

EXPLORATION 3.7 **Patterns in the Multiplication Table****PART 1: Base 10**

1. Examine the multiplication table and describe the patterns that you see.

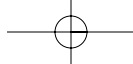
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

2. Select one pattern that your group will share with the class.
- Describe this pattern, as though you were talking on the phone to a friend who missed class today but who has a multiplication table handy. The purpose of your description is simply to get the person to see the pattern.
  - Exchange descriptions with another group. If they easily interpreted your description, great. If not, revise your description (like a second draft of an essay). Discuss the parts of your description that were not clear to the other group. That is, what was unclear about them, and why do you think the revised wording is better?
  - What did you learn from describing a pattern and reading another group's description?
3. Now explain *why* the pattern occurs.

**PART 2: Circle clocks**

Circle clocks (also called star patterns) have been used by many teachers to introduce many different mathematical concepts and to provide a visual connection for these ideas. The following steps use these circle clocks to give you another perspective on the basic multiplication facts.

Take out the Base 10 Circle Clocks on page 73. You will draw on one clock for each of the rows in the multiplication table from 2 through 9. The directions are to look only at the units digit. For example, if we look at the multiplication facts in row 2 and write down only the units digit, we have 2, 4, 6, 8, 0, and then the numbers repeat. Start your pencil at 2 on the circle; then draw a line from 2 to 4, then from 4 to 6, and so on.

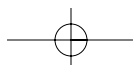
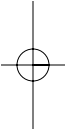
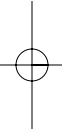
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1. Complete the circle clock for the multiples of 2, and describe the pattern as though you were talking to someone on the phone.
2. Complete the circle clocks for each of the other multiples.
3. What similarities do you see among the different circle clocks? Can you explain why those similarities occur?
4. Predict the shape of the circle clock for the multiples of 11. Explain your reasoning. Then draw the pattern. If your prediction was correct, great. If it wasn't, or if you weren't able to make a prediction, either describe the knowledge that you weren't able to apply or describe what enables you to understand why the pattern is what it is.

**PART 3: Other bases**

Make a set of multiplication tables in different bases determined by your class or your instructor.

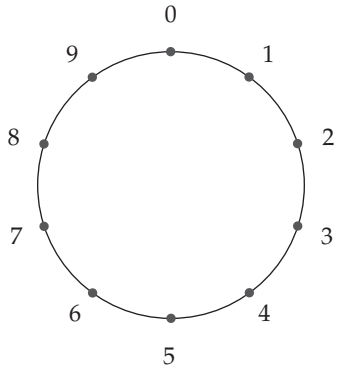
1.
  - a. Describe patterns that seem to be true in all bases.
  - b. Describe patterns that are true in some but not all bases.
2. Select one pattern and describe the pattern, as though on the phone to someone who has the tables in front of him or her.
3. Now describe the *why* behind the pattern.



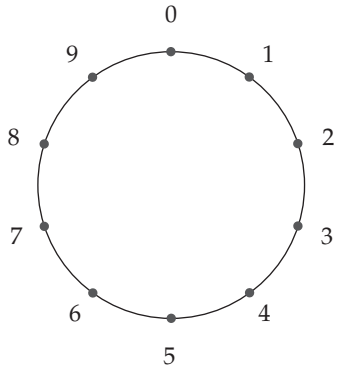
### Base 10 Circle Clocks for EXPLORATION 3.7, PART 2

#### Base 10 Circle Clocks

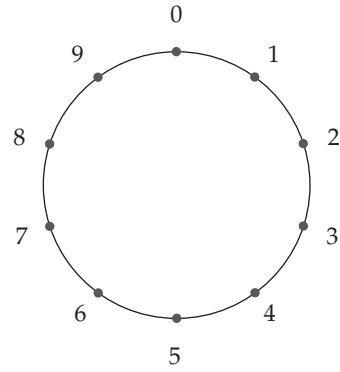
Counting by 1



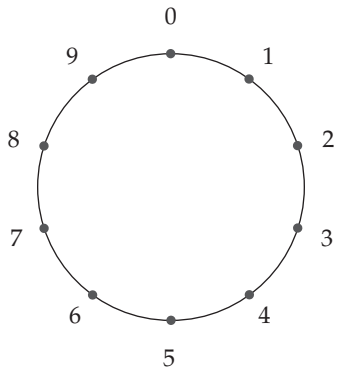
Counting by 2



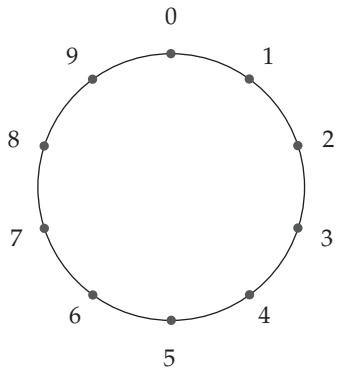
Counting by 3



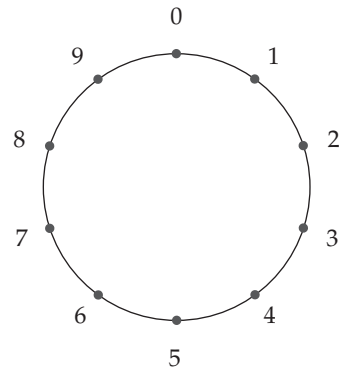
Counting by 4



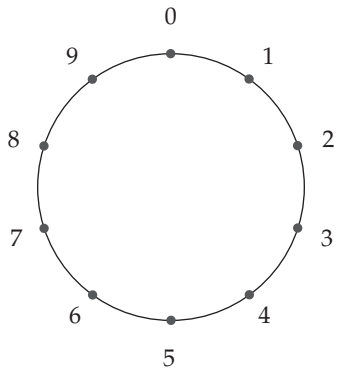
Counting by 5



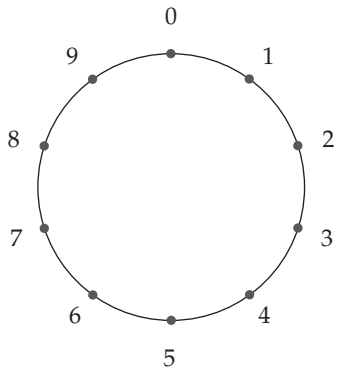
Counting by 6



Counting by 7



Counting by 8



Counting by 9

