ROUND #1

Gainesville State College
Mathematics Tournament
April 4, 2009

What is the 3997^{th} term of the sequence?

5, 0, 0, 0, -5, -5, 5, 0, 0, 0, -5, -5, 5, 0, 0, 0, -5, -5, …

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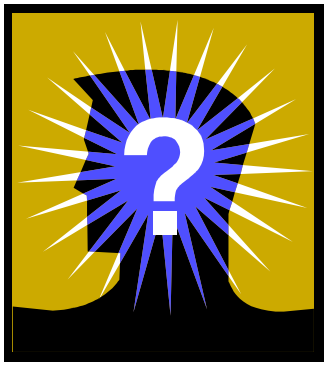
ROUND #2

Gainesville State College
Mathematics Tournament
April 4, 2009



For a given n-sided regular polygon with $n \geq 4$, find the length of its shortest diagonal. Express your answer in terms of a formula that depends on n.

(A diagonal is a line segment connecting two non-consecutive vertices of a polygon.)

ROUND #3

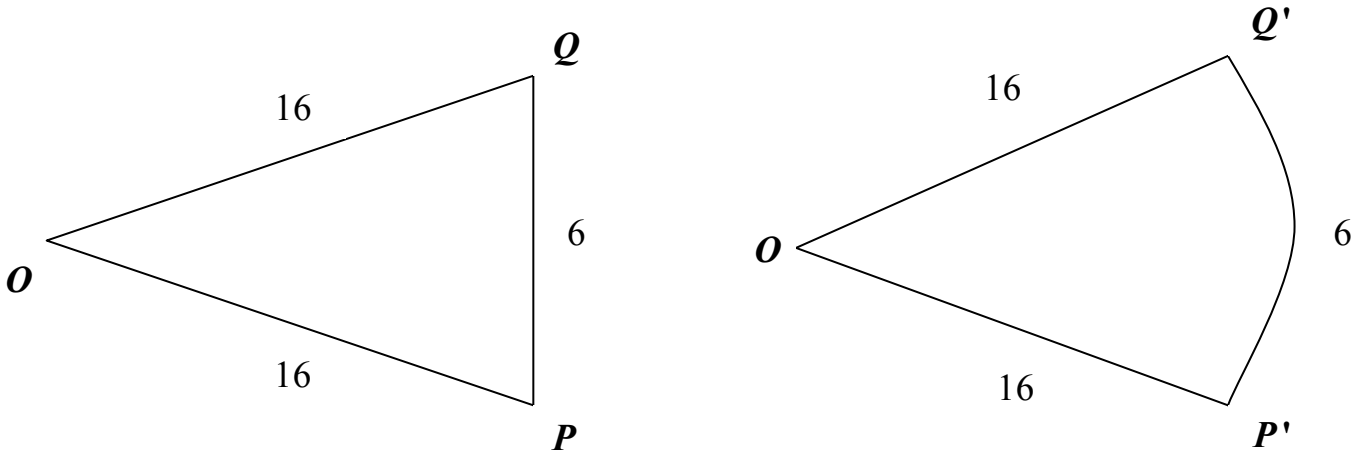
Gainesville State College
Mathematics Tournament
April 4, 2009

A cube 21 *inches* x 21 *inches* x 21 *inches*, made of light-colored wood, is painted black on all sides. Then it is cut into small cubes 1 *inch* x 1 *inch* x 1 *inch* each. How many small cubes have at least one side painted black?

ROUND #4

Gainesville State College
Mathematics Tournament
April 4, 2009

Triangle OPQ is constructed from a wire. The triangle is deformed into a circular sector $OP'Q'$. Determine the area of the circular sector $OP'Q'$.



ROUND #5

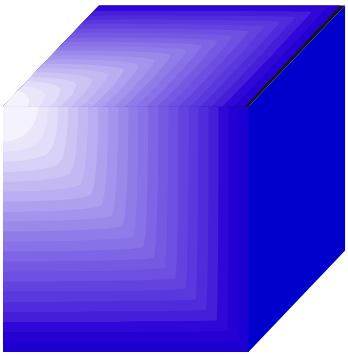
Gainesville State College
Mathematics Tournament
April 4, 2009

A train that is one mile long is moving with a constant speed of 30 miles per hour. A runner is running (inside the train) from the front of the train to the back (against the motion of the train), with a speed of 5 miles per hour, relative to the train. How far will the runner be displaced relative to the Earth during his run?

