

Names:

High School:

**Group Work (11th and 12th grades) Time: 40 Minutes**

1. Find one possible value for the next term in the sequence

1, 1, 2, 4, 7, 13, 24, 44, 81, 149, 274, 504,  $\dots$

2. Circles A and B with radii 3 and 4, respectively, intersect so that the tangents at the two points of intersection are perpendicular. Calculate the difference between the non-overlapping areas of the two circular regions.

**Names:**

**High School:**

3. Find the value of

$$\sqrt{3 + \sqrt{3 + \sqrt{3 + \dots}}}$$

4. A bag contains twenty white balls and thirty black balls. Four balls are randomly drawn, without replacement. What is the probability of selecting a white ball, followed by a black ball, then a black ball, and finally a white ball?

**Names:**

**High School:**

5. A holiday savings account is set up in a way that fifty weekly deposits are made that total to 12,500 dollars. If the deposits decrease by a fixed amount each week and the last deposit is 5 dollars, what is the amount of the first deposit?
6. Six identical copies of the *American Math Monthly* and four identical copies of *Bulletin of the American Mathematical Society* are stacked in a pile. How many different piles are possible?

**Names:**

**High School:**

7. The inhabitants of the moon have a unit of measure called a *lunar*. The number of square lunars in the moon's surface area is the same as the number of cubic lunars in the moon's volume. Assuming that the moon is a sphere of diameter 2160 miles, how long is a lunar in miles?

8. Find the derivative of

$$f(x) = e^{x^{e^{x^e}}}.$$