MULTIPLICATION TABLE PATTERNS

Objective: Investigate patterns found in multiplication tables.

Materials: Multiplication Table
Multiplication Table Transparencies
Overhead markers
Investigations handout

Procedures:

1. Using a Multiplication Table Transparency, illustrate some of the patterns found.
   • The diagonal from upper left to lower right contains the square numbers.
   • The Multiplication Table is a set of equivalent fractions. As an example, hi-light the lines containing 3 and 5 and you will see equivalent fractions.

3	6	9	12	15	18	21	24	27
5	10	15	20	25	30	35	40	45

2. Ask participants if they notice any patterns.
3. Pass out facts tables and give participants about five minutes to look for patterns. Then hand out the Investigations for them to explore.

Extensions:

1. Use tables extended to include twelves.
2. Have participants generate a multiplication table using a spread sheet.

Notes:

1. This activity can be adjusted for a variety of time needs.
2. Participants might need calculators for some of the investigations.

X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

X	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

Relations and Functions Session
Investigations on the Multiplication Table

Investigation One:

Find the sum of each of the diagonal rows (running from upper right to the lower left) of the multiplication table. Multiply each sum by 6. Write the products as factors of consecutive numbers. What patterns do you notice?
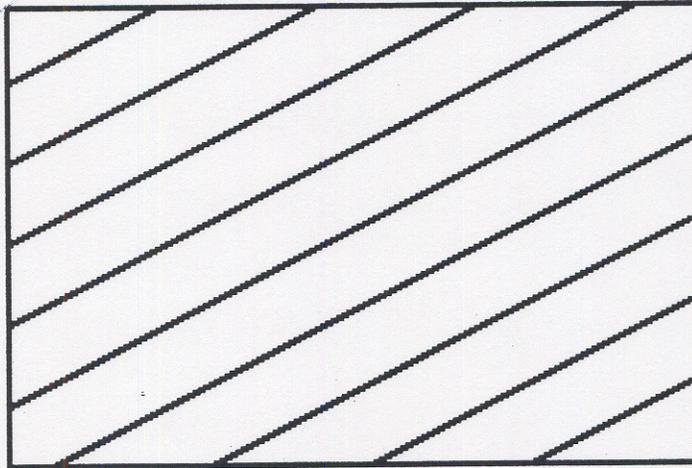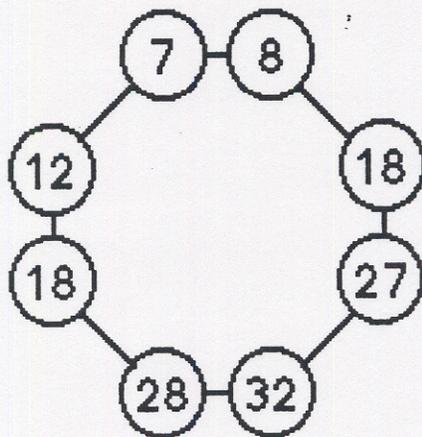

Investigation Two:

Select a portion of the multiplication table. Make a rectangle around the products listed on the table. The rectangle you make must contain numbers on the same rows and columns. Find the product of the four vertices located on the rectangle. What patterns do you see?

Investigation Three:

Select a portion of the multiplication table. Make a rectangle around the products listed on the table. The rectangle you make must contain numbers on the same rows and columns. Find the sum of the four vertices located on the rectangle. Locate the number of the row and column where the vertices are located. Do you notice any relationship between the row or column numbers and the sum of the vertices?

Investigation Four:

Make a non-lopsided octagon overlaid on the multiplication table. Find the product of the eight numbers in the circles. Repeat the process at least two more times. What is true of the products formed?

Relations and Functions Session
Investigations on the Multiplication Table

Investigation One:
Sum all the diagonal rows (running from upper right to the lower left) of the multiplication table. Multiply each sum by 6. Write the products as factors of consecutive numbers. What patterns do you notice?

$$1 \times 6 = 6 = 1 \times 2 \times 3$$
$$4 \times 6 = 24 = 2 \times 3 \times 4$$
$$10 \times 6 = 60 = 3 \times 4 \times 5$$
$$20 \times 6 = 120 = 4 \times 5 \times 6$$

Investigation Two:
Select a portion of the multiplication table. Make a rectangle around the products listed on the table. The rectangle you make must contain numbers on the same rows and columns. Find the product of the four vertices located on the rectangle. What patterns do you see? *The product is the square of the product of the two vertex numbers at opposite ends of either diagonal.*

Investigation Three:
Select a portion of the multiplication table. Make a rectangle around the products listed on the table. The rectangle you make must contain numbers on the same rows and columns. Find the sum of the four vertices located on the rectangle. Locate the number of the row and column where the vertices are located. Do you notice any relationship between the row or column numbers and the sum of the vertices? *The sum of the beginning and ending rows is one factor and the sum of the beginning and ending columns is the other factor. Multiply the two factors together and the answer equals the sum of the four vertices. An example:*

2	4	6	8
3	6	9	12
4	8	12	16

The 2 is in the second row first column. The 8 is in the second row fourth column. The 4 is in the fourth row first column. The row sum is 2 + 4 = 6 and the column sum is 1 + 4 = 5. So, 6 x 5 = 30. The sum of the four vertices is 2 + 8 + 4 + 16 = 30.

Investigation Four:
Make a non-lopsided octagon overlaid on the multiplication table. Find the product of the eight numbers in the circles. Repeat the process at least two more times. What is true of the products formed? *The product is always a square number.*