



★ REGIONAL LEVEL ★

December 2010

The Mandelbrot Competition

Round Two Test

Name: _____

Time Limit:
40 minutes

1. Compute the sum of all positive two-digit numbers containing the digit 3.		①
2. Sonia is standing in a line. To pass the time, she determines that 32% of the people in the line are standing in front of her, while 64% of the people are standing behind her. How many people are there in the line all together?		①
3. What is the maximum number of regions into which a circle and a rectangle can divide the plane? For instance, the configuration at right creates four regions.		②
4. Recall that quadrant <i>II</i> consists of all points (x, y) with $x < 0$ and $y > 0$. Suppose that a line $y = mx + b$ does not pass through quadrant <i>II</i> . Which <i>must</i> be true of this line? (Write A, B, 'both', or 'neither' as your answer.) A. The slope m is positive B. The y -intercept b is negative.		②
5. Let a , b , c and d be positive real numbers satisfying the condition that each of the products ab , bc and cd is equal to one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 or 9. Determine the minimum possible value of $a + d$.		②
6. Let l_1 be the line passing through $(5, 3)$ making an angle of inclination of 17° with the horizontal, and let l_2 be the line passing through $(5, 3)$ making an angle of inclination of 107° with the horizontal. Reflect point $P(1, 1)$ over line l_1 to obtain A , and reflect P over l_2 to obtain B . Compute distance AB .		③
7. Eight students are about to board a roller coaster car with eight seats, grouped into four pairs as shown. However, Casey and Stacey refuse to sit next to one another, and Jenny and Lenny also will not sit side by side. In how many ways can the eight students fill the seats?		③

SCORE: