



★ REGIONAL LEVEL ★

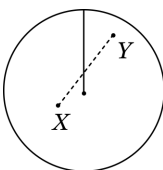
October 2018

# The Mandelbrot Competition

## Round One Test

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

*Time Limit:*  
40 minutes

1. Let $x$ be the positive real number for which $x^2 + 7x = 35$ . What is the value of $(x + 3)(x + 4)$ ?		①							
2. Jonas picks five points from among the nine points in a $3 \times 3$ square grid. He then draws all the lines, passing through at least two of his points, that are not horizontal nor vertical. How many lines can Jonas draw, at most?		①							
3. One can fill in the squares with the digits 1, 3, 6, 6, 7, 8, 9 so that each pair of adjacent digits is relatively prime, meaning they have no common factor other than 1. What is the smallest possible resulting seven-digit number? <div style="text-align: center;"> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> </div>									②
4. Simplify the product $(\log_{28} 216)(\log_6 2 + \log_6 \sqrt{7})$ , writing your answer in simplest form without logarithms.		②							
5. A circle is drawn, along with a particular radius. Next two points $X$ and $Y$ are chosen independently at random inside the circle. What is the probability that segment $\overline{XY}$ intersects the given radius, as shown? <div style="text-align: right;">  </div>		②							
6. Selene has 25 different books and 16 different bookmarks. One afternoon Selene loans some of her books and bookmarks to Lillie, who has none. It turns out that now Lillie has exactly one more way of selecting a book and a bookmark (from her items) than Selene does (from the remaining items that she kept). How many ways does Lillie have to choose a book and a bookmark?		③							
7. Let $\triangle ABC$ be a triangle with sides of length $AB = 13$ , $BC = 14$ and $AC = 15$ , and let $O$ be its circumcenter. If line $AO$ intersects the circumcircle of $\triangle ABC$ at $N$ , then compute distance $CN$ .		③							

SCORE: