Grade Level	Content Area	Course Title *(For 9-12 Samples Only)*	Unit Title
Grade 4	**Mathematics**		Amusing Multiplication

Length of Unit	Time of Year Taught	Expected Prior Knowledge
5 lessons/75 minutes long each	Fall Quarter	Base ten system; multiplication facts

Unit Description This lesson aims at getting students familiar with multiplication by solving problems using several different methods. Multiplying by tens is an "unintimidating" way to start students working with two-digit numbers, and it helps students confirm the importance of place value. Because the lesson starts with tactile solving strategies and then moves toward decomposing numbers, students are able to conceptualize the multiplication process better, making it easier to translate to symbols on paper. Decomposing numbers sets the stage for the partial-products multiplication strategy and for division.

Standards: Common Core State Standards for Mathematics	**Domain:** Operations and Algebraic Thinking **Cluster:** Use the four operations with whole numbers to solve problems. **Standard**: #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.
Summative Assessment *In addition to the description, include a copy of the summative assessment in the application package.*	The students will use Unifix cubes or base-ten blocks to solve multiplication word problems. They will then draw pictures to the solve word problems and write equations used to solve the problems.
Scoring for Summative Assessment *In addition to the description, include a copy of the answer key and scoring rubric (if applicable) for the summative assessment in the application package.*	Total points a student can earn on the summative assessment = 100 Mastery is set at 80%. Students must achieve 80 points to demonstrate mastery.
Materials/Resources Needed *Include all items for the entire unit.*	The Incredible Comparisons by Russell Ash with Richard Bonson ; 11" x 17" or larger poster paper Markers, crayons, rulers, and other supplies as needed for creating posters; Blocks (up to 500 packed and unpacked); 2 number lines (0-100) ; 1 place value mat with digit cards; base-ten grid paper or dot array paper; centimeter graph paper (optional) for the Routine activity; array pictures; chart paper; Unifix Cubes; Index Cards

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Instruction and Timeline Each lesson is planned for 75 minutes.	Introduce students to the book, Incredible Comparisons, by showing them the visual representations of comparisons throughout the book. Turn the pages slowly allowing students to comment on what they see. Make comments at various intervals, asking students questions such as "What do you notice about… or Have you ever seen… or What do you think about…" Towards the end of the book (or during a second viewing of the book), ask students such questions as "What can you tell me about the numbers in this situation? or What do you think about the comparison of..."(using the numbers as references). Engage students in choosing a set of facts from the book to consider as a mathematical situation. Then choose the corresponding mathematical facts to discuss. On page 37: "Over short distances, the pronghorn antelope of North America can run more than twice as fast as a charging African elephant." On page 36: "Despite its great bulk, a charging African elephant can hit 25 mph, easily outrunning a human athlete." Ask, "What question can we ask that can be answered with this information?" Help students articulate the question: "How fast can a	Introduction: Tell students they will use multiplication to solve word problems. Tell students they will create word problems using the topic of an amusement park. Brainstorm: the people, rides, games, food, tickets, and souvenir shops they might see at an amusement park. Write an example on the board. After students have had time to work, ask volunteers to share one of their problems. Discuss if it is indeed a word problem that require multiplication. These problems can be used throughout the unit as review. Present the following word problems: **"At the amusement park, Kelly bought three strips of tickets. Each strip had four tickets. How many tickets did Kelly have?"** **"At the amusement park, Stan had three tickets left for the rides. His brother Ron had four times as many tickets as Stan. How many tickets did Ron have?"** Ask students to discuss the similarities and differences between these two problems. Looking at the first problem, ask students to generate at least two different ways of solving the problem and record the	Introduction: Ask the following question- "Can someone summarize how you know when to use multiplication to solve a word problem? What clues help you?" Present the following problem: **"An amusement park ride has 12 cars. Each car can carry three people. How many people can the ride carry?"** Provide Unifix cubes or base-ten blocks for students to solve the problem. Ask students to share their solutions. Two possible strategies might include making groups of three cubes and then counting up by threes 12 times or making a list of 12 threes to add (repeated addition). Other students might think (6 x 3) + (6 x 3). Students break apart products into the sum of simpler products using multiplication facts they know. Students may not know 12 x 3, but they know they can break 12 into two groups of 6. Another approach might be to break apart, or decompose, 12 to (10 + 2) and think (10 x 3) + (2 x 3). As students discuss their strategies, point out how in each solution there are 10 groups of 3, with 2 extra groups of 3 that need to be added on. Record the following number sentence for students to see: (10 x 3) + (2 x 3) = 36. Ask students if the following is	Students will rotate between three different stations which include: **Station 1: Equation Writing** Provide the following word problems. Ask students to use different strategies to solve the problems and create as many varied equations as they can to solve the problems. Use the first word problem below to model that equations have equal signs: 3 x 15 = 15 + 15 + 15 = ____. In a package of chocolate chip cookies, Alice counted 15 cookies in each row and there were three rows in the package. How many chocolate chip cookies were in the package? On the classroom bookshelf, students counted eight mysteries. There were three times as many realistic fiction books as mysteries. How many realistic fiction books were on the classroom bookshelf? A farmer planted 16 rows of tomatoes. The farmer planted five tomato plants in each row. How many tomato plants did the farmer plant? **Station 2: Writing Word Problems**	Show students pictures of arrays. Have students make observations about how the arrays are arranged. Ask them how they could determine the amount in each array. Encourage students to generate varied strategies to determine the amount in each array (repeated addition, multiplying rows by the number in each row, counting, grouping together, counting by a certain number). Ask students to see if any items in the room are organized in an array. (Examples might be crayons in a box, chalk in a box, chairs in a row, monthly wall calendar, etc.) Provide additional contexts that facilitate thinking about arrays: There are three dozen eggs. How many eggs is three dozen? There are five 12-packs of soda. How many cans of soda are in five 12-packs? Ask students to draw a picture of the problem. Students can use pictures, dots, stars or any shape to represent the objects in their pictures. **"How many different ways can we solve this problem?"** Ask students to write the number sentences for their solutions. (5 x 6) + (5 x 6) = 5 x 12. Point out that the sentence also can be written as (6 x 5) + (6 x 5) = 12 x 5 by the

