

**University of North Georgia**  
**Mathematics Tournament**  
**April 6, 2019**

**Solutions for the Afternoon Team Competition**

**Round 1**

The area of the black region is found by taking the area of the square and subtracting the area of the semi-circles. The area of the black region is  $2r^2 - 2 \frac{r^2}{2} = 4r^2 - r^2 = 9 \cdot 2.25$ . Solving we get that  $r^2 = \frac{9}{4}$  and  $r = \frac{3}{2}$ . Therefore the perimeter of the square is  $2r \cdot 4 = 2 \cdot \frac{3}{2} \cdot 4 = 12$ .

**Round 2**

The area of each grid is  $100 \text{ ft}^2$ .

$$\frac{1}{2} \cdot 400 \text{ ft} \cdot h = 200 \text{ ft} \cdot 100 \text{ ft} = 0.5 \cdot 13 \cdot 100 \text{ ft}^2$$

$$200 \text{ ft} \cdot h = 2 \cdot 100 \text{ ft}^2 = 6.5 \cdot 100 \text{ ft}^2$$

$$200 \text{ ft} \cdot h = 4.5 \cdot 100 \text{ ft}^2 = \frac{9}{2} \cdot 100 \text{ ft}^2$$

$$h = \frac{9}{4} \cdot 100 \text{ ft} = 225 \text{ ft}$$

$$\sqrt{400^2 - 225^2} = \sqrt{2 \cdot \dots}$$

! -





Round 9

Using the law of cosines we have:  $a^2 = 36 + 64 - 48\sqrt{2}$ ,  $b^2 = x^2 + 36 - 6x\sqrt{3}$ , and  $c^2 = x^2 + 64 - 16x\cos 30^\circ = 45 + \sqrt{6} - \sqrt{2} / 4$ . Using the Pythagorean Theorem we have:

$$c^2 = a^2 + b^2$$

$$\frac{\sqrt{\quad} + \sqrt{\quad}}{\quad} = \sqrt{\quad}$$

