial three ships would be a product of nine ships. Write the equations 3 x 3 = 9 on chart paper or using a Mimio. Draw three ships in each of three groups.



3 x 3 = 9

Make a connection to using an array to show the ships. Make an array using the students and connect the physical array to the more abstract array written on the paper.

Challenge students to figure out how many ships Columbus would have if he had four times as many or six times as many. Use students to model, arrays on chart paper, and written equations

Partner Work or Small Group Work:
Students receive two problems for journal work in exemplar style. (Can be done in journals, on dry erase boards, or using technology.)
1) The Santa Maria has four barrels of water on board. The Nina has two times as much. How many barrels of water does the Nina has on board? (*This example problem demonstrates a product answer.)
2) The Pinta has twenty-four sailors and the Santa Maria has only eight. How many times as many sailors does the Pinta have as the Santa Maria? (*This example problem demonstrates a multiplier answer. 8 X y= 24 or 24 ÷ y = 8)

Students work together to use manipulatives to show the problem. The groups then create drawn models for solving the problem. Next, students write an equation to solve their problem. Finally, they write to explain how they found their solutions.

Small groups can then share their work with one another (or as a whole class sharing) in order to explore their thinking more deeply by explaining their process.

1. Expanding the experience

Trading With the Natives Card Game:
Materials: 1 deck of playing cards sorted (numbers 2 - 10 in one stack, letters A, J, Q, and K in another stack, paper, pencils

Important Information: Letter cards tell us the multiplicative comparison number (what the number of items being traded are being multiplied by: three times as many as _____), Number cards are the number of items being traded.
Letter card values: A - 2, J- 3, Q - 4, K - 5

Partner Game:
Step 1: Sort cards into two stacks.
Step 2: One person is the Native American and one person is Christopher Columbus.
Step 3: The person with the shortest pinky goes first.
Step 4: The first person pulls a card from each stack. (e.g., 9 and K)
Step 5: The cards tell that this person is trading 5 times as many as 9 (choose their own item for the trade item to pretend with).
Step 6: Solve to find out how many items are being traded.
Step 7: The partner pulls a card from each stack.
Step 8: The partner's cards tell that this person is trading ___ times as many as ____.
Step 9: Solve to find out how many items are being traded.
Step 10: Partners can compare which person traded more. Discuss: Was this a fair trade? Was this a trade that you would make? Why or why not?
Step 11: Repeat steps 4 - 10 for each round.

2. Extending the experience

Choices:

* Harcourt Math Lesson 7.5
* Troop County Schools website, Curriculum Map for 4th grade, p. 11
* Think Math Lesson 13.1 and Lesson 13.5
* Students create their own word problems with drawings and equations.

Summarizing:

3, 2, 1 = list 3 things you learned, list 2 things you are confused or unsure about, and list 1 thing you feel confident enough about to help others with

Going through the MOCC exemplars page locate the Best of Math 3 series and download either "Raising Chicks" or "Jeff's Marble Collection." Students complete the exemplar as an assessment.

Did your plans you include the following?

Models (Concrete—Semi-Concrete—Semi-Abstract—Abstract)

Problems/Situations

Questions

MCC4. OA.2

Instructional Strategies

Use multiplication and division fact families to show the relationship between division and multiplication. Explain how one is the inverse of the other.

Give the students story problems with multiplicative comparisons. Have them draw a picture or create a model of the problem, write an equation with a symbol for the unknown variable, and solve.

Assessment Strategies

Skill-Based Task:
Create and solve an equation from a given word problem.

Problem Task:
Over the summer, Raul read 8 books. Natalia read 4 times as many books. How many books did Natalia read? Draw a picture or create a model of the problem, write an equation with a symbol for the unknown variable, and solve.

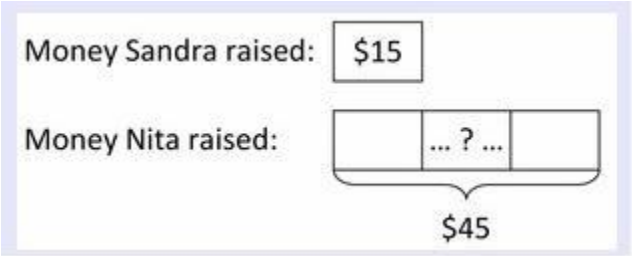
Create a Venn diagram that compares and contrasts additive comparison and multiplicative comparison.

