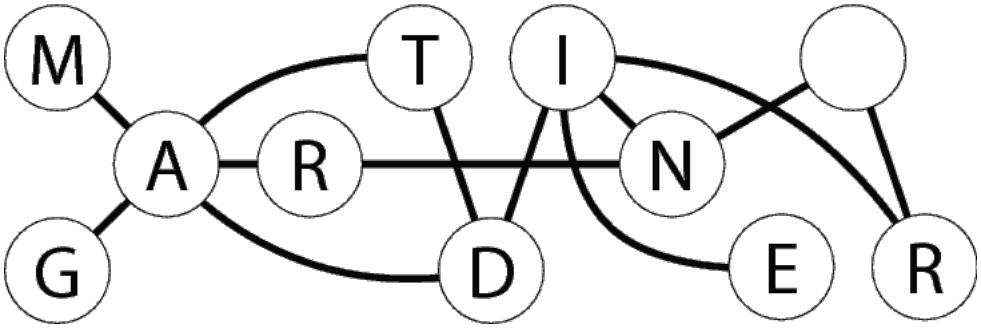


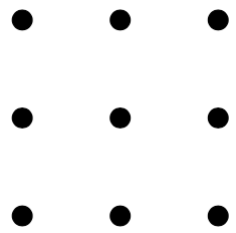
Photo Martin Gardner by Alex Bellos in 2008 in Norman

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

Stage 1

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

1. If you are not allowed to pick three dots in the same row, same column, or same diagonal, what is the maximum number of dots you can pick in a three by three grid of dots?



2. To convert from Fahrenheit (F) to Celsius (C), you use the formula

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

There is a temperature which is exactly the same number in both Fahrenheit and Celsius. What is that temperature?

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

a. If we write the number A in binary (base 2) it is 11. What is A?

b. If $\sec(\theta) = 5/3$, then what is $\sin(\theta)$?

c. If you have a spherical birthday cake and make three distinct straight cuts through the cake, what is the largest number of pieces you can make?

d. Let $x = 11^{10}$. Which of the following numbers is closest to x?

(a) 1,000,000

(b) 1,000,000,000

(c) 1,000,000,000,000

(d) 1,000,000,000,000,000

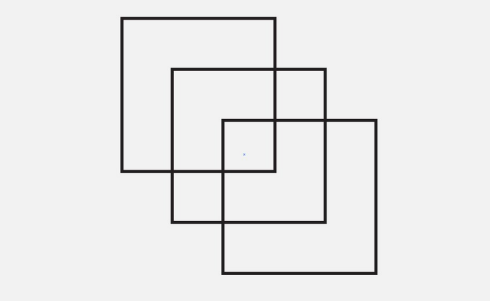
e. Which is more likely: rolling two sixes with two rolls of a fair die or drawing the four of spades from a standard deck of 52 playing cards which has been well-shuffled?

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

1. Hot dog buns are sold in packs of 8. Hot dogs are sold in packs of 6. Say you want to buy enough packs of buns and hot dogs so you have exactly one bun for each hot dog. What is the fewest[1] number of hot dogs you can buy?

2. A *palindromic polynomial* is a polynomial $p(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots a_1 x + a_0$ where $a_{n-k} = a_k$ for $k = 0, \ldots, n$. If $p(x)$ is a degree 3 palindromic polynomial with $p(0) = 2$ and $p(1) = 2$, then what is $p(x)$?

3. How many squares are in the following image?



[1] Greater than zero!

Lunch!

Stage 2

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

a. At a dinner party with three Sooners and three Cowboys, if every Sooner shakes hands with every Cowboy, how many handshakes happen?

b. If a square doubles in circumference, the new square's area is what multiple of the old square's area?

c. What is 2022 in base 3?

d. Consider the sequence $a_1 = 2, a_2 = -3, a_3 = 4, a_4 = -5, a_5 = 6, a_6 = -7, \ldots$.

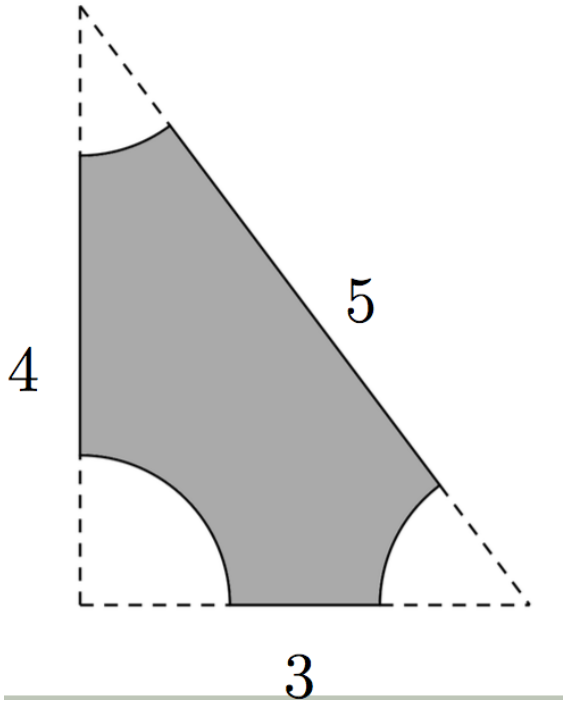
If you continue this sequence, what is a_{10}?

e. To be eligible to win the Fields Medal, you must be younger than what age?

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

1. If $a_1 = 1$, $a_2 = 1$, and $a_n = a_{n-1} + a_{n-2}$ for $n \geq 3$, then is a_{2022} even or odd?

2. In the figure below the white areas are cut out by circles of radius one centered at the vertices of the triangle. What is the total area of the regions cut out?



3. Consider the polynomial

$$p(x) = (1 - x)^{2022} + 2022.$$

If you were to expand out the product and write $p(x)$ in standard form as a combination of powers of x, what would be the constant term?

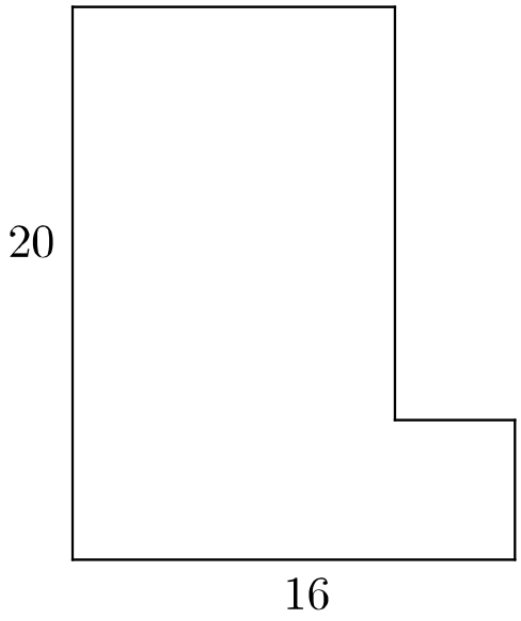
Stage 3

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

1. A test has five multiple choice questions with four possible answers for each. What is the probability you will get them all right by guessing at random?

2. Let x be a real number which is closer to 20 than to 16 and closer to 5 than to 33. How long is the interval of possible values for x?

3. What is the perimeter of the following shape?



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

1. Let $p(x) = ax^2 + bx + c$ where a, b, c are all from among $1, 2, \ldots, 9$. If $p(10) = 117$, then what are a, b, and c?

2. Here are the first few rows of Pascal's triangle. Assuming the pattern continues, if you were to sum up the numbers in the 2022th row, would the result be even or odd?

$$
\begin{array}{ccccccccccc}
 & & & & & 1 & & & & & \\
 & & & & 1 & & 1 & & & & \\
 & & & 1 & & 2 & & 1 & & & \\
 & & 1 & & 3 & & 3 & & 1 & & \\
 & 1 & & 4 & & 6 & & 4 & & 1 & \\
1 & & 5 & & 10 & & 10 & & 5 & & 1
\end{array}
$$

The End!

Spot Prize II (Word Search!)

Name:_____ **School:**_____

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

- DAVID
- PLAXCO
- OKSTATE
- COWBOYS
- LEWIS
- CARROLL
- SPHERICAL
- GREG
- MULLER
- HEXAFLEXAGON
- MATRIX
- CANTOR
- EMMY
- NOETHER
- MARTIN
- GARDNER
- SHUFFLE
- CARDS
- PERMUTATION
- MAGIC
- PROBABILITY
- MATH
- PUZZLE
- TULSA
- NORMAN
- OKLAHOMA
- POLYNOMIAL
- VIRTUAL
- REALITY
- PALINDROME
- SQUARE
- CIRCLE
- SONIA
- KOVALEVSKY

Spot Prize II (Word Search!)

Name:_____ **School:**_____

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

- DAVID
- PLAXCO
- OKSTATE
- COWBOYS
- LEWIS
- CARROLL
- SPHERICAL
- GREG
- MULLER
- HEXAFLEXAGON
- DR MATRIX
- CANTOR
- EMMY
- NOETHER
- MARTIN
- GARDNER
- SHUFFLE
- CARDS
- PERMUTATION
- MAGIC
- PROBABILITY
- 3DPRINT
- MATH
- PUZZLE
- TULSA
- NORMAN
- OKLAHOMA
- POLYNOMIAL
- VIRTUAL
- REALITY
- PALINDROME
- SQUARE
- CIRCLE
- SONIA
- KOVALEVSKY

Spot Prize I (Break the Code!)

Name:_____ **School:**_____

While exploring the OU campus, you find students have done a chalk drawing which says "Beat Texas!". When you look closer, you see the following pattern drawn next to it:

```
]45; :‡? (8500: *88† ;‡ †‡ 6) )4‡]
);?†8*;) 4‡] 69.8(18-; .8‡.08 -5* 28
5*† );600 )?--88†6 95: 28 5 ]‡*†8(1?0
95;4895;6-65* 5*† 159‡?)
28-5?)8 ‡1 6; 2?; 6 59 50)‡ ¶8(: 4?95*8
```

Your friend thinks this is some sort of code where each of these symbols stands for a letter of the alphabet:

0 1 2 3 4 5 6 7 8 9 . , : ; ( ) [ ] † ‡ $ ¢ - * ? ¶

Your friend makes a lucky guess that

"8" is an "E" and ";" is a "T".

Can you crack the code before time runs out?

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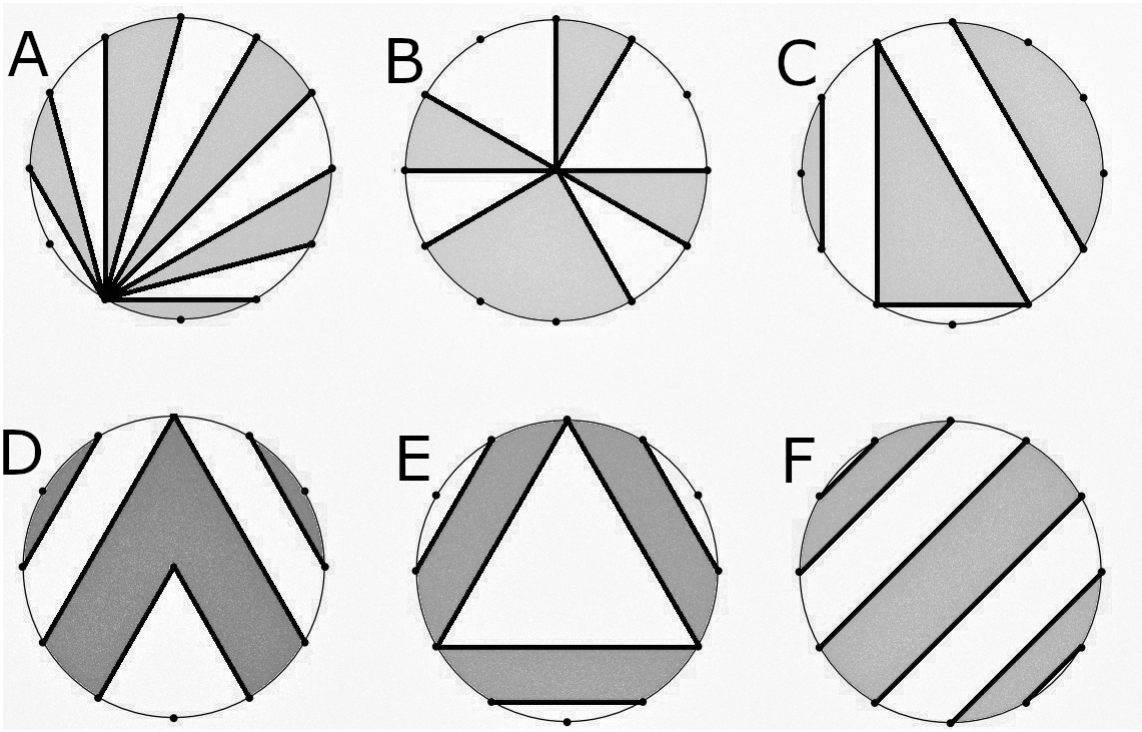
Lunch Problem

Name:_____ **School:**_____

Due after lunch at the door to the Math Bowl. Write your solution on the back.

For each circle, what proportion of the area is shaded? For example, for circle A determine if the shaded region is 1/2, 1/3, 2/5, etc. of the total area.



Notes:

1. The dots on the edge of a circle are equally spaced around the circle.
2. When there is a dot on the inside of a circle, it is at the center of the circle.
3. You don't need it, but if you like you can assume each circle has radius 1.