	pronghorn antelope of North America run?” Demonstrate how to write the chosen facts from the book and the related question on the poster paper. Leave room to illustrate the mathematical facts and the solution. As a class, discuss how to solve this problem with the blocks. Students may: Show 2 sets of 25 blocks using the place value mat and packed blocks. Show 25 blocks on one number line and 2 sets of 25 blocks on a second number line to model how far each animal can run in one hour. Ask the class to place the speed of the antelope (50 mph) in context. Ask, • How fast is that? • How long would it take the antelope to run to...? (a familiar distance) Ask for a student to volunteer to draw a block solution on the poster. Discuss how to write equations in order to represent what they did with the blocks. Record the equations on the poster. Some possible equations are: • 2 x 25 = 50 • 25 x 2 = 50 • 25 + 25 = 50 • 2 tens + 2 tens = 4 tens, 5 ones + 5 ones = 10 ones, and 40 + 10 = 50 • 5 + 5 = 10 and 10 + 20 + 20 = 50	methods on chart paper. Methods can include repeated addition (4 + 4 + 4 = 12); skip counting by 4s (4, 8, 12); writing a multiplication equation (3 x 4 = 12); and modeling using a manipulative (counters, chips) and then counting up the total. Ask students if they think they could use the same methods to solve the second problem and why. Give each student an index card. Present problems to the students. Ask students to write a number sentence for the word problem on the index card and hold it up. Remind students that when writing a number sentence for a multiplication problem, they need to use a multiplication sign and an equal sign. Use additional word problems to reinforce understanding if necessary. *Evaluation/Assessment:* Teacher observation Index-card activity to show understanding of the two types of multiplication problems; sharing and grouping	true or false: (10 x 3) + (2 x 3) = 12 x 3. Why? Ask students to generate as many true statements as they can to represent the solutions they found. Monitor student responses and guide thinking when necessary. Provide additional problems based on the amusement park context. Post some of the strategies that students used on chart paper and have students discuss the similarities between the strategies. Encourage students to try decomposing numbers to solve the multiplication problems.	Create two different word problems that require multiplication to solve. Then show at least two strategies you could use to solve each problem (see 4-1-1 Word Problem Template in the Materials section). Remind students that when writing a word problem, they need to use a question mark. **Station 3: Writing Numbers in Expanded Notation (Distributive Property over Addition)** Provide the following number sentences and ask students to explain if the sentences are true or false and how they know. (10 x 4) + (3 x 4) = 13 4 True or False? How do you know? 24 x 4 = (20 x 2) + (4 x 2) True or False? How do you know? 18 x 6 = (10 x 6) + (8 x 6) True or False? How do you know? Observe and listen to students as they model multiplication problems using Unifix Cubes. Monitor for understanding. Correct any misunderstandings. Ask students to solve 18 x 7 as a journal response. Then have students explain what they did and why they did each step. Finally ask students to explain	commutative property. (10 x 3) + (2 x 3) = 12 x 3. Look for opportunities to point out the properties in their solutions. Present the following problem: **“Four girls saw a strip of unusual stickers for $0.45 at the school store. Each girl had a dime and two pennies left over from buying lunch. The girls combined their coins on the counter of the store. Did they have enough to buy the strip of stickers?”** Encourage students to explain how they would approach this problem. Try to get them to focus on the idea of putting like coins together. In the first problem, putting the 4 dimes together gives $0.40 (4 x 10), and putting all the pennies together gives 8 pennies (4 x 2). Encourage students to represent the grouping of the 10s and singles using pictures (four rows of 10 dots each and four rows of two dots each displayed right next to the previous amount. Use the grid paper to color in the amount (4 x 10) + (4 x 2). Ask students to label the parts of the rectangular grid. Use “4” to label the width and “10 + 2” to label the length of the rectangle. Ask, **“Can someone explain what the first section represents?”** (4 groups of 10, 4 girls each had a dime (10 cents) **“the second section?”** (4 groups of 2, 4 girls each had

	Discuss what their solution tells them about the pronghorn antelope. The answer of 50 means that the pronghorn antelope can run faster than approximately 50 mph. Record the answer on the poster. Pass out the poster paper. Have the groups work together to: Look through the book to choose a set of related mathematical facts. Record the related facts on the poster paper. Write a question for the facts on the poster paper. Distribute the blocks, place value mats with digit cards, and number lines. Have the groups: Use the Digi-Block materials to solve their question. Record their block solution on the poster paper. Also, have the groups include on the paper the following: Appropriate mathematical equation/s. The answer to their problem. Allow each group to present its poster to the class. Hang the posters in a prominent place. Have the class give positive feedback about the posters. Ask questions like, What do you like about each			why they used the strategy they did to solve the problem *Assessment/Evaluation:* Observation Checklist Teacher observation during guided practice and group activities.	2 cents) Probe with questions that encourage thinking about number relationships and properties (such as the distributive property). For example, **"What if the four girls each had two dimes and two pennies? What would we have to change in our rectangular array and why? How is this answer related to $0.48?"** Present the following problem: **"Four children saw a used kite in the window of a thrift shop. Each child had a quarter and three pennies. The price marked on the kite was $1.15. Can the children combine their coins to buy the kite? Explain."** This problem context encourages the children to combine all the quarters together to make $1.00 and combine the pennies together to make 12 cents. Pass out base-ten grids. Ask students to outline the rectangular array that will represent the problem $0.28 4. (Four rows of 28 squares) The base-ten grid paper points out the groups of 10 in 28 with the 8 added on. Use additional multiplication problems similar to the one above to reinforce understanding if necessary. Provide problem sets for students to answer. Encourage

	poster? Which posters are very clear and easy to understand? Which solution methods are presented well? *Assessment/Evaluation:* Teacher observes for the following: Do students choose appropriate facts from the book? Do students write an appropriate mathematical question with their selected facts? Do students find the correct answer to their question? Do students clearly write or illustrate the facts, their question, and their solution on their poster?				them to use any strategy they have learned so far in the unit to solve these problems. Have students explain the relationship among the problems in each set. Have students draw rectangular arrays on the base-ten grid paper for the problem sets above. Students should label the rectangular array, making the connection to the related problems. Students should be asked to explain one of the drawings or expressions to demonstrate an understanding of multiplication by decomposition using arrays. Remind students to focus on 10s in these problems. *Assessment/Evaluation:* Array Practice Problems worksheet. Teacher observation of students solving multiplication problems using arrays.