1. Helen raised $12 for the food bank last year and she raised 6 times as much money this year. How much money did she raise this year?

She raised six times as much money (as shown in the diagram) so she raised $6\times12=72$

2. Sandra raised $15 for the PTA and Nita raised $45. How many times as much money did Nita raise as compared to Sandra?

Helen raised $72 this year. $?\times15=45$ is equivalent to $45\div15=?$



3. Nita raised $45 for the PTA, which was 3 times as much money as Sandra raised. How much money did Sandra raise?

Nita raised 3 times as much as Sandra. $3\times?=45$ is equivalent to $45\div3=?$

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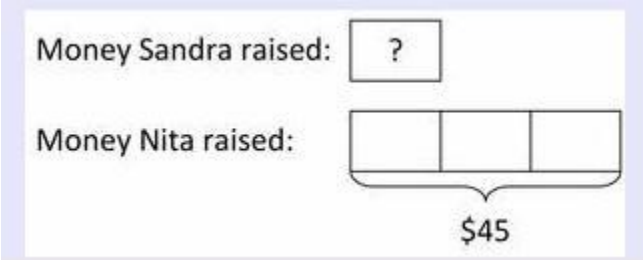

Sample Multiplicative Comparison Problems

Unknown Product:

1. A red umbrella costs $8.00. A green umbrella costs 3 times as much as the red umbrella. How much does the green umbrella cost?

2. Tom ran 4 laps of the football field. Sam ran 5 times as many laps of the football field as Tom. How many laps did Sam run?

3. A rubber band is 6 cm long. How long will the rubber band be if it is stretched to be 3 times as long?

4. The giraffe in the zoo is 4 times as tall as the gorilla. The gorilla is 4 feet tall. How tall is the giraffe?

5. A truck is twice as heavy as a car. The car weighs 3,000 pounds. How much does the truck weigh?

6. A pack of six pencils costs 5 times as much as a single pencil. A single pencil costs 9 cents. How much does the pack of six pencils cost?

7. Tom has 8 baseball cards. Jorge has 6 times as many cards. How many baseball cards does Jorge have?

8. Lisa has four CDs, Cynthia has three times as many as Lisa, and Megan has half as many as Lisa. How many CDs do Cynthia and Megan have?

9. A factory has 4 times as many workers as a grocery store. The grocery store has 8 workers. How many workers does the factory have?

10. Sam picked 7 apples. Lucy picked 6 times as many apples as Sam. How many apples did Lucy pick?

11. Paula has 20 coins in her coin collection. Tony has 5 times as many coins as Paula. How many coins does Tony have?

12. This month Peter saved 4 times as much money as last month. Last month he saved $8. How much money did Peter save this month?

Group Size Unknown:

1. A family size pizza is $24 and costs 3 times as much as a small pizza. How much does a small pizza cost?

2. A rubber band is stretched to be 18cm long, 3 times as long as it was to begin with. How long was the rubber band to begin with?

3. A tree is 24 feet tall. It is 4 times as tall as Mr. Smith. How tall is Mr. Smith?

4. Sue picked 30 apples. She picked 5 times as many apples as Bob. How many apples did Bob pick?

5. There are 20 monkeys in a zoo. There are 4 times as many monkeys as tigers. How many tigers are there?

6. Frankie and Tony went fishing. Tony caught 24 fish. He caught 6 times as many fish as Frankie. How many fish did Frankie catch?

7. James and Tony took a math test. James correctly answered 30 problems. James correctly answered twice as many problems as Tony. How many problems did Tony correctly complete?

8. You read 5 times as long this week as you read last week. If you read for 110 minutes this week, how long did you read last week?

9. This month Jane saved 6 times as much money as she did last month. If she saved $42 this month, how much did she save last month?

