

Math 210 - Dr. Miller - Homework #4: Intro to Sequences

1. Find a plausible next term for each sequence; justify with a sentence of explanation.
 - (a) 1, 3, 5, 7, ...
 - (b) 1, 4, 9, 16, ...
 - (c) 15, 2, 4, 15, 2, 4, 15, ...
 - (d) 4, 7, 10, 13, ...
 - (e) 6, 4, 2, 0, ...
 - (f) 0.5, 2, 8, 32, ...
 - (g) 8, 4, 2, 1, ...
 - (h) $-2, 1.5, -2, 1, -2, 1.5, -2, \dots$
 - (i) 5, 6, 8, 11, ...
 - (j) 1, 3, 4, 7, 11, 18, ...
 - (k) 2, 5, 11, 23, ...
 - (l) 5, $-9, -4, -13, \dots$
2. Find the tenth term of each sequence above. (No explanation necessary.)
3. Which of the sequences from Problem #1 are...
 - (a) arithmetic?
 - (b) geometric?
 - (c) Fibonacci-type?
 - (d) repeating?
 - (e) none of these types?
4. Write the first five terms of each sequence described below.
 - (a) an arithmetic sequence with common difference $d = 6$ and first term equal to 8
 - (b) an arithmetic sequence with common difference $d = -5$ and $a_3 = 8$
 - (c) an arithmetic sequence whose second term is 8 and whose fourth term is 20
 - (d) an arithmetic sequence whose third term is 12 more than the first
 - (e) an arithmetic sequence whose second term is 10 times its first
 - (f) an arithmetic sequence where the third term is the negative of the first
 - (g) a geometric sequence with common ratio $r = 3$ and $a_1 = 0.4$
 - (h) a geometric sequence with common ratio $r = 1/3$ and first term equal to 54
 - (i) a geometric sequence with common ratio equal to 10 and $a_3 = 150$
 - (j) a geometric sequence with common ratio equal to $1/4$ and *third* term equal to 12
 - (k) a geometric sequence whose fourth term is 5 and where a_3 is 25 more than a_4
 - (l) a Fibonacci-type sequence whose third and fourth terms are equal
 - (m) a Fibonacci-type sequence whose first three terms add up to 10
 - (n) a Fibonacci-type sequence whose second term is 5 less than the first
 - (o) a sequence of no special type with $a_2 = 10$ and first difference sequence $+1, -2, +3, -4, \dots$
 - (p) a sequence whose third term is 8, fourth term is 4, and first difference sequence is all the same.
 - (q) a sequence with $a_1 = 0$ and SECOND difference sequence $\times 2, \times 2, \times 2, \dots$

1.
 - (a) 9, because it's the sequence of odd numbers.
 - (b) 25, because it's the sequence of perfect squares.
 - (c) 2, because it repeats the block 15, 2, 4.
 - (d) 16, because the terms increase by 3 each time.
 - (e) -2, because the terms decrease by 2 each time.
 - (f) 128, because the terms are multiplied by 4 each time.
 - (g) One half or 0.5, because the terms are cut in half each time.
 - (h) 1, because it repeats the block -2, 1.5, -2, 1 over and over.
 - (i) 15, because the difference sequence begins 1, 2, 3, and 4 should be added next.
 - (j) 29, because you add the previous two terms to create the next one each time.
 - (k) 47, because the difference sequence begins 3, 6, 12, doubling each time, so 24 must be added next time.
 - (l) -17, because you add the previous two terms to create the next one each time.
2.
 - (a) 19
 - (b) 100
 - (c) 15
 - (d) 31
 - (e) -12
 - (f) 131,072
 - (g) 0.015625
 - (h) 1.5
 - (i) 50
 - (j) 123
 - (k) 1,535
 - (l) -201
3.
 - (a) Arithmetic: a (common difference 2), d (common difference 3), e (common difference -2)
 - (b) Geometric: f (common ratio 4), g (common ratio 1/2)
 - (c) Fibonacci-type: j, l
 - (d) Repeating: c, h (probably)
 - (e) None: b, i, k
4.
 - (a) 8, 14, 20, 26, 32, ...
 - (b) 18, 13, 8, 3, -2, ...
 - (c) 2, 8, 14, 20, 26, ...
 - (d) Various (I didn't specify any exact term values.) This is one correct answer: 10, 16, 22, 28, 34, ...
 - (e) Again, there are many answers; 5, 50, 95, 140, 185, ... is one. Don't keep multiplying by 10, since that makes a geometric sequence, and I asked for an arithmetic one.
 - (f) Various. Here's one answer: 5, 0, -5, -10, 15, ...
 - (g) 0.4, 1.2, 3.6, 10.8, 32.4, ...
 - (h) 54, 18, 6, 2, 2/3, ...
 - (i) 1.5, 15, 150, 1500, 15000, ...
 - (j) 192, 48, 12, 3, 3/4, ...

- (k) 1080, 180, 30, 5, $5/6$, ...
- (l) Various, but they all have this form: $a, 0, a, a, 2a, \dots$ (such as 3,0,3,3,6, ...)
- (m) Various: 2,3,5,8,13, ... or 1,3,6,9,15, ... are some options
- (n) Various: 6,1,7,8,15, ... is one option
- (o) 9, 10, 8, 11, 7, ...
- (p) 16, 12, 8, 4, 0, ... or 32, 16, 8, 4, 2, ... (one is arithmetic, the other geometric).
- (q) Various: We get to pick the start of our FIRST difference sequence, but then ITS terms double every time. If I make my first difference sequence start with 1, it can go +1, +2, +4, +8, ..., and my answer sequence will begin 0, 1, 3, 7, 15. If I make my first difference sequence start with $\times 5$, then it can go $\times 5, \times 10, \times 20, \dots$, and my original sequence has - Wow!- just 0, 0, 0, 0, 0 for its first five terms.