Name: Date:

1. $\boxed{100\sqrt{3}}$

2. $\boxed{1:3}$

3. $\boxed{4}$

4. $\boxed{16}$

5. $\boxed{10}$

6. $\boxed{45}$

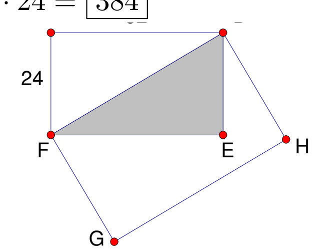
7. If we let the sides of the triangle be primes p, q, q then the perimeter is $p + 2q$. It now remains to examine the smallest possible composite perimeters.

   We start with 22: $p + 2q = 22$ implies that $p = 22 - 2q$ so p is even. Since it is also prime, $p = 2$ and then $q = 10$ which is not prime. So our triangle cannot have a perimeter of 22.

   The perimeter cannot be 23 because we are looking for a composite perimeter, and 23 is prime.

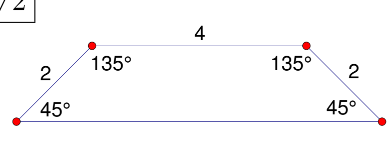
   Next we examine 24: $p + 2q = 24$ implies that $p = 24 - 2q$ so we know that $p = 2$. Then $q = 11$, which is prime and so $\boxed{24}$ is our smallest possible perimeter.

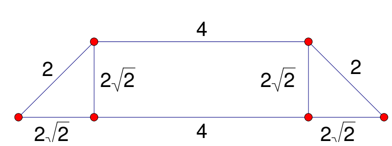
8. The diagram is drawn below with the intersection shaded. We are looking for the shaded area, which is clearly just $\frac{1}{2} \cdot 32 \cdot 24 = \boxed{384}$



9. This may have been graded incorrectly.

   Since the shaded region is made up of four congruent isosceles trapezoids, we need only find the area of one and multiply it by 4. In the diagram shown below, we examine one of these trapezoids. Notice first that because a regular octagon has interior angles that measure $\frac{180(8-2)}{8} = 135$, our trapezoid has angle measures of 135, 135, 45, 45. Now when we draw both altitudes down we get a rectangle and two 45-45-90 triangles, from which we can find the lengths of the bottom base to be $4 + 4\sqrt{2}$ and the altitude to be $2\sqrt{2}$. Now the area of the trapezoid is $\left(\frac{4+4+4\sqrt{2}}{2}\right) \cdot 2\sqrt{2} = 8 + 8\sqrt{2}$. The area of all four of the trapezoids gives us $\boxed{32 + 32\sqrt{2}}$





10. $\boxed{6 + \sqrt{6}}$