

Student Name: _____

Please write your name on *every* page.

6 Section F

F1

If $2^x = 8^y$ what is the value of $\frac{x}{y}$?

Answer to F1: _____

F2

Each day, Sarah can either take the bus or a scooter to work, and each one costs money to use. In a 5 day work week from Monday to Friday, Sarah takes the bus three times and a scooter twice, for a total cost of \$19.25. On the weekend, she takes a scooter once and a bus once, for a total cost of \$8.00. How much more does the scooter cost to take than the bus?

Answer to F2: _____

F3

The following is the flag of Greece, which is drawn to scale. It has a 3:2 ratio between horizontal length and vertical length. What fraction of the flag is shaded?



Answer to F3: _____

F4

A number between 1 and 200 ends in 7 in base 9, 5 in base 8, and 0 in base 7. In base 6, what does the number end in?

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Answer to F4: _____

F5

What is the side length of a regular tetrahedron whose volume and surface area are equal?

Answer to F5: _____

F6

How many six digit numbers consist only of digits 1, 2, and 3, and are divisible by 7?

Answer to F6: _____

F7

William rolls four 6-sided dice. He discards the lowest roll, and then sums the remaining three rolls. On average, what can he expect the sum to be?

Answer to F7: _____

F8

Alex and Brian are playing a game with a deck of cards. Each card has one of four suits (spades, clubs, hearts, or diamonds) and one of 13 ranks (A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K), for a total of $13 \times 4 = 52$ cards in the deck. The game proceeds as follows: Alex draws n cards from the deck, and chooses one to place face down. He then arranges the remaining $n - 1$ cards in whatever order he wants, and then gives them to Brian. Brian then attempts to guess which card Alex has face down based only on which cards he received and the order that they are in. They both win if Brian guesses correctly, otherwise they lose. If they are allowed to agree on a strategy beforehand, what is the smallest value of n for which Brian can always correctly guess what Alex's face down card is?

Answer to F8: _____