BREAKFAST CEREAL MATH

A Math Puzzle Book For Non-Math People



MATH-A-TIZE ME CAP'N!

Net WT 3.14 OZ

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The Heart Behind Breakfast Cereal Math

To set the scene for Breakfast Cereal Math you will need to transport yourself back to the year 2004. Picture a seven year old boy waking up to start his Saturday morning excited to play Legos or whatever seven year old boys do in 2004, but before he can accomplish this he needs to eat a complete breakfast. According to the food pyramid he saw at school a bowl of Captain Crunch cereal counts as a “complete breakfast” so he is going to go with that. As he pours his cereal and begins to eat there is a moment of boredom while watching the dry pieces get a bit soggier. His eyes then drift to the back of the box to keep him occupied as entertainment. As he examines the cartoon pirate ship drawing he does the maze provided and solves the strange word puzzles about people’s ethnicities. His mind is active in thinking and he finds his boredom disappearing. Before he knows it his cereal is finished and his Saturday of fun can begin.

Now for the plot twist, this 7 year old boy was me. Fast forward 21 years and I am currently a math teacher who is bombarded with a related age old question, “why do we have to learn this?” This question causes me to think back on those Breakfast Cereal puzzles I spent time on that had no ulterior motivation, no money to be won for getting it right, no good grade attached to solving and usually not even hearing a “good job” from a parent. So why did I do it? What is the appeal? How could I as a math teacher tap into this playful solving that so many of us do when we are kids? As I do some meaningful reflection on these questions I find myself tapping into a shared universal truth for humanity. We love a unique new challenge. There is something innate about tackling something that provides either physical or mental challenge when the reward is just solving the problem itself. Especially when something feels like it is a brand new challenge, the satisfaction of solving is even sweeter.

But what about that Captain Crunch cereal box, do I still wake up and look forward to solving the back of the cereal box? No.

There is a little fun fact about the Captain Crunch cereal box that I looked at 22 years ago, it didn’t change the design for the back of the box for almost 20 years. The exact same puzzles with all the same solutions. The cereal box has lost its magic when you see the same pirate ship 50+ times. So as I got older I just kind of gave up with entertaining the back of the Captain Crunch box because it never changed. Always the same old box. Once you crack the code you never have to critically think about how to solve the puzzles, you just go through the motions.

The state of US mathematics education feels this way sometimes to me. If math education was a cereal box it feels like its design hasn’t changed in decades. The same old box for decades and decades, maybe this is the cause of so much of math’s notoriety?

Many of the stories from students overlap in a similar theme, “math used to be engaging back when I was first learning it but now it is boring, confusing and only works for students that can memorize what the teacher says.” So what happens between these younger years of enthusiasm for math and the formative high school times when a hate for math starts? I

personally believe it starts out at the elementary level where most kids have this innate desire to challenge themselves and solve the problem for the sake of solving and feeling good about the achievement, kind of like solving the back of the cereal box for fun. But then there is a stagnant culture of math education where teaching practices that emphasize memorizing over understanding. This approach does not allow students to critically think, leading students to get stuck in a rut and buy into the lie that there are “math people” and “non math people”. When students buy into that lie then they set their expectations for failure with math and much of the education system just passes them along to the next math course when they truly haven’t mastered the material. To the cereal box metaphor it feels like kids divide themselves into groups, kids that have memorized the back of the box and those who have not, and if you haven’t then you just weren’t made for math.

So what is the solution to this issue? How can we address this nationwide issue of students hating math? I propose a different design of a cereal box. A design that is purposefully challenging and promotes student thinking while still feeling like it is something new for students. Puzzle creator Martin Gardner saw the same issue in the world of math education and proposed a different approach to making a math curriculum. He is quoted in saying, “The man who cannot solve problems is at best a clever mimic, while he who can solve problems is a creator.” which sums up the number one problem he saw. Students are being taught to mimic and remember what their teacher said and not actually engage in problem solving. Gardner was famous for math puzzles that on the surface may feel irrelevant to the subject, for example one of his more famous problems was about cutting up a chess board and putting dominoes on it. These types of problems are hard to tie to specific math standards taught in the classroom. But what Gardner insisted on is that meaningful engagement with problem solving even if not directly related to curriculum is better than students just reciting word for word what their teacher says without actually understanding what it means.

Problem solving is a muscle and Breakfast Cereal Math aims to work that muscle out. In the vein of Gardner’s puzzles. There may be problems that could potentially be tied to specific math standards but that is not the point. There are definitely better questions to tackle those standards that you see in school, but instead here is a short collection of goofy random problems designed to be able to be tackled from multiple angles whether doodling, graphs, straight equations, or just careful thought. Included are problems that are probably just a bit too out of the box to be found in math textbooks and are closer in nature to the cartoon worlds of cereal boxes. This collection aims to be the back of a cereal box with little puzzles that hopefully feel new, challenging and a good way to pass the time while feeling good about thinking through a problem.

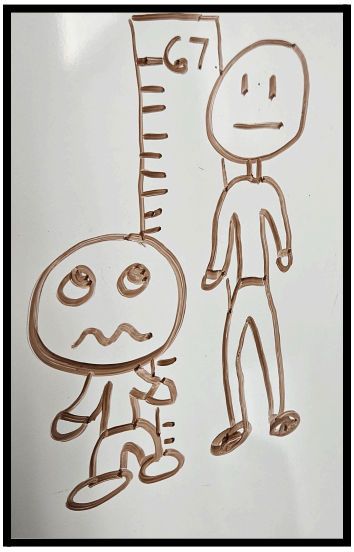
So whether you are someone who received an A in Calculus in High School or some self proclaimed math hater, hopefully there is enough out of the box novelty found in these 45 problems to appeal to a wide range of emotions felt towards the subject.

The alarm clock is ringing, good morning, this is Breakfast Cereal Math.

Puzzles

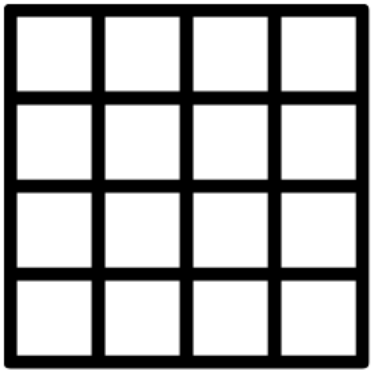
1.) Not On My Level

There are 6 people with heights of 61 in, 63 in, 65 in, 67 in, 69 in and 71 in. How could you line them up left to right so that the differences in height between each person is unique.



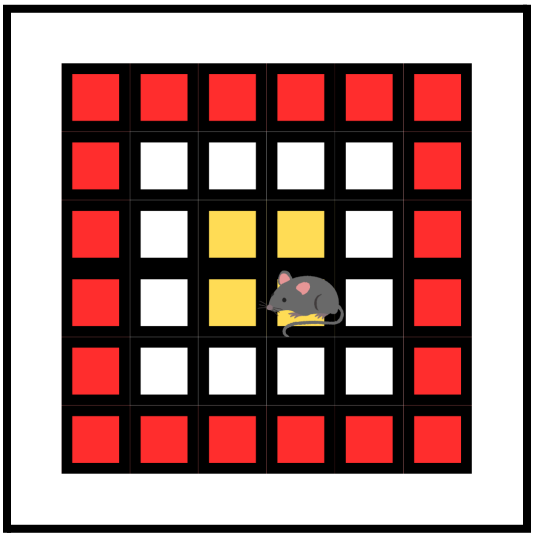
2.) Bad Neighbors

Create a 4 x 4 square grid. Try to place the numbers 1-16 in any order in any open square as long as there is not a consecutive number adjacent to it horizontally, vertically or diagonally.



3.) Mouse in the House

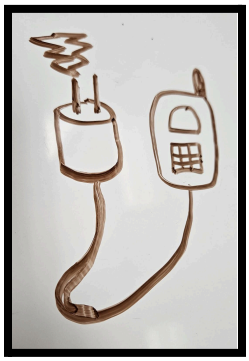
There is a mouse that is trying to escape your house (the square grid). You can lay a mousetrap by any exterior side of a red square that will catch the mouse if he steps onto it. But every time you lay a new mouse trap the mouse moves one space horizontally or vertically to the closest exterior side that does not have mouse traps blocking an exit from the house. What is the lowest amount of mouse traps would you already have to start with for it to be successful?



4.) World's Worst Phone Battery

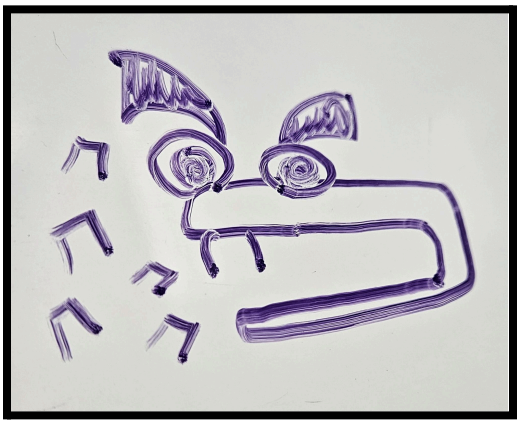
There is a phone that loses its percent of charge for each minute it is used based on the hour it happens in. For example if you use your phone for 3 minutes when it is 10 AM then you lose 30%.

If a phone has 100% charge and loses all of its charge in 21 continuous whole minutes of phone use then what time period was it used?



5.) Bad Stapler

In the teacher's lounge there is a bad stapler that gets less efficient after every consecutive use. The first staple gets all the pages but the second staple gets only half of the pages, the next gets half of that half and so on. One teacher stapled six separate packets with the same amount of paper and lost every single piece of paper that wasn't stapled. If the teacher is left with 63 pages altogether with the 6 packers. How much paper should have been in each packet?



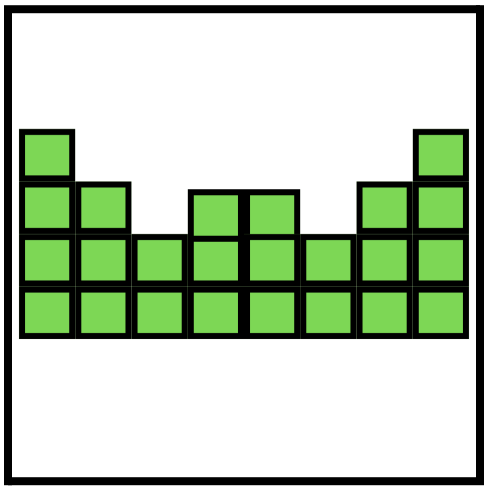
6.) Rising Prices

Inflation is real for these balloons in air and price. Each hour they aren't sold these balloons become one dollar more expensive. If he sells one of the 15 balloons each hour for 15 hours and makes $180 at the end of the day, how much did they start out costing?



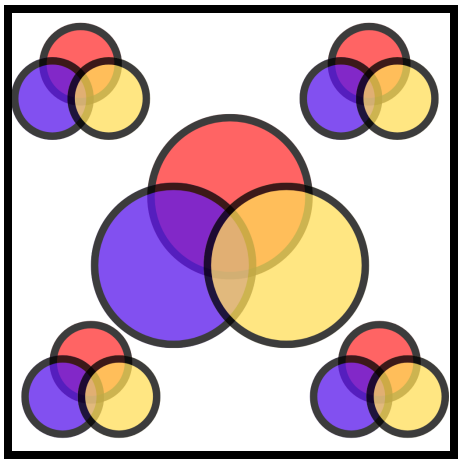
7.) Equal Grounds

There are 6 brothers splitting up this piece of land into equal shapes with the same area. What does the divided land look like?



8.) Stack

If you had 3 blue, 3 red and 3 yellow game pieces and you could stack them together by either stacking two stacks of the same height together OR two stacks that have the same color on top, how could you get all of them into one stack?



9.) Traveling States

Pick any US state. Then pick another US state that starts with the same letter your previous state ended with. Continue until you can't pick a new state. What is the highest chain you can make with this?

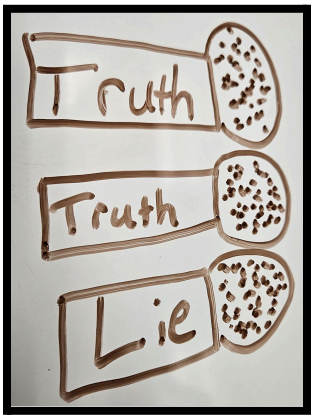
10.) 2 Truths and a Lie

There is an R&B Girl Group called "2 Truths and a Lie". There are 3 members of the group, T. Ruth, Honesty and Sincerity. Two of them always tell the truth and the other always lies. When asked who thought of their group name they replied:

T. Ruth: "Honesty thought of the name."

Honesty: “I did not think of the name.”
Sincerity: “T. Ruth thought of the name.”

Who thought of it first?



11.) Extra Social

There are 46 students in a class. 18 have Instagram and 12 have Tik Tok. If half the class does not have any social media, how many students have **both** Instagram and TikTok



12.) Bomb Defuser

There is a bomb with a 3 digit code you enter in one digit from right to left to defuse it. You can hit enter at any time to see if the numbers on the display are correct and if they are wrong you lose the amount showing on the display in seconds. If the digits shown are correct then you lose no time but the countdown continues until you

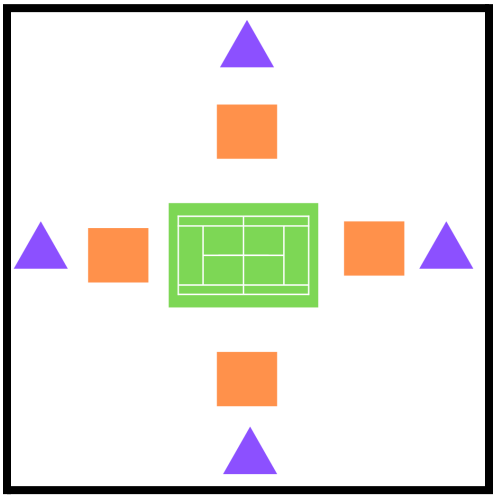
complete the entire 3 digit number correctly. What is the maximum amount of time you would need to defuse it?

