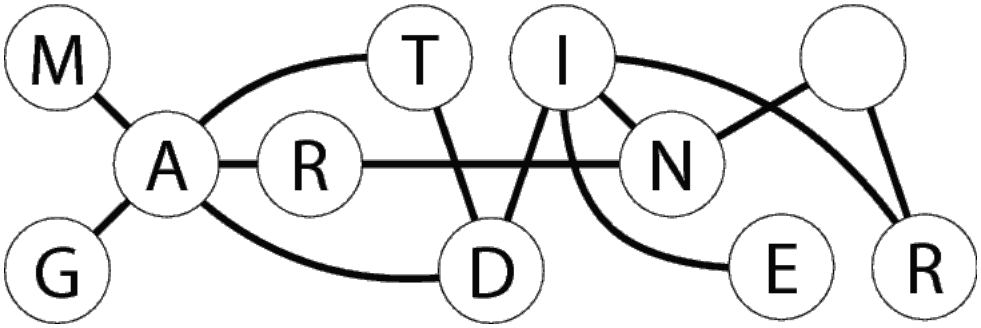


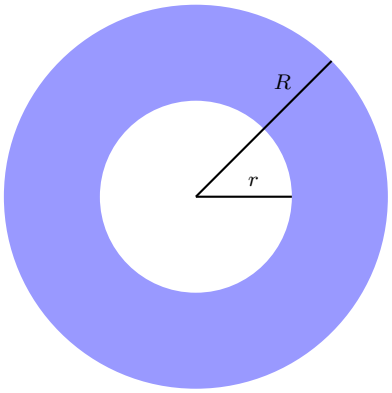
Photo Martin Gardner by Alex Bellos in 2008 in Norman

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

Stage 1

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

1. Say there are two concentric circles of radius r and R as in the picture below.



If the shaded region covers half the area of the larger circle, please determine the ratio R/r.

2. If a and b are positive real numbers whose average is 10, what is the average of a, b, and 1?

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

a. If we write the number A in base 7 it is 11. What is A?

b. True or False: The word stifle is an anagram of itself.

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

d. Let $x = 2^{0^{1^{9}}}$. What is x?

e. Which is more likely: getting 7 heads in a row while flipping a fair coin, or picking a person at random from a large group and the person's birthday happens to be today?

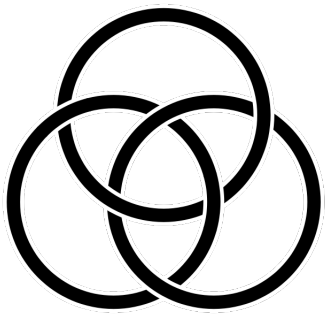
Stage 1, Round 3 (3 Questions, 5 Minutes)

1. Adam is looking at Zoe. Zoe is looking at Joshua. Adam is married. Joshua is not married.

   True or False: A married person is looking at a person who is not married.

2. Say we have a polynomial $p(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$. I know 2, 0, 1, and 9 are four of its coefficients but the fifth coefficient is unknown. When I check my scratch paper I discover we also know $p(1) = 20$. What is the missing coefficient?

3. These three interlocked rings are called the *Borromean Rings*:



   True or False: If you delete any one of the rings, the remaining two rings can then be separated.

Lunch!

Stage 2

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

a. The word "lemon" is an anagram of which other fruit?

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

c. What is 2019 in base 7?

d. Consider the sequence $a_1 = 2, a_2 = -1, a_3 = -4, a_4 = -7, a_5 = -10, \ldots$.

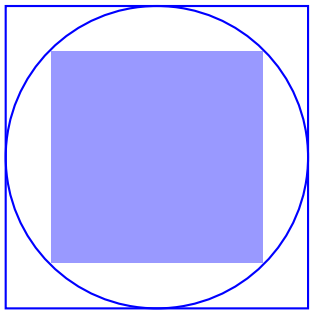
If you continue this sequence, will a_{2019} be even or odd?

e. How many Platonic solids are there?

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

1. A furlong is 1/8 of a mile and a fortnight is two weeks. How many miles per hour is 2688 furlongs per fortnight?

2. Say you have a square inscribed in a circle inscribed in a 4×4 square like in the picture below. What is the area of the inner, shaded square?



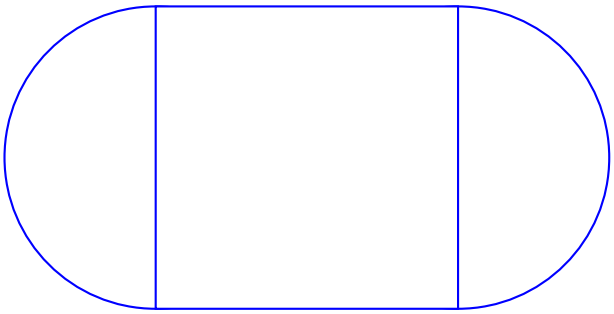
4

3. You are trying to break into the Top Secret Math Bowl vault so you can look at next year's questions. You know the vault requires a 4 digit access code. When you dust for fingerprints on the keypad you see the numbers 2, 0, 1, and 9 are the only ones with finger prints. How many different combinations will you have to try?