ROUND #6

Gainesville State College
Mathematics Tournament
April 4, 2009

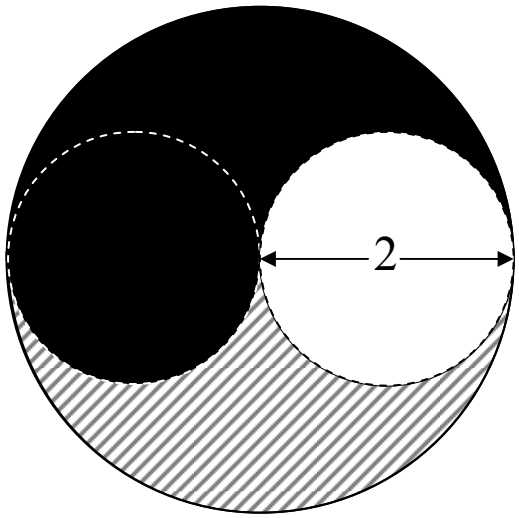
If each side of a cube is increased by 2%, by what percent is the volume of the cube increased? Express your answer to the nearest one-hundredth of a percent.



ROUND #7

Gainesville State College
Mathematics Tournament
April 4, 2009

What is the ratio of the area of the white circle to the shaded area at the bottom of the circle?



ROUND #8

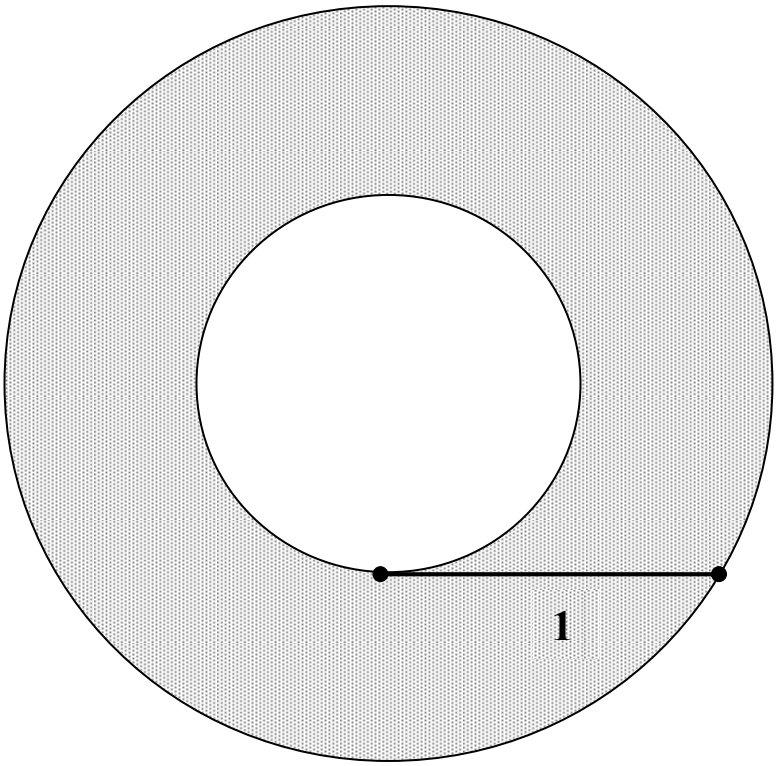
Gainesville State College
Mathematics Tournament
April 4, 2009

A rectangle has dimensions a units by b units with $a > b$. A diagonal divides the rectangle into two triangles. A square with sides parallel to those of the rectangle is inscribed in each triangle. Find the distance between the vertices of the squares that lie in the interior of the rectangle.

ROUND #9

Gainesville State College
Mathematics Tournament
April 4, 2009

What is the area of the shaded region in the picture below?



ROUND #10

Gainesville State College
Mathematics Tournament
April 4, 2009

Sarah and Sam are standing back to back. They each walk 10 feet straight ahead. They each then turn 90 degrees to their right and walk 8 feet straight ahead. Finally, they each turn 90 degrees to their left and walk 5 feet straight ahead. How many feet apart are they now?