13.) Two Digits

What are all the two digit numbers that can be divided by the sum of their digits?

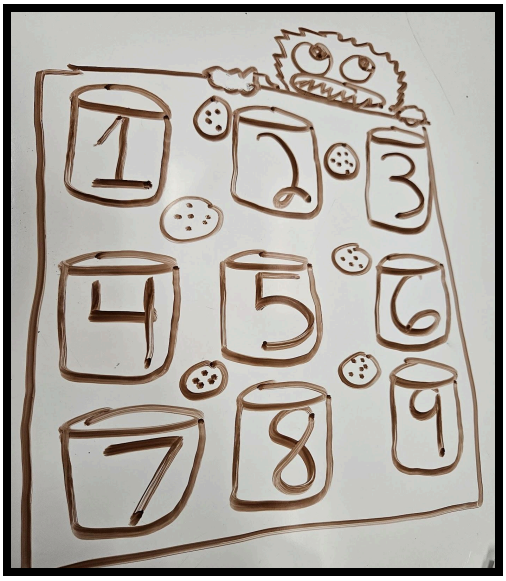
14.) Gatekeepers

The map below is of a private country club where the rectangle is the tennis court and the triangles are houses that pay for the country club membership. The country club wants to build a fence to keep out the square houses that don't pay but also let the triangle house get inside. How would you build this fence?



15.) Efficient Cookie Eating

Cookie Monster selects one number to eat that many cookies from each jar that has that many cookies available. If it doesn't have that amount then he skips over it. What is the least amount of moves for Cookie Monster to eat the jars 1-16 each filled with the amount of cookies found on the jar.



16.) Unlimited Energy Drink

There is an energy drink so powerful that it will burst your heart if you have more than one ounce in an hour. They come in cans of 12 oz, 7 oz and 6 oz. How could you measure one oz with one completely filled 12 oz can and empty 7 and 6 oz cans?

17.) Weird Money

There is a small country that wants to make their own society around special numbers to them. The only money values they have with their paper money are 7, 17 and 27. How could you make 100 with these bills as options?

18.) Fit Check

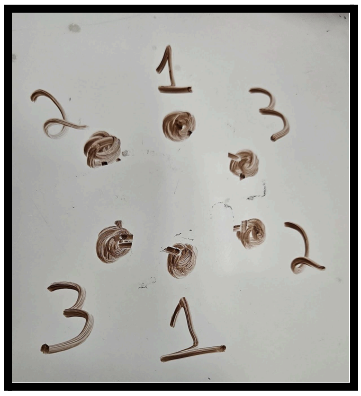
You bought an outfit where the shirt was double the cost of the belt and the pants were triple the amount of the shirt. If you spent 90 dollars altogether, how much was each item?

19.) Automatic Painting

There are two painting robots that are painting posts on a fence. They rotate between painting each post Red, Blue and Yellow and then they start over doing the same cycle once they have done those colors. If one robot skips one post each time and the other robot skips two posts each time what post number will they meet and color it the same color?

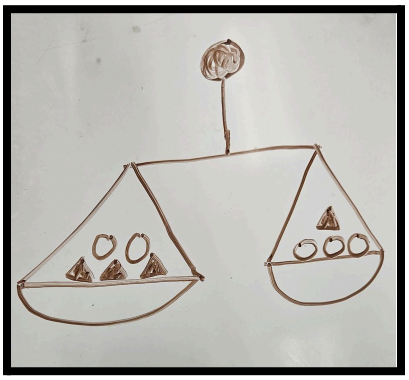
20.) Connect the Dots

Connect each dot with an amount of straight lines that goes with the number that is by the dot. (For Example: The 1 dot is connected to one other dot, the 2 dot is connected to 2 other dots and the 3 dot is connected to 3 other dots.)



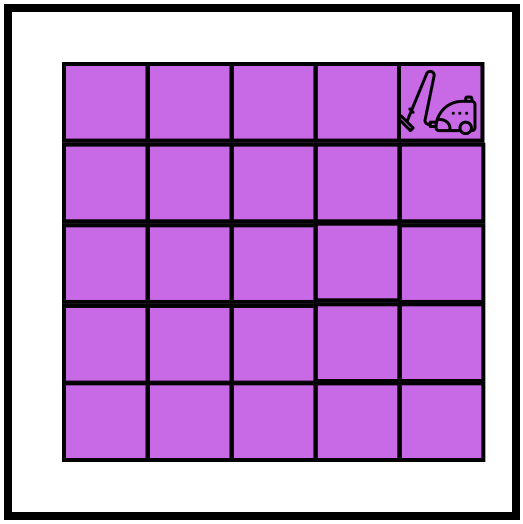
21.) Balanced Shapes

What could a single triangle and a single circle weigh separately if they are perfectly balanced in the picture below?



22.) Program: Clean

You have a vacuum that you can program to automatically clean your floors. It will follow any route that takes it tile to tile only travelling horizontally or vertically. Once it has cleaned a tile it won't go back through it. Could you place the vacuum on any tile and have it successfully programmed to clean every tile?



23.) Pencil Art

Grab 5 pencils. Arrange them in a way that each pencil is able to touch the other 4 pencils.

24.) Hot Dog Math

Hot dogs come in packs of 8 and hot dog buns come in packs of 12. If you are planning an event that will have a maximum of 100 people, how many should you buy of each to make sure everyone is fed one hot dog but also all leftovers have one bun for each hot dog?

25.) Pizza Roll Party

You are planning a party and Pizza Rolls are the main entree (pretty lame but understandable.) Pizza Rolls come in boxes of 4,7 and 17. If you want to guarantee that everyone gets at least one Pizza Roll without having extra Pizza Rolls left over what number of people would not work to invite over for your party?

26.) Irregular Square

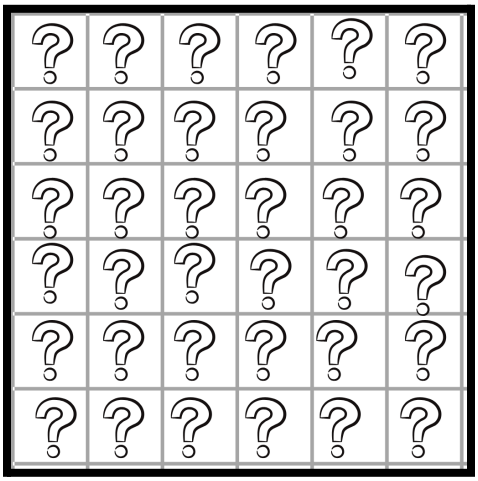
Organize the numbers 1-16 in a 4x4 grid so that every horizontal, vertical and two main diagonal sums are different.

27.) Race to the 31st

You are playing a game with someone else where you both start out with the date January 1st. The first person must raise either the month or the date but not both in any increasing increment, so a sample first turn could be going from January 1st to April 10th or January 1st to January 12th. The first person to December 31st wins. Should you go first or second to win for sure?

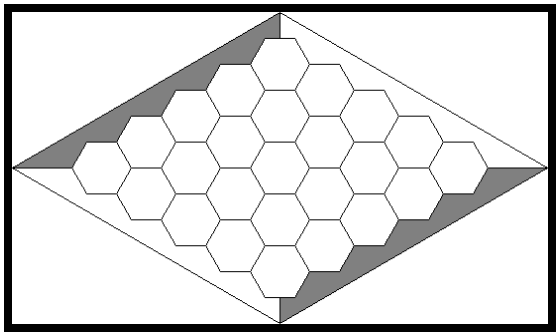
28.) Follow the Floor

A new dance studio wants a 6 x 6 square tile dance floor to teach beginning dancers. In order to learn new moves they want the squares to be different colors so that a dancer anywhere on the floor will not be able to reach the color they are currently on moving one square horizontally, vertically or diagonally. What is the least amount of colors you would need to make this happen?



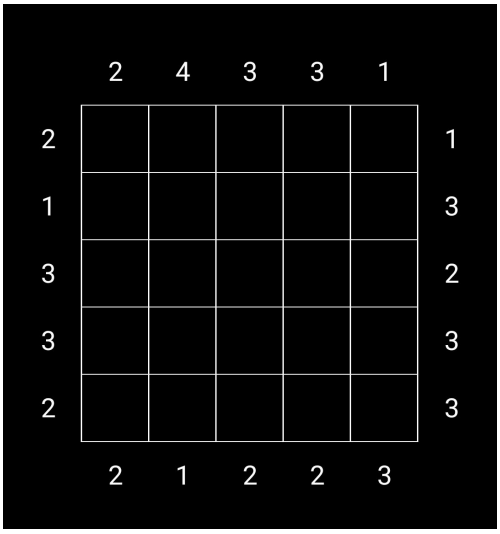
29.) Connections

The goal of the game is for White to place a line of adjacently connected white pieces from white border to white border and Black wants to do the same with black pieces and the black border. What would a finished game that ends in a draw look like?



30.) Towers

There are people from the outside of every outer square on the exterior side looking to see how many buildings they can see. There are 5 types of buildings, 1 story, 2 story, 3 story, 4 story and 5 story buildings. If there must be one of each type of building in each row and column, how could you fill out the puzzle below if the number represents how many buildings that person can see right in front of them?



31.) Islands and Bridges

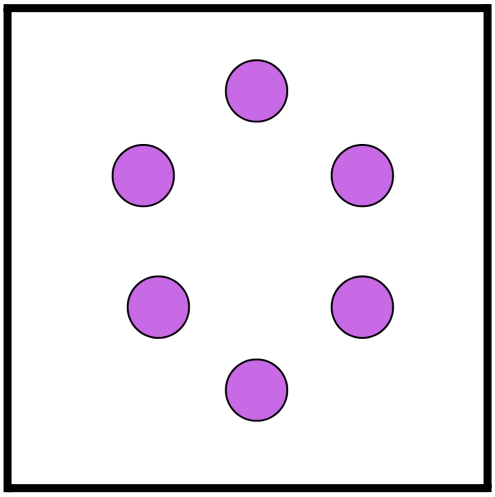
How could you arrange 1 main island, 3 small islands and 7 bridges in a way for each small island to have at least one bridge to the main island, every island to be visited at least once and every bridge only used once?

32.) Egg

If 3 chickens lay 3 eggs in 3 days, how many eggs would 30 chickens lay in 30 days?

33.) Triangles of Death

Connect any two dots of the six that aren't already connected with a straight line. What is the most amount of lines you can make before a triangle appears?



34.) Soggiest Pancake

There are 25 pancakes spread out into 3 piles of different sizes. Two people take turns eating an amount of pancakes that is equal to the smallest pile of pancakes from one other higher stack. If there is only one pile left then the person must eat the entire pile. Whoever eats the last one eats the soggiest pancakes and loses. How many would have to be in each stack for the first eater to guarantee them to not eat the soggiest pancake?

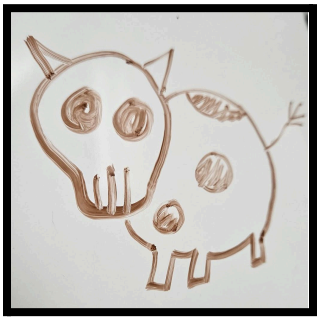
35.) Planet Hopper

There is a universe where there is an alien thief you are in charge of capturing. In this universe every planet is equally spaced in one direction and you know the alien is travelling the same amount of planets each day but you don't know how many planets it is. If you can only teleport to one planet each day right after the alien teleports once a

day, how could you create a plan to catch him eventually even if there were an infinite amount of planets starting from your home planet where the alien started?

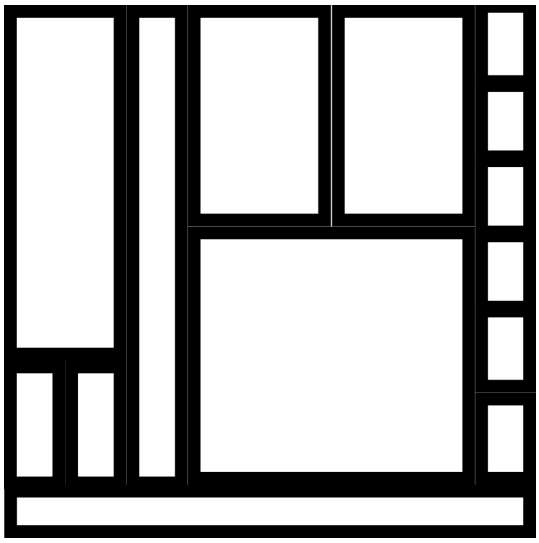
36.) Cow

For the equation COW x COW = DEDCOW, what numbers could work for each letter?



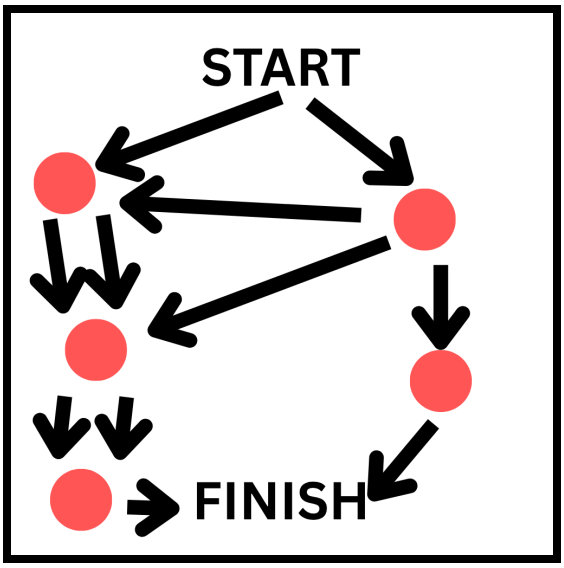
37.) Stained Glass Art

What is the smallest number of unique colors you could color this stained glass window design so that no segment that borders another has the same color?



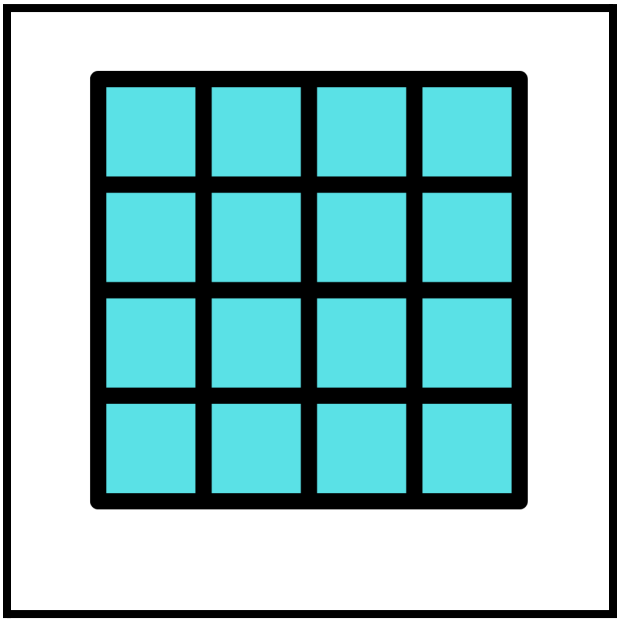
38.) Every Path

How many unique ways can you reach the finish line by following the arrows without going backwards?



39.) Lasers

Place four lasers that shoot horizontally, vertically and diagonally in all directions on the grid so that they don't shoot each other.



40.) Number Guess

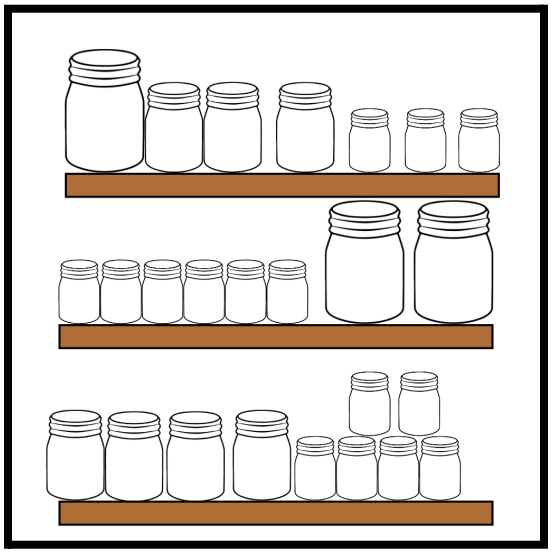
What is the highest number you could be able to for sure guess with just 10 questions?

41.) Candy Pile

A teacher has a pile of candy to start the day to give to each of his 3 classes. He splits the candy up into 3 equal groups with one candy left over which he eats. He gives his first class one of these groups of candy. He then combines the leftover groups and does the same thing for the next class, he splits it up into 3 groups, eats one and gives the class one group. For his last class he splits it up into three groups, gives one group to the class and eats one. Then the next day he splits up the leftover candy into 3 equal groups for each class and then eats one. What is the smallest amount of candy he could have started the day with?

42.) Jam

Each shelf holds 40 ounces of jam with all the jars combined together. There are 3 sizes, large, medium and small. If the shelves below are all at max capacity below how much does each size hold?



43.) Super Math Bros

There is a weekly meetup of 6 gamers that play the same game. Each week they get ranked based on wins. Last week the rankings were as follows:

1. A Koopa
2. Bowser
3. Captain Falcon
4. Daisy
5. Ethan
6. Fox

The following week every single person got a new ranking in a different spot. Bowser changed the most. Daisy and Fox have the same product when you multiply their two rankings from both weeks together. What are the second week rankings?

44.) Circle Fight

There is a group of 7 people that have serious beef with you. They begin to circle around you. Fortunately 6 of them are super weak and you could easily take them but the 7th person is way too strong to take on and you can't run away if there are at least two still standing. You strike a deal with them to fight them one at a time fighting every 7th person still standing in a clockwise motion. If you are planning on running away if the 6 weak ones get knocked down from fighting, who should you pick first to start fighting?

45.) No Time to Weight

There is a scooter that can hold up to two kids or one adult. It can't hold an adult and a kid at the same time. If a family of two adults and two kids want to scooter to the park how could they do it in the shortest amount of trips going back and forth with the scooter?

Things to think about if you are stuck:

Before you go on and just go grab the answers at the very end, I would strongly suggest taking a look at the related hint. All of these are in question form designed to help you approach thinking about it in a potentially different perspective but regardless

still giving you a chance to have some productive struggle before you go and wave the white flag.

1.) Not on My Level

What is the biggest difference? What is the smallest difference?

2.) Bad Neighbors

What numbers would have the least amount of consecutive numbers? What places on the 4 x 4 grid have the most adjacent connections?

3.) Mouse in the House

Is there a pattern in the mouse's exit path? What would be the minimum to block this?

4.) World's Worst Phone Battery

How much charge will a phone lose during the hour of 1:00-2:00? How about 2:00-3:00?

5.) Bad Stapler

What is a half of a half? What is a half of a half of a half? What is a half of a half of a half of a half?....

6.) Rising Prices

What would it look like if each balloon was $1. What would the ending price be?

7.) Equal Grounds

The most important first step to solving this one is to figure out first how big should each equal piece be? How many different shapes can you make with that amount of squares?

8.) Stack

If each set of colors is odd what does that force us to do?

9.) Traveling States

What is the most popular letter that states start with? What is the most popular letter that states end with?

10.) 2 Truths and a Lie

Will each statement hold true for all members?

11.) Extra Social

What part of the venn diagram is missing?

12.) Bomb Defuser

Is it better to test every 3 digit combination? Or try each space one time?

13.) Two Digits

What is the lowest sum of two digits? What is the highest?

14.) Gatekeepers

What would a fence look like that keeps out the square houses only? How could you modify it to include the triangles?

15.) Efficient Cookie Eating

What would be the longest way to eat the cookies?

16.) Unlimited Energy Drink

What ways can you make 1 with the numbers 12,7,6?

17.) Weird Money

You know the ending result, 100 is even, if all 3 numbers are odd how many times can they be added to get to an even number?

18.) Fit Check

How could you write this as an equation with variables?

19.) Automatic Painting

How can you simplify this with multiples?

20.) Connect the Dots

What dots are the most limited?

21.) Balanced Shapes

What would an equation with two variables with both sides of the scale equal to each other look like?

22.) Program: Clean

Why is starting in a corner different from any other position?

23.) Pencil Art

What would it look like to use a pencil being a 3D object to your advantage?

24.) Hot Dog Math

What is the lowest number where the buns and hot dogs would be the same?

25.) Pizza Roll Party

How many ways can you combine the three amounts?

26.) Irregular Square

What are the highest and lowest of the set? Where should they go?

27.) Race to the 31st

What would be the fastest way to get to December 31st?

28.) Follow the Floor

What position on the board offers the most choices to move in any direction?

29.) Connections

Is there a way to space out both colors evenly so that they don't touch on a hex board?

30.) Towers

What tower is in front of a person who can only see one tower?

31.) Islands and Bridges

What number of bridges forces you to have to either start or end on that island?

32.) Egg

The answer is not 30.

33.) Triangles of Death

What does a mostly completed triangle look like?

34.) Soggiest Pancake

How can divisibility be utilized in a solution?

35.) Planet Hopper

Where would the alien be if it moved 1 planet at a time? 2 planets at a time? 3 planets at a time? What nights could you align to check each possible planet length?

36.) Cow

What numbers times themselves gives you the same number in the one place of the product?

37.) Stained Glass Art

Draw a shape with different segments where you can touch a lot of the segments together, is it possible to alternate colors for them not to touch?

38.) Every Path

If there are two arrows from a circle what can we do to all previous paths connected to it?

39.) Lasers

What are the most restricting positions you can put a laser in so that it hits the least amount of boxes?

40.) Number Guess

Only using the question “higher or lower than ___?” What could you get for a maximum number?

41.) Candy Pile

What would work for this problem if it was 2 classes divided with 2 twice and one left over each time?

42.) Jam

Is there a way that you can find a ratio of how small relates to medium and medium relates to large without actually knowing the exact amount?

43.) Super Math Bros

How many different ways can the numbers 1-6 get you the same product?

44.) Circle Fight

How do the initial position and the final position relate?

45.) No Time to Weight

What different valid combinations can ride the scooter?

Answers

1.) Not on My Level

61, 71, 63, 69, 65, 67

2.) Bad Neighbors

10	15	13	9
12	1	3	11
6	14	16	5
8	4	2	7

3.) Mouse in the House

4 traps

4.) World's Worst Phone Battery

2:50 - 3:30.

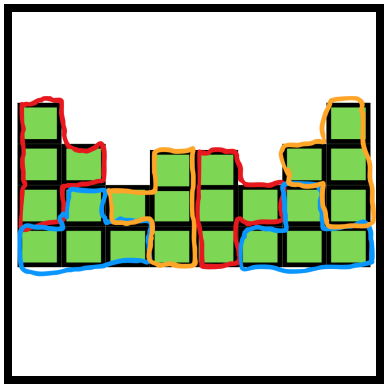
5.) Bad Stapler

32 Pages

6.) Rising Prices

$4

7.) Equal Grounds



8.) Stack

B B B R R R Y Y Y
BR B B R R Y Y Y
BR BR B R Y Y Y
BR BR YY B Y
BR BRYY B Y
BR BRYY BY
BRBRYY BY
BRBRYYBY

9.) Traveling States

Many correct answers but one example is: Utah, Hawaii, Idaho, Ohio, Oklahoma, Alabama, Alaska, Arizona, Arkansas, South Carolina

10.) 2 Truths and a Lie

T. Ruth is lying

11.) Extra Social

7

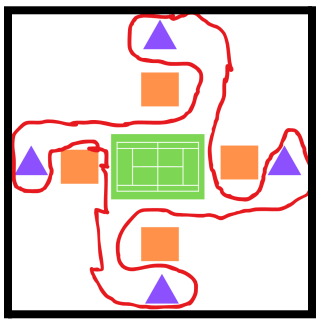
12.) Bomb Defuser

4,968 seconds

13.) Two Digits

10, 12, 18, 20, 21, 24, 27, 30, 36, 40, 42, 45, 48, 50, 54, 60, 63, 70, 72, 80, 81, 84, 90

14.) Gatekeepers



15.) Efficient Cookie Eating

5 moves. One possible solution is eat 16, 8, 4, 2, 1

16.) Unlimited Energy Drink

Pour the 12 into the 7 till it is full. Pour the 7 into the 6. Whatever is left in the 7 will be one ounce you can drink.

17.) Weird Money

17, 17,17, 7,7,7,7,7,7,7

18.) Fit Check

Belt = $10

Shirt = $20

Pants = $60

19.) Automatic Painting

18 and Yellow

20.) Connect the Dots

9

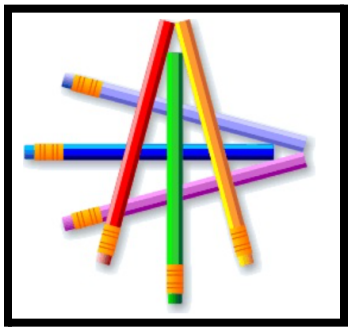
21.) Balanced Shapes

Every circle equals 2 triangles or any combination following this ratio.

22.) Program: Clean

No.

23.) Pencil Art



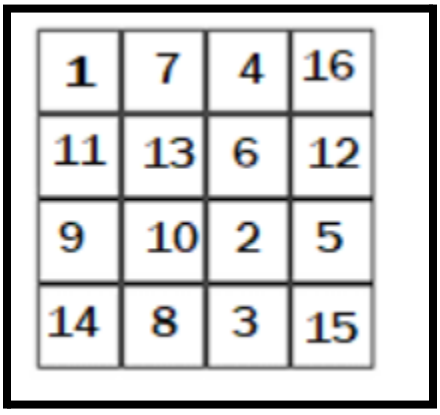
24.) Hot Dog Math

15 packs of hot dogs, 10 packs of buns

25.) Pizza Roll Party

1,2,3,5,7,9,10,13

26.) Irregular Square



27.) Race to the 31st

Choose to go second

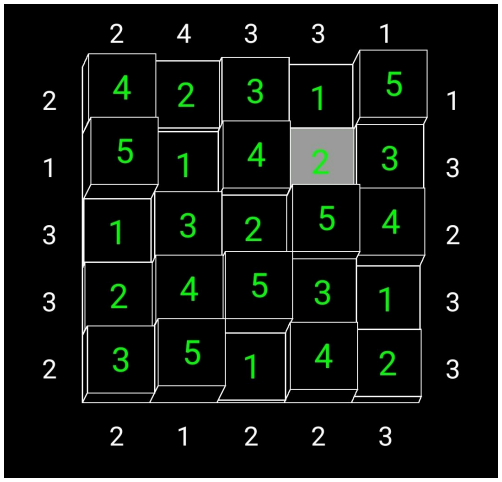
28.) Follow the Floor

9 colors

29.) Connections

It is impossible to tie.

30.) Towers



31.) Islands and Bridges

There are multiple correct solutions but it must fit within the parameters that either only one small island has 3 bridges OR two small islands have 3 bridges.

32.) Egg

300 Eggs

33.) Triangles of Death

Nine lines.

34.) Soggiest Pancake

21,3,1 or 16,8,1

35.) Planet Hopper

On the first day you could travel to the first planet to investigate a planet skip of 1, then the next day you could investigate the fourth planet to investigate a planet skip of 2 because you the alien already jumped 2 the first day and 2 the second day to get 4. This pattern continues in an exponential manner where each day you should could to the planet n to the n power depending on what day you are investigating for eternity until you find that alien.

