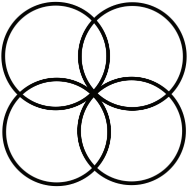
A ♣

Equal Sums 4

THE CHALLENGE: These four circles create 8 regions. Put 1 to 8 once each in these regions so the sum of the numbers in each circle is the same.



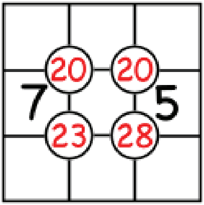
1 2 3 4 5 6 7 8

♣ A

2 ♣

Sujiko Puzzle 3

THE CHALLENGE: Fill in this Sujiko Puzzle. Use the numbers from 1 to 9 in the nine squares. Each circled number must be the sum of the four squares surrounding it.



2 ♣

3 ♣

Stick Areas

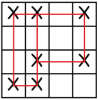
12 sticks are used to enclose a region. These three possibilities enclose areas of size 3, 5, and 9.

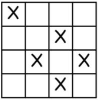
THE CHALLENGE: Find all the possible areas you can enclose with 12 sticks. What happens for other numbers of sticks?

♣ 3

4 ♣

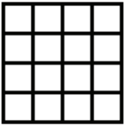
Avoiding Rectangles 2





The X's in the left grid form two rectangles. The X's in the right grid avoid forming any rectangles.

THE CHALLENGE: Place as many X's as you can in this grid avoiding creating any rectangles.

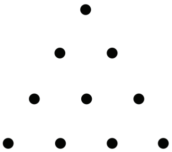


♣ 4

5
♣

Avoiding Triangles

A ***regular triangle*** is a triangle with equal sides and equal angles.



THE CHALLENGE: Remove the fewest dots so no regular triangles of any size or orientation are formed by the remaining dots.

♣
5

6 ♣

Last Number Standing

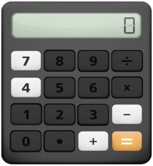
The numbers 1 to 5 are written on a board. Choose any two numbers to be erased and replaced by their difference. This continues until there is just one number.

THE CHALLENGE: Which values are possible for that last single number? Does your answer change if the numbers go from 1 to 6? What about from 1 to 7?

♣ 6

7 ♣

Broken Calculator 1



This calculator is broken. The only keys that work are: 4, 7, –, and +. It's still possible to make every number. For example $1 = 4 + 4 - 7$.

THE CHALLENGE: Show how to make every number from 1 to 12.

♣ 7

8 ♣

Ladybugs Don't Add Up 2

Ladybugs with numbers land on leaves. No two ladybugs on a leaf can add up to another on that leaf. The left leaf is OK; the right has 2+4 = 6.

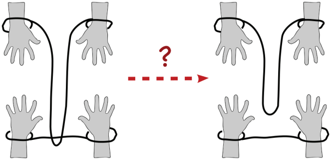
THE CHALLENGE: Starting at 1, how high can you safely go putting ladybugs on three leaves?

♣ 8

9 ♣

Are Their Hands Tied?

THE CHALLENGE: Two people tie their own hands together loosely with a string. The two strings loop inside each other. Can they get apart without untying their strings?

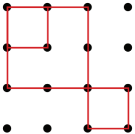


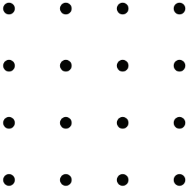
9 ♣

10 ♣

Finding Squares 1

This grid has a few red squares marked with up, down, left, and right sides.





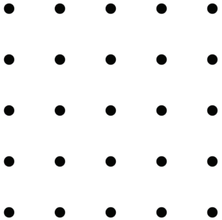
THE CHALLENGE: Count the total number of squares of all sizes in this grid.

♣ 10

J ♣

Finding Squares 2

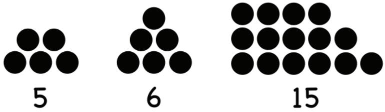
THE CHALLENGE: Count the squares of all sizes and orientations in this grid (some will have diagonal sides).



Q ♣

Trapezoidal Numbers 1

Trapezoidal Numbers are the sum of two or more consecutive numbers, possibly starting at 1. You can make a trapezoid (or triangle) with that many dots.



THE CHALLENGE: Why are all odd numbers starting with three trapezoidal?

♣ Q

K ♣

Handshakes at a Party 2

Six people were at a party. A lot of handshaking took place. When asked how many hands each person shook, they discovered that each number was different. One person yelled out “That’s impossible!”

THE CHALLENGE: Was that person right, did someone make a mistake in their handshake count? How do you know?

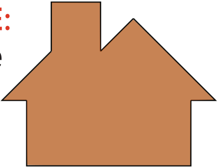
♣ K

A ♦

Finding the Pieces 3

A ***Trapezoid*** has one pair of parallel sides, a ***Parallelogram*** has two pairs. ***Rectangles*** have four right angles. ***Squares*** are equal-sided rectangles. ***Right triangles*** have a right angle.

THE CHALLENGE:
Break this figure into as few of these pieces as possible.



♦ A

2 ♦

Letter Substitutions 4

In ***Letter Substitution Puzzles,*** each letter is a digit from 0 to 9, different letters within a single puzzle have different values, and no number has 0 as its leftmost digit.

THE CHALLENGE: Find the value of the letters in these 2 puzzles.

```
      A          D
+  B  B     +  E  D
--------    --------
   C  6        D  E
```

♦ 2

3 ♦

Letter Substitutions 5

In ***Letter Substitution Puzzles,*** each letter is a digit from 0 to 9, different letters within a single puzzle have different values, and no number has 0 as its leftmost digit.

THE CHALLENGE: Find the value of the letters in these 2 puzzles.

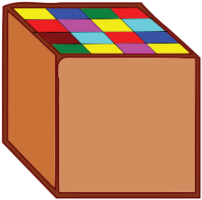
```
   B E        T O
 + B E      + G O
 -----      -----
 S E E      O U T
```

♦ 3

4 ♦

Boxed Blocks

THE CHALLENGE: There is a wooden box, without a lid, holding a 4 x 4 x 4 collection of 64 blocks. How many of the blocks touch a part of the box?



♦ 4

5 ♦

Removing Digits

12345123451234512345123451234512345

THE CHALLENGE: Which ten digits would you remove (they don't need to be next to each other) from this number to make the new number as large as possible? Which ten digits would you remove to make it as small as possible?

5 ♦

6 ♦

Product Equals Sum

THE CHALLENGE: If you have five positive whole numbers which, when you add them up you get the same answer as when you multiply them, what is the largest possible value of one of those five numbers?

EXPLORATION: What happens for different numbers of numbers in this situation? For example, for two numbers $2 \times 2 = 2 + 2$.

♦ 6

7 ♦

Max Product For Sums of 16

THE CHALLENGE: What is the largest product you can make using numbers that add up to 16?

Example: 16 = 10+6; 10×6 = 60

Better: 16 = 6+5+5; 6×5×5 = 150

EXPLORATION: How does your strategy change if you replace 16 with 20, or even 100?

♦ 7

8 ♦

Equal Products

THE CHALLENGE: Using the numbers from 1 to 9 at most once, assign seven different numbers to the letters A to G so that these three products are the same.

A × B × C = C × D × E = E × F × G

♦ 8

9 ♦

Extreme Products 1

THE CHALLENGE: Use the digits from 1 to 9 at most once to make two 2-digit numbers whose product is as large as possible. Also, make two different 2-digit numbers whose product is as small as possible.

☐☐ × ☐☐

1 2 3 4 5 6 7 8 9

♦ 9

10 ♦

Moving Digits 2

If you reverse the digits for 2754 you get the number 4572.

THE CHALLENGE: Find a 4-digit number that, when you multiply it by 4, you reverse its digits.

EXPLORATION: Why doesn't this happen for numbers less than 1000? Also, look for numbers larger than 9,999 that have this property.

♦ 10

J ♦

Water Cups 1

You have an unmarked 3-unit and 7-unit cup. Use these cups to create other amounts. For example, create 4 units in the larger cup by filling the 7-unit cup and pouring out 3 units to fill the smaller cup.

THE CHALLENGE: Describe steps for putting 2 units in one of these cups. Can you make other amounts?

♦ J

Q ♦

Water Cups 2

You have an unmarked 9-unit and 15-unit cup. Use these cups to create other amounts. For example, create 6 units in the larger cup by filling the 15-unit cup and pouring out 9 units to fill the smaller cup.

THE CHALLENGE: Find all the units you can create using these two cups. Why are some impossible?

♦ Q

K ♦

Pirates with Gold 1

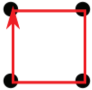
Three smart and greedy pirates want to split up 12 gold coins. Their rule is: The youngest pirate proposes a plan. The plan is used if okay with over half of all the pirates. If not, the youngest pirate leaves with no gold, and the new youngest pirate proposes a plan.

THE CHALLENGE: What is the most the youngest pirate can get?

♦ K

A ♥

Lines 1



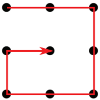
These four connected line segments begin and end at the same place and go through all four points.

