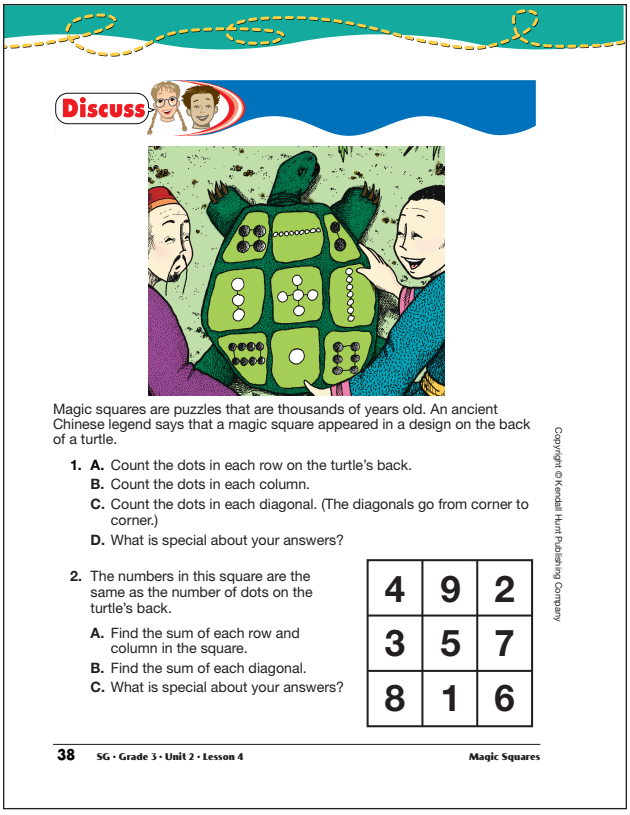
Student Guide

Magic Squares (SG pp. 38–39)
Questions 1–5

1. **A.** 15
   B. 15
   C. 15
   D. They are all the same.
2. **A.** 15
   B. 15
   C. The sum of each row, column, and main diagonal is 15.
3. * 21
4. * A is a magic square. B is not because the column sums are not the same. For example, the sum of the middle column is 15, but the sum of the third column is 17.
5. **A.** * 15
   B. * Possible response: All of the numbers are odd. There are only three different numbers instead of nine.
   C. * The middle number, 5, is in the center of the square. The numbers in one of the diagonals are in order—3, 5, 7.



Discuss

Magic squares are puzzles that are thousands of years old. An ancient Chinese legend says that a magic square appeared in a design on the back of a turtle.

1. **A.** Count the dots in each row on the turtle's back.
   B. Count the dots in each column.
   C. Count the dots in each diagonal. (The diagonals go from corner to corner.)
   D. What is special about your answers?
2. The numbers in this square are the same as the number of dots on the turtle's back.
   A. Find the sum of each row and column in the square.
   B. Find the sum of each diagonal.
   C. What is special about your answers?

4	9	2
3	5	7
8	1	6

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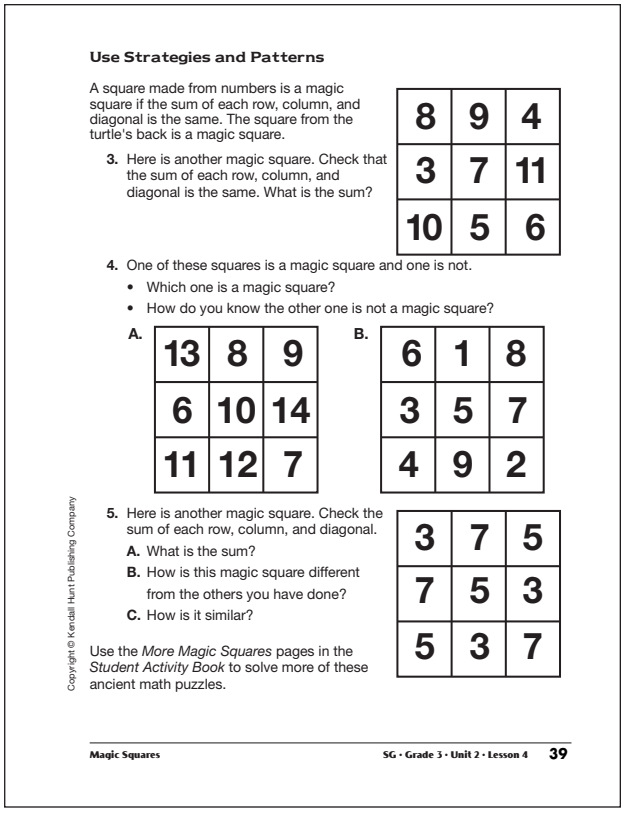

Use Strategies and Patterns

A square made from numbers is a magic square if the sum of each row, column, and diagonal is the same. The square from the turtle's back is a magic square.

8	9	4
3	7	11
10	5	6

3. Here is another magic square. Check that the sum of each row, column, and diagonal is the same. What is the sum?
4. One of these squares is a magic square and one is not.
   - Which one is a magic square?
   - How do you know the other one is not a magic square?

A.

13	8	9
6	10	14
11	12	7

B.

6	1	8
3	5	7
4	9	2

5. Here is another magic square. Check the sum of each row, column, and diagonal.
   A. What is the sum?
   B. How is this magic square different from the others you have done?
   C. How is it similar?

3	7	5
7	5	3
5	3	7

Use the *More Magic Squares* pages in the *Student Activity Book* to solve more of these ancient math puzzles.

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***Answers and/or discussion are included in the lesson.**

Name _____ Date _____

More Magic Squares

1. Use what you have learned about magic squares and the digits 4, 6, 8, and 9 to complete this magic square.

7	12	5
		10
11		

2. Here is another incomplete magic square.
   - **A.** Fill in the empty boxes to make a magic square that has three 1s, three 5s, and three 9s.
   - **B.** Find another solution for the blank magic square below that also uses the digits 1, 1, 1, 5, 5, 5, 9, 9, 9.
   - **C.** Show or tell the strategy you used to find the sum of each row, column, and diagonal.

9	1	
	5	
		1

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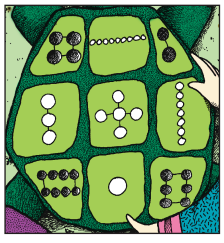
Name _____ Date _____

3. **A.** Fill in the empty boxes. This magic square uses the digits 3, 3, 3, 7, 7, 7, 11, 11, 11.
   - **B.** Show or tell the patterns you used to help you complete the square.

3	11	7
		11

4. Arrange 1, 2, 3, 4, 5, 6, 7, 8, 9 into a magic square that is different from the one on the back of the turtle.



5. Challenge:
   - **A.** Find as many different magic squares as you can with the numbers from the square in Question 2.
   - **B.** Find as many different magic squares as you can with the numbers from the square in Question 3.
   - **C.** How are the solutions to the magic squares in Parts A and B alike?

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Student Activity Book

More Magic Squares (SAB pp. 43–44) Questions 1–5

1.

7	12	5
6	**8**	10
11	**4**	**9**

2. **A.**

9	1	**5**
1	5	**9**
5	**9**	1

B. For a list of all possible solutions, see 5A.

C. Answers will vary. The diagonals have the same middle number, 5. Each row and column has one of each number. The sums are the same. All the numbers are odd.

3. **A.**

3	11	7
11	**7**	**3**
7	**3**	11

B. Possible response: I knew that each row, column, and diagonal had to have a 3, 7, and 11. I also knew that 7 would be in the middle square since it is the middle number in this group of numbers. The first row was done and the last column already had 7 and 11 in place, so I added the 3 in the last column. Since I had put 7 in the middle square, I knew I had to put an 11 in the second row, first column. Then I could finish the last row with the 7 and the 3.

4. Possible solutions:

2	9	4
7	5	3
6	1	8

8	1	6
3	5	7
4	9	2

4	3	8
9	5	1
2	7	6

6	1	8
7	5	3
2	9	4

8	3	4
1	5	9
6	7	2

6	7	2
1	5	9
8	3	4

2	7	6
9	5	1
4	3	8

5. A. The four solutions are listed below.

9	1	5
1	5	9
5	9	1

5	9	1
1	5	9
9	1	5

1	9	5
9	5	1
5	1	9

5	1	9
9	5	1
1	9	5

B. The four solutions are listed below:

3	11	7
11	7	3
7	3	11

7	11	3
3	7	11
11	3	7

11	3	7
3	7	11
7	11	3

7	3	11
11	7	3
3	11	7

C. Possible response: All of the solutions use only odd numbers. The middle number in each list is always in the middle square of the magic square. There are four solutions for each set of numbers. There is always one diagonal in each solution that has three numbers that are the same.

Name _____ Date _____

Homework

Dear Family Member:

Magic squares are ancient number puzzles that have intrigued people for thousands of years. In a magic square, the numbers in the rows, columns, and diagonals all have the same sum. Here is a magic square with the sum 15. Thank you.

2	7	6
9	5	1
4	3	8

1. Here is an incomplete magic square:

3	9	6
	6	
6		

A. What is the sum of the first row? _____

B. Use 3, 3, 9, and 9 to complete the magic square. Remember that each row, column, and diagonal must have the same sum.

2. Which of the following is a magic square?

A.

7	14	9
12	10	8
11	6	13

B.

11	6	13
7	11	15
14	10	9

Explain why the other one is not a magic square.

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Name _____ Date _____

3. Here is an incomplete magic square.

A. What is its sum? _____

B. Use the digits 5, 7, 11, and 12 to complete the magic square.

6	13	8
	9	
10		

4. Find a different magic square that uses the same sum and numbers as the one in Question 3. Use the digits 5, 6, 7, 8, 9, 10, 11, 12, 13.

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Student Activity Book

More Magic Squares (SAB pp. 45–46)

Homework

Questions 1–4

1. **A.** 18

   B. The following is one of four solutions.

3	9	6
9	6	3
6	3	9

2. A is a magic square. B is not because the rows, columns, and diagonals have different sums. For example, the sum of row 1 is 30. The sum of row 2 is 33.

3. **A.** 27

   B.

6	13	8
11	9	7
10	5	12

4. There are seven more possible solutions.

10	5	12
11	9	7
6	13	8

12	5	10
7	9	11
8	13	6

8	13	6
7	9	11
12	5	10

12	7	8
5	9	13
10	11	6

6	11	10
13	9	5
8	7	12

8	7	12
13	9	5
6	11	10

10	11	6
5	9	13
12	7	8