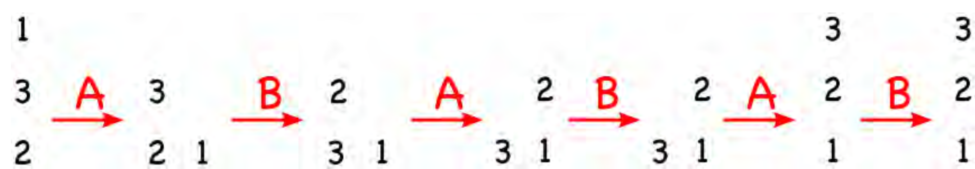
Puzzle of the Week
Card Deck Ordering – 1

Two Steps:

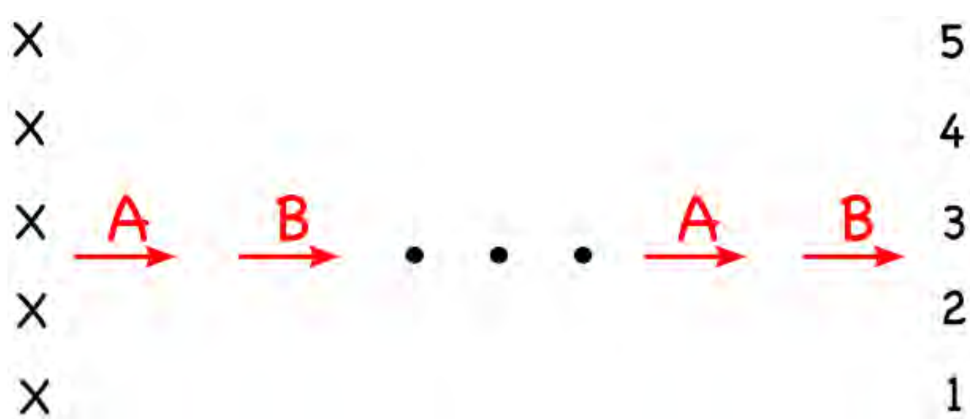
Step A: Remove the top card from the stack of cards and place it on top of the discard pile.

Step B: Move the new top card of the stack to the bottom of the stack.

Example: if you start with a stack of cards ordered 1 - 3 - 2 and then repeatedly use the Two Step process, the result is a discard pile of cards ordered from largest to smallest: 3 - 2 - 1.



THE CHALLENGE: Take cards numbered 1 to 5 and stack them in some way so that if you repeat the Two Steps over and over with that stack, you will end up with a discard pile of cards in order from 5 down to 1.



EXPLORATION: Can you do this for decks with cards from 1 to 6, 1 to 7, or even higher? What patterns do you notice?

Puzzle of the Week

Card Deck Ordering – 1 – Notes

THE CHALLENGE & EXPLORATION: The difficulty with this puzzle is being systematic. For any size deck of cards, you can play around with it and eventually come up with the answer, and that is perfectly fine for a young child.

Let's look for interesting patterns that make it easier.

Suppose you lay out the cards in order on the table. Here are the solutions for the first seven cases. Let's see what we can learn from them. The numbers listed after the arrow give the order of the remaining cards after the first pass through the cards – that is, after each card has been touched just once.

1

1 2 -> 2

1 3 2 -> 3

1 3 2 4 -> 3 4

1 5 2 4 3 -> 5 4

1 4 2 6 3 5 -> 4 6 5

1 6 2 5 3 7 4 -> 6 5 7

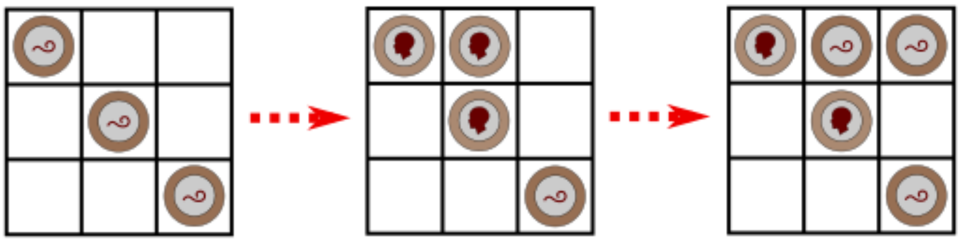
If there are an even number of cards (say 6), then the odd positions are filled with the first half of the cards in order (3 in this case), and the other spots are filled using the solution for half as many cards only bumped up in value. In the example for 6, the odd spots are filled with 1, 2, 3, and the even spots are filled with 4, 6, 5 - the values 1, 3, 2 (the solution for a three-card deck) each increased by 3.

The pattern for an odd number of cards is a little trickier. As before, the odd spots are filled with the first roughly half of the numbers (1 to 4 in the case of 7). If you look at the examples, the first card after the arrow is going to be moved to the end, so it should be the card you want last in that sequence. After that observation, the answer proceeds as in the even case.

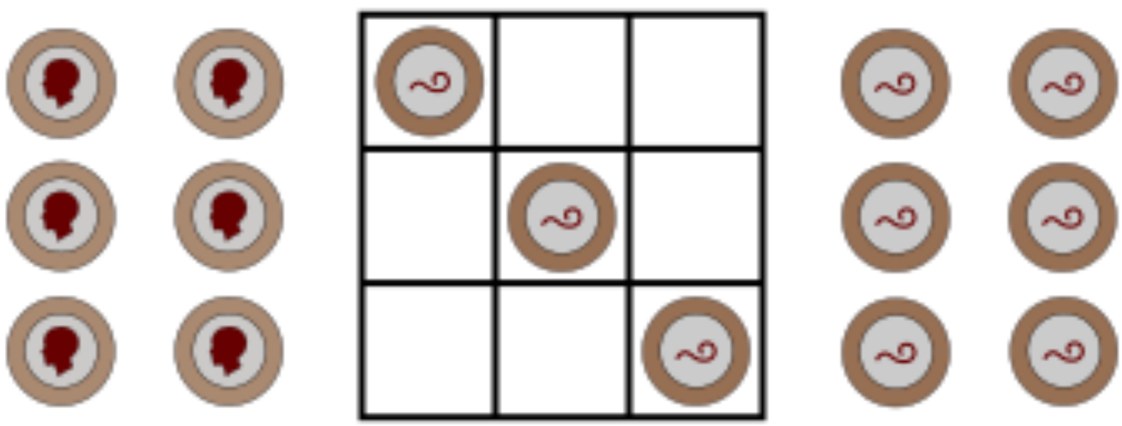
Puzzle of the Week

Coin Flipping – 1

A coin may be placed heads up or down in any empty spot. When a coin is placed, all coins touching its sides must be flipped over.



THE CHALLENGE: Fill this grid so all the coins end up heads up or heads down.



EXPLORATION: Put a few coins in other starting positions and see which of these work out. Can you find any patterns in which ones work and which ones don't?

Puzzle of the Week

Coin Flipping – 1 – Notes

THE CHALLENGE: This puzzle can be solved enjoyably and satisfactorily with a lot of trial and error. To reduce the trial and error, predict the number of flips an existing coin will have. For example, the coins in the upper left and lower right corners have two neighbors, so they will each be flipped twice (ultimately leaving them the same as they started). Similarly, the coin in the center has four neighbors, so it will be flipped four times and return to its original state. So, no matter the choices that are made, the three diagonal coins will all end up being heads down.

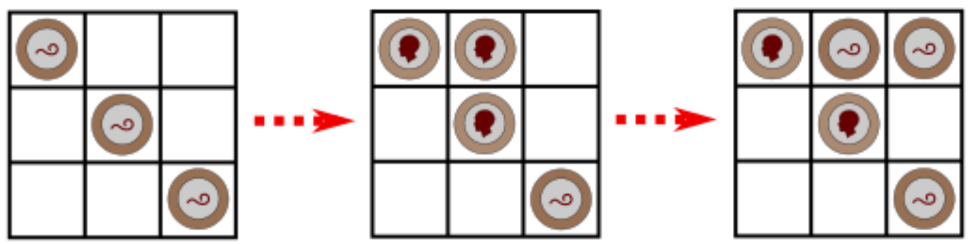
Once you know how to handle the diagonal coins, the rest of this small puzzle is pretty straightforward.

EXPLORATION: For any puzzle with three coins in a single row, column, or diagonal, to be doable the coins must all be heads up or heads down. For other arrangements, it will be determined by whether the initial number of empty slots around each coin is odd or even.

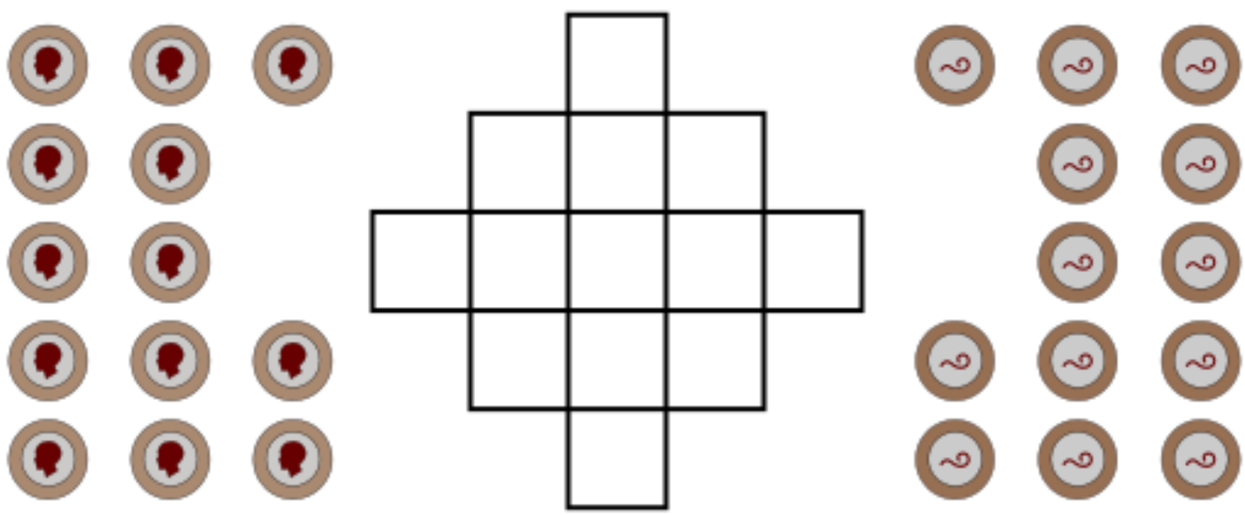
Puzzle of the Week

Coin Flipping – 2

A coin may be placed heads up or down in any empty spot. When a coin is placed, all coins touching its sides must be flipped over.



THE CHALLENGE: Fill this grid so all the coins end up heads up or heads down.



EXPLORATION: See what happens with other patterns of squares. Are there any that are impossible?

Puzzle of the Week

Coin Flipping – 2 – Notes

THE CHALLENGE: There are many simple strategies for doing this puzzle. Perhaps the easiest is to start by putting heads up coins in the four squares that have a single neighbor. Then, in the 3 by 3 empty box that remains, put heads down coins along a diagonal of the 3 by 3 box. Now you can finish solving this exactly as you did the “Coin Flipping - 1” puzzle.

A different strategy is to start at the top and fill them in order from top to bottom and left to right. Look at how many coins have yet to be filled in that will neighbor the current square - if that number is even, make that coin heads up, and if it is odd, make that coin heads down.

EXPLORATION: They should all be possible. It is just a matter of keeping track of evens and odds.

Puzzle of the Week

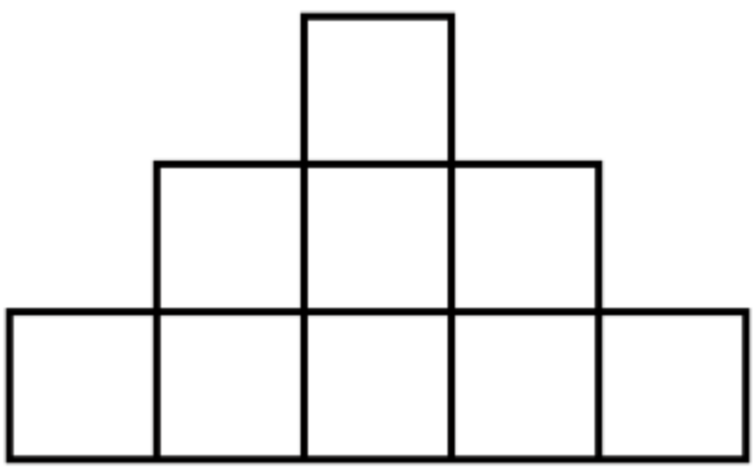
Consecutive Numbers – 1

The numbers from 1 to 10 have been placed in these two diagrams. In the diagram on the left, the boxes with numbers 2 and 3 share a side, and the boxes with numbers 9 and 10 touch diagonally. In the diagram on the right, no two consecutive numbers share a side or touch diagonally.

2	6	1	7	10
3	8	4	9	5

3	1	4	2	5
6	9	7	10	8

THE CHALLENGE: Place the numbers from 1 to 9 in this diagram so that the boxes for consecutive numbers do not share a side or touch diagonally.



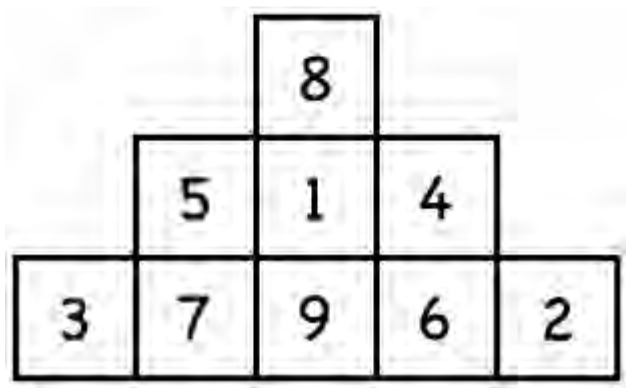
1 2 3 4 5 6 7 8 9

EXPLORATION: Make these puzzles for your friends.

Puzzle of the Week

Consecutive Numbers – 1 – Notes

THE CHALLENGE: The first and last numbers only have one neighboring number, unlike the other numbers which have two, so put them in the most central locations. Here is one possible solution.



Puzzle of the Week

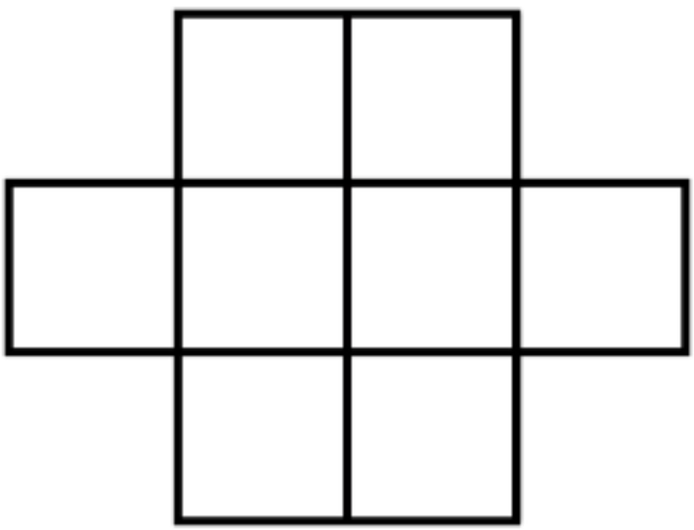
Consecutive Numbers – 2

The numbers from 1 to 10 have been placed in these two diagrams. In the diagram on the left, the boxes with numbers 2 and 3 share a side, and the boxes with numbers 9 and 10 touch diagonally. In the diagram on the right, no two consecutive numbers share a side or touch diagonally.

2	6	1	7	10
3	8	4	9	5

3	1	4	2	5
6	9	7	10	8

THE CHALLENGE: Place the numbers from 1 to 8 in this diagram so that the boxes for consecutive numbers do not share a side or touch diagonally.



1 2 3 4 5 6 7 8

EXPLORATION: Make these puzzles for your friends.

Puzzle of the Week

Consecutive Numbers – 2 – Notes

THE CHALLENGE: The first and last numbers only have one neighboring number, unlike the other numbers which have two, so put them in the most central locations. Here is one possible solution.

	3	5	
7	1	8	2
	4	6	

Puzzle of the Week

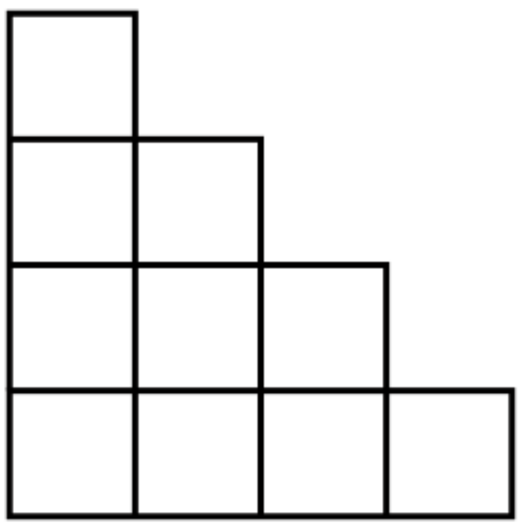
Consecutive Numbers – 3

The numbers from 1 to 10 have been placed in these two diagrams. In the diagram on the left, the boxes with numbers 2 and 3 share a side, and the boxes with numbers 9 and 10 touch diagonally. In the diagram on the right, no two consecutive numbers share a side or touch diagonally.

2	6	1	7	10
3	8	4	9	5

3	1	4	2	5
6	9	7	10	8

THE CHALLENGE: Place the numbers from 1 to 10 in this diagram so that the boxes for consecutive numbers do not share a side or touch diagonally.



1 2 3 4 5 6 7 8 9 10

EXPLORATION: Make these puzzles for your friends.

Puzzle of the Week

Consecutive Numbers – 3 – Notes

THE CHALLENGE: The first and last numbers only have one neighboring number, unlike the other numbers which have two, so put them in the most central locations. Here is one possible solution.

9			
3	5		
7	1	8	
10	4	6	2

Puzzle of the Week

Consecutive Numbers – 4

The numbers from 1 to 10 have been placed in these two diagrams. In the diagram on the left, the boxes with numbers 2 and 3 share a side, and the boxes with numbers 9 and 10 touch diagonally. In the diagram on the right, no two consecutive numbers share a side or touch diagonally.

2	6	1	7	10
3	8	4	9	5

3	1	4	2	5
6	9	7	10	8

THE CHALLENGE: Place the numbers from 1 to 12 in this diagram so that the boxes for consecutive numbers do not share a side or touch diagonally.

1 2 3 4 5 6 7 8 9 10 11 12

EXPLORATION: Make these puzzles for your friends.

Puzzle of the Week

Consecutive Numbers – 4 – Notes

THE CHALLENGE: The first and last numbers only have one neighboring number, unlike the other numbers which have two, so put them in the most central locations. Here is one possible solution.

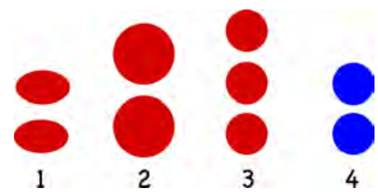
3	7	5	10
11	1	12	2
4	8	6	9

Puzzle of the Week

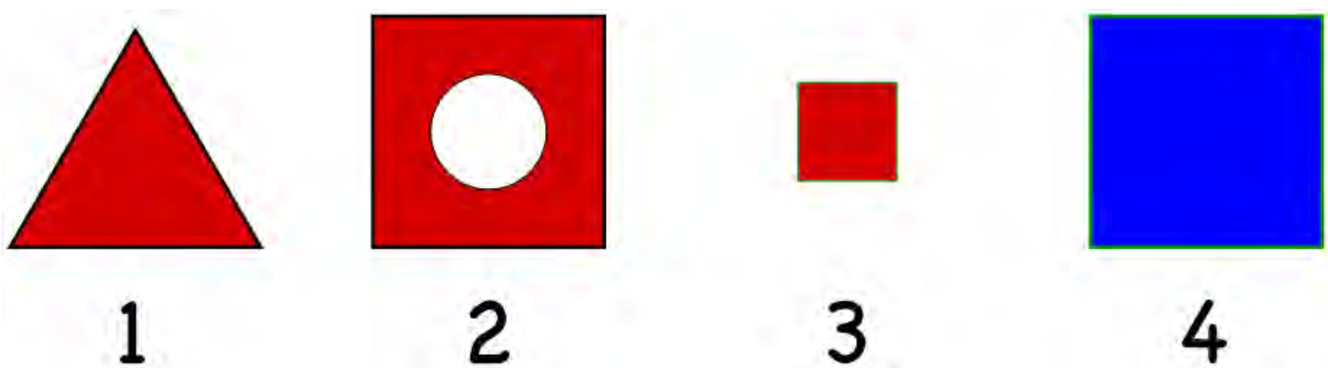
Each of These is Not Like the Others – 1

The objects in this group share some properties, but the objects also differ in some distinctive ways.

1. These are ovals, the other three have circles.
2. These are larger figures, the other three are smaller.
3. There are three figures, the other three have two.
4. This is blue, the other three are red.



THE CHALLENGE: For each of these next four objects, describe a property that the remaining three objects have that it does not.



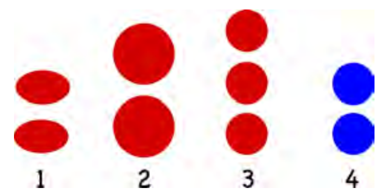
EXPLORATION: Find other groups of four things where each group of three of them has a property the fourth does not. Can you think of a group of five things like this?

Puzzle of the Week

Each of These is Not Like the Others – 2

The objects in this group share some properties, but the objects also differ in some distinctive ways.

1. These are ovals, the other three have circles.
2. These are larger figures, the other three are smaller.
3. There are three figures, the other three have two.
4. This is blue, the other three are red.



THE CHALLENGE: For each of these next four objects, describe a property that the remaining three objects have that it does not.

EXPLORATION: Find other groups of four things where each group of three of them has a property the fourth does not. Can you think of a group of five things like this?

Puzzle of the Week

Each of These is Not Like the Others – 3

The objects in this group share some properties, but the objects also differ in some distinctive ways.

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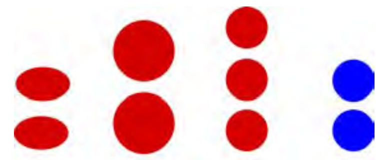
3. There are three figures, the other three have two.
4. This is blue, the other three are red.



THE CHALLENGE: For each of these next four objects, describe a property that the remaining three objects have that it does not.

EXPLORATION: Find other groups of four things where each group of three of them has a property the fourth does not. Can you think of a group of five things like this?

Puzzle of the Week

Each of These is Not Like the Others – 4

The objects in this group share some properties, but the objects also differ in some distinctive ways.

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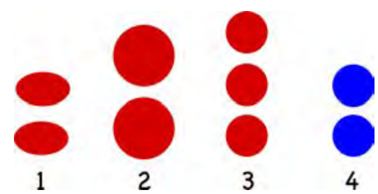
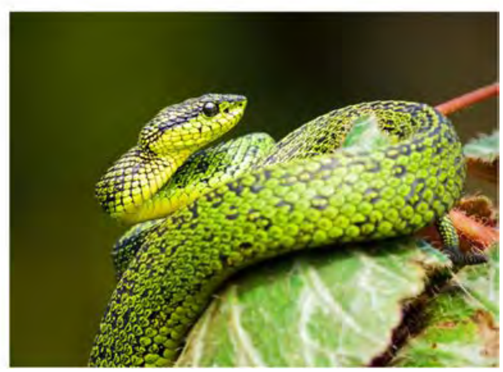


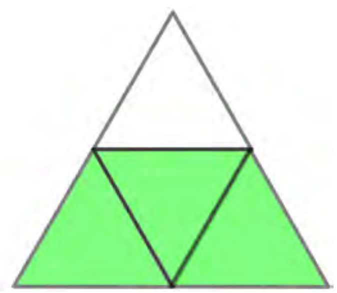
THE CHALLENGE: For each of these next four objects, describe a property that the remaining three objects have that it does not.



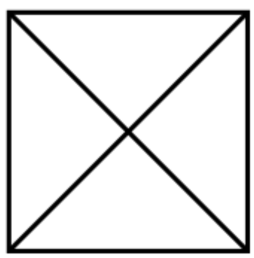
EXPLORATION: Find other groups of four things where each group of three of them has a property the fourth does not. Can you think of a group of five things like this?

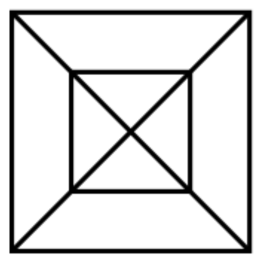
Puzzle of the Week
Finding the Pieces – 1

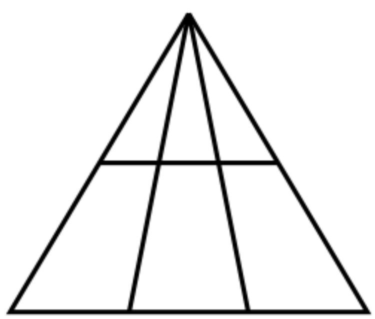
A ***trapezoid*** is a four-sided figure that has exactly one pair of parallel sides (parallel lines in a surface are lines that never meet). In the large triangle on the left, there are five triangles marked – the four colored triangles and the entire triangle. The same large triangle on the right has one of its three trapezoids colored in green.



THE CHALLENGE: In each of these three figures, count the number of triangles and trapezoids.







EXPLORATION: Make drawings like these for other people to count the triangles and trapezoids.

math for love

Puzzle of the Week

Finding the Pieces – 1 – Notes

THE CHALLENGE: The square in the upper left has four smaller triangles plus four more triangles made out of pairs of smaller triangles. So it has eight triangles in all. It has no trapezoids in it.

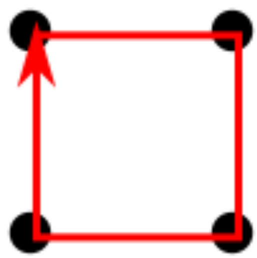
The square in the upper right corner eight triangles in the inside square and eight more in the big square, so 16 triangles in all. It has four trapezoids.

The triangle in the bottom has a total of 12 triangles and six trapezoids.

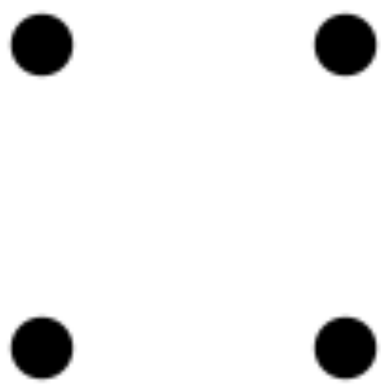
Puzzle of the Week

Lines – 1

Here is a 2 by 2 array of dots. Four connected line segments have been drawn in a path that begins and ends at the same point, and that goes 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.



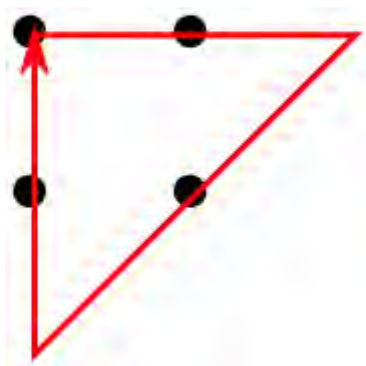
EXPLORATION: Play around with other grids and discover shortest paths that go through all the points.

Puzzle of the Week

Lines – 1 – Notes

THE CHALLENGE: The key to answering this puzzle, and the next one with a 3 by 3 grid, is to think outside the “box.” The temptation in these puzzles is to think that the world of the puzzle is contained within the grid of points.

Here is the solution:

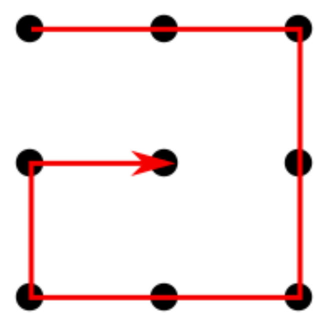


EXPLORATION: In the puzzle “Lines – 2” we will see the answer for a 3 by 3 grid where the path does not start and end at the same point. These are fun geometry puzzles and I am not aware of a general strategy of path creation that is associated with them.

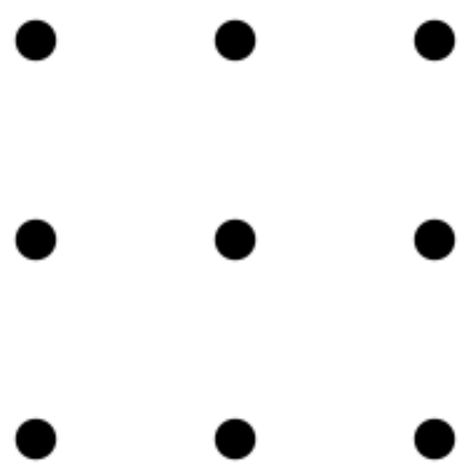
Puzzle of the Week

Lines – 2

Here is a 3 by 3 array of dots. Five connected line segments have been drawn in a path that goes through all nine points.



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



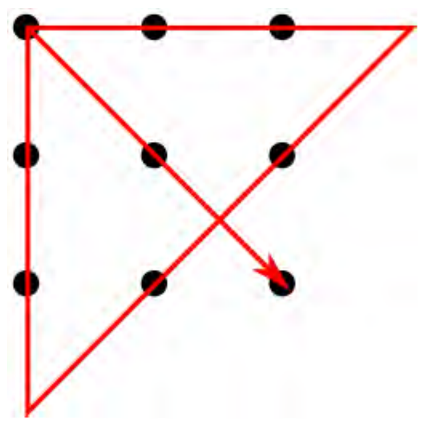
EXPLORATION: Play around with other grids and discover shortest paths that go through all the points.

Puzzle of the Week

Lines – 2 – Notes

THE CHALLENGE: The key to answering this puzzle, and the next one with a 3 by 3 grid, is to think outside the "box." The temptation in these puzzles is to think that the world of the puzzle is contained within the grid of points.

Here is the solution:



EXPLORATION: These are fun geometry puzzles and I am not aware of a general strategy of path creation that is associated with them.

Puzzle of the Week

Pan Balance – 1

A pan balance tells you when its two sides are carrying the same amount of weight or whether one side is heavier than the other.

THE CHALLENGE: You have eight coins. Seven of the coins weigh the same amount. The eighth coin is a counterfeit and is just a tiny bit lighter than the others. Use two weighings on the pan balance to find the counterfeit coin.

EXPLORATION: Instead of having eight coins, suppose you had nine coins with one counterfeit - could you still identify it with two weighings? What is the largest number of coins you could have and still identify a counterfeit in two weighings? How about three weighings? Four weighings? See if you can find a pattern.

Puzzle of the Week

Pan Balance – 1 – Notes

THE CHALLENGE: Encourage your students to experiment with simpler versions of this problem.

For two coins, one weighing tells the whole story in the obvious way.

For three coins, randomly choose two to weigh, one on each side. If they balance, you know the counterfeit is the third coin. If they don't balance, the coin on the lighter side is the counterfeit coin.

For four or five coins, there is no way to do it in one weighing, and it is very easy to do it in two weighings.

For six or seven coins, you can start by weighing two groups of two, or by weighing two groups of three.

For eight coins, start by weighing two groups of three. If they balance, weigh the remaining two coins. If they don't balance, weigh two coins from the lighter group of three.

EXPLORATION: The earlier experimentation shows the importance of splitting things up into three parts.

For nine coins, split them into three groups of three. Choose two of those groups and weigh them against each other. If they are equal, the counterfeit is in the remaining group of three. They are unbalanced, the counterfeit is in the lighter group of three.

This strategy of breaking things into three groups will continue to work for more weighings. For example, if you are allowed three weighings, you can start by breaking up 27 coins into three groups of nine. If you are allowed four weighings, you can start by breaking up 81 coins into three groups of 27.

Puzzle of the Week

Pan Balance – 2

A pan balance tells you when its two sides are carrying the same amount of weight or whether one side is heavier than the other.

THE CHALLENGE: You have some coins. All the coins but one weigh the same amount. The remaining coin is a counterfeit and is just a tiny bit lighter or heavier (you don't know which). What's the maximum number of coins you can have and be able to decide which coin is the counterfeit with just two weighings?

EXPLORATION: Investigate using three weighings with more coins. How many coins can you have and still be able to find the counterfeit in three weighings? How about four weighings – can you determine the counterfeit out of 16 coins with four weighings?

Puzzle of the Week

Pan Balance – 2 – Notes

THE CHALLENGE: The maximum number is four for two weighings.

Start by choosing two coins and weighing them against each other.

If they balance, the counterfeit is one of the two remaining coins. Choose one of the original two coins and weigh it against one of the two remaining ones. If they balance, then the last coin is counterfeit; if they don't balance, then the coin being weighed that wasn't in the original pair must be counterfeit.

If they don't balance, then one of those two is counterfeit and the remaining two are normal. Choose one of the original two coins and one of the remaining two coins and weigh them against each other. The logic is then similar to the last case.

EXPLORATION: For three weighings, the maximum number is 13. The logic for doing three weighings for 12 or 13 coins is fairly involved. Rather than repeating it here, please see "Balance Puzzle" on Wikipedia. There is also extensive mathematical literature on pan balance problems.

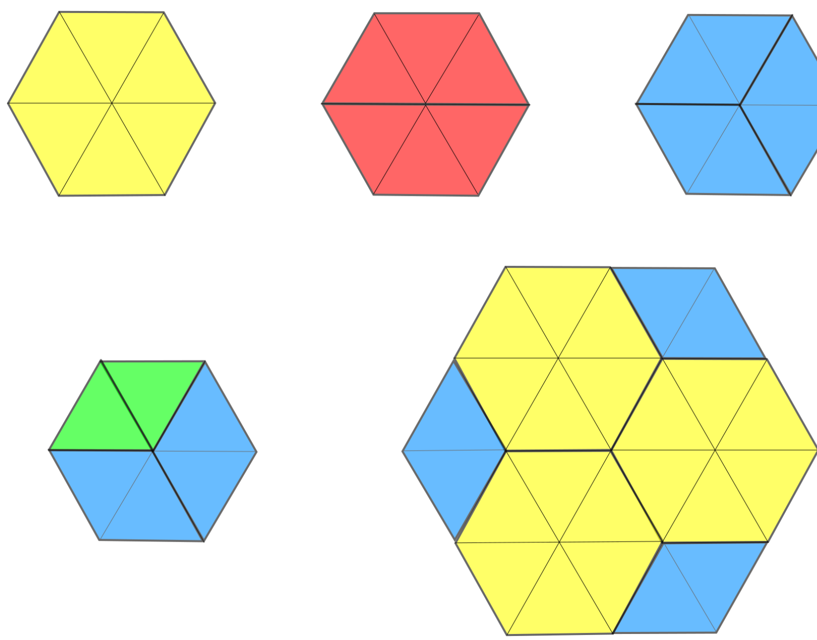
To solve the puzzle of using 4 weighings to find the counterfeit coin among 16 coins, start by weighing two groups of four against each other. If they balance, use four of those coins to test four of the remaining coins. If they do not balance, use four of the remaining coins to test one of the first two groups of coins. In every instance, we have now narrowed down the possibilities to one group of four coins with two weighings remaining. Note we also know of 12 regular coins at this point.

Use two of the regular coins to test two of the coins in the special group of four - if they balance, the counterfeit is in the remaining two; if they don't balance the counterfeit is one of those two from the group of four. Now use one normal coin to test one of the two coins. This will finally identify which of the two coins is the counterfeit coin.

Puzzle of the Week

Pattern Blocks – Hexagons

Using just four of the standard pattern block shapes, here are examples of making hexagons with one, two, three, four and six of those shapes.



THE CHALLENGE: For each of the numbers from 5 to 10, make a hexagon that uses that many of these shapes.

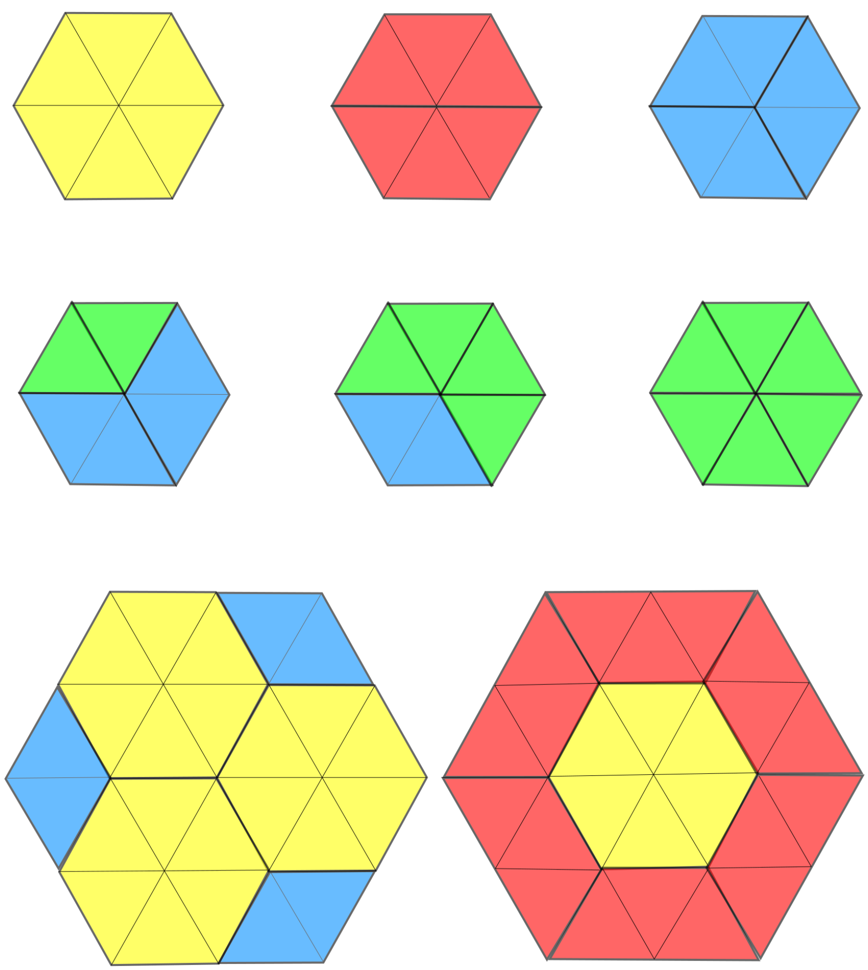
EXPLORATION: Can you find more than one way to do some of these? Extend your list of possible numbers to 20!

Puzzle of the Week

Pattern Blocks – Hexagons – Notes

THE CHALLENGE & EXPLORATION: There are a large number of ways to do this. Any design that involves a parallelogram can be used to create a hexagon that has one more triangle by splitting the parallelogram into two triangles. Similarly, trapezoids can be split into a parallelogram and a triangle. Also, hexagons can be split into two trapezoids, three parallelograms, or six triangles. All of these give automatic ways of creating hexagons with one additional shape over and over again.

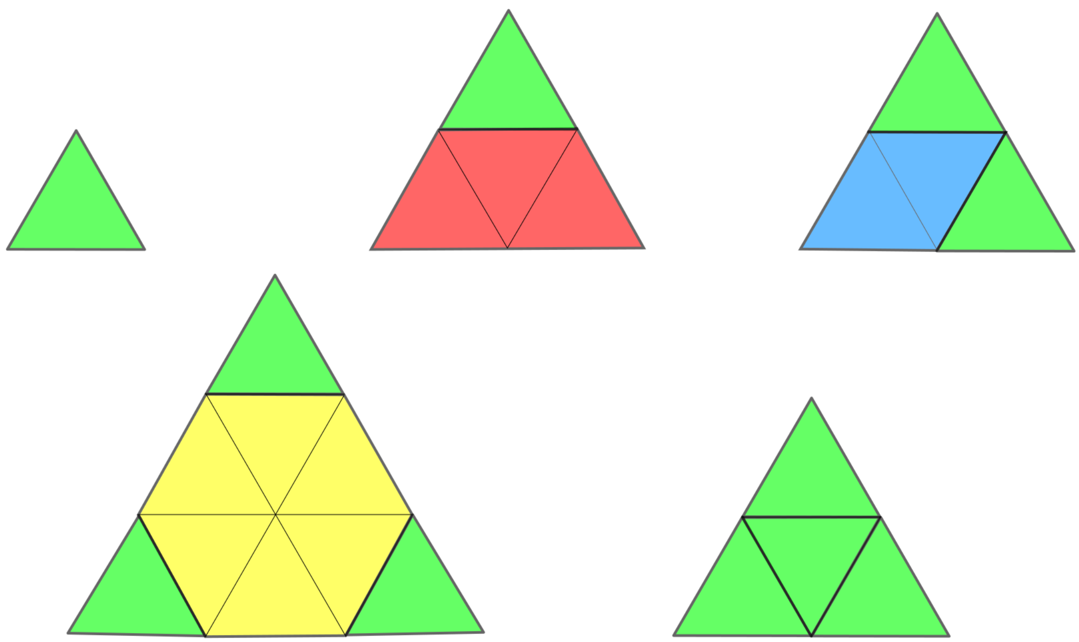
Here are just a few of the starting numbers. There are too many to attempt to show them all. Some of the patterns your students create will make pretty patterns and may look good hung on the walls of your classroom.



Puzzle of the Week

Pattern Blocks – Triangles

Using just four of the standard pattern block shapes, here are examples of making triangles with one, two, three, and four of those shapes.



THE CHALLENGE: For each of the numbers from 5 to 10, make a triangle that uses that many of these shapes.

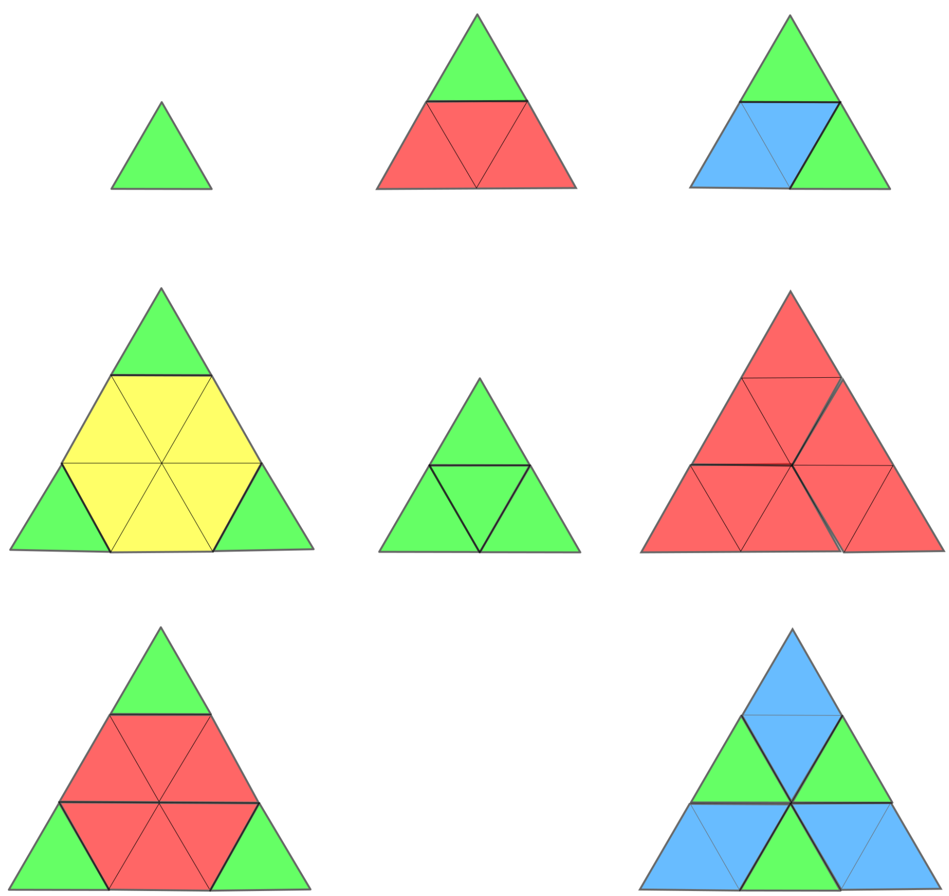
EXPLORATION: Can you find more than one way to do some of these? Extend your list of possible numbers to 20!

Puzzle of the Week

Pattern Blocks – Triangles – Notes

THE CHALLENGE & EXPLORATION: There are a very large number of ways to do this. Any design that involves a parallelogram can be used to create a triangle with one more triangle by splitting the parallelogram into two triangles. Similarly, trapezoids can be split into a parallelogram and a triangle. Also, hexagons can be split into two trapezoids, three parallelograms, or six triangles. All of these give automatic ways of creating triangles with one additional shape over and over again.

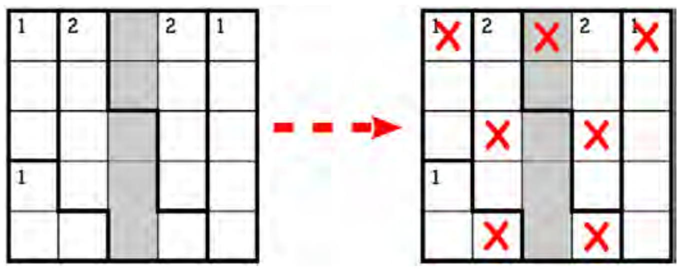
Here are just a few of the starting numbers. There are too many to attempt to show them all. Some of the patterns your students create will make pretty patterns and may look good hung on the walls of your classroom.



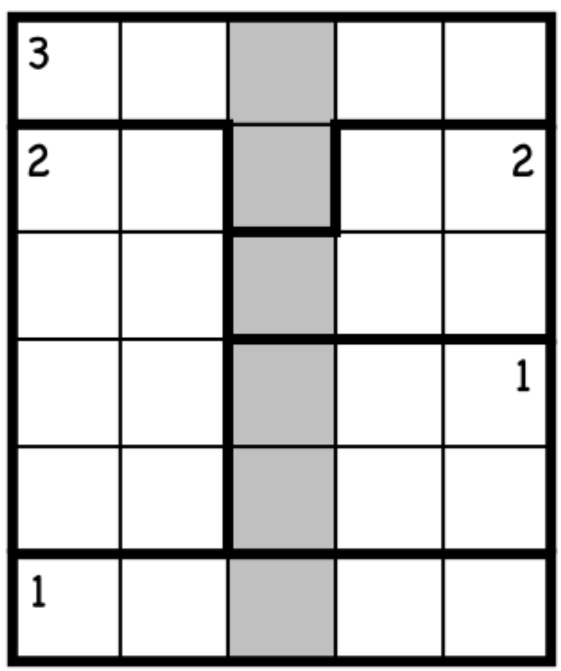
Puzzle of the Week

Reflect on This! – 1

This larger square is broken into regions with dark borders. Each region has a number that indicates how many X's it should have. Whether in the same region or not, no two X's may share a side or touch diagonally. Lastly, any X to the left of the gray column must be matched with its reflection, an X in the same position to the right of the gray column.



THE CHALLENGE: Solve this larger Reflect on This! puzzle.



EXPLORATION: Make some of these puzzles for others.

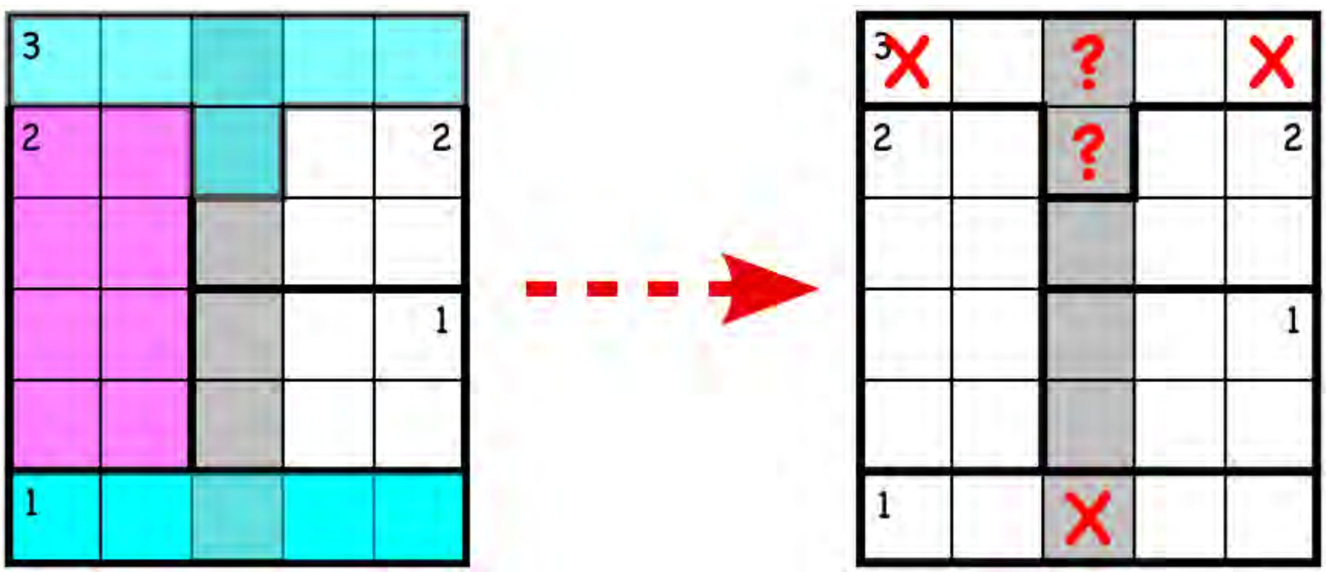
Puzzle of the Week

Reflect on This! – 1 – Notes

THE CHALLENGE & EXPLORATION: Start by looking at the two regions colored light blue. Because of symmetry, the only way the bottom blue region can have one X is if that X is in the middle square. The only way the top blue region can have three X's is if there are X's at the far right and left, and one X in the middle, in one of the two squares marked with a ?.

If the X is in the square with the lower of the two ?'s, then it is impossible to get two X's in the uncolored '2' region. So, the third X in the upper blue region must be in the upper square with a ?.

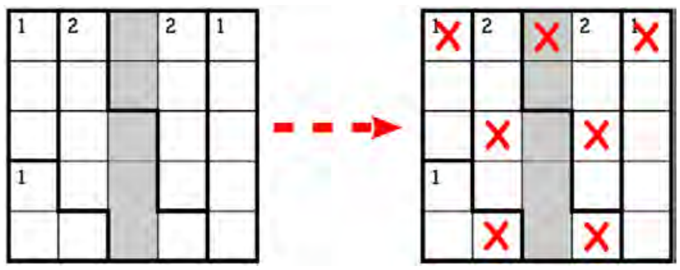
At this point, do the uncolored '2' region next, then the '1' region. Finally, the positions of the X's in the pink '2' region are both forced by symmetry.



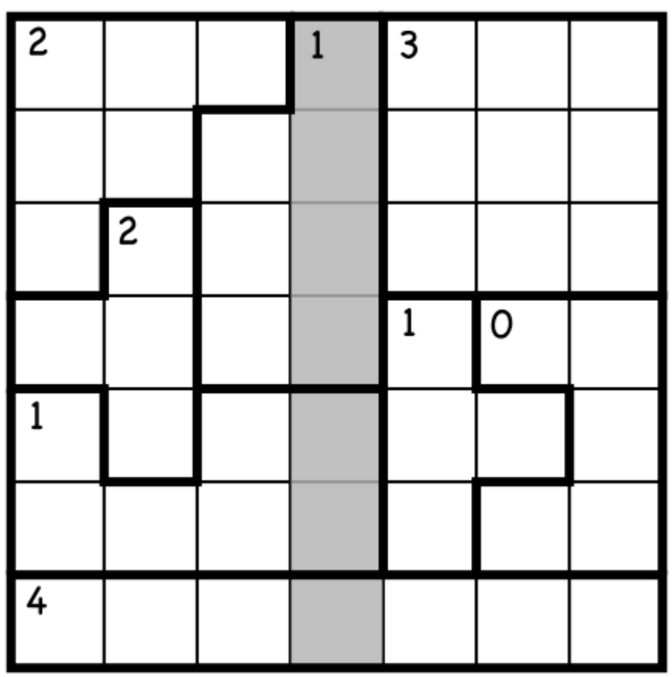
Puzzle of the Week

Reflect on This! – 2

This larger square is broken into regions with dark borders. Each region has a number that indicates how many X's it should have. Whether in the same region or not, no two X's may share a side or touch diagonally. Lastly, any X to the left of the gray column must be matched with its reflection, an X in the same position to the right of the gray column.



THE CHALLENGE: Solve this larger Reflect on This! puzzle.



EXPLORATION: Make some of these puzzles for others.

Puzzle of the Week

Reflect on This! – 2 – Notes

THE CHALLENGE & EXPLORATION: The purple "2" region is one of the easier places to start. There is only one way to place two X's into that region.

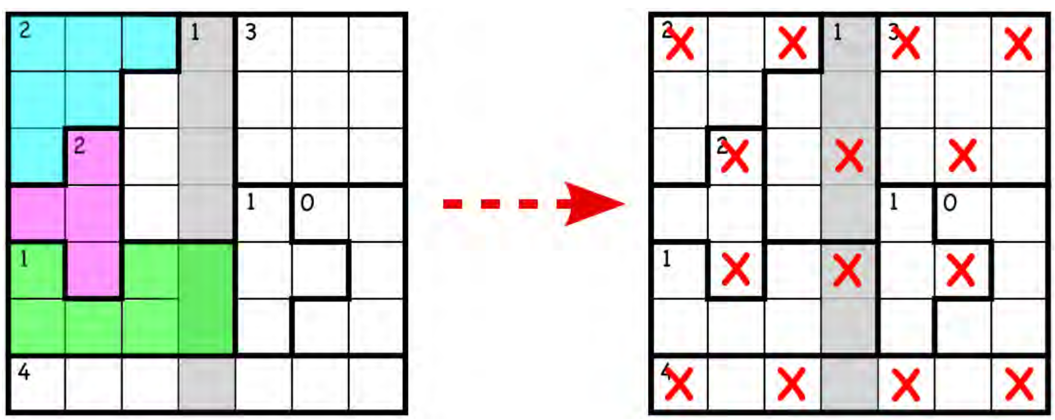
The blue "2" region is a good next step. With the X in the upper purple region, there is only one way to place two X's in the blue region.

The "4" region on the bottom can only be filled in one way.

With those regions filled, there is only one square available in the green "1" region.

Similarly, with all that done, there is only one place left in the "1" region above the green region.

The rest can be filled in using the reflection property.



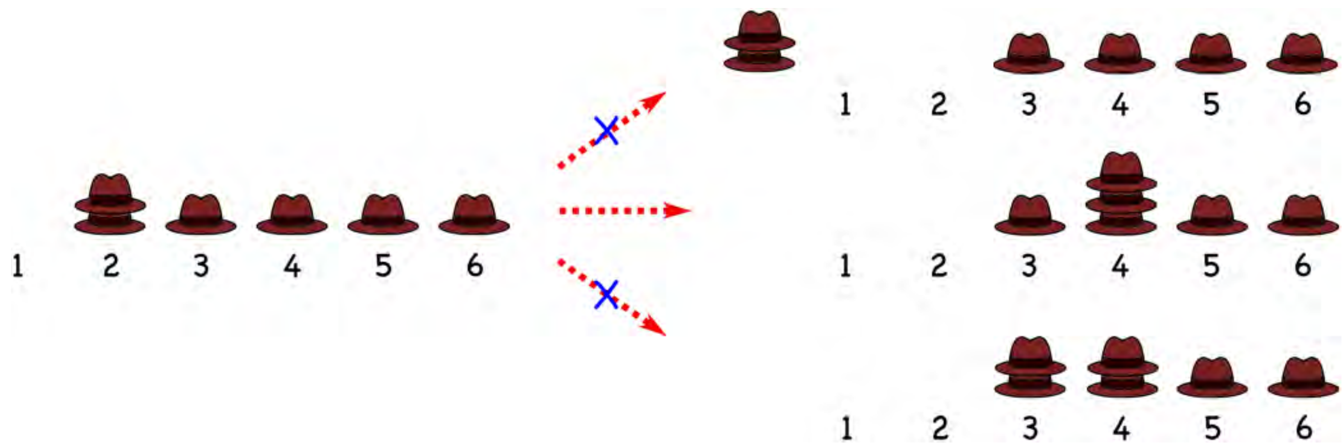
Puzzle of the Week
Stacking Hats – 1

Rules for stacking:

1) When you move a stack, you must move the whole stack onto a place with at least one hat.

2) A stack moves over the number of places for how many hats there are.

3) You can only use the original six spots.



THE CHALLENGE: Use these rules to move the six hats into one stack. Can the final stack of six hats end up in any of the six positions, or do only some of the positions work?

EXPLORATION: What happens if you start with seven hats in seven places? What about other numbers?

Puzzle of the Week

Stacking Hats – 1 – Notes

THE CHALLENGE & EXPLORATION: It is actually easiest to show how to do this with any number of hats ending up in any position. Interestingly, sometimes making a problem more general makes it easier to do.

Doing this puzzle for one, two, or three hats is very easy.

So, assume we have some number of hats that is bigger than three, and also assume we know how to do this puzzle for any number of hats less than this number.

Select the spot where you want all the hats to end up. Leave that hat alone - it does not ever need to move. I'll assume there are hats on both sides of that special hat - if there aren't, then you only need to concern yourself with the one side.

For the hats that form a group of hats on the left side, use your expertise to pile them up in one stack on the far left side. Similarly, for the hats that form a group of hats on the right side, use your expertise to pile them up in one stack on the far right side. Finally, jump the hats on the far left onto the special hat and jump the hats on the right side onto the special hat. We now have all the hats in one pile where we wanted them to be.

