Calcusolve 2020-21: 7th and 8th Grade Problems

1. (Group Problem) Assume that when a pen draws any continuous curve of 10 feet in length, it will use 1% of its ink to do so. Consider an isosceles right triangle that could be drawn by this pen without running out of ink. What is the largest integer length one of the two equal sides of this triangle could have?

2. Consider a line segment connecting the points $(-1,1)$ and $(3,5)$. Also, consider the line perpendicular to the segment which passes through the segment's midpoint. What is the y value when $x = 10$ of this line?

   Hint: If $m_1$and m_2 are the slopes of perpendicular lines then $m_1 = -\frac{1}{m_2}$

3. If a right triangle has a height which is equal to four times its base and the area of the triangle is 128 square inches, then what would be the area of a square with side length equal to the base of this triangle?

   Hint: For triangles $Area = \frac{1}{2}(base)(height)$

4. Assume City 1 and City 2 are 580 miles apart and connected by a straight railroad track. If a train leaves City 2 at midnight travelling at a rate of 80 miles per hour towards City 1 and two hours later another train leaves City 1 heading toward City 2 at a rate of 60 miles per hours, then at what time would the trains collide?

   Hint: $Distance = (rate)(time)$

5. Find five consecutive even numbers whose sum is equal to 240.

   Hint: If N is even then the next consecutive even number is $N + 2$

6. If a wheel with a diameter of 2 feet is rolling along a flat road and rotating at a rate of 100 rotations per minute, then what is the exact speed that the wheel is moving along the direction of the road in feet per minute?

   Hint: $Circumference = \pi(diameter)$

7. Describe all the x values which satisfy the inequalities $-2 \leq 6 - 4x < 18$.

   Hint: Solve for x using properties of inequalities.

8. If a 30 meter flag pole stands perpendicular to flat ground and the ends of a fully extended 50 meter rope are connected from the top of the pole to the ground level then how far away from the base of the pole is the point where the rope meets the ground?Consider the two arithmetic sequences given below. What is the one number both sequences would have in common?

   Sequence 1: 3000, 3002, 3004, 3006, 3008, …
   Sequence 2: 600, 608 ,616, 624, 632, 640, …

   Hint: Pythagorean Theorem

9. (Group Problem) Consider the two arithmetic sequences given below. What is the one number both sequences would have in common?

   Sequence 1: 3000, 3002, 3004, 3006, 3008, …
   Sequence 2: 600, 608 ,616, 624, 632, 640, …