



Cumberland County Schools

Objective 5.04 – Finding Unknowns

Lesson Title: Finding Unknowns
Curriculum Area: Mathematics
Grade: Third Grade
Time: 60 minutes

I. PLAN

- A. NCSCS Goal 5:**
The learner will recognize, determine, and represent patterns and simple mathematical relationships.
- B. NCSCS Objective**
5.04 - Find the value of an unknown in a number sentence.
- C. CCS Task Analysis:**
TLW: Recognize given symbols as the unknown in a number sentence.
TLW: Solve for non-numeric symbols in problems.
TLW: Create a picture to display solutions for non-numeric symbols.
- D. CCS Pacing Guide:**
Quarter: Third
Week(s): 1-2
- E. Lesson Background:**
Strand: Algebra
Marzano Level: Analyzing
- F. Materials:**
- Story, Ben Franklin and the Magic Squares, by Frank Murphy
 - Number tiles
 - Copies of Magic Square 15; one for each student and one overhead (Attachment A)
 - Copies of additional magic squares; one for each student and one overhead (Attachment B)
 - Teacher copy of answer key (Attachment C)
 - TI - 15 calculators
 - Small counting manipulatives such as unifix cubes for each student
 - Word Problems (Attachment D)
 - Spinner (Attachment E)
 - Number Cards (Attachment F)
 - White board
- G. Prerequisite Skills:**
- Knowledge of addition and subtraction
 - Ability to use basic calculator functions
- H. Essential Question(s):**
- What strategies can be used to solve problems for missing addends?

II. IMPLEMENT

A. Anticipatory Set:

Have children sit together for a read aloud of Ben Franklin and the Magic Squares. Stop reading the story before you get to the explanation of how he created the magic squares.

B. Teacher Input:

Tell the students that they are going to work on number puzzles that have missing parts. On the overhead show the following number sentence: $8 + \square = 12$. The teacher will think aloud about how he/she would solve this problem. Show a “count on” method. For example, the teacher can say, “Put 8 in my head and use my fingers to count on 9, 10, 11, 12. The answer is four, the number of fingers I am holding up.” The teacher will show the four fingers she used to count up. Math problems can be solved in many different ways. “I can find the answer to $8 + \square = 12$ another way.” The teacher will then show 12 manipulatives and take away 8, which will show a remainder of 4. The teacher will then write the solution for the problem on the board or overhead.

$$8 + \square = 12$$

$$\square = 4$$

$$8 + 4 = 12$$

Rehearsal: Rally Coach

Give students the following number sentence: $4 + \square = 9$. Have them pick a strategy of their choice to solve the equation. After each student has solved the equation, he/she will work with a partner to describe his/her solution and strategy. Student A will explain his/her solution strategy first. If Student A is correct, Student B will celebrate the correct answer. If needed, Student B coaches and then celebrates. The roles are then switched. Student B will explain his solution strategy. If Student B is correct, Student A will celebrate the correct answer. If needed, Student A coaches and then celebrates.

Teacher Input: Overhead of Attachment A

The teacher will show an overhead of the Magic Square 15. “I am going to try to figure out the same magic square pattern that Benjamin Franklin discovered in the story.” The teacher will begin by explaining to the students that only the numbers 1-9 can be used and each number can only be used one time. The teacher will also explain that the sum must be 15 whether you add vertically, horizontally, or diagonally. Use the think aloud strategy to solve the magic square.

8	1	6
3	5	7
4	9	2

After finding the correct number for each square, the teacher will finish reading Ben Franklin and the Magic Squares.

Rehearsal: Attachment A

Students will work in pairs to solve the magic square problem in a different way. Before the students begin working, have them use the Magic Squares sheet and fill in the largest square at the top of the page, using the same numbers that the teacher used. “Notice that there are three more magic squares at the bottom of the sheet. You and your partner are going to complete one more magic square. Be sure your numbers are arranged differently than mine.”

Teacher Input:

The teacher will show several alternative answers to the magic square that the students found while working. “Boys and Girls, when you were working to find where each number belongs within the magic square, you were finding the unknown. When we started our lesson today, you solved the problem $4 + \square = 9$ (rewrite the problem on the board for the students to see). In this particular problem the \square represented the unknown. The number that belongs in the box was unknown – you had to figure it out. With the magic square, each box was unknown. I had to figure out what to put into the boxes. So far, we have used a \square to represent an unknown.” The teacher will draw a box on the overhead or board. “We can also use different symbols instead of the \square to represent the unknown.” The teacher will rewrite the problem on the board, $4 + \odot = 9$. “With this problem the unknown is represented by a \odot instead of a box.”

Rehearsal: Rally Coach

Give students the following number sentence: $23 + \heartsuit = 30$. Have them pick a strategy of their choice to solve the equation. After each student has solved the equation, he/she will work with a partner to describe his/her solution and strategy. Student A will explain his solution strategy first. If Student A is correct, Student B will celebrate the correct answer. If needed, Student B coaches and then celebrates. The roles are then switched. Student B will explain his solution strategy. If Student B is correct, Student A will celebrate the correct answer. If needed, Student A coaches and then celebrates.

Teacher Input: Overhead of Attachment B

The teacher will show an overhead of Magic Square 75. “I am going to figure out Magic Square 75. Notice that Magic Square 75 contains symbols for each unknown number.” The teacher will think aloud while she/he solves Magic Square 75.

Rehearsal: Rally Coach and Attachment B

Give students Attachment B. Have each student solve Magic Square 132. After each student has solved Magic Square 132, he/she will work with a partner to describe his/her solution and strategy. Student A will explain his/her solution strategy first. If Student A is correct, Student B will celebrate the correct answer. If needed, Student B coaches and then celebrates. The roles are then switched. Student B will explain his solution strategy. If Student B is correct, Student A will celebrate the correct answer. If needed, Student A coaches and then celebrates. The teacher will conduct a class check of Magic Square 132 before moving to guided practice.

C. Guided Practice: Rally Coach and Attachment B

Students will work in groups of four. Within the group of four, one pair of students will work to solve Magic Square 621, and the second pair will solve Magic Square 921. After the pairs solve their Magic Square, pair A will check, coach if needed, and celebrate pair B's work. Then pair B will check, coach if needed, and celebrate pair A's work. Finally, the teacher will conduct a class check by first asking the girls to share what number the smiley face represented. If the girls are correct, the boys will celebrate the learning. Next, the boys will share what number was represented by the heart. If the boys are correct, the girls will celebrate the learning. The process will continue until each symbol has been checked for the correct number.

D. Closure: “Show Me” and White Board

The teacher will show the following problem on the overhead: $62 + \triangle = 109$. The teacher will use the “Show Me” strategy to show the number representation of the \triangle on a white board. The teacher will continue with the process until many examples are shown.

E. Independent Practice:**Differentiated Assignment:****Advanced Learners:**

Students will work in a small group to reread the pages of *Ben Franklin and the Magic Squares* (45 – 47), which explains the process of creating magic squares. Students will use the directions in the book to create their own magic square. After creating a magic square, student pairs will trade papers and solve a teammate's creation.

Proficient Learners: Attachment D and Pairs Check

The students will solve the word problems from Attachment D individually and then pair with a partner to verify accuracy of the answers. A correct answer must include the number sentence with an unknown and then a number sentence that shows what number the symbol represented (i.e., $3 + \odot = 5$ and $\odot = 2$). If time allows, the students can write their own word problem and the number sentence that solves the problem.

Strategic Learners: Attachment E

The students will work in pairs. Student A will spin the spinner first. Both students will write the number in their math journal (i.e., 8). Next, Student B will spin the spinner twice, using the two spins to create a two-digit number (i.e., 23). Student A will create a number sentence with the two numbers, being sure to use a symbol to represent the unknown (i.e., $8 + \text{pencil} = 23$ and $\text{pencil} = 15$). The students will switch roles and create as many number sentences as possible.

Intensive Learners: Attachment F

The students will work in pairs. Student A will draw a card first. Both students will write the number in their math journal (i.e., 8). Next, Student B will draw a card (i.e., 3). Student A will create a number sentence with the two numbers, being sure to use a symbol to represent the unknown (i.e., $3 + \text{pencil} = 8$ and $\text{pencil} = 5$). The students will switch roles and create as many number sentences as possible.

III. ASSESS:

- A. Products:
- B. Diagnostic (see background):
- C. Pre-Assessment:
- D. Post Assessment (EOG format plus 2 open-ended)

IV: RESOURCES:

- A. Websites:
- B. Materials:
- C. Professional Development Opportunities:

Magic Square 15

Directions: Place the numbers 1 to 9 in the squares below so that the sum of the numbers in any row, column, or diagonal equals 15.

Is there more than one way to solve this magic square?
List other solutions below.

Can you solve these magic squares? Replace the symbols with numbers that give the solution.

Magic Square 75

♥	♦	40
35	♠	15
10	♣	Ψ

Magic Square 132

A	36	B
C	44	D
38	E	42

Magic Square 621

208	203	☺
209	♡	☀
☾	⚡	206

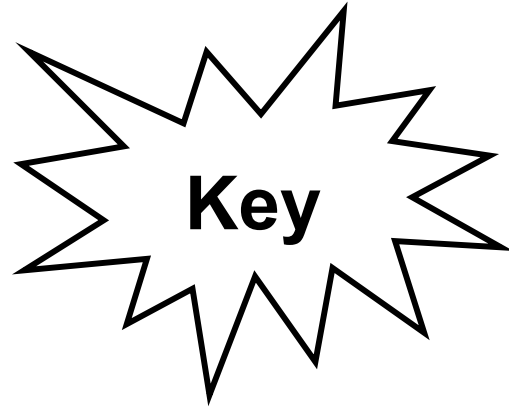
Magic Square 921

308	303	Z
309	Y	V
T	R	306

A Teacher's Guide to Creating Magic Squares

A magic square is a three by three square. Three times the middle number is the sum of the magic square. The Magic Square 15 is a guide to creating other magic squares. Any sequence of nine consecutive numbers can be used to create a new magic square if the numbers are placed in the same positions as the numbers 1-9 in the Magic Square 15.

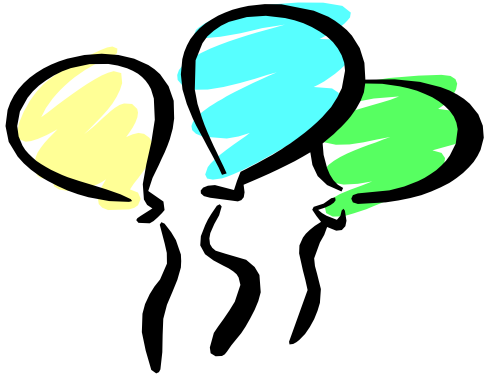
6	1	8
7	5	3
2	9	4



Write any sequence of nine numbers and place them in the magic square grid according to the key. Triple the middle number to find out what the magic square number is.

Word Problems

Susan took 54 balloons to the park. The wind blew some balloons away. When the wind stopped blowing, Susan had seven balloons. How many balloons blew away?



Stephanie and Kay made cookies for the party. Stephanie made 28 cookies. Kay made 14 more cookies than Stephanie. How many cookies did Kay make?



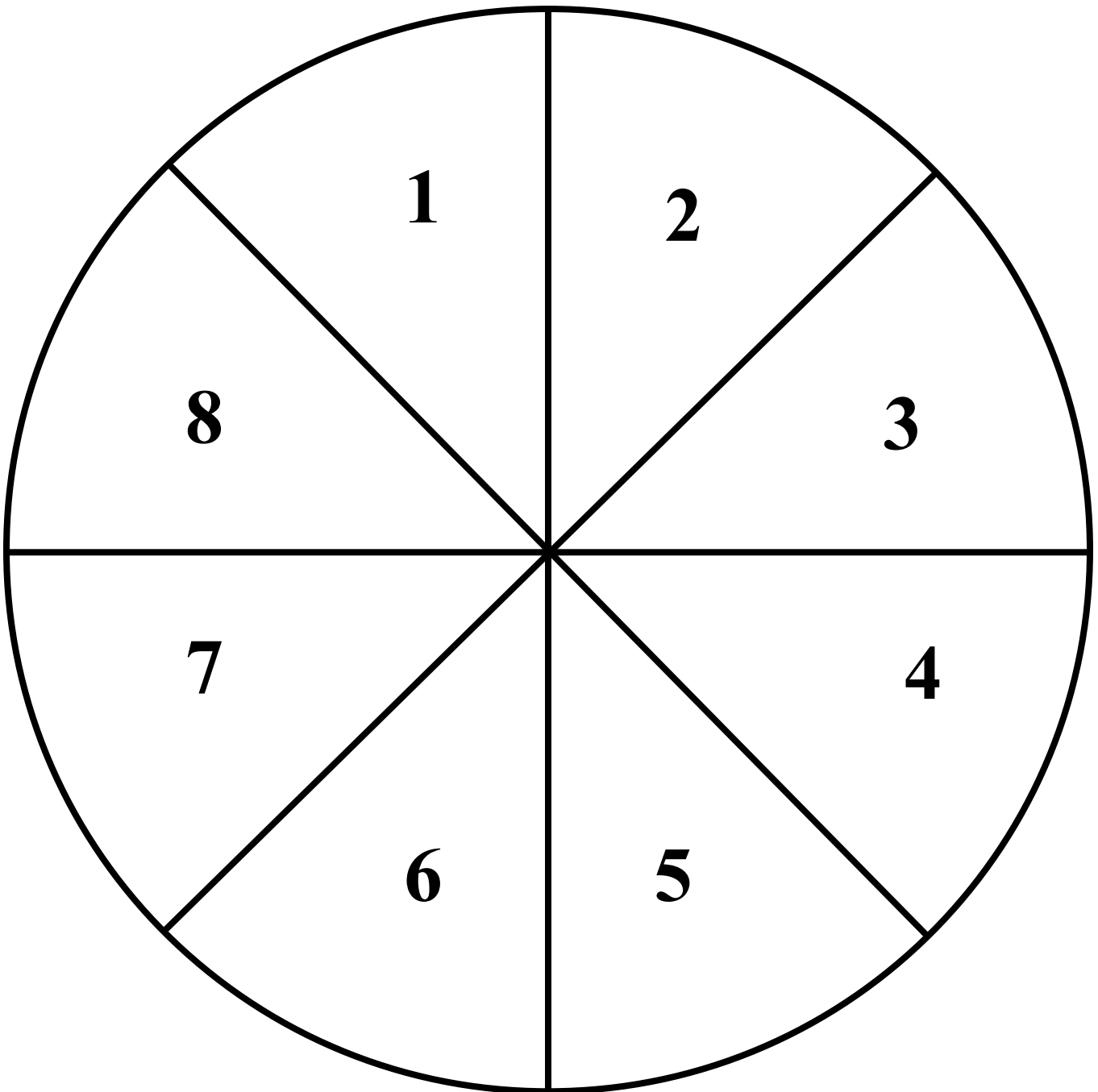
Rylie took some books to school. She gave four books to Todd and then put eight books in her desk. How many books did Rylie bring to school?



Bryce gave Lee twenty-six marbles. Lee's brother gave him some marbles, too. Lee has eighty-three marbles now. How many marbles did his brother give him?



Spinner



Use a large paperclip and a pencil for the spinning mechanism

Number Cards

0

1

2

3

4

5

6

7

8

9