



★ REGIONAL LEVEL ★

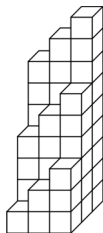
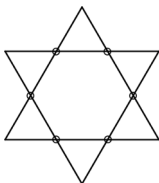
January 2018

# The Mandelbrot Competition

## Round Four Test

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

Time Limit:  
40 minutes

<p>1. It is possible to place eight of the nine digits 1, 2, 3, 4, 5, 6, 7, 8, 9 into the squares below to create four true statements. Which digit is <i>not</i> used?</p> <p><math>\square \div \square = 2</math>,    <math>\square - \square = 4</math>,    <math>\square \times \square = 6</math>,    <math>\square + \square = 8</math></p>		1
<p>2. Jack walks from home to the bean store at an average rate of 3 ft/sec, then returns at an average rate of 8 ft/sec. The next day he walks to the store at an average rate of 4 ft/sec and returns at an average rate of 5 ft/sec. Which day involves the <i>least</i> total round trip travel time?</p> <p>(A) The first day      (B) The second day      (C) Same total both days</p>		1
<p>3. A solid is built by stacking 45 unit cubes into nine columns on a desk, as shown. The front row of the solid has stacks of height 1, 2 and 3 unit cubes. The middle row has stacks of height 4, 5 and 6, while the back row has stacks of height 7, 8 and 9. What is the surface area of the resulting solid? (Include the bottom.)</p>		2
<p>4. Let <math>p</math>, <math>q</math>, <math>r</math> and <math>s</math> be prime numbers satisfying the equations below. What is the value of the largest of these four primes?</p> <p><math>p + q + r = 72</math>,    <math>p + r + s = 74</math>,    <math>q + r + s = 89</math></p>		2
<p>5. Six long segments form two overlapping equilateral triangles. How many ways are there to color each long segment either green, yellow, or orange so that any pair of long segments that cross at a circled point always have different colors?</p>		2
<p>6. Let <math>x</math> and <math>y</math> be positive real numbers such that <math>\log_x y - \log_y(x^2) = 1</math> and <math>x + y = 20</math>. Find the sum of all possible positive values of <math>x</math>.</p>		3
<p>7. Points <math>X</math> and <math>Y</math> along chord <math>\overline{AB}</math> of a circle are situated so that <math>AX = 3</math>, <math>XY = 4</math> and <math>YB = 5</math>. If <math>\overline{OX}</math> and <math>\overline{OY}</math> are perpendicular, where <math>O</math> is the center of the circle, then find the area of this circle.</p>		3

SCORE: