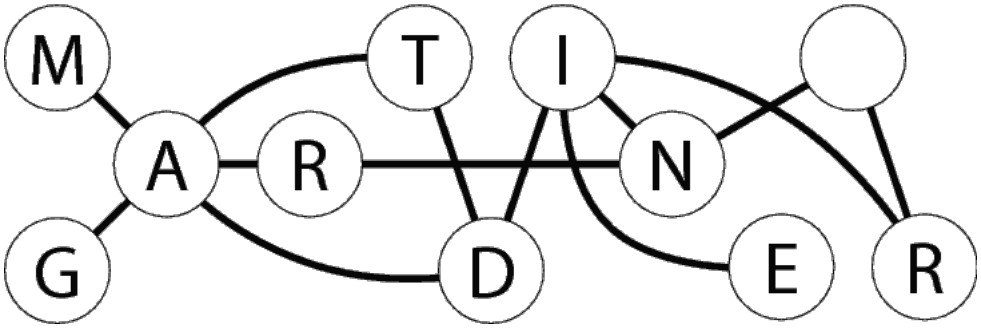


Photo Martin Gardner by Alex Bellos in 2008 in Norman

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

Stage 1

Basic Instructions:

- Each team can take one or two packets for each round. This should make it easier for everyone to see the questions and have extra scratch paper.
- However, you will turn in ONLY ONE answer sheet per team per round.

Sooner Math Bowl

Stage 1, Round 1
Answer Sheet

School: _____

Team Name:_____

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

1. Two points in the plane have integer coordinates and the distance between them is $\sqrt{50}$. If these points form the opposite corners of a rectangle whose sides are parallel to the coordinate axes, what is the maximal area of such a rectangle.

2. If the integers a, b, c and d are such that

$$2^a 3^b 5^c 7^d - 76 = 2024,$$

what is $a + b + c + d$?

Sooner Math Bowl

Stage 1, Round 2
Answer Sheet

School: _____

Team Name:_____

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

a. If a and b are real numbers whose average is 10, what is the average of a, b, and 16?

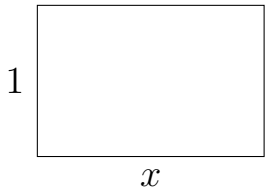
b. What is the largest positive integer k for which 3^k divides $\underbrace{999\ldots9}_{2024}$?

c. Which is more likely: rolling two fours with a fair die or getting 4 heads by tossing a fair coin?

d. What is the first prime larger than 49?

e. If $\tan(\theta) = 5/9$, then what is $\cos(\theta)$?

f. Find a value $x > 1$ so that a 1 by x rectangle can be cut into two congruent rectangles each similar to the original 1 by x rectangle.



g. What is the sum of the first five primes?

Sooner Math Bowl

Stage 1, Round 3
Answer Sheet

School: _____

Team Name:_____

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

1. If you reflect a line of slope π over the y-axis, what is the slope of the reflected line?

2. If x is twice the square of half of the square root of 2024, what is $x + 1$ (simplified)?

3. Red stones weigh 1 pound while black stones weigh 2 pounds. How many different combinations of red and black stones weigh a total of 100 pounds? A combination must contain a minimum of one red stone and one black stone.

Lunch!

Basic Instructions:

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- However, you will turn in ONLY ONE answer sheet per team per round.

Stage 2

Basic Instructions:

- Each team can take one or two packets for each round. This should make it easier for everyone to see the questions and have extra scratch paper.
- However, you will turn in ONLY ONE answer sheet per team per round.

Sooner Math Bowl

Stage 2, Round 1
Answer Sheet

School: _____

Team Name:_____

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

a. Suppose you have 10 distinct numbers. The average of the smallest 4 numbers is 20, while the average of the largest 6 numbers is 30. What is the average of all 10 numbers?

b. If you have a square with side length ℓ whose perimeter equals its area, what is ℓ?

c. What is $x = 4^{2^{0^2}}$?

d. Consider the sequence $a_1 = -1, a_2 = 3, a_3 = 4, a_4 = 8, a_5 = 9, a_6 = 13, a_7 = 14, \ldots$. If you continue this sequence, what is a_{11}?

e. In a regular deck of 52 playing cards, is it more likely to draw a non-face card or a black card (i.e. club or spade)?

f. Write the number seventeen in base 2.

g. What is the last digit of $M = 1! + 2! + 3! + \ + 2024!$?

