

Student Name: _____

Please write your name on *every* page.

Section F

F1

If $-5 \leq x \leq 3$ and $-2 \leq y \leq 7$, find the maximum possible value of $x^2 - y^2$.

Answer to F1: _____

F2

Find the greatest real value of x that satisfies the nonic equation

$$1 + x + x^2 + x^3 + \dots + x^9 = 1023$$

Answer to F2: _____

F3

Two people each arrive at a restaurant at a random instant between 5 PM and 6 PM. Each person stays for half an hour. What is the probability that there will be some point in time when both of them are at the restaurant?

Answer to F3: _____

F4

Find all values of x such that $\log_2(\log_4(x)) = \log_4(\log_2(x))$.

Answer to F4: _____

F5

There are 25 poles on a bike rack, each of which is currently holding 2 bikes. The 50 bikers who have attached their bikes to the rack leave in a random order. After 46 people leave, what is the probability that there's still a pole with 2 bikes attached?

Answer to F5: _____

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F6

Find the smallest positive integer n that satisfies

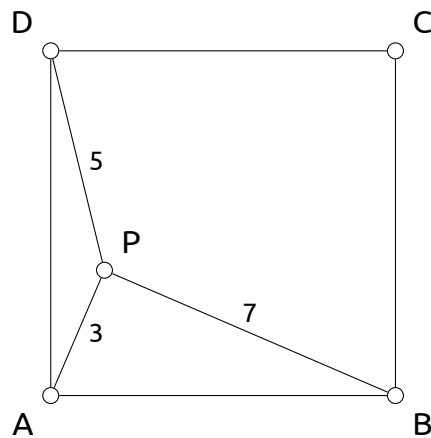
$$\gcd(n^2 + 4n - 5, 2n^2 + 9n - 5) = 2016$$

where $\gcd(a, b)$ denotes the greatest common divisor of a and b .

Answer to F6: _____

F7

Point P is inside square $ABCD$ with $PA = 3$, $PB = 7$, and $PD = 5$. What is the area of the square $ABCD$?



Answer to F7: _____

F8

Determine the number of 4-tuples (a, b, c, d) of (not necessarily distinct) positive integers whose product, $abcd$, is 2016. You may use the fact that $2016 = 2^5 \cdot 3^2 \cdot 7$.

Answer to F8: _____