

Number Sleuth



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● 60 ●
Math Challenges
for Fun and
Flexible Thinking



A Note About Number Sense

Students with number sense think flexibly about numbers.

Students with number sense can:

- Compose and decompose numbers in a variety of ways
- Leverage their understanding of numbers to add, subtract, multiply, and divide fluently.
- Make sense of their calculations and determine whether their results are reasonable.

Number sense practice should be engaging and fun. It can be done in just a few minutes a day. Over time, consistent practice and play lead to improved student confidence and greater success.

Number Sleuth is an opportunity for students to play with numbers and essential math concepts. It enables students to think about numbers in diverse ways. It positions them to be flexible and efficient. **Number Sleuth** builds number sense.

Number Sleuth: How It Works

Number Sleuth pairs digit cards with challenge cards. Students have a designated amount of time to find and mark solutions on the digit card that answers the challenge question.

Helpful Tips to Get You Started

- Model the way a solution can be found for a given challenge before students (players) begin the challenge.
- Modify the challenge(s) as needed to best meet the needs of players.
- Consider providing students (players) with tools like calculators, fact charts, or number charts to support accuracy.
- If number cards become too marked up, encourage students to record their findings on a piece of paper.
- Create your own challenges or have students create new challenges.

Playing Number Sleuth in the Classroom

Getting students engaged in play with numbers is essential for developing fluency and number sense. **Number Sleuth** can be played in a variety of ways to serve a variety purposes.

- *Whole-Class Activity*

To play as a whole-class activity, each student receives a digit card and plays against one or more students in the class.

The teacher playing against the class is a great way to introduce a new game variation. To do this, the teacher plays with one digit card to complete a challenge while the class plays together using another digit card projected with a document camera or something similar.

This use of **Number Sleuth** is helpful for reinforcing number concepts and framing discussions about solutions and strategies.

- *Math Stations*

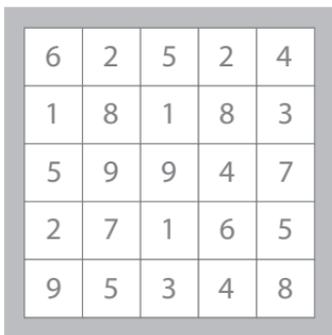
Pairs activity: divide students into pairs or groups of three. Each player receives a digit card, but players share the same challenge card. Players mark their answers and discuss them together before going on to the next cards.

Independent play: Players using **Number Sleuth** independently use the digit and challenge cards and find solutions on their own.

- Players should record their solutions, along with the challenges they complete.
- Students playing **Number Sleuth** independently might also write about how they found their solutions or about any patterns they noticed when finding the answers. Players might also create new solutions that satisfy the challenge but weren't present on their digit cards.

How to Play Number Sleuth

1. Each player gets a **Number Sleuth** digit card. A challenge card is selected.



6	2	5	2	4
1	8	1	8	3
5	9	9	4	7
2	7	1	6	5
9	5	3	4	8

Digit Card



Challenge Card

2. Players then use the random digits on their cards to find the answers as stated on the challenge cards in a specified amount of time. But there is a catch. The digits players use to find each solution must be adjacent to one another on the card. Digits can be adjacent horizontally, vertically, or diagonally in either direction—example: left to right or right to left.

3. There are quite a few solutions on this digit card that satisfy the challenge. 62 and 81 are found with two digits that are horizontally adjacent; 97 and 86 are diagonally adjacent; 73 is vertically adjacent.
4. Only one example of a solution per card can be used. For example, 97 can only be scored once on the card at right.
5. After time is called, players count the number of solutions they found and earn a point for each. Examples of solutions should be discussed with the group for confirmation of accuracy.

6	2	5	2	4
1	8	1	8	3
5	9	9	4	7
2	7	1	6	5
9	5	3	4	8

Note: Time for each challenge can be adjusted to meet the needs of the players. In most cases, 1–2 minutes is the perfect amount of time. In other cases, 3–4 minutes might be a better option. Time should be set so that players have enough time to find the number of solutions described on the challenge card but not so long that players sit idle because solutions are exhausted.

How to Find Numbers with Three or More Digits

Numbers with three or more digits are found adjacent to each other. Here, two three-digit numbers less than 500 are found in two different ways:

- 183 is found linearly.
- 415 is found diagonally, down to the left.

6	2	5	2	4
1	8	1	8	3
5	9	9	4	7
2	7	1	6	5
9	5	3	4	8

How to Find Fractions

Fractions can be found similarly to how two-digit numbers are found.

- Here, 2 and 4 are marked. They could be used to show the fraction $2/4$ or $4/2$ depending on the challenge.
- Other fractions shown here include $1/3$ or $3/1$ and $5/8$ or $8/5$.

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5	9	9	4	7
2	7	1	6	5
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How to Find Decimals

There are no decimal points in **Number Sleuth**, but players can still play with decimal concepts. Players simply note where they would insert a decimal between digits.

- Here, 9 and 1 are circled. Those digits could be used to show 9.1, 0.91, 1.9, or 0.19 relative to the challenge that the player is working on.
- 6 and 5 could be used for 6.5, 0.65, 5.6, or 0.56.

6	2	5	2	4
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How to Find Integers

Number sense extends beyond whole numbers and fractions. **Number Sleuth** is perfect for developing integer sense. Digit cards can be used for integer challenges.

When using digit cards for integer challenges, each digit can represent either a positive or negative number.

For the challenge here, players use integers to find sums of -3 .

- To do this, a player identified 5 and 2, thinking $-5 + 2 = -3$.
- Other possible solutions are: $-8 + 5 = -3$ and $-9 + 6 = -3$.



6	2	5	2	4
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Game Variations for Extra Practice

Nonlinear Solutions

- In **Number Sleuth**, players find examples using adjacent digits.
- In a more advanced game, players are free to find solutions that are nonlinear, that is, not in a row as described on pages 6–7.
- For the example below, players find digits that round to 800. Players come up with 815 and 794 as two possible solutions. Note that these digits are not in a row, but are still adjacent.



6	2	5	2	4
1	8	1	8	3
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How Many Examples? (whole class)

- In this non-competitive version, players work individually or together to find as many examples as possible.
- Before the challenge begins, players set a goal for how many solutions they want to find as individuals or as a the group.

Play and Pass

- In this competitive version, players complete a challenge with their digit card.
- After the challenge, players earn a score for the number of examples they find that satisfy the challenge.
- Players pass their digit card to another player and play the next challenge with their new card. Players accumulate points for each new round.

Cancel Out

- In this version, players only earn points for unique examples—i.e., examples that have not been identified by other players. For example, a fourth-grade class might be finding fractions equivalent to $\frac{1}{2}$. Player 1 finds $\frac{2}{4}$, $\frac{4}{8}$, $\frac{16}{32}$, and $\frac{6}{12}$. Player 2 finds $\frac{2}{4}$, $\frac{4}{8}$, and $\frac{7}{14}$.

- Players earn one point for each unique example. (For example, Player 1 would earn two points because $16/32$ and $6/12$ are unique finds. Player 2 would earn one point for $7/14$.)

Duplicates Allowed

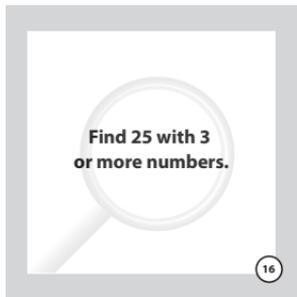
- In **Number Sleuth**, an example of a solution is scored only once even if the solution appears more than once. In this version, players earn a point for each example found on the digit card. Duplicates are allowed.
- Consider the challenge card and the digits below. Here, the player finds 85 in three different ways. Each example would earn a point in this “duplicates allowed” version.



6	2	5	2	4
1	8	1	8	3
5	9	9	4	7
2	7	1	6	5
9	5	3	4	8

Disconnects

- In Number Sleuth, players find examples using adjacent digits. In “Disconnects,” players are free to use any of the digits on their digit card.
- For the example below, players find 25 with four digits. Those digits, 6, 5, 5, and 9 are not connected. That example would earn one point. Another example that would earn a point is 6, 5, 4, 8, and 2. In this version, duplicate examples should not be scored.



6	2	5	2	4
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5	9	9	4	7
2	7	1	6	5
9	5	3	4	8

Number Sleuth:

60 Math Challenges for Fun and Flexible Thinking

Available at didax.com:

Grades 2–3 211744

- Place value and comparison through 1,000
- Decomposition of numbers
- Benchmark numbers
- Estimation and rounding
- Finding sums
- Finding differences
- Even and odd

Grades 3–4 211745

- Place value through 10,000
- Decomposition of numbers and fractions
- Multi-digit addition and subtraction
- Benchmark numbers and fractions
- Estimating whole numbers and fractions
- Comparing whole numbers and fractions
- Multiplication and division (basic facts)

(continued next page)

Grades 6–8 211746

- Estimating fractions
- Fraction computation
- Decimals
- Ratio
- Percent
- Integers
- Equations and inequalities