Puzzle of the Week

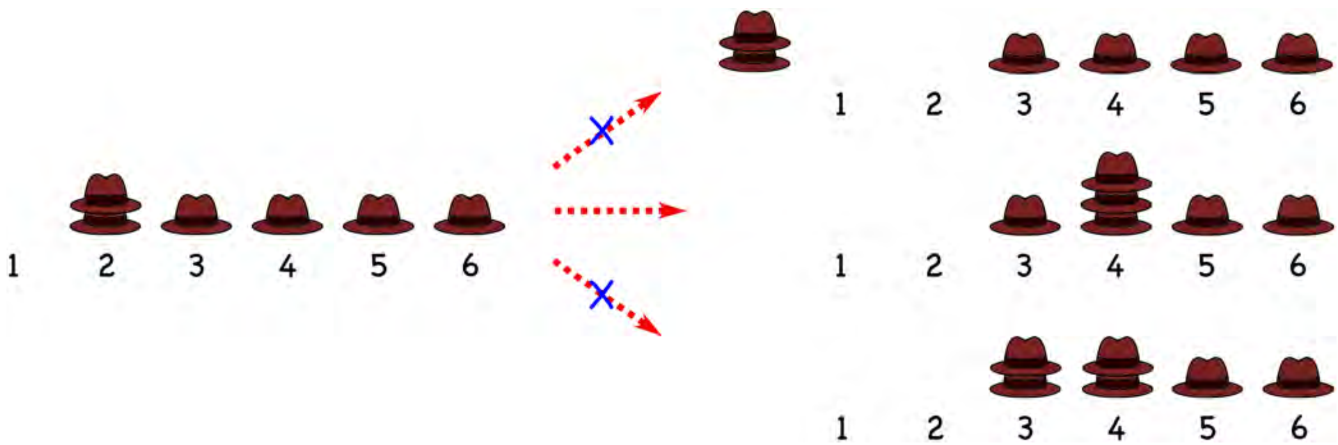
Stacking Hats – 2

Rules for stacking:

1) When you move a stack, you must move the whole stack onto a place with at least one hat.

2) A stack moves over the number of places for how many hats there are.

3) You can only use the original six spots.



THE CHALLENGE: Use these rules to move the six hats into one stack. The small blue hat needs to end up on top of the stack. Can the final stack of six hats end up in any of the six positions, or do only some of the positions work? Can the blue hat start in any position, or do only some of the starting positions work?

EXPLORATION: What happens if you start with seven hats in seven places? What changes if you allow hats to move to empty positions?

Puzzle of the Week

Stacking Hats – 2 – Notes

THE CHALLENGE & EXPLORATION: Dealing with a blue hat makes the Stacking Hats puzzle much trickier! If you look at the results below, you'll notice some clear patterns. However, I'll just describe what happens with different numbers of hats and leave it at that.

A couple general thoughts first. Because it is not legal to move a stack into an empty position, and the Blue hat must be moved away from its initial position so that it will be on top, it is never possible to have the final stack end up where the Blue hat started. To save work, I will only consider Blue hat positions for the positions on the left side - the other positions can be easily analyzed by taking mirror images of the left side positions.

The shorthand I will use is BL for Blue, BR for Brown, Y for yes, and N for no. For example, (BL BR BR) - (N Y N) means that when there are three hats ordered Blue - Brown - Blue, it is possible to have a stack of all three hats with the Blue hat on top only ending in the middle position.

1 Hat: (BL) - (Y)
2 Hats: (BL BR) - (N Y)
3 Hats: (BL BR BR) - (N Y N); (BR BL BR) - (Y N Y)
4 Hats: (BL BR BR BR) - (N Y N Y); (BR BL BR BR) - (Y N Y Y)
5 Hats: (BL BR BR BR BR) - (N Y N Y Y); (BR BL BR BR BR) - (Y N Y Y Y); (BR BR BL BR BR) - (Y Y N Y Y)
6 Hats: (BL BR BR BR BR BR) - (N Y N Y Y Y); (BR BL BR BR BR BR) - (Y N Y Y Y Y);
(BR BR BL BR BR BR) - (Y Y N Y Y Y)
7 Hats: (BL BR BR BR BR BR BR) - (N Y N Y Y Y Y); (BR BL BR BR BR BR BR) - (Y N Y Y Y Y Y);
(BR BR BL BR BR BR BR) - (Y Y N Y Y Y Y); (BR BR BR BL BR BR BR) - (Y Y Y N Y Y Y)

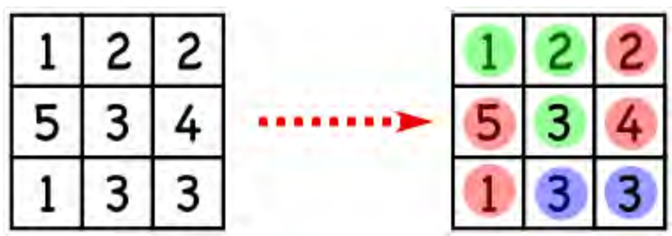
Allowing stacks of hats to jump into empty spots makes it possible to almost always succeed. I have put in red Y's for the new places that are possible.

1 Hat: (BL) - (Y)
2 Hats: (BL BR) - (N Y)
3 Hats: (BL BR BR) - (**Y** Y **Y**); (BR BL BR) - (Y N Y)
4 Hats: (BL BR BR BR) - (**Y** Y **Y** Y); (BR BL BR BR) - (Y **Y** Y Y)
5 Hats: (BL BR BR BR BR) - (**Y** Y **Y** Y Y); (BR BL BR BR BR) - (Y **Y** Y Y Y); (BR BR BL BR BR) - (Y Y **Y** Y Y)
6 Hats: (BL BR BR BR BR BR) - (**Y** Y **Y** Y Y Y); (BR BL BR BR BR BR) - (Y **Y** Y Y Y Y);
(BR BR BL BR BR BR) - (Y Y **Y** Y Y Y)
7 Hats: (BL BR BR BR BR BR BR) - (**Y** Y **Y** Y Y Y Y); (BR BL BR BR BR BR BR) - (Y **Y** Y Y Y Y Y);
(BR BR BL BR BR BR BR) - (Y Y **Y** Y Y Y Y); (BR BR BR BL BR BR BR) - (Y Y Y **Y** Y Y Y)

Puzzle of the Week

Sum Groups 6-a

This puzzle is filled with numbers that can be grouped together to sum to 6. Each group of numbers that sum to 6 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 6.

1	0	1
5	5	4
3	3	2

1	5	2	4
3	2	1	5
1	2	3	1
2	4	3	3

EXPLORATION: Make some of these puzzles for others to solve.

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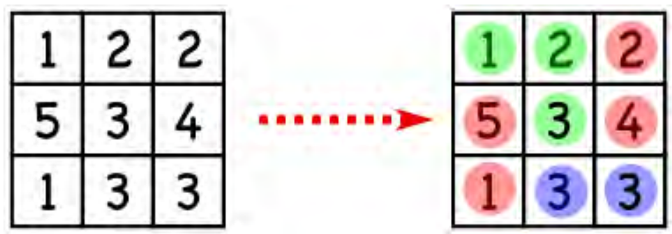
Puzzle of the Week

Sum Groups 6-b

This puzzle is filled with numbers that can be grouped together to sum to 6. Each group of numbers that sum to 6 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 6.

2	3	3
1	5	1
3	6	0

5	1	2	2
3	1	1	2
1	2	3	6
2	3	2	0

EXPLORATION: Make some of these puzzles for others to solve.

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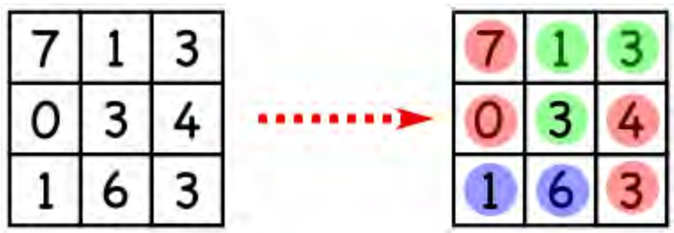
Puzzle of the Week

Sum Groups 7-a

This puzzle is filled with numbers that can be grouped together to sum to 7. Each group of numbers that sum to 7 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 7.

2	6	1
1	4	5
4	3	2

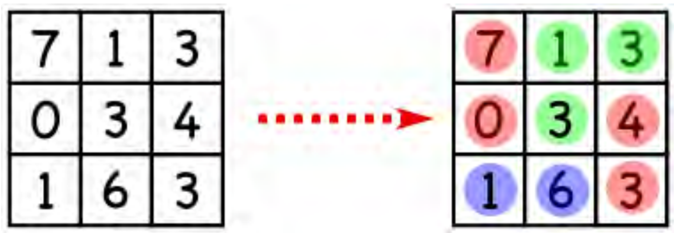
6	1	4	1
4	5	2	3
3	2	3	4
1	6	3	1

EXPLORATION: Make some of these puzzles for others to solve.

Puzzle of the Week

Sum Groups 7-b

This puzzle is filled with numbers that can be grouped together to sum to 7. Each group of numbers that sum to 7 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 7.

5	7	0
1	6	1
1	4	3

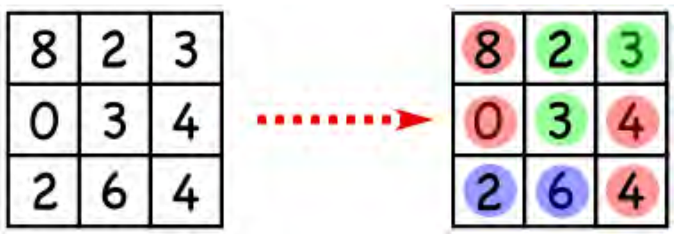
4	2	4	3
3	1	2	5
3	2	3	7
1	5	4	0

EXPLORATION: Make some of these puzzles for others to solve.

Puzzle of the Week

Sum Groups 8-a

This puzzle is filled with numbers that can be grouped together to sum to 8. Each group of numbers that sum to 8 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 8.

5	1	7
1	2	3
6	2	5

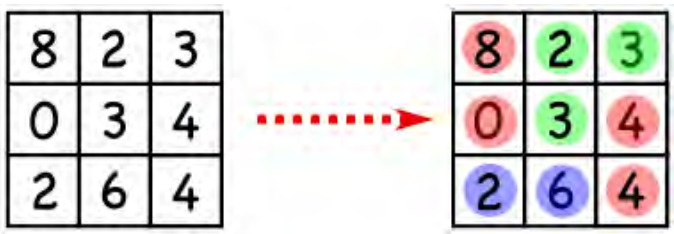
0	8	3	2
2	4	4	3
6	5	5	7
1	2	3	1

EXPLORATION: Make some of these puzzles for others to solve.

