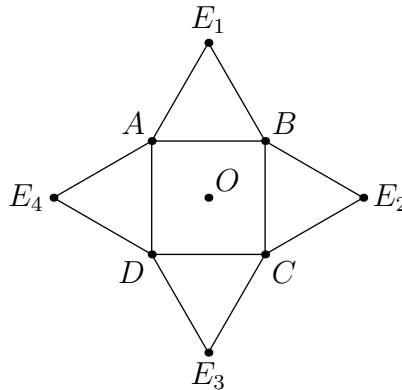
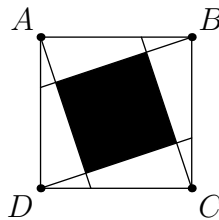


- Ed, Fred and George are playing on a see-saw that is slightly off center. When Ed sits on the left side and George, who weighs 100 pounds, on the right side, they are perfectly balanced. Similarly, if Fred, who weighs 400 pounds, sits on the left and Ed sits on the right, they are also perfectly balanced. Assuming the see-saw has negligible weight, what is the weight of Ed, in pounds?
- How many digits does the product  $2^{42} \cdot 5^{38}$  have?
- Square  $ABCD$  has equilateral triangles drawn external to each side, as pictured. If each triangle is folded upwards to meet at a point  $E$ , then a square pyramid can be made. If the center of square  $ABCD$  is  $O$ , what is the measure of  $\angle OEA$ ?



- How many solutions  $(x, y)$  in the positive integers are there to  $3x + 7y = 1337$ ?
- A trapezoid with height 12 has legs of length 20 and 15 and a *larger* base of length 42. What are the possible lengths of the other base?
- Let  $f(x) = 6x + 7$  and  $g(x) = 7x + 6$ . Find the value of  $a$  such that  $g^{-1}(f^{-1}(g(f(a)))) = 1$ .
- Billy and Cindy want to meet at their favorite restaurant, and they have made plans to do so sometime between 1:00 and 2:00 this Sunday. Unfortunately, they didn't decide on an exact time, so they both decide to arrive at a random time between 1:00 and 2:00. Silly Billy is impatient, though, and if he has to wait for Cindy, he will leave after 15 minutes. Cindy, on the other hand, will happily wait for Billy from whenever she arrives until 2:00. What is the probability that Billy and Cindy will be able to dine together?
- As pictured, lines are drawn from the vertices of a unit square to an opposite trisection point. If each triangle has legs with ratio 3 : 1, what is the area of the shaded region?



- For any positive integer  $n$ , let  $f_1(n)$  denote the sum of the squares of the digits of  $n$ . For  $k \geq 2$ , let  $f_k(n) = f_{k-1}(f_1(n))$ . Then,  $f_1(5) = 25$  and  $f_3(5) = f_2(25) = 85$ . Find  $f_{2012}(15)$ .
- Given that 2012022012 has 8 distinct prime factors, find its largest prime factor.