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Student Activities and Timeline	Students write an appropriate question for mathematical facts presented in the book, The Incredible Comparisons. They use blocks to model and solve the problem. Students make a poster by writing the mathematical facts they chose, the question they wrote, and their block solution One student in each group will read the mathematical facts presented in the book. Another student will read the problem they wrote about the facts. A third student will describe how they solved the problem.	Students will work in a group and write word problems that would require multiplication. Remind them when writing a word problem, they need to put a question mark at the end. Students will record on chart paper any word problems created by the group. Students will identify the similarities and differences between two word problems. Students will write a number sentence for given word problems.	Students will use more than one way to solve word problems. Students will record the process they used along with number sentences for the solution. Students will discuss their strategies. Students will generate as many true statements as they can to represent the solutions they found. Students will solve problems using multiplication and record the number sentence for the solution process. Students will share their strategies with each other for students to solve.	Station 1: Students will use different strategies to solve the problems and create as many varied equations as they can to solve the problems. Station 2: Students will create two different word problems that require multiplication to solve. Then show at least two strategies used to solve each problem. Station 3: Students will explain if the sentences are true or false and how they know. Students will use Unifix cubes or base-ten blocks to model a multiplication problem. Students will write the number sentence on an index card for each problem modeled and hold the card up. Repeat using two or three other examples. Then have students explain to a partner how they would solve a problem like 14 x 5. Students will solve 18 x 7 as a journal response. Then explain what they did and why they did each step.	Students will generate varied strategies to determine the amount in each array. Students will draw a picture of a problem. Students can use pictures, dots, stars or any shape to represent the objects in their pictures. Students will write number sentences for their solutions. Students will outline rectangular arrays that represent specific problems. **Extension:** Students who have mastered the concept quickly or easily can think about how to solve a two-digit by two-digit multiplication problem using arrays. Have them test their theory. Students could write word problems to solve and exchange their problems with a partner. This will provide additional practice and the added complexity of translating a story into symbols to reach a solution.

Part I: Observation Checklist (On-going Assessment)

This checklist will be used throughout the unit to observe and document students' understanding of using multiplication to solve word problems.

Observation Checklist

Using Multiplication to Solve Word Problems
Observation Checklist

P - Proficient
M - Making Progress
N - Needs Support

Student name	Create word problems			Create a number sentence for a word problem			Develop strategies to solve a word problem			Use decomposing of numbers to solve a multiplication problem		
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N
	P	M	N	P	M	N	P	M	N	P	M	N

Summative Assessment

Part II: The students will use Unifix cubes or base-ten blocks to solve multiplication word problems. They will then draw pictures to the solve word problems and write equations used to solve the problems.

MULTIPLICATION

1. Use Unifix cubes or base-ten blocks to solve the following multiplication word problem.

   There are 4 boxes with 14 bouncy balls in each box. How many bouncy balls are there in all?

   In the box below, draw a picture of what you did to solve the problem.

   Answer: _____

Write an equation that can be used to solve this word problem. _____

2. Use Unifix cubes or base-ten blocks to solve the word problem below.

   There are 13 tables set up at a party. Each table has 6 guests. How many guests are seated at the party?

   In the box below, draw a picture of what you did to solve the problem.

   Answer: _____

Write an equation that can be used to solve this word problem. _____

Write a different equation that can be used to solve this word problem. _____

3.

$$12 + 12 + 12 + 12 + 12 = 60$$
$$12 \times 5 = 60$$
$$(10 \times 5) + (2 \times 5) = 60$$

The equations in the box above all represent the same multiplication problem. How do you know?

_____

_____

_____

Write a word problem using one of the above equations.

Think...

- What might 12 represent? There are 12 what? _____
- What might 5 represent? There are 5 what? _____

Remember that when writing a word problem, you need to use a question mark.

Word problem: _____

_____

_____

Scoring for Summative Assessment:

1. Answer = 56 (10 points)
   Drawings should display one of the following: (10 points)
   4 rows of 14 objects or 14 rows of 4 objects
   Equations: 14 x 4 = 56 or 14 + 14 + 14 + 14 = 56 (10 points)
2. Answer = 78 (10 points)
   Drawings should display one of the following: (10 points)
   13 rows of 6 objects or 6 rows of 13 objects
   Equations (must show 2): 13 + 13 + 13 + 13 + 13 + 13 = 78
   13 x 6 = 78
   6 x 13 = 78
   (20 points)
3. Part I: Answers may vary but must include the following information:
   Each equation shows a sum of 5 groups of 12 (10 points)
   Part II: Students will write a word problem using one of the equations listed in Part I. Answers will vary. (20 points)

   Total points = 100
   Mastery is set at 80%. Students must achieve 80 points for mastery.