THE CHALLENGE: Find ***three*** connected line segments that create a path that begins and ends at the same point, and that goes through all four points.

A ♥

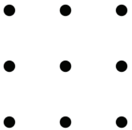
2 ♥

Lines 2



These five connected line segments go through all nine points of this 3 x 3 array.

THE CHALLENGE: Find ***four*** connected line segments that create a path that goes through all nine points.

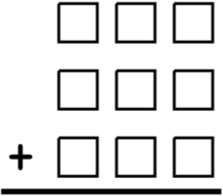


2 ♥

3 ♥

Fill in the Blanks 7

THE CHALLENGE: Using the numbers 1 to 9 once each, make this sum as close to 1000 as you can.



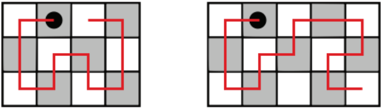
1 2 3 4 5 6 7 8 9

3 ♥

4 ♥

Paths on Boards 1

The first board has a path that visits every square starting at the black dot. The second board does not.



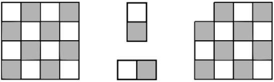
THE CHALLENGE: Identify other starting positions that begin paths that can visit every square.

♥ 4

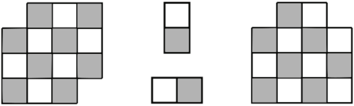
5 ♥

Dominoes on Boards

This first board is easy to cover with dominoes. The second is impossible.



THE CHALLENGE: Why is one of these impossible to cover?



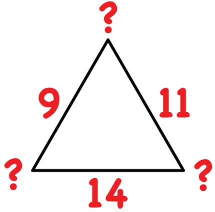
5 ♥

6 ♥

Mystery Sums 1

This triangle has secret numbers on its corners. The sum of each pair of numbers is shown in the middle of the side that connects them.

THE CHALLENGE: Find the three secret numbers.



6 ♥

7 ♥

Mystery Sums 2

There are 5 boxes to weigh, and each of them weighs under 20 pounds. Unfortunately, the one available scale only weighs things over 20 pounds. The packages, weighed in pairs, weigh 22, 24, 25, 26, 27, 28, 29, 30, 32, and 33 pounds.

THE CHALLENGE: Find out how much each package weighs.

♥ 7

8 ♥

Combining Digits 1 2 4 8

Here is a way to get 0 and 1 using each of 1, 2, 4, and 8 exactly once.

$0 = 8 - (1 \times 2 \times 4)$

$1 = 8 - 4 - 2 - 1$

THE CHALLENGE: Starting at 0, how many numbers can you get using all the numbers 1, 2, 4, and 8 in any order, using addition, subtraction, and multiplication?

♥ 8

9 ♥

Combining Digits 1 2 3 4

Here is a way to get 0 and 1 using each of 1, 2, 3, and 4 exactly once.

$$0 = 1 + 4 - (2 + 3)$$

$$1 = (2 - 1) \times (4 - 3)$$

THE CHALLENGE: Starting at 0, how many numbers can you get using all the numbers 1, 2, 3, and 4 in any order, using addition, subtraction, and multiplication?

9 ♥

10 ♥

Combining Digits Five 2's

Here is a way to get 0 and 1 using exactly five 2's.

0 = (22 – 22) × 2

1 = 2 – (2 / 2) × (2 / 2)

THE CHALLENGE: Starting at 0, how many numbers can you get using five 2's with addition, subtraction, multiplication, division, and two-digit numbers?

♥ 10

J ♥

Turning the Tables

This 2 to 9 multiplication table has had its rows and columns moved, and many numbers removed.

THE CHALLENGE: Fill in all the missing numbers.

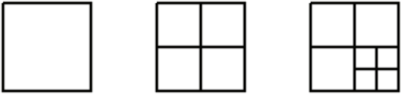
X			3	
		32		
	10			
		40		
				49

J ♥

Q ♥

Filling Squares With Squares

Here is how to fill one large square with 1, 4, or 7 squares.



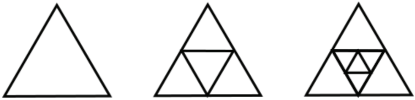
THE CHALLENGE: Find other square counts for filling a large square. Can you do it for 2, 3, 5, 6, 8, 9, or 10 squares?

Q ♥

K ♥

Filling Triangles With Triangles

Here's how to fill one large triangle with 1, 4, or 7 triangles.



THE CHALLENGE: Find other triangle counts for filling a large triangle. Can you do it for 2, 3, 5, 6, 8, 9, or 10 triangles?

