

The Mandelbrot Competition

Round Three Test

Time Limit:
40 minutes

Name: _____

1. Which choice below gives the equation of a line perpendicular to the line defined by $2x + 3y = 4$? (Write either A, B, or C as your answer.)

A. $3x + 2y = 4$

B. $4y + 5 = 6x$

C. $y = -\frac{2}{3}x + \frac{4}{3}$

1

2. Each of the cards at right has a single digit from 1 to 9 written on the back. The statement shown on each card is true, unless the digit on the other side is a 4, in which case it is false. What is the sum of the two hidden numbers?

The sum of the
numbers is 11.

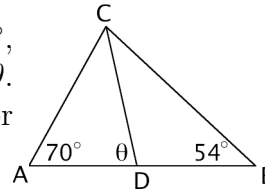
The product of the
numbers is 28.

1

3. Two congruent circular outlets in a dam together permit 1000 gallons per minute (gpm) of water to flow through. Assuming that flow rate is proportional to the area of the outlet, what would the total flow rate be, in gpm, if the diameter of one hole were doubled while the other diameter were halved?

2

4. Let ABC be a triangular piece of paper with $m\angle A = 70^\circ$, $m\angle B = 54^\circ$. Mark a point D along \overline{AB} with $m\angle ADC = \theta$. Fold and crease the paper so that C lands on top of D . For what value of θ is the resulting quadrilateral cyclic?

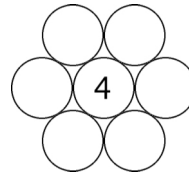


2

5. Let $P = (13)(17)(23) \cdots (97)$ be the product of all two digit numbers ending with either a 3 or a 7. What are the last two digits of P ?

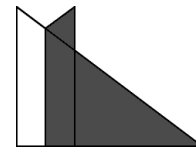
2

6. One can place the digits from 1 to 7 in the circles, with the 4 in the middle, so that the sums of the numbers within any row or diagonal—nine sums in all—are all different. Which two digits (other than the 4) must be placed next to the 1?



3

7. Given a triangular sheet of paper with sides of length 3, 4, and 5, one can fold the paper along a crease perpendicular to the side of length 4 to obtain a five-sided polygon (the shaded region) whose area depends on where the crease is made. Determine the smallest possible such area.



3

SCORE: