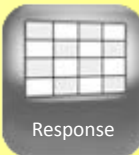


Semifinal

Question #1—100 Points

$$11,111,011,111_2 =$$

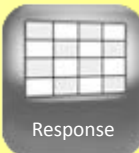
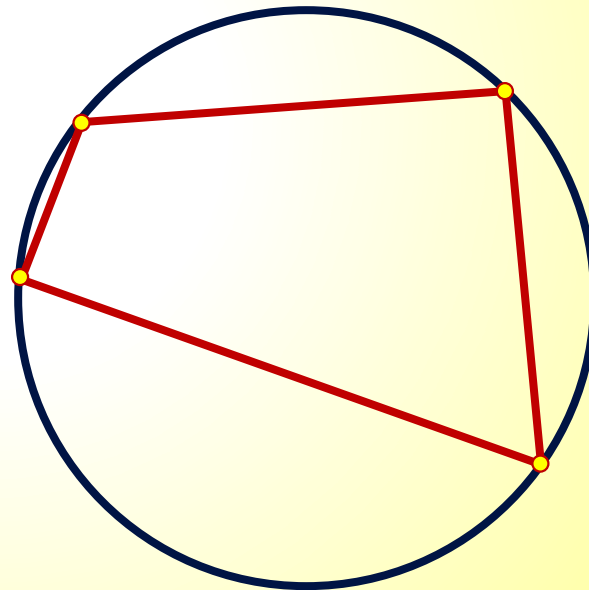
- 0
- A. 1829
- 0
- B. 1891
- 0
- C. 2015
- 0
- D. 4063



Question #2—200 Points

Four points on a circle of diameter 2 units are connected to make a quadrilateral. What is the largest possible area (in square units) of a quadrilateral determined this way?

- A. 1
B. 2
C. π
D. 4



Question #3—300 Points

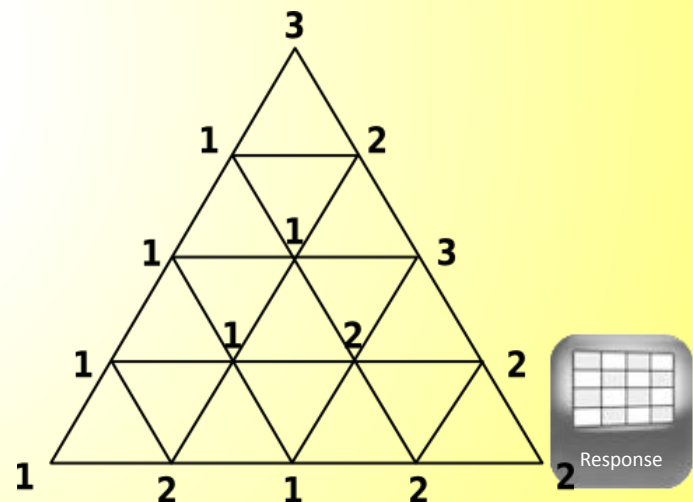
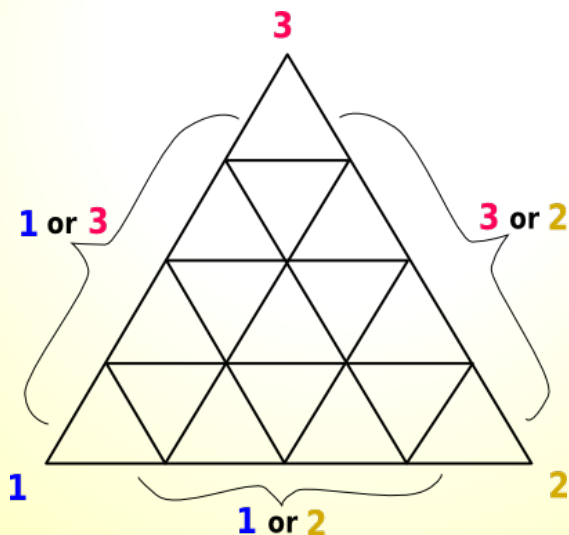
The following lemma is attributed to which of the following mathematicians?

Lemma: Consider a big triangle whose corners are labelled 1, 2, and 3. Suppose it is subdivided into smaller triangles (that meet nicely along edges) and such that

1. Edge vertices are labelled with one of the two labels from the corners that span that edge
2. Vertices inside the triangle are arbitrarily labelled either 1, 2, or 3.

Then there exists a smaller triangle whose vertices have all labels: 1, 2, and 3.

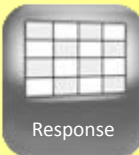
- A. Fatou
- B. Heron
- C. Sierpinski
- D. Sperner



Question #4—400 Points

The positive integers 725,725 and 432,432 have...