Sooner Math Bowl

Stage 2, Round 2
Answer Sheet

School: _____

Team Name:_____

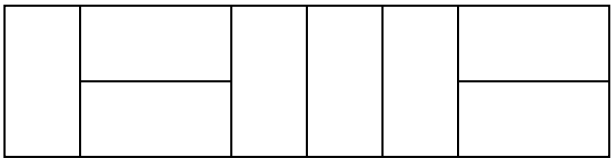
Stage 2, Round 2 (3 Questions, 5 Minutes)

1. The positive integers a and b each have exactly two prime factors: 2 and 3. If a does not divide b and b does not divide a, what is the smallest that a can be?

2. Carlos is looking at Rachel. Rachel is looking at Bob. Carlos is a Sooner. Bob is a Cowboy. (And, of course, Rachel is either a Cowboy or a Sooner, and no one is both!)

   True or False: A Sooner is looking at a person who is a Cowboy.

3. A $2 \times N$ room is tiled with small rectangles of size 1×2. An example of tiling is given in the picture below. If $N = 8$, in how many ways can you tile the room?



Stage 3

Basic Instructions:

- Each team can take one or two packets for each round. This should make it easier for everyone to see the questions and have extra scratch paper.
- However, you will turn in ONLY ONE answer sheet per team per round.

Sooner Math Bowl

Stage 3, Round 1
Answer Sheet

School: _____

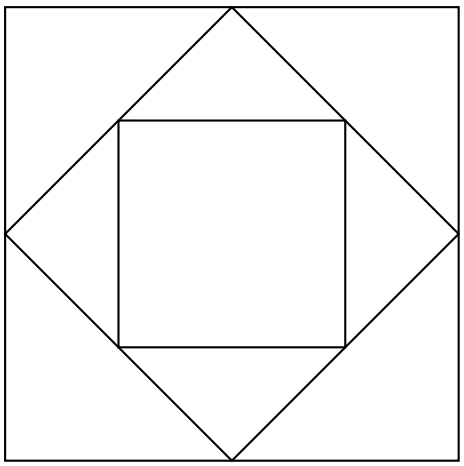
Team Name:_____

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

1. The polynomnial
$$p(x) = x^5 - 4x^4 - 12x^3 + 34x^2 + 11x - 30$$
has roots $x = 1, -1, 2, 5$. Since $p(x)$ is degree 5 it must have one more root. What is it?

2. Find the integer a that satisfies
$$a!(a+1)! = 10!$$

3. In the figure below, the corners of each square touch the midpoint of the sides of the next larger square. If the center square has area 1 square inch, what is the area of the largest square?



Sooner Math Bowl

Stage 3, Round 2
Answer Sheet

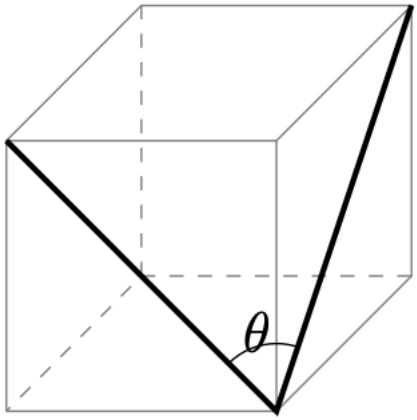
School: _____

Team Name:_____

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

1. Compute the number $1 + 3 + 5 + \cdots + 17 + 19 + 21$.

2. What is the angle, in degrees, between two face diagonals of a cube meeting at the same corner?



3. How many triangles have sides of length $\pi, \sqrt{2}$, and a, where a is an integer? (The order of the sides is irrelevant.)

The End!

Basic Instructions:

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Spot Prize II (Word Search!)