Number of Groups Unknown:

1. A single rose costs $3 and a bunch of roses costs $12. How many times as much does the bunch of roses cost than the single rose?

2. A rubber band was 6cm long. It is stretched to 18cm long. How many times as long is the rubber band now as it was to begin with?

3. A kangaroo weighs 50 lb. A gorilla weighs 500 lb. How many times heavier is the gorilla than the kangaroo?

4. A piece of string is 7cm long. A piece of wool is 42cm long. How many times longer is the piece of wool than the piece of string?

5. Henry picked 30 oranges. Janet picked 6 oranges. How many times as many oranges did Henry pick as Janet did?

6. Rebecca saved $32 this month. Last month she saved $8. How many times as much money did Rebecca save this month as last?

A red ribbon is 6cm long. A blue ribbon is 3 times longer. How long is the blue ribbon?

I have 2 kittens. My friend has 3 times as many kittens as me. How many kittens does my friend have?

Ben has twice as many pets as Tom. If Ben has 8 pets how many pets does Tom have?

An apple tree is 3 times taller than a pear tree. If the height of the pear tree is 42cm, how tall is the apple tree?

My dog is 6 times heavier than my cat. My cat weighs 4kg. What is the weight of my dog?

Yesterday I ran 4 laps of the oval. Today I ran 5 times as many laps. How many laps did I run today?

This month I saved three times as much as last month. Last month I saved $9.00. How much did I save this month?

This week I ate 5 times as many apples as last week. This week I ate 10 apples. How many apples did I eat last week?

CHRISTOFO COLUMBO (Christopher Columbus)
1911 (out of copyright) with words by
Ring Lardner.

I'll sing to you about a man whose name you'll find in hist'ry
He solved a problem very deep which long had been a myst'ry;
Navigators young and old gave way to him quite fitly,
His name it was Columbus and he came from sunny It'ly.

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory
Christofo Columbo.

To the Kings and Queens of Europe, Columbus told his theory,
They simply thought him crazy, and asked him this here query,
How could the earth stand up if round, it surely would suspend,
For answer, C'lumbus took an egg and stood it on its end.

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory
Christofo Columbo.

In Fourteen Hundred and Ninety-two,'twas then Columbus started,
From Pales on the coast of Spain to the westward he departed,
His object was to find a route, a short one to East India,
Columbus wore no whiskers, and the wind it blew quite windy.

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory
Christofo Columbo.

When Sixty days away from land, upon the broad Atlantic,
The sailors they went on a strike which nearly caused a panic,
They all demanded eggs to eat for each man in the crew,
Columbus had no eggs aboard, but he made the ship lay too.

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory

Christofo Columbo.

The hungry crew impatient grew, and beef-steak they demanded,
Equal to the emergency, Columbus then commanded
That ev'ry sailor who proves true, and his duty never shirks,
Can have a juicy porterhouse, "I'11 get it from the bulwarks."

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory
Christofo Columbo.

Not satisfied with steak and eggs, the crew they yelled for chicken,
Columbus seemed at a loss for once, and the plot it seemed to thicken,
The men threatened to jump overboard, Columbus blocked their pathway,
And cried: "If chicken you must have, I'll get it from the hatchway.

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory
Christofo Columbo.

The sailors now so long from home with fear became imbued,
On the twelfth day of October their fears were all subdued,
For after Ninety days at sea, they discovered America's shores,
And quickly made a landing on the Isle of Salvador.

He knew the earth was round-ho!
That land it could be found-ho!
That geographic, hard and hoary
Navigator, gyratory
Christofo Columbo.

Christopher Columbus
By: Ron Brown

Way back in 1492
All the people thought the world was flat
But young Columbus simply disagreed
The earth was round, he was sure of that.

Way back in 1492
The queen of Spain gave him three strong ships.
He headed West on the ocean blue,
In search of the Indies and a treasure or two.

Sail away Christopher Columbus
Sail away on the deep blue sea
Sail away Christopher Columbus
On the Nina and the Pinta and the Santa Maria
Look what you have found!

Sail away Christopher Columbus
It's a new world big and round.

Sail away!
Many thanks to Ron Brown for permission to display these lyrics.