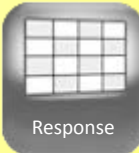
- 0 **A.** no common prime factors
- 0 **B.** exactly one common prime factor
- 0 **C.** exactly two common prime factors
- 0 **D.** exactly three common prime factors



Question #5—500 Points

The San Antonio Spurs roster has 1 center, 7 guards, 4 forwards and 3 players who can play either center or forward. How many different line-ups are possible, consisting of 1 center, 2 guards, and 2 forwards?

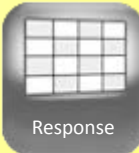
- 0 **A.** 504
- 0 **B.** 1,386
- 0 **C.** 1,764
- 0 **D.** 2,205



Question #6—600 Points

According to its website, the San Antonio River Walk is five miles long. Suppose that Rod runs at a constant rate of 8 miles per hour and Sid runs at a constant rate of 6 miles per hour. Both Rod and Sid start running at the same end of the River Walk and head towards the other end. When Rod reaches the other end, he turns around and runs back toward Sid. How long does it take for Rod to meet Sid, measuring time from when they began the run?

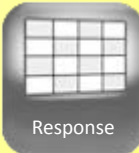
- A. $2/3$ hr.
- B. $3/4$ hr.
- C. $5/7$ hr.
- D. $11/14$ hr.

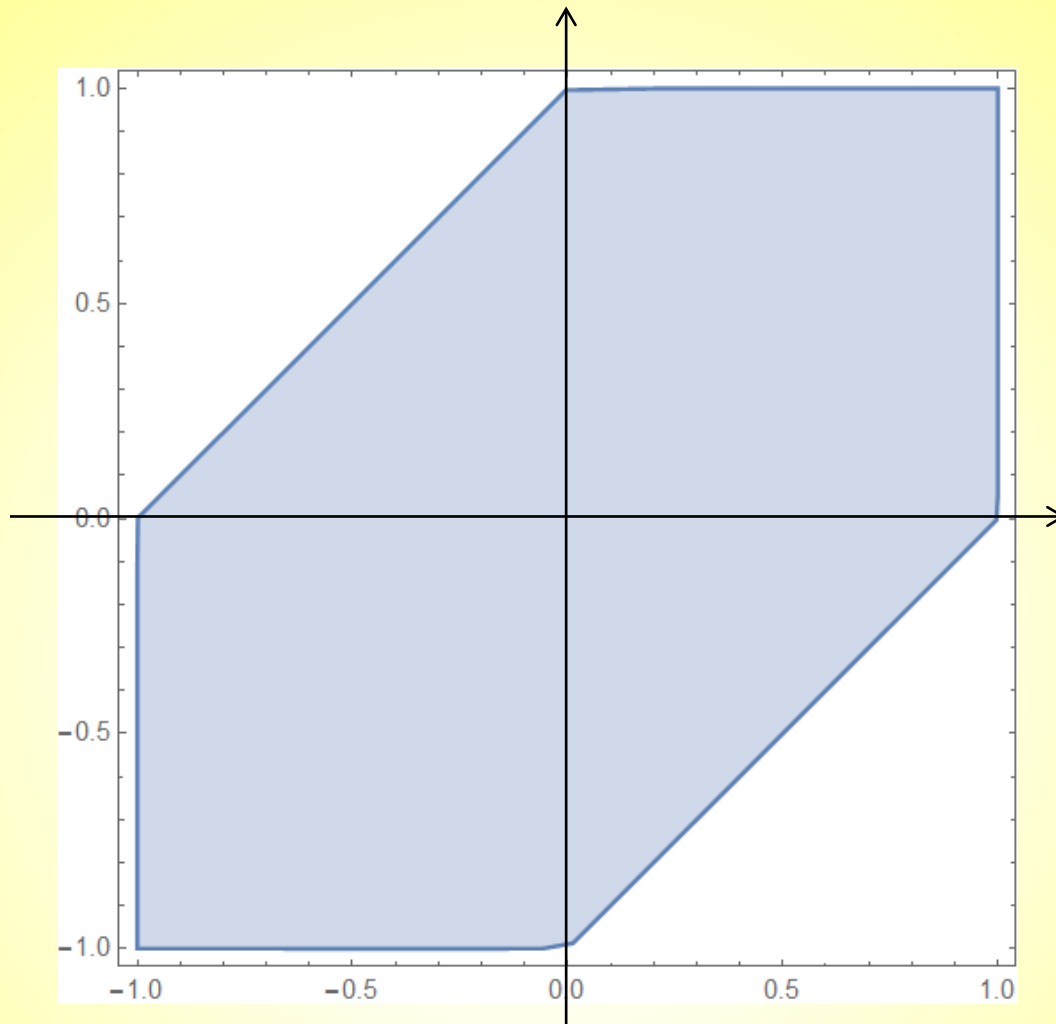


Question #7—700 Points

What is the area of the region defined by the inequality $|x| + |y| + |y - x| \leq 2$?