K ♥

A
♠

Magic Squares 4

In ***Magic Squares,*** all rows, columns, and diagonals add up the same.

THE CHALLENGE: Use the numbers 2 to 10 once each to complete a Magic Square. Is there more than one way to do it?

♠
A

2 ♠

Odd Squares

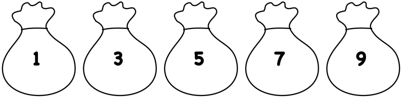
An ***Odd Square*** is a square grid of numbers in which each row and column add up to an odd number.

THE CHALLENGE: Use all the numbers from 1 to 9 to form a 3 by 3 Odd Square.

2 ♠

3 ♠

Adding Ten Numbers



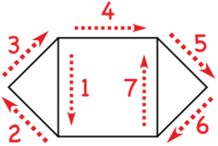
THE CHALLENGE: You have five bags of coins. Each has one kind of coin. The bags have coins worth 1, 3, 5, 7, and 9. If you can, find ten coins that add up to 43. If you can't, describe why it is impossible. Which numbers are possible?

♠ 3

4 ♠

Parades 1

The red line is almost a parade route that crosses each edge exactly once. Alas, one side was missed!



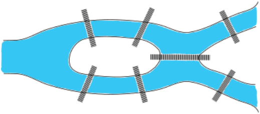
THE CHALLENGE: Find a route crossing each edge exactly once. If you can't, give a reason why.

♠ 4

5 ♠

Parades 2

This map of Königsberg shows the island in the middle of the river and the seven bridges that span the river.



THE CHALLENGE: If you can, find a parade route that crosses each of the bridges exactly once. If you can't, give a reason why.

♠ 5

6 ♠

Fractions 1

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make the equation true. Is there more than one solution?

$$\frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square\square}$$

1 2 3 4 5 6 7 8 9

6 ♠

7 ♠

Fractions 2

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make the sum as small as possible. Do it again making the sum as large as possible. How does this change if you allow, or not allow, improper fractions?

$$\frac{\square}{\square} + \frac{\square}{\square}$$

1 2 3 4 5 6 7 8 9

♠ 7

8
♠

Fractions 3

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make this difference as small as possible. How does this change if you allow, or not allow, improper fractions?

$$\square\frac{\square}{\square} - \square\frac{\square}{\square}$$

1 2 3 4 5 6 7 8 9

♠
8

9 ♠

Fractions 4

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make the double-digit fraction as close to the Target Number as possible without equalling it. Use Target Numbers starting at 1 and going up to 8.

$$\frac{\square\square}{\square\square} \sim \text{Target}$$

1 2 3 4 5 6 7 8 9

♠ 6

10 ♠

Fractions 6

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make the equation true. How many solutions can you find?

$$\frac{\square}{\square} + \frac{\square}{\square} = \square$$

1 2 3 4 5 6 7 8 9

EXPLORATION: Are there values for the right side that are impossible?

♠ 10

J ♠

Fractions 7

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make the equation true. How many solutions can you find using proper fractions?

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$$

1 2 3 4 5 6 7 8 9

♠ J

Q ♠

Fractions 9

THE CHALLENGE: Use 2 to 9 at most once in these boxes to make the equation true. Organize the answers using increasing denominators and numerators from left to right.

$$\frac{\square}{\square} \times \frac{\square}{\square} = 1$$

2 3 4 5 6 7 8 9

♠ Q

K ♠

Fractions 12

THE CHALLENGE: Use 1 to 9 at most once in these boxes to make the expression 1) equal to 2/3, and again 2) as close to 5/11 as possible.

$$\frac{\square}{\square} \times \frac{\square}{\square} = \frac{2}{3}$$

$$\frac{\square}{\square} \times \frac{\square}{\square} \sim \frac{5}{11}$$

1 2 3 4 5 6 7 8 9

♠ K

Joker

Parallel lines have a lot in common ...
it's a shame they'll never meet.

How do you keep warm in a cold room? ...
go to the corner – it's always 90 degrees.

Joker

Joker

I saw my math teacher looking
suspicious with a piece of graph paper ...
the teacher must be plotting something.

A farmer had 197 cows out in the field ...
but when he rounded them up
he had 200!

Joker

Grades 2-5 Math Puzzles

These puzzles are for grades 2 to 5. They can also be enjoyed by 'children' of all ages. Get solutions, notes, card face images, and more detailed versions of each puzzle at this link.

www.EarlyFamilyMath.org/deck-2-5

Early Family Math

math for love

Card back illustration by Kienn Nguyen

EarlyFamilyMath.org
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