Number Patterns

1. Determine the recursive rule for the patterns below. Then, using the rule, find the next two terms in each pattern.
   
   a) \( a_n = 3 \cdot a_{n-1} \)
   \[ a_6 = 243, a_7 = 729 \]
   
   b) \( a_n = 2 \cdot a_{n-1} + 3 \)
   \[ a_5 = 61, a_6 = 125 \]
   
   c) \( a_n = (-1) \cdot a_{n-1} \)
   \[ a_6 = -5, a_7 = 5 \]
   
   d) \( a_n = a_{n-1} + n - 1 \)
   \[ a_6 = 17, a_7 = 23 \]

2. Determine the explicit rule for the patterns below. Then, using the rule, find the next two terms in each pattern.
   
   a) \( a_n = 4 \cdot n \)
   \[ a_6 = 24, a_7 = 28 \]
   
   b) \( a_n = 2 \cdot (n + 2) \)
   \[ a_5 = 14, a_6 = 16 \]
   
   c) \( a_n = n! \)
   \[ a_6 = 720, a_7 = 5040 \]

3. Determine the missing number(s) of the following patterns:
   
   a) \( 3, 9, 27, 81, 243, 729, \ldots \)
   
   b) \( 70, 63, 56, 49, 42, 35, \ldots \)
   
   c) \( 415, 257, 158, 99, 59, 40, 19, \ldots \)
4. The 48th arrow will be

5. 15
6. 1
7. Fred
8. 20
9. On the 9th day.
10. 162
11. 50 seconds
12. Pascal's Triangle

13. Look-and-say sequence
   a) Each term describes the one before it verbally. For example, the second term describes the first term which is “one one” or 11. The third term describes the second term which is “two ones” or 21. The fourth term describes the third term which is “one two one one” or 1211. The pattern continues in this manner.
   b) No. Think about why.