- 0 A. $\sqrt{2}$
- 0 B. 2
- 0 C. 3
- 0 D. $2 + \sqrt{2}$



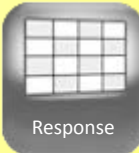


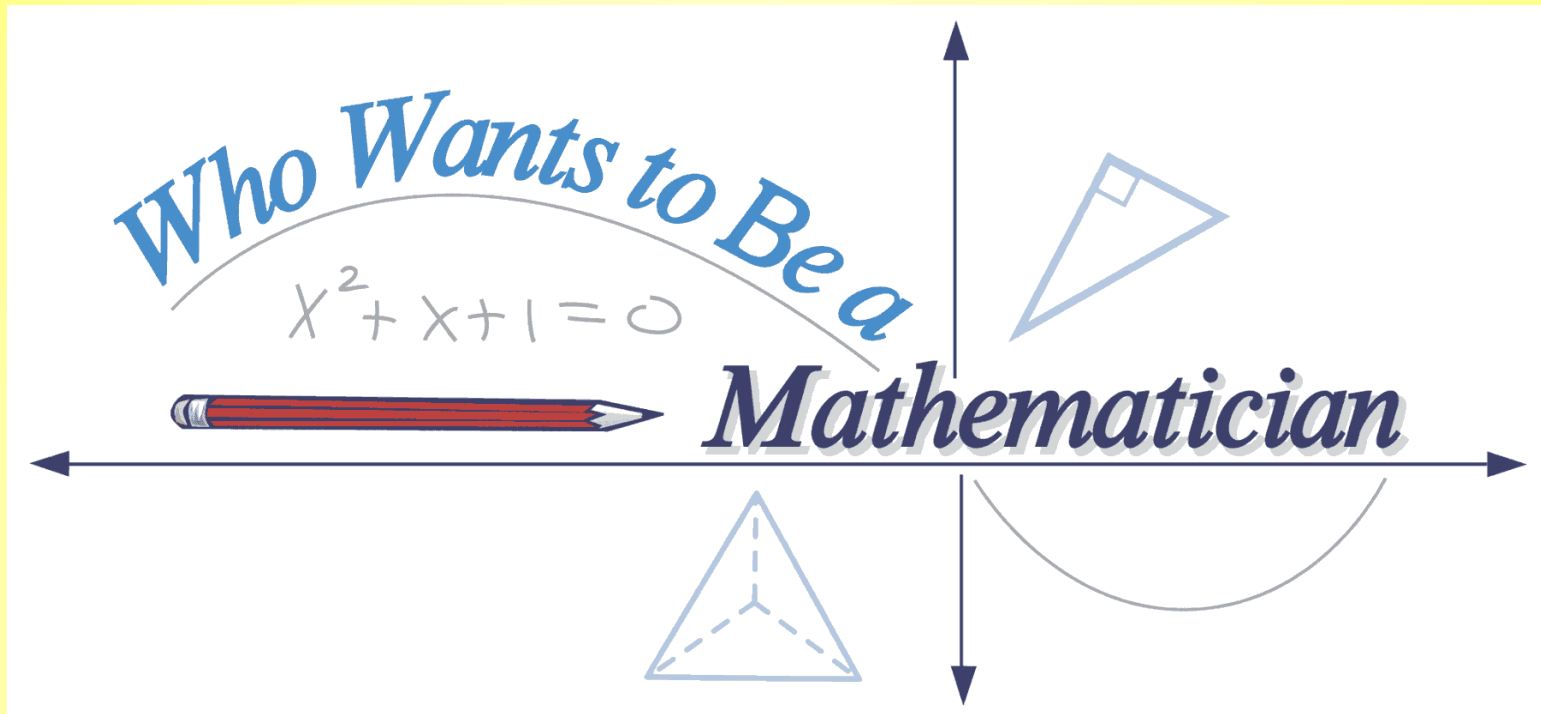
$$|x| + |y| + |y - x| \leq 2$$

Question #8—800 Points

What is the remainder when the 111-digit number
1234567891011...5960 is divided by 99?

- 0 **A.** 0
- 0 **B.** 30
- 0 **C.** 48
- 0 **D.** 51





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