1. Consider the degree 9 polynomial \((4x - 2)^9\). We can express this polynomial as \((4x - 2)^9 = c_0 + c_1x + c_2x^2 + c_3x^3 + c_4x^4 + c_5x^5 + c_6x^6 + c_7x^7 + c_8x^8 + c_9x^9\). What is the sum \(c_1 + c_2 + c_3 + c_4 + c_5 + c_6 + c_7 + c_8 + c_9\)?

2. How many positive integer factors of 9,800,000 are not perfect squares?

3. List the number of two digit numbers \(10 \leq x \leq 99\) satisfying the following properties: \(x\) is divisible by the sum of its digits and \(x\) divided by the sum of its digits gives 7.

4. Let \(\{a_n\}_{n=1}^{\infty}\) be a sequence such that \(a_1 = 0\) and

\[
a_{n+1} = \frac{a_n - \sqrt{3}}{\sqrt{3}a_n + 1}
\]

for \(n = 1, 2, 3, \ldots\). Calculate \(a_1 + a_2 + a_3 + \cdots + a_{2018}\).

5. Let \(E\) be the subset of the plane consisting of points \((x, y)\), where \(x, y\) are elements of the set \((-1, 0, 1)\). For example the point \((-1, 0)\) is in \(E\). Let us pick any three points from \(E\). Then what is the probability that there exist two points among these three points whose distance is \(\sqrt{5}\)?

6. King Hiero II of Syracuse wants to approximate the area of a circle but has forgotten the formula. His friend Archimedes suggests the following approximation to the area: take \(n\) equally spaced points \((P_1, P_2, \ldots, P_{n-1}, P_n)\) on the circumference of the circle resulting in an \(n\)-sided regular polygon. Then, approximate the area of the circle by the area of this \(n\)-sided regular polygon. What is the approximation to the area of a circle with a diameter of 4 units if King Hiero II uses Archimedes method with \(n = 8\) points?

7. There are two taps in a restroom which together fill a 100 gallon tank in 10 hours. However, Tap 1 takes 4 hours longer to fill a 50 gallon tank than it takes Tap 2 to fill a 30 gallon tank. What is the largest sized tank in gallons that can be filled by Tap 1 in 5 hours?

8. Janet decides to donate money to a charity every year. But being a mathematician, she decides that the number of dollars she donates to the charity would be equal to the total number of odd positive integers with distinct digits between 1 and the current year. (So, for example, 253 is one such number, but 799 is not since 9 is repeated).
How much money did Janet donate to the charity this year (that is, in 2018)?

9. Let $A, B, C$ be three points on the plane. $A = (2, 1)$, the point $B$ is on the $x$-axis, and the point $C$ is on the line $x = y$. Suppose we can move $B$ along the $x$-axis and $C$ along the line $x = y$ freely. What is the minimum value of the perimeter of the triangle $ABC$?

10. Let $x_1, x_2, x_3$ be nonnegative real numbers such that $x_1 + x_2 + x_3 = 1$. Calculate the maximum value of 
\[ (x_1 + 3x_2 + 5x_3)(x_1 + \frac{x_2}{3} + \frac{x_3}{5}). \]