Stage 3

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

1. This shape is made from a square and two semicircles. What is the total area of the shape if the square has side length 4?



2. To convert from Celsius to Fahrenheit, you use the formula

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

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

3. Say a, b, and c are real numbers such that

$$4 = \frac{a+b}{2},$$
$$8 = \frac{a+c}{2},$$
$$12 = \frac{a+b+c}{3}.$$

What is a?

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 2019th 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:**_____

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

DIANA
DAVIS
SWARTHMORE
PHINEAS
PHOENIX
LEWIS
CARROLL
DYNAMICS
GREG
MULLER
HEXAFLEXAGON
DRMATRIX
MARTIN
EMMY
NOETHER
GARDNER
SHUFFLE
PERMUTATION
PERIODIC
PROBABILITY
BILLIARDS
MATH
PUZZLE
TULSA
NORMAN
OKLAHOMA
TEXAS
POLYNOMIAL
PENTAGON
PATHS
ANAGRAM
SQUARE
CIRCLE
SONIA
KOVALEVSKY
MIRZAKHANI

Spot Prize II (Word Search!)

Name:_____ **School:**_____

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

DIANA
DAVIS
SWARTHMORE
PHINEAS
PHOENIX
LEWIS
CARROLL
DYNAMICS
GREG
MULLER
HEXAFLEXAGON
DRMATRIX
MARTIN
EMMY
NOETHER
GARDNER
SHUFFLE
PERMUTATION
PERIODIC
PROBABILITY
BILLIARDS
MATH
PUZZLE
TULSA
NORMAN
OKLAHOMA
TEXAS
POLYNOMIAL
PENTAGON
PATHS
ANAGRAM
SQUARE
CIRCLE
SONIA
KOVALEVSKY
MIRZAKHANI

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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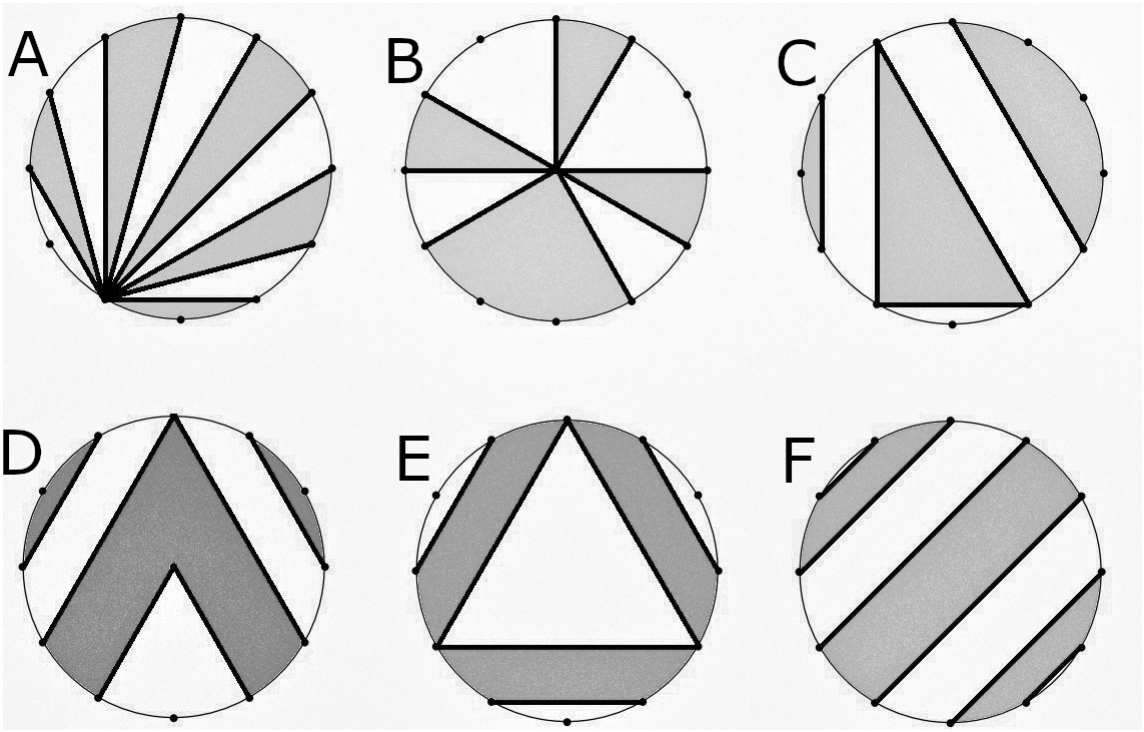
Lunch Problem

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.