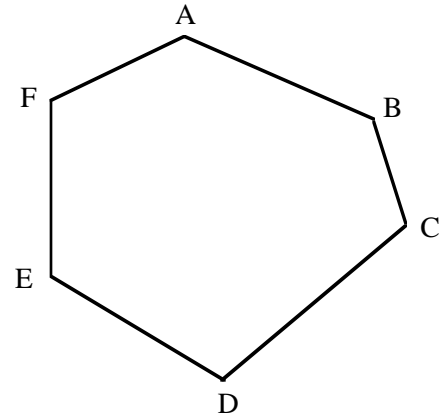


**WISCONSIN MATHEMATICS SCIENCE & ENGINEERING TALENT SEARCH**

**PROBLEM SET III (1994-95)**

**DECEMBER 1994**

1. Find the largest positive integer  $x$ , not divisible by 10, such that if the last two digits of  $x^2$  are removed, then the remaining number is also a perfect square.
2. Suppose that each of the three main diagonals  $AD$ ,  $BE$ , and  $CF$  divide the hexagon  $ABCDEF$  into two regions of equal area. Prove that the three diagonals meet at a common point.



3. Find all positive integer solutions of the equation

$$x^3 - y^3 = xy + 61.$$

4. Without using a calculator or a computer, determine which of the two numbers  $31^{11}$  or  $17^{14}$  is larger.
5. Suppose that  $S$  is a set of 400 consecutive integers. How many ordered pairs  $(s, t)$  are there, with  $s$  and  $t$  in  $S$ , such that either  $s \neq t$  and  $s + t$  is divisible by 80, or  $s = t$  and  $s + t$  is divisible by 160.

Happy New Year!

**You are invited to submit a solution even if you get just one problem**

RETURN TO:

MATHEMATICS TALENT SEARCH  
 Dept. of Mathematics, 480 Lincoln Drive  
 University of Wisconsin, Madison, WI 53706

DEADLINE  
 January 2  
 1995

(PLEASE DETACH)

LAST NAME      FIRST      GRADE

SCHOOL                                      TOWN

HOME ADDRESS      TOWN      ZIP CODE

PROBLEM	SCORE
1	
2	
3	
4	
5	

**PROBLEM SET III**