

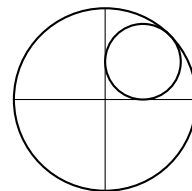
**MATHEMATICS ENRICHMENT CLUB.**  
**Problem Sheet 17, September 24, 2019**

1. *AMC 2010 Senior Division, Q16.*

The 5-digit number  $a986b$ , where  $a$  is the first digit and  $b$  is the units digit, is divisible by 72. What is the value of  $a + b$ ?

2. *AMC 2010 Senior Division, Q19.*

A circle is inscribed in a quadrant of a larger circle. What is the ratio of the area of the inner circle to that of the quadrant?



3. *AMC 2010 Senior Division, Q24.*

What is the smallest  $n$  such that no matter how  $n$  points are placed inside or on the surface of a cube of side length 16 units, there are at least two of these points which are closer than 14 units to each other?

4. A sequence of real numbers,  $\{x_1; x_2; x_3; \dots\}$ , is defined by

$$x_1 = \frac{p}{2}; \quad x_2 = \frac{p}{3};$$

$$x_n = x_{n-1} - x_{n-2} \quad \text{for } n \geq 3;$$

## Senior Questions

1. The numbers  $x$  and  $y$  are positive integers that satisfy

$$3x^2 - 8y^2 + 3x^2y^2 = 2008:$$

Find all possible values of  $x$  and  $y$ .

2. *AMC 2010 Senior Division, Q26.*

A polynomial  $f$  is given. All we know about  $f$  is that all its coefficients are non-negative integers,  $f(1) = 6$  and  $f(7) = 3438$ .

What is the value of  $f(3)$ ?

3. *AMC 2008 Senior Division, Q29.*

A point  $O$  is inside an equilateral triangle  $PQR$  and the perpendiculars  $OL$ ,  $OM$  and  $ON$  are drawn to the sides  $PQ$ ,  $QR$  and  $RP$  respectively.

The ratios of the lengths of the perpendiculars  $OL : OM : ON$  is  $1 : 2 : 3$ . If

$$\frac{\text{area of } \triangle LONP}{\text{area of } \triangle PQR} = \frac{a}{b},$$

where  $a$  and  $b$  are integers with no common factors, what is the value of  $a + b$ ?