Puzzle of the Week

Sum Groups 8-b

This puzzle is filled with numbers that can be grouped together to sum to 8. Each group of numbers that sum to 8 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 8.

6	2	4
3	1	4
5	3	4

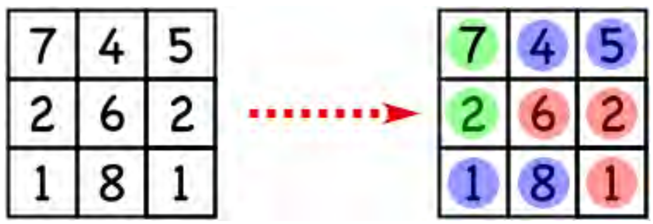
2	3	5	3
6	4	3	2
2	4	3	5
4	2	1	7

EXPLORATION: Make some of these puzzles for others to solve.

Puzzle of the Week

Sum Groups 9-a

This puzzle is filled with numbers that can be grouped together to sum to 9. Each group of numbers that sum to 9 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 9.

1	0	9
4	6	5
4	3	4

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

EXPLORATION: Make some of these puzzles for others to solve.

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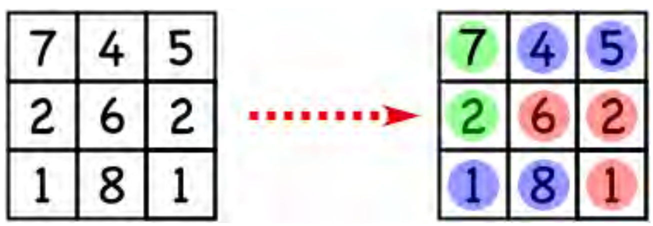
Puzzle of the Week

Sum Groups 9-b

This puzzle is filled with numbers that can be grouped together to sum to 9. Each group of numbers that sum to 9 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 9.

5	6	3
4	5	7
3	1	2

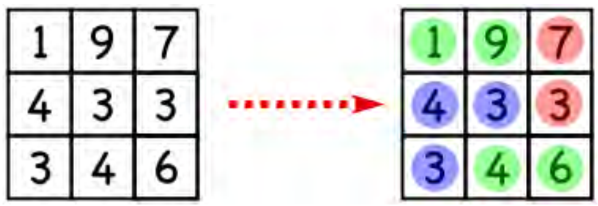
5	5	4	5
2	4	2	7
2	6	3	6
1	8	1	2

EXPLORATION: Make some of these puzzles for others to solve.

Puzzle of the Week

Sum Groups 10-a

This puzzle is filled with numbers that can be grouped together to sum to 10. Each group of numbers that sum to 10 must be connected, and each square must share a side with at least one other square in the group.



THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 10.

8	2	3
5	3	4
5	7	3

1	5	3	2
4	3	7	4
5	3	5	6
3	4	1	4

EXPLORATION: Make some of these puzzles for others to solve.

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Puzzle of the Week

Sum Groups 10-b

This puzzle is filled with numbers that can be grouped together to sum to 10. Each group of numbers that sum to 10 must be connected, and each square must share a side with at least one other square in the group.

1	9	7
4	3	3
3	4	6

→

1	9	7
4	3	3
3	4	6

THE CHALLENGE: Divide each of these squares into groups of two or three numbers that add up to 10.

6	5	5
1	3	6
2	8	4

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

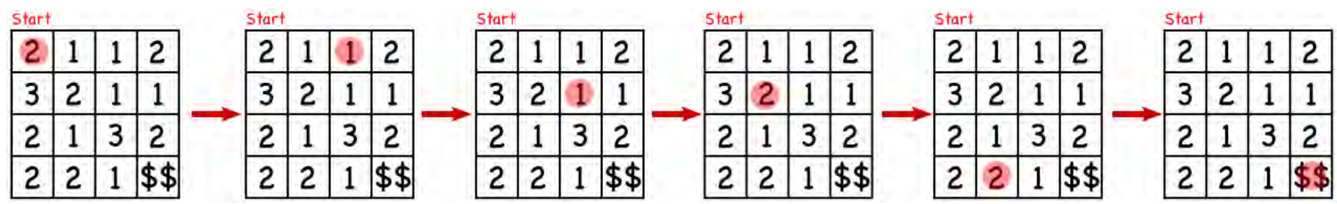
EXPLORATION: Make some of these puzzles for others to solve.

Puzzle of the Week

Treasure Map – 1

When standing on a square in a treasure map, you must move exactly the given number of squares, and you can only move to the right, left, up, or down.

Here is an example of one way to solve this example of a treasure map.



THE CHALLENGE: Find a route from the Start to the $$ in this new treasure map.

Start

1	3	2	1
2	1	2	2
1	2	2	3
1	3	1	$$

EXPLORATION: Make treasure maps for others to solve. Can you make them with only one route to the treasure?

Puzzle of the Week

Treasure Map – 1 – Notes

THE CHALLENGE: These puzzles are fun for children to play around with. They can be particularly fun if you make a big map on the ground (perhaps chalk or painter's tape) that they can walk through as they try to discover the secret route to the treasure.

Beyond playing around and practicing with small numbers, these can give excellent practice with an important problem-solving technique. Namely, working forwards from the beginning and backwards from the end. These puzzles are simple enough that this technique is not essential, but it becomes extremely valuable for larger puzzles that are 5 by 5, 6 by 6, or larger.

Label the columns, from left to right, A, B, C, and D. Label the rows, from top to bottom, 1, 2, 3, and 4. The player starts at square A1 and wants to end up at D4.

Moving forwards from A1, the first squares hit are B1 and A2. B1 is no good because the only place it leads to is B4, and B4 just leads back to B1. So, let's move forward one move from A2. That brings us to C2 and A4.

Let's work backwards from D4 and see if we can get to either C2 or A4. The only squares that can get to D4 in one move are D2 and C4. The only square that can move to D2 is D1, and there is no way to get to D1, so that route is not going to work. That only leaves C4. The only way to get to C4 is from C2, and we've found the connection we need.

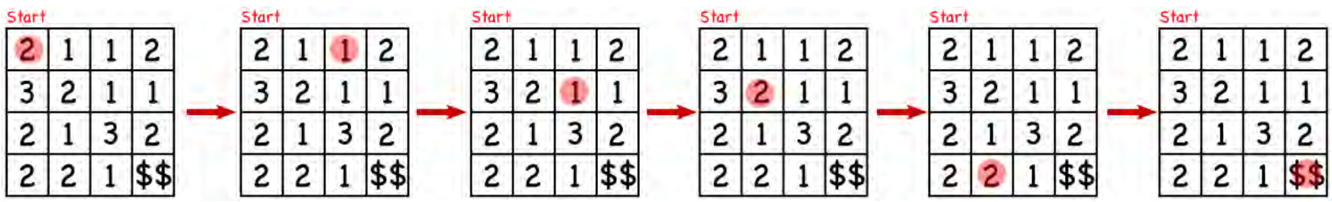
The answer is A1 => A2 => C2 => C4 => D4.

Puzzle of the Week

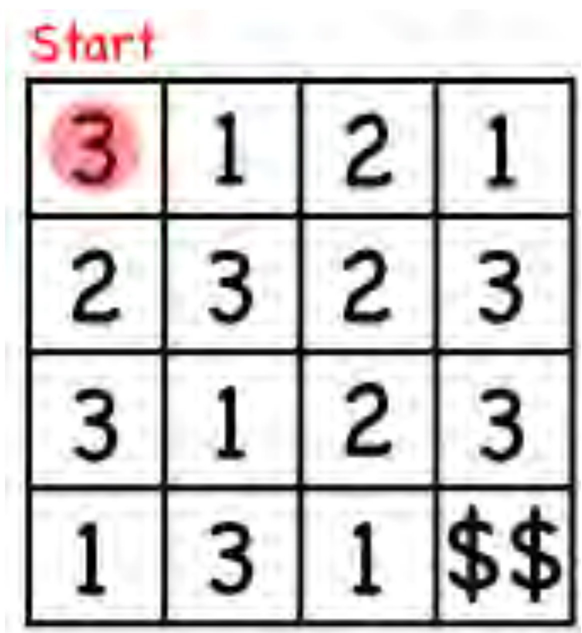
Treasure Map – 2

When standing on a square in a treasure map, you must move exactly the given number of squares, and you can only move to the right, left, up, or down.

Here is an example of one way to solve this example of a treasure map.



THE CHALLENGE: Find a route from the Start to the $$ in this new treasure map..



EXPLORATION: Make treasure maps for others to solve. Can you make them with only one route to the treasure?

Puzzle of the Week

Treasure Map – 2 – Notes

THE CHALLENGE: These puzzles are fun for children to play around with. They can be particularly fun if you make a big map on the ground (perhaps chalk or painter's tape) that they can walk through as they try to discover the secret route to the treasure.

Beyond playing around and practicing with small numbers, these can give excellent practice with an important problem-solving technique. Namely, working forwards from the beginning and backwards from the end. These puzzles are simple enough that this technique is not essential, but it becomes extremely valuable for larger puzzles that are 5 by 5, 6 by 6, or larger.

Label the columns, from left to right, A, B, C, and D. Label the rows, from top to bottom, 1, 2, 3, and 4. The player starts at square A1 and wants to end up at D4.

Moving forwards from A1, the first move will either be to A4 or D1. A4 can go to A3 or B4. A3 bounces back and forth with D3, so it leads nowhere. B4 goes to B1. D1 can either go to C1 or D2. So, we want to connect up with either B1, C1, or D2.

Moving backwards from D4, there is only one way to get to D4 and that is from C4. The only way to get to C4 is from C2. The only way to get to C2 is from A2. And the only way to get to A2 is from D2. At last we have a connection! Notice that, for this puzzle, working backwards was much easier because there weren't any choices so there were fewer possibilities to consider.

The answer is: A1 => D1 => D2 => A2 => C2 => C4 => D4.