

## Sequences Introduction Worksheet

1. Find the next three numbers/letters in the following sequences. Write down anything you notice in finding the pattern.

- (a) 7, 10, 13, 16, 19, 22, 25, 28
- (b)  $-2.5, -2, -1.5, -1, -0.5, 0, 0.5, 1$
- (c)  $-2, -5, -8, -11, -14, -17, -20, -23$
- (d) 1, 4, 9, 16, 25, 36, 49, 64
- (e)  $-1, 0, 3, 8, 15, 24, 35, 48$
- (f) 0, 2, 6, 14, 30, 62, 126, 254
- (g)  $-3, 4, 25, 66, 133, 232, 369, 550$
- (h) 1, 1, 2, 3, 5, 8, 13
- (i)  $M, T, W, T, F$
- (j)  $M, V, E, M, J$
- (k)  $D, N, O, S, A, J$
- (l)  $B, E, H, K, N$
- (m)  $st, nd, rd$

$th, th, th$
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2. Generate the first four terms of the following sequences. Remember that the term number  $n$  always starts at 1 and increases by one each time;  $n = 1, 2, 3, 4, 5 \dots$

- (a)  $T = 3n + 1.$
- (b)  $T = 2 - n.$
- (c)  $T = -3n - 2.$
- (d)  $T = \frac{n+1}{2}.$
- (e)  $T = \frac{2n+1}{n+1}.$
- (f)  $T = n^2 + 1.$
- (g)  $T = 1 - n + n^2.$
- (h)  $T = n^3 + n^2.$
- (i)  $T = 2^n + 1.$
- (j)  $T = \left(\frac{1}{2}\right)^n.$
- (k)  $T = 2^n - n^2.$
- (l)  $T = n(n - 1)(n - 2).$
- (m)  $T = n^n.$

3. Find a formula (like those in question 2) for the following arithmetic sequences.

- (a) 3, 7, 11, 15, 19
- (b)  $-3, -13, -23, -33, -43$
- (c) 0.1, 0.4, 0.7, 1, 1.3
- (d) 23, 19, 15, 11, 7

4. Find the 100th term of the following sequences by finding an expression for the  $n$ th term.

- (a) 7, 10, 13, 16, 19,  $\dots$

- (b)  $6, 4, 2, 0, -2, \dots$   
(c)  $2.7, 2.9, 3.1, 3.3, 3.5, \dots$   
(d)  $-10, -14, -18, -22, -26, \dots$
5. The number 289 is a term in the sequence  $9, 16, 23, 30, \dots$ . Which term is it?
6. Do the sequences given by  $2n + 5$  and  $8n + 6$  ever have a common term?
7. Find the  $n$ th term of the following two sequences:
- (a)  $2, 3, 4, 5, 6, \dots$   
(b)  $3, 5, 7, 9, 11, \dots$
- Using your answers to (a) and (b) find an expression for the  $n$ th term of  $\frac{2}{3}, \frac{3}{5}, \frac{4}{7}, \frac{5}{9}, \frac{6}{11}, \dots$ .
8. Using a similar argument to the one above, find an expression for the  $n$ th term of  $\frac{3}{1}, \frac{5}{4}, \frac{7}{9}, \frac{9}{16}, \frac{11}{25}, \dots$ .
9. Generate the first 5 terms of the following *inductively* defined sequences:
- (a)  $a_1 = 7$  and  $a_{n+1} = a_n + 3$ .  
(b)  $a_1 = 1$  and  $a_{n+1} = 2a_n$ .  
(c)  $a_1 = -3$  and  $a_{n+1} = 4 - 2a_n$ .  
(d)  $a_1 = 1$  and  $a_{n+1} = \frac{1}{1+a_n}$ .  
(e)  $a_1 = 1, a_2 = 4$  and  $a_{n+2} = 3a_{n+1} - 2a_n$ .  
(f)  $a_1 = 100$  and  $a_{n+1} = -a_n$ .