Name:_____ **School:**_____

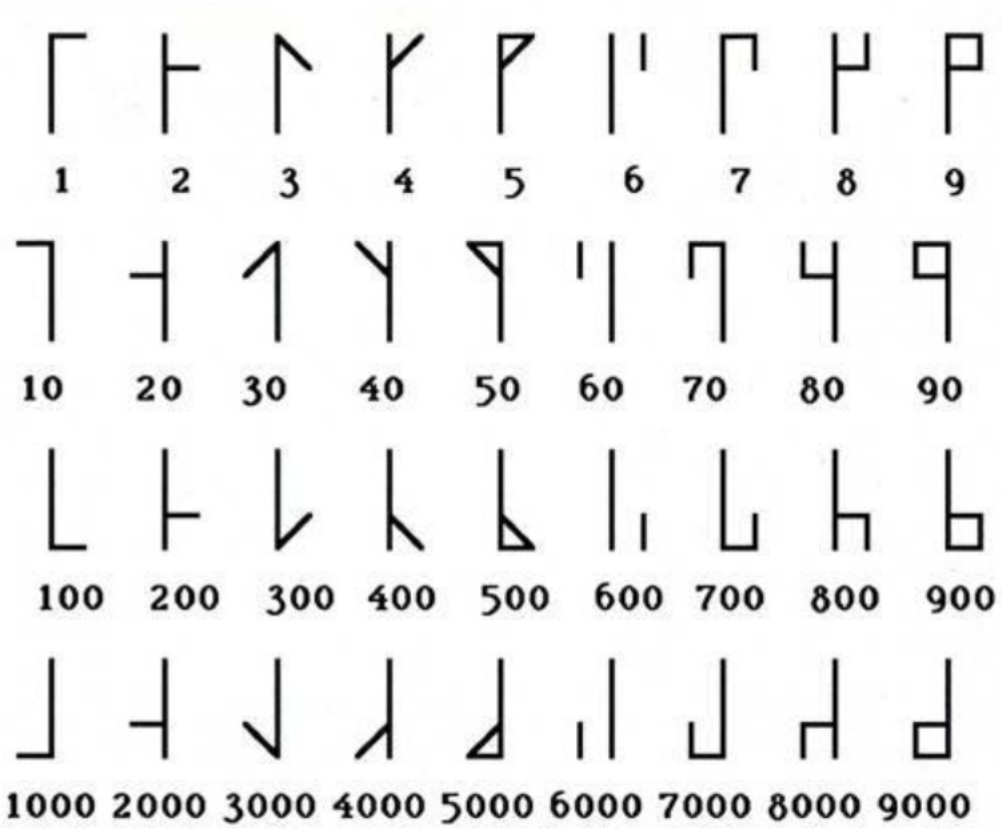
S A S Q U A R E B J L Y N F T J S R S V C R
G Y N L A I M O N Y L O P H L P E O H K R X
D A O D O O O Z U H I B E L I H Z K U W E W
R N R B R E T A T S K O O N T L T I F J D Y
L A A D W A T H G J R R N E J O W U F A E W
D A V L N O S P T E R I O Q A R E F L K O D
K G O Q O E C D M A N N C N V I F J E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

- NIKOLA
- PETROV
- OKSTATE
- COWBOYS
- LEWIS
- CARROLL
- SPHERICAL
- ANDRAS
- LORINCZ
- SPINNING
- WHEELS
- CANTOR
- EMMY
- NOETHER
- MARTIN
- GARDNER
- SHUFFLE
- CARDS
- PERMUTATION
- MAGIC
- PROBABILITY
- MATH
- PUZZLE
- TULSA
- NORMAN
- OKLAHOMA
- POLYNOMIAL
- ROLAND
- ROEDER
- INDIANA
- SQUARE
- CIRCLE
- ALGEBRA
- THEOREM

Spot Prize I (Break the Code!)

Name:_____ **School:**_____

During the Middle Ages, Cistercian monks developed an interesting additive numeration system where each number from 1 to 9999 could be expressed as a single symbol. Their convention is illustrated in the table below:



For example, 2024 would be reprsented by  and 1001 by  . If X is the largest multiple of 4 whose Cistercian notation is invariant under a 180° rotation, what is X?

OU Math Day 2024 **November 7, 2024**

Lunch Problem

Name:_____ **School:**_____

Due after lunch at the door to the Math Bowl.

Write your solution on the back.

Amongst four friends, Alice, Bob, Charly and Donna, each person either always lies or always tells the truth. One evening, they make the following statements:

Alice - Bob is a liar!

Charly - Alice is a liar.

Donna - Alice and Charly are both liars. Bob is a liar!

Who are the liars? Pick from the options below, then do your best to explain your reasoning.

(A) Alice & Bob (B) Alice & Charlie (C) Alice & Donna

(D) Bob & Donna (E) Charlie & Donna