Standards addressed by these experiences:
3.OA.1 Interpret products of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 x 7.*
3.OA.3 Use multiplication and division within 100 to solve word problems in situations **involving equal groups,** arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Materials:
- 11 pieces of chart paper- Label each with one group, 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 11s, 12s, and post around the room
- Markers
- Math Notebooks

Big Idea: Students will connect the idea of groups of to multiplication through an exploration of things that come in groups.

This is a four day lesson process.

Day 1

Pose the following problem to students:

1. How many gloves are needed for 4 people? Ask students to share their strategies and record their ideas on the board. Have each student explain their thinking. (Some notation may be 2 + 2 +2 + 2 = 8, or 2, 4, 6, 8, or 2 x 4 = 8, just record what the students say)
2. Pose another problem: How many gloves would we need for everyone in our class? Ask students to discuss in small groups and solve the problem. Ask groups to share their thinking and record their ideas on the board. Make sure to use mathematical notation to record student thinking.
3. Have the class brainstorm other things that come in twos (i.e. hands, ears, eyes, etc.) If students only list things in one category (i.e. body parts), offer other suggestions to broaden their thinking (i.e. bike wheels, chopsticks, etc.)
4. Tell students their task is to think of other things that come in groups. Call their attention to the charts posted around the room. Tell students they are to work in pairs to come up with different things that come in groups of a specified number. Assign each pair to a chart and have them work at that chart for a few minutes. Then have student pairs move to the next chart in a carousel activity. When all groups have added to each chart, bring student back in for discussion. (Variation- if you don't want to do the carousel activity- have students work in groups to come up with groups for each number)
5. Have student's study each list and see if there are any items that are disputed (i.e. someone puts octopus tentacles under 9 when they really have 8, etc.). Any ideas that can't be resolved put a "R" next to it for research later (great extension or homework idea).
6. For homework, have students go home and ask their family about other things that come in groups to add to the class list. Tell them to be ready share the next day.

Day 2

1. Begin by having students share some of the things they would like to add to each list and add them to the lists.
2. Reassign students to new student pairs and assign each group to a chart. Tell students that they are to write a problem about their group to share with the class. Tell them they must include the groups of idea in the problem (remind them of the gloves idea from the day before). Tell students, "On the back of your problem, show at least 2 ways you could solve your problem."
3. As students are working, monitor each group and ask guiding questions if they are stuck. Pay attention to the way they are writing their problems and how they are solving them. Look to see if they understand the groups of idea.
4. Have each group share their problem with the class and have others come up with ways to solve it in their Math notebooks. Pick students to share their ideas with the class and look for strategies that highlight groups of ideas. Have at least 2 students share their thinking with the class and have student compare their strategies and make connections between them. For example, consider the following possible problem for groups of 5.
    - Sandy found 4 starfish on the beach. Each starfish had 5 arms. How many arms in all?

      Possible solutions to highlight to compare and connect

      a) 5 + 5 + 5 + 5 = 20 (10 + 10 = 20) b) 5, 10, 15, 20 c) 4 x 5 = 20

NOTE: You can have students share all the problems in one day, or you could break it up and have one group share each day and have students solve and share their strategies as you go. If you choose to do one a day, you may try this order to help students build on previous relationships: 2s, 5s, 10s, 4s, 3s, 6s, 7s, 8s, 9s, 11s, 12s.

Day 3

This day will also address the following standard:

3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even and explain why 4 times a number can be decomposed into two equal addends.

Additional Materials for Day 3:

- 0-99 chart
- Each child needs a crayon or marker

1. Direct students back to the groups of chart made on day 1. Tell students that they will use items from this list to investigate patterns on the 0-99 chart.
2. Discuss the word multiple with students. Tell them that when we multiply numbers the answers to the problem are multiples of the two numbers that were multiplied. For example, when we multiply 4 x 5, 20 is a multiple of both numbers. Ask students if they know a multiple of 12. Have students share. If they are struggling, it may help to tell them that when you count by a number, the numbers you say are multiples of the original number. For example, when counting by 3; 3, 6, 9, 12. 12 is a multiple of 3.
3. Using ears as an example, pose the following problem: How many ears do six children have? Ask 6 students to come to the front of the class and have the class count their ears. Count by ones. Count by twos. Write the multiplication problem on the board 6 x 2 = 12. Explain how this equation relates to the problem: six groups of two ears means each student has 2 ears; six groups of two equals 12 eyes altogether.
4. Repeat the problem with eight children: How many ears do eight children have? Have two additional students come to the front and count again. Write the multiplication sentence 8 x 2 =16. Explain how eight groups of two ears is 16 ears. Tell students that 16 is a multiple of 8 and of 2.
5. Ask the class how many ears do three children have? Students may count 3, 6, 9 or then may say 3 x 2 =6. Ask all students to explain their thinking. Record the multiplication sentence on the board.
6. Help students set up a ratio table (t-chart) to help them discover the patterns in multiples. Draw the following on the board.

children	ears	
0	0	0 x 2 = 0
1	2	1 x 2 = 2

7. Continue the chart with students, writing the number of children and ears, as well as the multiplication sentence for each.
8. Have students say the multiples with you going down the chart, 0, 2, 4, 6, 8, 10, 12… Ask students what patterns they notice in the numbers. Have students justify their reasoning.
9. Show students a 0-99 chart and shade the multiples from the chart (0-24). Have the children describe the visual patterns they see and have them tell you the other numbers to color in the chart.
10. Tell students they are to investigate the pattern of another number (you can assign numbers or let students choose their own- but make sure all numbers are represented- for Unit 2 you can stick to the numbers 2, 3,4, 5 and 10, and use the other numbers [from Unit 5] to differentiate for students). Give each child their own 0-99 chart and tell them they need a crayon or marker. Have them consult the classroom charts made on day 1. Have them pick something from the chart to create their own multiples pattern from (i.e. starfish arms in groups of 5). Have them create a t-chart to find the multiples and then shade the multiples on their chart. They will discuss the patterns they found on day 4.

Day 4

Materials:

- **Students' 0-99 charts**

1. Post students' colored charts on the board for all to see, or use your document camera to share each number individually.
2. Lead a classroom discussion of what patterns they notice. The following are questions you may want to use to guide your discussion. You may want to record students' observations on an anchor chart during the discussion.
    - What patterns do you notice?
    - Which numbers have all even multiples?
    - Which numbers have all odd multiples?
    - Which numbers have some even and odd multiples?
    - Was there a number that was shaded on all the charts?
    - Are there any numbers that aren't colored on any of the charts?
    - Which patterns are the easiest to see?
    - Which patterns are the most difficult to see?
    - What do you notice about the number of multiples as the start number increases? (the bigger the number is you start with, the fewer multiples there will be)

3. To end the lesson, have students record some of their observations from discussion today and reflect on what they noticed in their math notebooks. After a few minutes of writing, have students share out.