

**2016 MATH FIELD DAY  
HUDDLE PROBLEMS**

**Problem 1.** Evaluate

$$\frac{1}{\sqrt{1} + \sqrt{0}} + \frac{1}{\sqrt{2} + \sqrt{1}} + \frac{1}{\sqrt{3} + \sqrt{2}} + \cdots + \frac{1}{\sqrt{2015} + \sqrt{2014}}$$

**Problem 2.** The *oblocity* of a right circular cylinder (open on both ends) is defined to be its volume (in cubic inches) minus the area of its curved surface (in square inches). When the cylinder's radius is tripled, its oblocity is multiplied by 10. What is the radius of the cylinder, in inches?

**Problem 3.** For any real number  $r$ , let  $\lfloor r \rfloor$  be the greatest integer less than or equal to  $r$ . For example, we have  $\lfloor 2\frac{3}{4} \rfloor = 2$  and  $\lfloor 3 \rfloor = 3$ . In effect,  $\lfloor r \rfloor$  rounds  $r$  down to an integer. Set

$$f(n) = \left\lfloor \frac{n}{1} \right\rfloor + \left\lfloor \frac{n}{2} \right\rfloor + \cdots + \left\lfloor \frac{n}{n} \right\rfloor$$

for each positive integer  $n$ . Evaluate  $f(100) - f(99)$ .

**Problem 4.** Find the smallest positive angle  $\theta$ , in radians, for which

$$\ln(\sin(3\theta)) = \frac{\ln(\cos(6\theta))}{2} + \ln\left(\frac{1}{\sqrt{2}}\right).$$