36.) Cow

376 × 376 = 141376

37.) Stained Glass Art

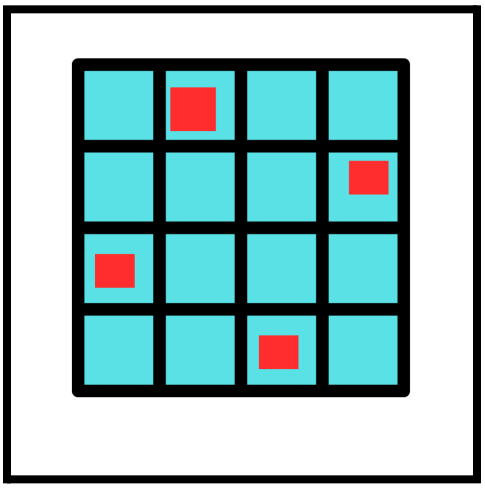
Four is the minimum amount of colors needed

38.) Every Path

Ten unique paths

‘

39.) Lasers



40.) Number Guess

1,024

41.) Candy Pile

79 pieces of candy

42.) Jam

Small = 1 and 1/9
Medium = 3 and ⅓
Large = 6 and ⅔

43.) Super Math Bros

1. Captain Falcon
2. A Koopa
3. E
4. Fox
5. Bowser
6. Daisy

44.) Circle Fight

Fight 3 spots clockwise from the strongest person.

45.) Family Scooter

9 moves is the quickest.

A is for Adult and K is for Kid

AAKK	
->	
AA	KK
<-	
AAK	K
->	
AK	AK
<-	
AKK	A
->	
A	AKK
<-	
AK	AK
->	
K	AAK
<-	
KK	AA
->	
	AAKK

Going Deeper:

I will be the first to admit that in the strictest sense I am not a mathematician. The ability to create rigorous proofs for mathematical ideas eludes me but I am fascinated by the field and the ideas it produces. A lot of these problems are a result of that curiosity and are strange offshoots of my own wonder and discovery of math ideas. Some of the puzzles spring from math theorems while others are problems inspired by internet flash games. But regardless of where they came from, many of these there is definitely a rabbit hole of discovery you can go on your own, which I will provide starting points in this next section. Happy digging!

1.) Not on My Level

There is actually a fair amount of depth behind this type of problem as it is representative of “The Graceful Tree Conjecture”. The conjecture says that any set of consecutive numbers can be arranged to be connected to each other so that each difference between the connections is unique. It is one of those things in Math that is simple enough to understand but also has yet to be proven!

2.) Bad Neighbors

This puzzle is a cousin of the similar concept found in “The Graceful Tree Conjecture.” While it isn’t explicitly dealing with differences you are still aware of which numbers will have the least amount of consecutive numbers (1 and 16) and place them in the center square (the area with the most points of connection). In a way it is like an inverse of Tic-Tac-Toe where many children quickly discover the center includes the most valid connections to a winning line. For a related extension try playing some “Squava”, a game played on a five by five board similar to Tic-Tac-Toe where a line of 4 will win but if you ever make a line of 3 you instantly lose.

3.) Mouse in the House

This puzzle was inspired by an internet flash game I used to play back in the day called “Circle the Cat.” The original game was played on a hexagonal board…. What would a solution be for that?

4.) World’s Worst Phone Battery

This puzzle takes some factor knowledge to truly understand a solution. Some hours will not give you whole numbers that add up to 100 exactly. For an extension, what are all the valid hours that could work in general?

6.) Rising Prices

Most of these would be hard to make for being included in a curriculum but this is definitely one puzzle that works well for solving variables. Of course one way is always guess and check but for the math teachers out there in the world having the beginning cost be x is a good way to incorporate the learning standards in something that may be a bit goofier than normal.

7.) Equal Grounds

The video game Tetris utilizes this shape in the solution because if you notice every piece in Tetris only has 4 squares. These are called Tetraminos and there are only 7 possible configurations of them. The general description of these are called polyminos and there isn't currently an algorithm to calculate how many unique polymino configurations for any n-minos.

8.) Stack

This puzzle was inspired by the game Babylon designed by Bruno Faidutti which involves 12 tiles in four colors played with two people. These changes make solving the game more complex but a lot of the principles you discovered in the puzzle will carry over in your pursuits to win.

9.) Traveling States

This is one of those general games that can be applied to any set of words. Random poster, page in a book, a menu. Some statistics that may guide you to a victory are

1. The most common ending letter in English is E
2. The most common starting letter in English is S
3. Least common starting letter is Z
4. Least common ending letters are Q and J

11.) Extra Social

Venn Diagrams are taught at a young age and typically not in a math setting which is surprising because it is the fundamental start of set theory which typically uses notation like $\cup$ or $\subset$ instead of the intuitive two circles that a kindergartner can understand.

12.) The Worst Bomb

To tackle this successfully someone must have a firm grasp on place value which many learn early in their math learning but we usually adhere to a base 10 system which has 10 digits for each place value and then it extends into the next biggest one. The Aztecs had 20 digits for their number system for each place value. How would you solve an Aztec bomb?

14.) Gatekeepers

This is a problem that shifts our typical approach with fences that bend in unusual ways, a light take on topology if you want a math research topic that is a bit meatier than this problem.

15.) Efficient Cookie Eating

The numbers in the solution are chosen because they are powers of 2. If you think about a doubling function starting with one you would go from 1 to 2 to 4 to 8 which are also powers of 2. If we are working backwards to effectively take away things we can still use these numbers to take away things based on what is the highest power of 2 related to the set. What would be the minimum amount of moves to eat jars 1-32?

16.) Unlimited Energy Drink

This puzzle uses Bezout's identity which states in the context of the liquid pouring problem that there is a solution if and only if the desired volume is a multiple of the greatest common divisor of all the volume capacity of the containers.

17.) Weird Money

If you had know idea before attempting this puzzle then you may have stumbled upon some patterns about how odd #'s and even #'s add. Such as 2 odd numbers added together will always equal an even then maybe taking it further and noticing that 3 odd numbers added together are always odd. Why is this happening?

18.) Fit Check

Here is another example of a puzzle that definitely can be curricular as a system

of equations will give you an answer.

21.) Balanced Shapes

The acceptable answers for this problem are infinite. What would some fraction answers look like?

22.) Program: Clean

You might have already played around with it but what about other square board sizes, are any of them possible for a vacuum to cover every square starting from wherever?

24.) Hot Dog Math

This real life application problem was brought to you by Steve Martin's character in "Father of the Bride."

25.) Pizza Roll Party

The more famous pop culture version of this puzzle is referred to as the McNugget Numbers, inspired by the sizes McNuggets used to come in 6,9 and 12. The highest number that is impossible to make is referred to as the Frobenius number. If you find numbers fun, try and work out some other examples, what happens when it is just two numbers? What happens when numbers are further apart from each other?

27.) Race to the 31st

This puzzle can be abstracted to become a Nim pile game, which is a game where two players take turns removing items from finite piles. A good approach for any type of Nim pile game is to start from the "terminal position" (the losing move) and work out all the paths that would get someone there.

28.) Follow the Floor

I was inspired to create this puzzle by the board game Kamisado. Kamisado

definitely doesn't follow the stipulations for a solution but its colorful board is incredibly intriguing and it has a great thinking game mechanic behind it.

