Grade 6 Math Circles
February 20-22, 2024
Arithmetic Sequences - Problem Set

1. Determine which sequences are arithmetic, geometric, both, or neither.

   (a) 1, 5, 9, 13, 17, 21

   (b) 9, 7, 5, 4, 2, 0

   (c) 64, 32, 16, 8, 4 ,2, 1

   (d) −10, 0, 10, 20, 30, 40

   (e) 3, 3, 3, 3 ...

2. An arithmetic sequence has a common difference of 5. If the first term is 10 and the last term is 165, how many terms are in the sequence? How does this change if the first term is −10?

3. Consider the arithmetic sequence

$$5, \ 11, \ 17, \ 23, \ 29$$

   (a) Determine the values of a, b, n and d.

   (b) Use these values to find the sum of the sequence. Verify your answer with a calculator.

4. To try and reduce her use of oil-based fuel, Maura purchases an electric vehicle that takes 2,700 gallons of diesel fuel to manufacture, but requires no gasoline to use once its made. Meanwhile, the average gas-powered car only takes about 260 gallons of diesel fuel to manufacture, but uses one gallon of gasoline per 22 miles travelled. Create an arithmetic sequence to model the fuel consumption of both types of vehicles, then determine how many miles must be travelled for both vehicles to consume equal amounts of fuel in their lifetimes. What happens after this point?

5. Find the sum of the sequence below:

$$-12, \ -31, \ -50, \ ... \ -1190, \ -1209, \ -1228$$

6. What is the sum of the first 30 negative odd numbers?

7. Alicia has 20 shares of stock in the Euclid corporation. Each share has an initial value of $10. The share value increases each week according to the arithmetic sequence: $10, $13, $16, ...

   (a) If Alicia waits 20 weeks and then sells all of her shares, how much money will she have?

(b) If Alicia sells one share at $10 and then one share per week thereafter until she has no shares left, how much money will she have?

8. The first 45 terms of an arithmetic sequence are:

$$-308, \ -301, \ -294 \ ..., \ -21, \ -14, \ -7$$

The sum of the **entire sequence** is zero. Without using any formulas, explain how we could predict the total number of terms in the sequence.

9. Create a sequence of nine consecutive even numbers whose sum is exactly 900.

10. A pyramid of rectangular blocks is drawn below. Each row of the pyramid corresponds to the number of blocks in that row. For example, the first row has one block, the second row has two blocks, and so on.
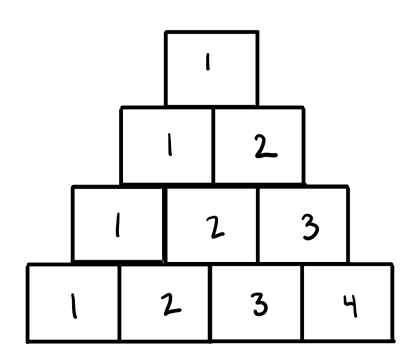
(a) How many blocks are there in total for a block pyramid with 500 rows?

(b) If each block is 2.5 pounds, how much does this row weigh?

11. * A restaurant has tables in the shape of an octagon which hold one person per edge of the octagonal table. However, when the tables are joined for larger parties, the sides joining another table can no longer be used for seating. If the restaurant were big enough to hold large crowds of people, use sequences to find how many tables are needed to seat exactly 200 people.

Table 1   Table 2   Table 3