

1.14 Starry, Starry Night, E14

1. [PUMAC 2018] Frist Campus Center is located 1 mile north and 1 mile west of Fine Hall. What is the area within 5 miles of Fine Hall that is located both north and east of Frist?

Proposed by Alex Song

2. [EMCC 2018] Farmer James places the numbers $1, 2, \dots, 9$ in a 3×3 grid such that each number appears exactly once in the grid. Let x_i be the product of the numbers in row i , and y_i be the product of the numbers in column i . An arrangement is called *balanced* if the (unordered) sets $\mathcal{R} = \{x_1, x_2, x_3\}$ and $\mathcal{C} = \{y_1, y_2, y_3\}$ are the same. How many balanced arrangements could Farmer James have made?

Proposed by Ivan Borsenco

3. [CMIMC 2017/G10] Suppose triangle ABC is such that $AB = 13$, $AC = 15$, and $BC = 14$. It is given that there exists a unique point D on side BC such that the Euler lines of triangle ABD and triangle ACD are parallel. Determine the value of $\frac{BD}{CD}$. (The *Euler line* of a triangle ABC is the line connecting the centroid, circumcenter, and orthocenter of ABC .)

Proposed by David Joseph Altizio