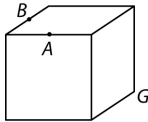
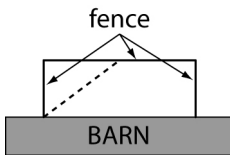
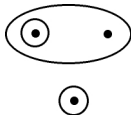


# The Mandelbrot Competition

## Round Five Test

Name: \_\_\_\_\_

Time Limit:  
40 minutes

1. Imagine the plane passing through the points $A$ , $B$ and $G$ shown at right. The intersection of this plane with the cube is a polygon. How many sides does this polygon have?		1
2. Gabby and Saelig are painting a house, and each works at a steady rate. Gabby paints 30% more area per hour than Saelig, but spends 30% less time on the job. Who paints the greater area? (Write A, B or C for your answer.) A. Gabby paints more    B. Saelig paints more    C. They paint the same		1
3. At Mel's Mighty Market one can only buy fruit in bags. It is possible to purchase a bag with 3 apples and 5 bananas for \$4.00, or a bag with 7 apples and 9 bananas for \$7.50. Marge wishes to purchase at least 20 apples and at least 30 bananas. What is the least amount that she could spend?		2
4. Given a fraction $\frac{m}{n}$ between 0 and 1 written in lowest terms, create a new fraction $\frac{n-m+1}{n+m+2}$ , then reduce it to lowest terms. Suppose repeating this process on the new fraction yields $\frac{m}{n}$ again. Determine both possible values of $\frac{m}{n}$ .		2
5. A rectangular pen is built against the side of a barn. The total length of fencing used for the three sides is 20 meters. Suppose that the distance from one corner to the midpoint of the opposite side (indicated by the dashed line) is 9 meters. What is the area of the pen?		2
6. How many ways are there to draw three loops around three given points so that each loop contains at least one point, each loop surrounds a different set of points, and no two loops intersect?		3
7. Let $\alpha$ be the positive real solution to $x^3 + \frac{2}{5}x - 1 = 0$ . Find the exact numerical value of $\alpha^2 + 2\alpha^5 + 3\alpha^8 + 4\alpha^{11} + \dots$ .		3

SCORE: