Date Completed: _____
Mentor Initials: _____

Sequences

1. Find the second term in the sequence:

$$972, \_\_\_\_, 108, 36, 12, 4$$

A. 216
B. 243
C. 324
D. 372
E. 486

2. The first term in the geometric sequence below is -6. If it can be determined, what is the seventh term?

$$-6, 12, -24, 48, -96\ldots$$

A. -384
B. -288
C. 288
D. 384
E. Cannot be determined from the given information

3. In a conference room, there are 6 rows of chairs in a triangular shape. The first row contains 1 chair. Each successive row contains 2 more chairs than the previous row. How many chairs are in the conference room?
A. 32
B. 36
C. 40
D. 44
E. 48

4. The first 5 terms of an arithmetic sequence are $-2, 1, 4, 7,$ and 10. In terms of n, what is the nth term of this sequence?
A. $2n - 4$
B. $3n - 5$
C. $4n - 6$
D. $5n - 7$
E. $6n - 8$

5. The 1st and 2nd terms of a certain geometric sequence are -15 and 5, respectively. What is the 5th term of the sequence?

A. $\frac{5}{3}$

B. $\frac{5}{27}$

C. $-\frac{5}{9}$

D. $-\frac{5}{27}$

E. $-\frac{5}{81}$

6. A gardener is planting seeds in a triangular plot with 8 rows. The 1st row has 7 seeds and each row has 4 more seeds than the previous row. How many seeds are there total?

A. 148
B. 156
C. 162
D. 168
E. 176

7. The 1st term of a geometric sequence is 9, and the 4th term is $\frac{8}{3}$. In terms of n, what is the nth term of the sequence?

A. $9\left(\frac{2}{3}\right)^{n-1}$

B. $9\left(\frac{2}{3}\right)^{n}$

C. $9\left(\frac{3}{2}\right)^{n-1}$

D. $9\left(\frac{3}{2}\right)^{n}$

E. $9\left(\frac{3}{2}\right)n$

8. A company that builds bridges used a pile driver to drive a post into the ground. The post was driven 24 feet into the ground by the first hit of the pile driver. On each hit after the first hit, the post was driven into the ground an additional distance that was $\frac{3}{4}$ the distance the post was driven in the previous hit. After a total of 3 hits, the post was driven how many feet into the ground?

A. $51\frac{1}{2}$
B. 53
C. $55\frac{1}{2}$
D. 57
E. $59\frac{1}{2}$

9. Mr. Jones's garden has 81 roses in it. Unsurprisingly, he thinks it is too big and wants to reduce its size. In 3 years, he wants to have only 24 roses. If Mr. Jones wants to reduce his garden proportionally each year by the same fraction, by what factor will the total number of roses be multiplied by each year, approximately?

A. $\frac{1}{4}$
B. $\frac{1}{3}$
C. $\frac{1}{2}$
D. $\frac{2}{3}$
E. $\frac{3}{4}$

10. The recursive formula for a sequence is given below, where a_n is the value of the nth term:

$$a_1 = 12$$
$$a_n = a_{n-1} + 7$$

What is the correct formula for the nth term in terms of n, the number of terms in the sequence?

A. $a_n = -7n + 19$
B. $a_n = 7n + 5$
C. $a_n = 7n + 7$
D. $a_n = 12n$
E. $a_n = 12n + 7$

11. An arithmetic sequence has n terms and a common difference d between each term. For example, the following arithmetic sequence has a common difference d of 2:

$$1, 3, 5, 7\ldots$$

If the fourth term of a different arithmetic sequence is $\frac{1}{2}$ and the seventh term is $-\frac{1}{2}$, then what is the eighth term?

A. $-\frac{3}{4}$

B. $-\frac{5}{6}$

C. -1

D. $-1\frac{1}{6}$

E. $-1\frac{1}{3}$

12. A finite arithmetic sequence has 7 terms, and the first term is $\frac{1}{2}$. What is the difference between the mean and median of the 7 terms, if it can be determined?

A. 0

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. 1

E. Cannot be determined from the given information

13. On his first day as a telemarketer, Timmy made 14 phone calls. Each day, his goal was to make 4 more calls than he did the day before. If Timmy reached his goal exactly, how many calls had he made by his 15^{th} day on the job?

A. 540
B. 570
C. 600
D. 630
E. 660

14. A sequence is defined for all positive integers by $a_n = 2 * a_{n-1} + n$ and $a_1 = 3$. What is a_5?

A. 77
B. 81
C. 85
D. 89
E. 93

15. The first term in a geometric sequence is 6. The fourth term is $\frac{16}{9}$. What is the sixth term in the sequence?

A. $\frac{64}{243}$

B. $\frac{32}{81}$

C. $\frac{64}{81}$

D. $\frac{32}{27}$

E. $\frac{64}{27}$