Making Multiplication Circle Patterns

Lesson Summary

- Students will explore pictorially the patterns created by the terminating digit in the various times table chart facts and record their observations to share with the class.

Standards

- CCSS.Math.Content.3.OA.7 Fluently multiply and divide within 100 using strategies such as the relationship between multiplication and division (e.g. knowing that 8 x 5 = 40, one knows 40/5 = 8) or properties of operations. By the end of grade 3, know from memory all products of two 1-digit numbers.
- CCSS.Math.Content.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.
- CCSS.Math.Practice.7.Look for and make use of structure. Mathematically proficient students look closely to discern a pattern or structure.

Assessment

- Each group will record their observations on chart paper and present this to the class.
- The teacher will also move about the room to make anecdotal observations of student work focusing on:
    - Are students demonstrating an understanding of their multiplication facts?
    - Are students making connections between fact families that create similar patterns?
    - Are students using good mathematical language and engaging in mathematical discourse?

Materials

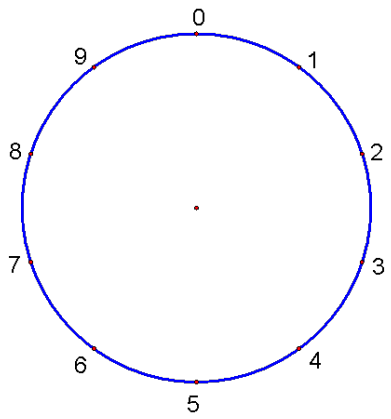
- Circle template sheets (one per child)
- Chart Paper, 1 per group
- Markers
- Tape
- Multiplication Charts
- Rulers
- Pencils

Procedure

Pass out rulers and one circle sheet packet for each child.

Tell students that today we are going to explore some patterns that we can find in the multiplication chart. In math we often look at patterns in different ways. Sometimes we build patterns with concrete materials, sometimes we look at number patterns, and sometimes we draw pictures of patterns. Today we are going to use number patterns to create pictures.

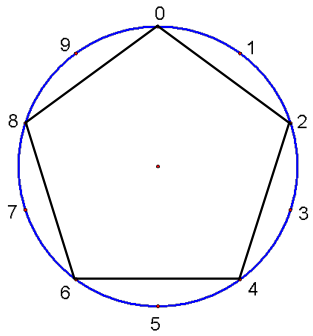
Demonstrate the number circle by counting with the students from 1 to 20. Pause at 10 to explain how the zero only tells us about the one's place digit, and then proceed to 11, 12 and so on.



Demonstrate how to complete the pattern with the multiples of 2. Use either the template with the t-chart or a blank piece of paper to write down the multiples of 2. Then use a ruler to draw a line from 0 to 2 to 4 and so on. Help students to notice when you get to 2 x 6, that the pattern goes back to the 2 and then to 4 and 6 and 8 and so on. Ask questions like:

- Do you think I would ever hit 3 if I keep going?
- Will it always follow this pattern?
- Do you think other multiplication fact families would make different patterns?
- Ask students to come up with their own questions.

Tell students to record the 2 pattern on their circle sheet that they have been given and to write "x 2" in the center of the circle.



Have the students make circles for each of the other facts from 1 to 9 and then make as many observations as they can about the patterns that they have created. Have students record their observations At the bottom of the last page. Have students discuss the observations with their group and write them on the chart paper. Students will present their observations to the class.

As the students work, circulate and ask appropriate probing questions:

- Are there any fact families that hit every number?
- Are there some fact families that make the same pattern? Do they create it in the same way?
- Is there a relationship between the facts that create the same patterns?

Have 2 members from each group present their observations to the class. Work together to create a list of observations that are true from what all of the groups have observed. Students should notice that:

- No even number multiplication fact can ever have an odd number one's place digit. (2, 4, 6, 8 only hit 2, 4, 6, 8, and 0).
- 5 only hits 5 and 0 so it is a straight line.
- 1, 3, 7, and 9 hit all possible one's place digits.
- Make tens partners create the same circle pattern (1 and 9 make the same pattern, 2 and 8 make the same pattern and so on). Some students may further observe that these patterns are created in the opposite order (ex 2 starts at two and makes the pattern in a clockwise direction, whereas 8 starts at 8 and goes in a counter clockwise direction to make the pattern).

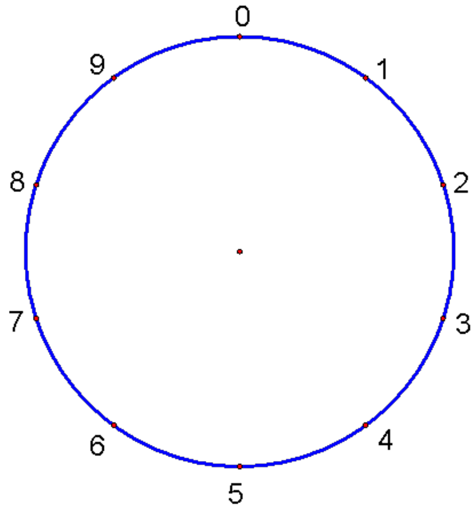
Extensions

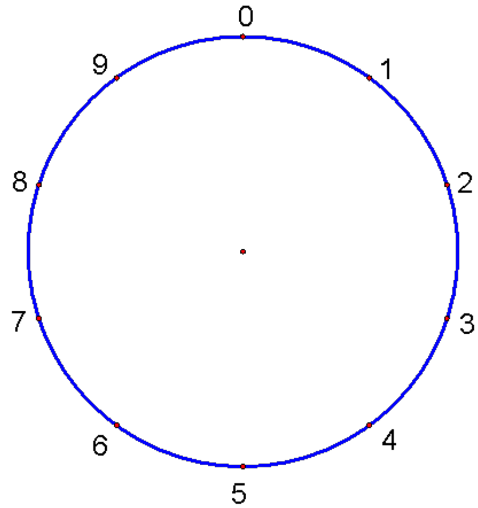
Groups that finish early can continue to draw multiplication facts for facts above 9 (10, 11, 12, etc.), still charting only the ones digits. Ask students to make connections between what they observed with the 1-9 facts and these extended facts.

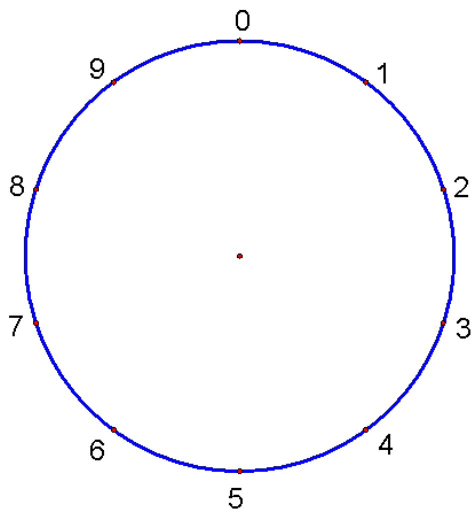
Follow-up Activities

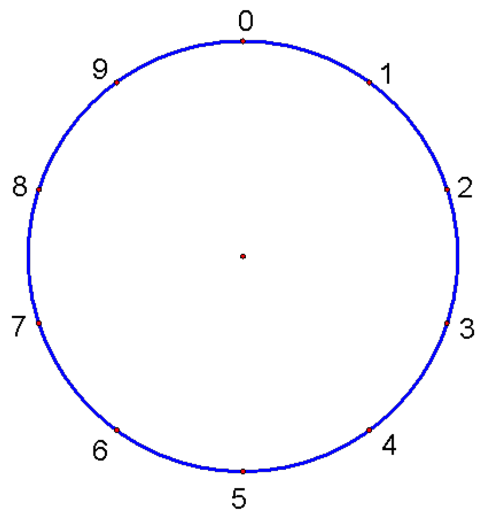
- Write a journal entry about the circle patterns you observed today in class. Was there anything that you found surprising?

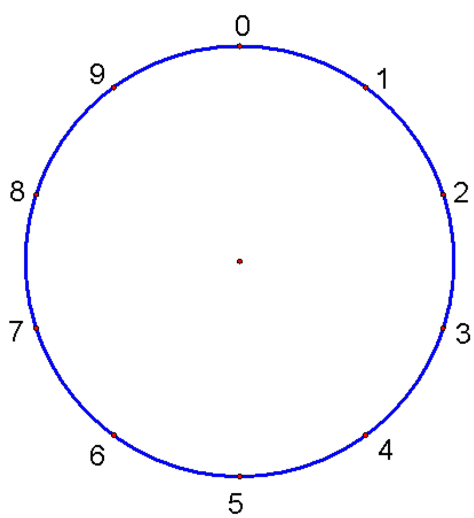
Make a circle pattern for each fact family from 1 to 9.

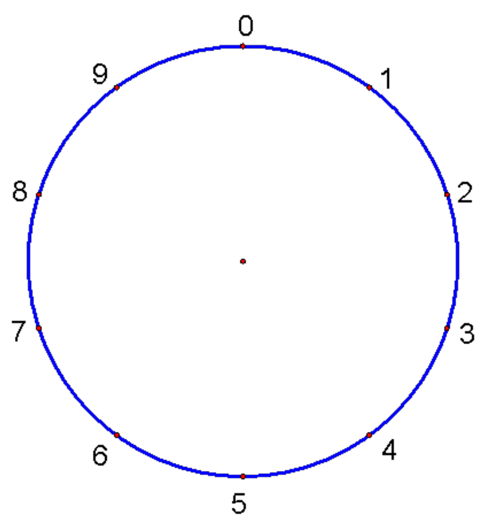


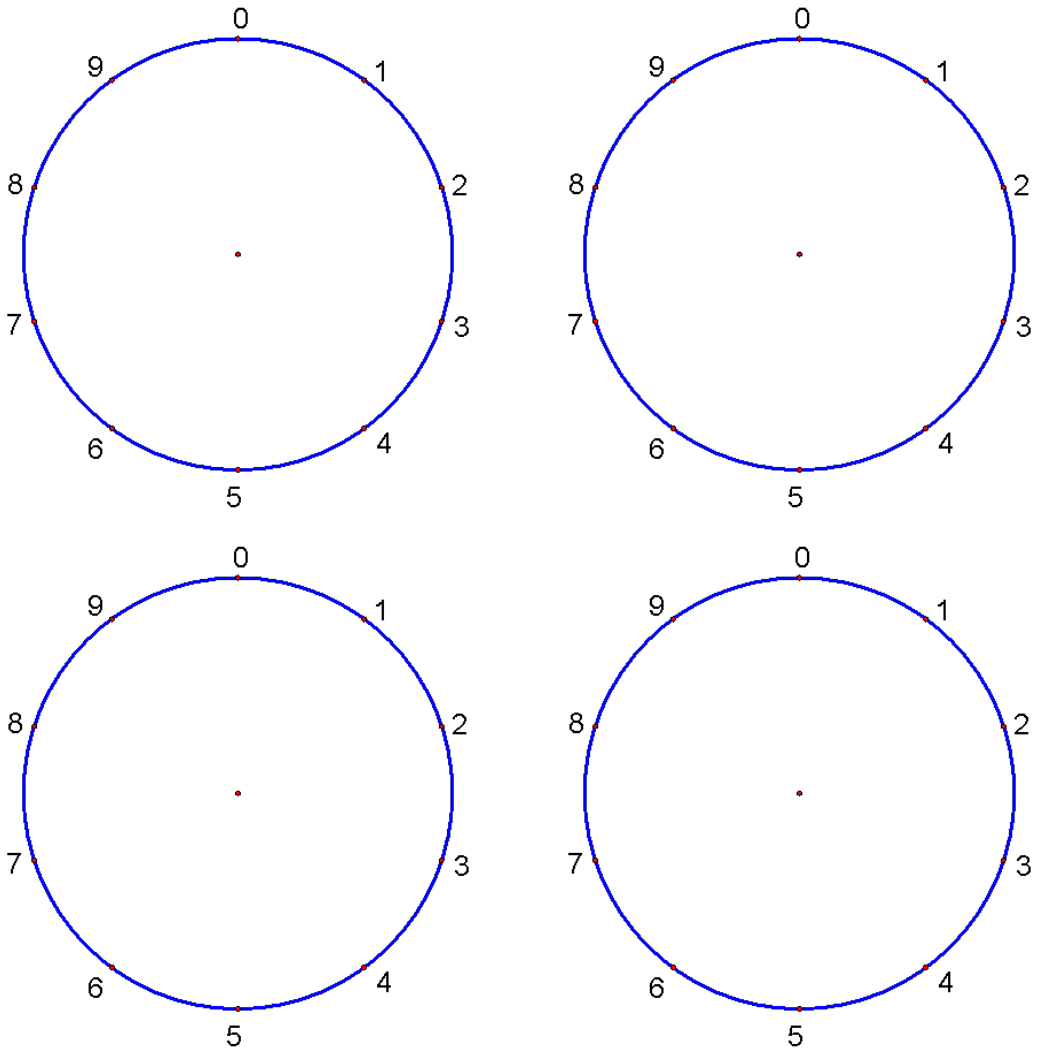




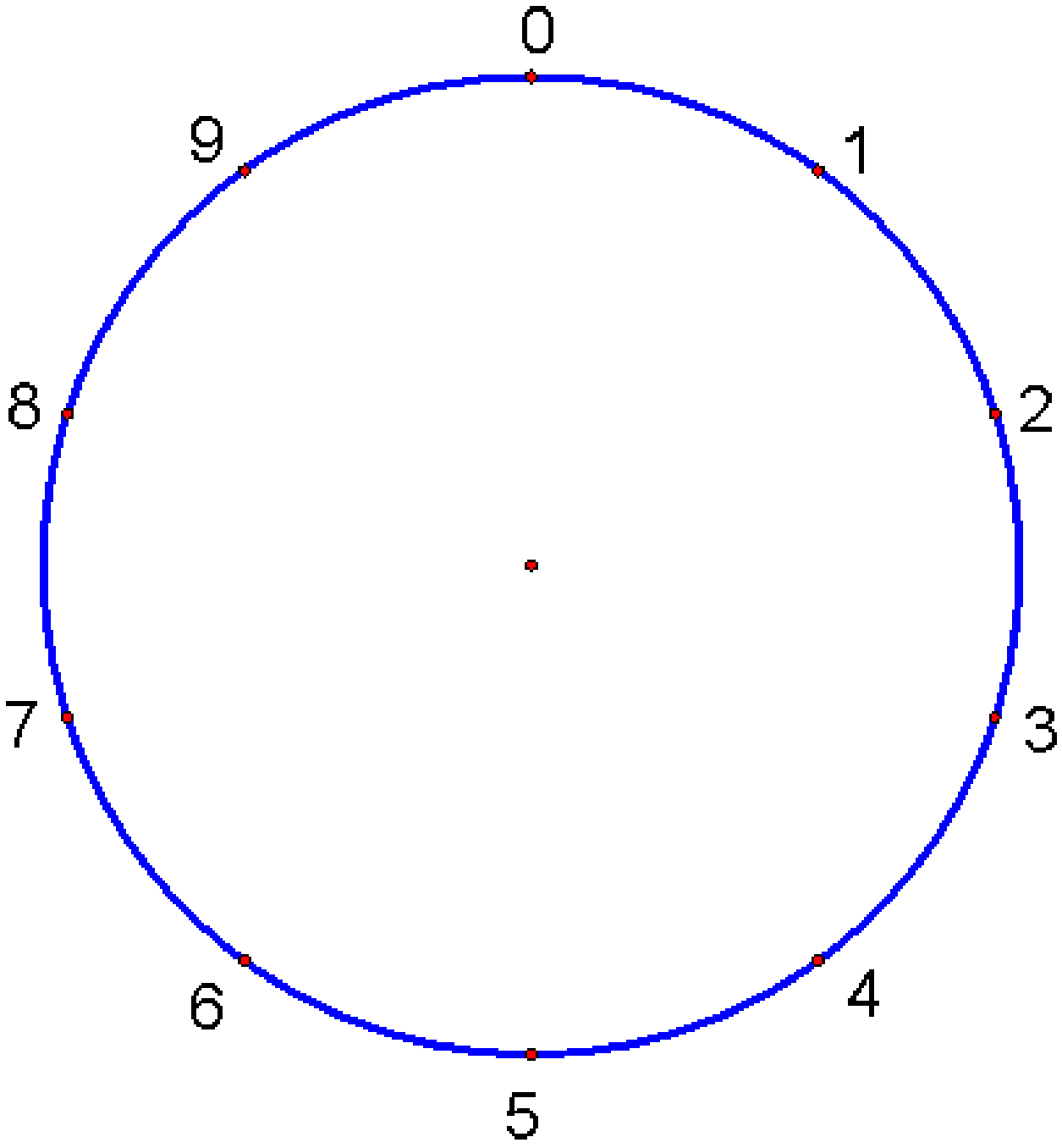








Record your observations about the patterns that you made.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