29.) Connections

This puzzle is actually a game called Hex. The game was created in 1942 by Piet Hein. If you hate games where chance has any kind of hand in the game then Hex is definitely for you! It is a finite drawless game which still brings a small group of people to still play the game today and study it. (Shameless Plug) Check my profile cowboycookie out on abstractplay.com to try a game out!

30.) Towers

This is a version of latin squares which is a large genre of puzzles with Sudoku being the most famous example of it.

31.) Islands and Bridges

This puzzle takes its inspiration to one of the most famous problems in graph theory that was solved by Euler. There were pieces of land connected by bridges and it was a popular pastime to see if anyone was able to use each bridge once and visit each piece of land. Euler uses great logic as he abstracts the problem down to its bare essence and states that "any network may only have at most two odd numbered vertices with connections to others". Try it out with your own island and bridge creations to see his logic come to life!

32.) Egg

This puzzle is a tweaked version of an age-old challenge. If 6 cats catch 6 mice in 6 minutes, how many will they catch in 100 minutes? Natural instinct will tell us 100 but proportional reasoning will tell us to not always jump to conclusions.

33.) Triangles of Death

This puzzle is based on the game of Sim, a game which has been

mathematically scrutinized and analyzed. It has direct relation to Ramsey's Theorem which states "in any sufficiently large complete graph with edges colored in different ways, there will always be a monochromatic (all one color) complete subgraph of a certain size." Which may seem a bit overwhelming to directly relate this puzzle to this dense idea but a neat real world application using this theorem is that within any group of 6 people either 3 people will be complete strangers or 3 people that know each other.

34.) Soggiest Pancake

This puzzle is another Nim variant but the choices in the Nim game have very little change on the game. It is one that is fairly determined from its setup. What if you could have stacks be the same size from the beginning, what other pile counts could you have?

35.) Planet Hopper

This puzzle is a simplified version of the Groundhog Problem which adds the additional challenges of the thing you are tracking could be moving either forwards or backwards AND you don't know what number the thing starts at. Truly intimidating at first reading it, (at least for me.) But using your solution for the Planet Hopper you are one step closer to solving!

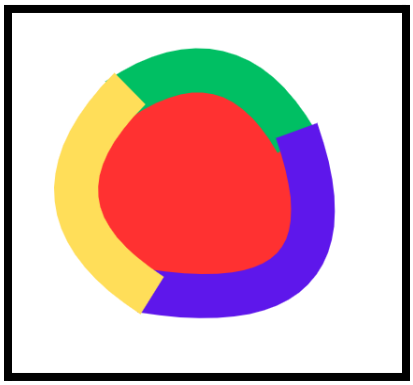
36.) Cow

This puzzle is referred to as a cryptarithmetic problem which is just one of the few in a world of tons of them. One of the more famous examples is SEND + MORE = MONEY.

37.) Stained Glass Art

This puzzle was inspired by "The Four Color Theorem" which states that "any

map in a plane can be colored using four-colors in such a way that regions sharing a common boundary (other than a single point) do not share the same color.” This is one of the conjectures that went a good while of being unproven but backed up by a proof with the help of computing in the 1970s. The proof itself is pretty hefty to work through but an armchair mathematician like myself would explain it like this, “the picture below shows the most points of contact for any four colors, if we add more segments on the outside of the red circle then we can just alternate with the three outer colors.” While it severely undersells what the proof accomplished it does help us to begin to understand what is going on to tell us why four might be the minimum amount of colors.



38.) Every Path

This puzzle is a permutation problem but the tedious work of labeling every combination has been made more tedious by removing any markings for each connection point. But I am sure you as a real mathematician were able to make your own!

39.) Lasers

This is a scaled down version of the “8-Queens Problem” where the Lasers are just chess queens and there are 8 of them on an 8 x 8 board. This problem has also been more generalized to be known as “N-Queens Problem” where n queens should be arranged to not be in the line of sight of each other on an n x n board. Solutions exist for all natural numbers except for 2 and 3. If you want a mathematical achievement all the possible answers for 28 Queens on a 28 x 28 board have not been found.

40.) Number Guess

This puzzle also operates on the powers of 2 like the cookie eating one just on a

larger scale.

41.) Candy Pile

This puzzle is the closest these puzzles will get to incredibly famous problems in the world of recreational math, it is my take on an infamous puzzle called “Coconuts”. In the problem coconuts are being split up 5 ways with a remainder of 1 five times. The problem was found in a 1926 Saturday Evening Post issue but did not include an answer. This elicited more than 2,000 reader letters demanding an answer. Martin Gardener, the puzzle maker mentioned in my intro also had his take and referred to it as one of his favorites, saying “it was my most worked on and least solved.” This toned down version of mine allows solvers to have a lower floor into working their way into a solution, but after seeing the solution for mine solve for 2 divisions with a remainder of 1, the 4 divisions with a remainder of 1 and look for a pattern. It is a beautiful one once you see it!

42.) Jam

This puzzle works well as another curricular puzzle for systems of equations because it is easier to visualize the idea of substituting variables in the different equations to find out how many small jars fit inside a medium jar and how many medium jars fit inside a large jar. Also maybe give a chance to fraction despisers to see them in a problem in a different manner.

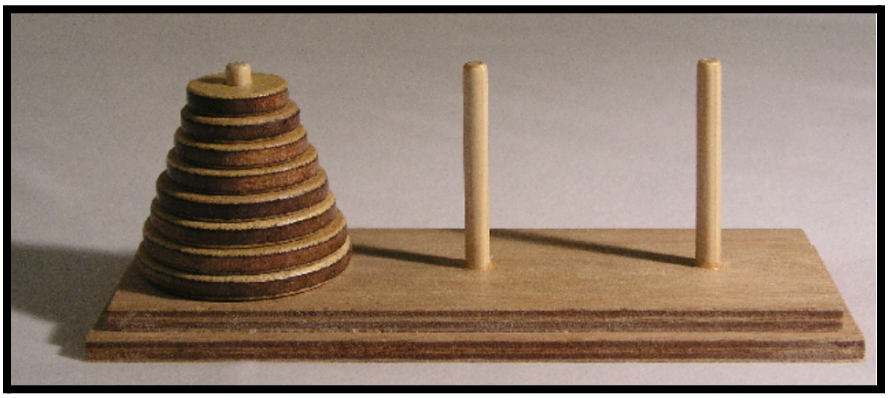
44.) Circle Fight

This puzzle takes inspiration from the “Josephus Problem”, which is an account in which 40 soldiers were captured and chose death by suicide. They stood in a circle and starting with one soldier in a clockwise manner they would kill the next living person next to them. This continues around the circle until one is remaining. Where is the best place to stand in the circle to stay alive?

45.) No Time to Weight

This puzzle uses similar thinking used to solve a Tower of Hanoi. Tower of Hanoi

is a set of unique sized discs and usually three pegs where the goal is to get all the discs to the 3rd peg by moving one disc at a time but you can’t place a larger disc on top of a smaller disc.



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