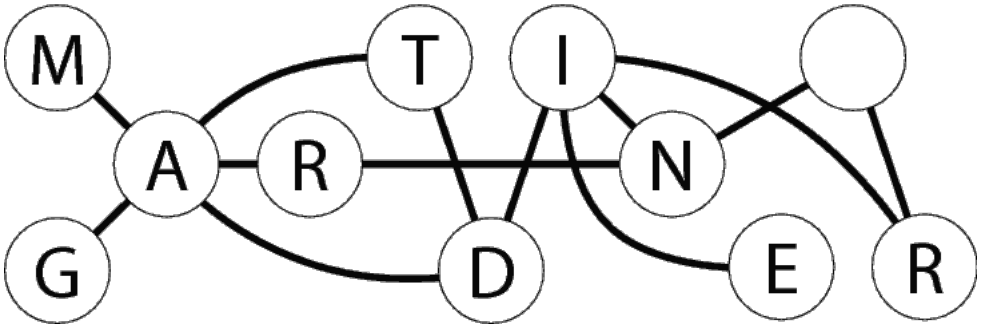


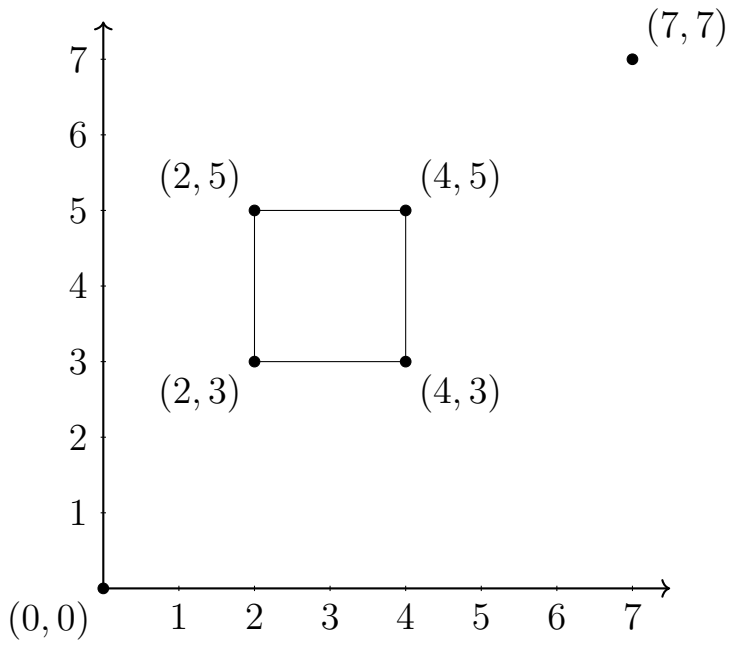
Photo Martin Gardner by Alex Bellos in 2008 in Norman

Born in Tulsa in 1914 and passed away in Norman in 2010.

Stage 1

Stage 1, Round 1 (2 Questions, 3 Minutes)

1. What is the length of the shortest path from $(0, 0)$ to $(7, 7)$ that does not go inside the square shown? The path may touch the square.



2. Find the nearest integer to $1024^{\log_2(256)} - 256^{\log_2(1024)}$

Stage 1, Round 2 (Blitz Round, 3 Minutes)

a. If you roll two dice and add the numbers you get, what is the probability you will get exactly 5?

b. If you cut a square cake with three straight cuts (all distinct, all nontrivial), what is the *minimum* number of pieces you can have at the end?

c. A $3 \times 3 \times 3$ cube has all its sides painted crimson. If it is cut into $1 \times 1 \times 1$ cubes, how many of those little cubes will be crimson on *at least* two sides?

d. Let $x = 2023^6$. Which of the following numbers is closest to x:

- 2,000
- 2,000,000,000
- 20,000,000,000,000
- 2,000,000,000,000,000,000

e. Your boss offers to give you a raise. You can either get a single 30% raise or get two raises, one immediately after the other. The two raises would be a 15% each. Is it better to get the 30% raise, or the two raises, or does it not matter?

f. If the polynomial $p(x) = x^{2023} + x^{2021} + x^{2019} + c$ has $x + 1$ as a factor, what is c?

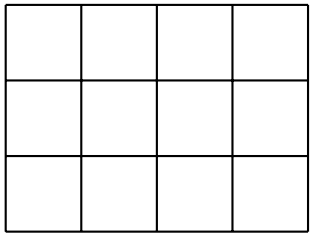
g. Consider powers of 2, i.e. $2^1, 2^2, 2^3, \ldots$. If you add the first 6 powers of 2, what do you get?

Stage 1, Round 3 (3 Questions, 5 Minutes)

1. The area of a circle is 100π $units^2$. If the radius is increased by 1 $unit$, how much will the area change?

2. If $x + \frac{1}{x} = 3$, what is $x^2 + \frac{1}{x^2}$?

3. How many rectangles are in the grid below? Only count those rectangles whose edges lie on the lines shown.



Lunch!

Stage 2

Stage 2, Round 1 (Blitz Round, 3 Minutes)

a. How many zeros does 100^{100} have?

b. If you have circle with radius r and its perimeter equals its area, then what is r?

c. Which is larger: 15^6 or 6^{15}?

d. Consider the sequence $a_1 = 0, a_2 = 3, a_3 = 8, a_4 = 15 \ldots$.

If you continue this sequence, what is a_5?

e. How many roman numerals are required to write 19? How about 2023?

f. If 1012 is a number written in base 3, then which number is it (in our usual base 10)?

g. Imagine the letters of the alphabet are made out of a rubbery material that you can stretch and deform as much as you like, but you can't cut it or glue it together. Which of the following letters can be deformed into the letter P?

$$A, B, C, D, E, F, G$$

Stage 2, Round 2 (3 Questions, 5 Minutes)

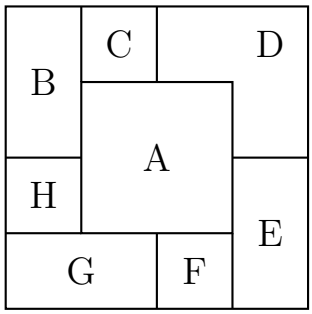
1. Let $P = (a, b)$ and $Q = (c, d)$ be two points on the curve given by $y = x^2$. If the distance between their x-coordinates is exactly 1 unit and the distance between their y-coordinates is as small as possible, what are P and Q?

2. To convert between F degrees Fahrenheit to C degrees Celsius, you use the formula

$$C = \frac{5(F - 32)}{9}.$$

   Which temperature(s) have the same numerical value in both systems?

3. This morning, your teacher neatly stacked square napkins in a pile before class. What is the letter of the napkin they put down first?



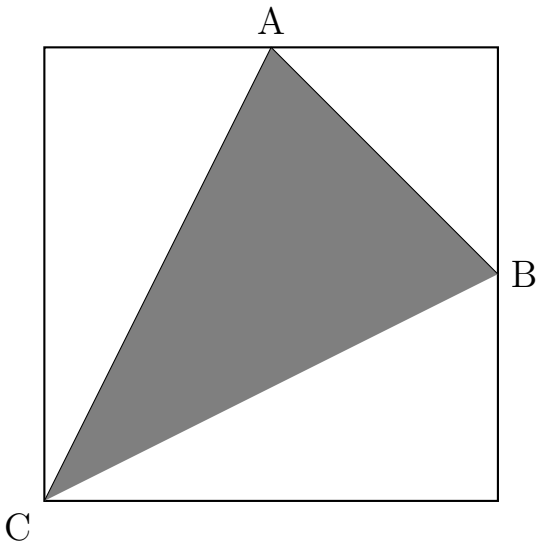
Stage 3

Stage 3, Round 1 (3 Questions, 5 Minutes)

1. This morning, I got the following message on my phone: "Your screen time was down 37% from last week for an average of 9 minutes/day." What was my screen time, in minutes, last week?

2. Suppose x is a single digit $0, 1, \ldots, 9$. If the 8 digit number $23456x89$ is divisible by 9, what is x?

3. If A and B are midpoints of the sides in the 1 by 1 square shown, what is the area of the shaded region?



Stage 3, Round 2 (2 Questions, 5 Minutes)

1. We call a polynomial

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x + a_0$$

a *mirrored polynomial* if $a_0 = a_n$, $a_1 = a_{n-1}$, $a_2 = a_{n-2}$, etc.

If $p(x)$ is a degree two mirrored polynomial and you know that $p(0) = 3$ and $p(1) = 8$, then what is $p(x)$?

2. If the average of a and b is 7, the average of b and c is 8, and the average of a and c is 9, then what is the average of a, b, and c?

3. How many distinct rearrangements are there of the letters OURULES?

The End!

Spot Prize II (Word Search!)

Name:_____ **School:**_____

Y S U X K B S R I Y B J L C O Y T L J W I T
W R Q J I S H O P V E L E A V B O D U E Y S
M U O S M R B T O E E B W A I R Y A I T H C
N A N E N A T N M N J M G W I M J P I A S J
S G R Q P C Z A O Z E Z H N M M O L L I B Y
R A S T G H J C M I Y T C E N S I N W N T A
L R Y K I S D R A C T Z A O C B Q E Y I U P
V D O I B N H A D J R A R T A W L U L L H Y
W N B A M O H A L K O M T B S U T A A A O E
L E W Y B B U D G A A V O U Y K E A Q R T P
A R O Y A B D W F N S R P V M R O Y A B E X
U G C A R R O L L D P P M U W R S M A T H K
T U B Y Y E W Q G R S S H D Z H E L C T Z B
R N O G A X E L F A X E H E U Z G P I U C D
I J R R A Y V Q T S S Q T F R E L I G L I Z
V P A L I N D R O M E R F Q B I O E A S R V
T J H B X N O J V V Z L E R W V C C M A C T
P S Q J I B H I J O E C A T S L I A M H L W
S W M K I U S K L K M D O U R K Y I L F E P
E U O M U X F G V O R T E P N O E T H E R R
D L C O B V P Q T A N S V A J M M Z E I J E
A N Q S I V N I N Q H N C K Z M E R O E H T

- NIKOLA
- PETROV
- OKSTATE
- COWBOYS
- LEWIS
- CARROLL
- SPHERICAL
- ANDRAS
- LORINCZ
- HEXAFLEXAGON
- MATRIX
- CANTOR
- EMMY
- NOETHER
- MARTIN
- GARDNER
- SHUFFLE
- CARDS
- PERMUTATION
- MAGIC
- PROBABILITY
- MATH
- PUZZLE
- TULSA
- NORMAN
- OKLAHOMA
- POLYNOMIAL
- VIRTUAL
- REALITY
- PALINDROME
- SQUARE
- CIRCLE
- ALGEBRA
- THEOREM

Spot Prize I (Break the Code!)

Name:_____ School:_____

Scientists at NASA have been feverishly analyzing the comet dust from Bennu which was recently returned by the OSIRIS-REx mission. Unfortunately, some of the scientists fell ill and it was discovered that they had acquired a stranger new virus.

Sequencing the DNA of the virus, it was discovered that there were repeats of the same sequence over and over. All DNA is made up of the letters A, C, T, and G, and this virus's DNA is endless repeats of:

GTT ATG TCC CTC TCA GTC TCC CTC ACG CTC TGG AGA.

Endless repeats are not natural. Could this virus be artificial? Left behind by an advanced alien civilization for us to discover!?

After an intensive study of the above sequence, evidence quickly emerged that it must have been created artificially by an intelligent being. One of the letters above marks a familiar sequence of integers. What sequences was left for us to find?