An intro to Sequences

What is a sequence?

- ***A pattern that a set of numbers follows (determined by a set formula)***

Notation: t_n = *the* n^{th} *term of the sequence.*

1) Given $t_n = 3n^2 - 5n$, find

a) t_7

$n = 7$ $t_7 = 3(7)^2 - 5(7)$

$= 112$

b) t_{12}

$n = 12$ $t_{12} = 3(12)^2 - 5(12)$

$= 372$

Some sequence follow +/- by a set common value and start from a first term called a (these are called arithmetic sequences)

2) Given $t_n = 8n - 11$

a) sub in 1 to find a

$t_1 = 8(1) - 11$ $t_1 = -3$

b) sub in 2 to find t_2

$t_2 = 8(2) - 11$ $t_2 = 5$

so, $d = 8$

c) find t_{52}

$t_{52} = 8(52) - 11$ $t_{52} = 40$

---

3) Given $t_n = 18 - 7.2n$

a) sub in 1 to find a

$t_1 = 18 - 7.2(1)$ $t_1 = 10.8$

b) sub in 2 to find t_2

$t_2 = 18 - 7.2(2)$ $t_2 = 3.6$

so, $d = 7.2$

c) find t_{33}

$t_{33} = 18 - 7.2(33)$ $t_{33} = -219.6$

Some sequence follow x/÷ by a set common ratio and start from a first term called a (these are called geometric sequences)

4) Given $t_n = 15(\tfrac{1}{2})^n$

a) sub in 1 to find a

$t_1 = 15(\tfrac{1}{2})^1$ $t_1 = 7.5$

b) sub in 2 to find t_2

$t_2 = 15(\tfrac{1}{2})^2$ $t_2 = 3.75$

so, $r = \tfrac{1}{2}$

c) find t_7

$t_7 = 15(\tfrac{1}{2})^7$ $t_7 = 0.1171875$

---

5) Given $t_n = 60(-2)^{n-2}$

a) sub in 1 to find a

$t_1 = 60(-2)^{1-2}$ $t_1 = -30$

b) sub in 2 to find t_2

$t_2 = 60(-2)^{2-2}$ $t_2 = 60$

so, $r = -2$

c) find t_9

$t_9 = 60(-2)^{9-2}$ $t_9 = -7680$

Some sequences use previous terms to generate the next term
(this is called a recursive sequence)

6) Given $t_n = 8t_{n-1} - 3$ and $t_1 = 4$
Find t_2, t_3, t_4

To find t_2, n= 2 → $t_2 = 8t_{2-1} - 3$ or $t_2 = 8t_1 - 3$ but $t_1 = 4$
$t_2 = 8(4) - 3$ $t_2 = 29$

To find t_3, n= 3 → $t_3 = 8t_{3-1} - 3$ or $t_3 = 8t_2 - 3$ but $t_2 = 29$
$t_3 = 8(29) - 3$ $t_3 = 229$

To find t_4, n= 4 → $t_4 = 8t_{4-1} - 3$ or $t_4 = 8t_3 - 3$ but $t_3 = 229$
$t_4 = 8(229) - 3$ $t_4 = 1829$

The Fibonacci Sequence $t_n = t_{n-1} + t_{n-2}$ $t_1 = t_2 = 1$
Find t_3, t_4, t_5

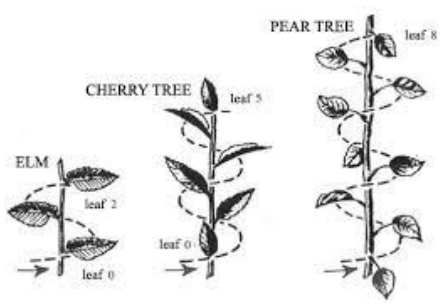
To find t_3, n= 3 → $t_3 = t_{3-1} + t_{3-2}$ or $t_3 = t_2 + t_1$ but $t_1 = t_2 = 1$
$t_3 = 1 + 1$ $t_3 = 2$

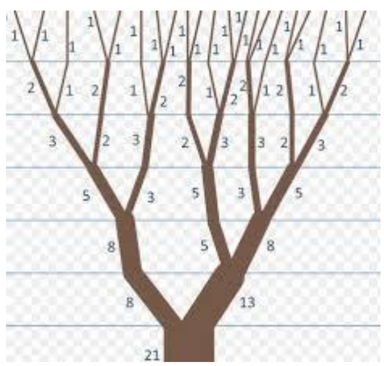
To find t_4, n= 4 → $t_4 = t_{4-1} + t_{4-2}$ or $t_4 = t_3 + t_2$ but $t_2 = 1, t_3 = 2$
$t_4 = 2 + 1$ $t_4 = 3$

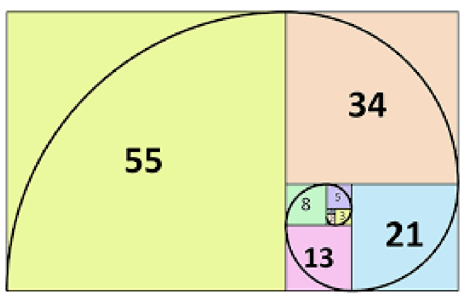
To find t_5, n= 5 → $t_5 = t_{5-1} + t_{5-2}$ or $t_5 = t_4 + t_3$ but $t_2 = 2, t_4 = 3$
$t_5 = 3 + 2$ $t_5 = 5$

To continue the pattern: 1, ,1, 2, 3, 5, 8, 13, 21, …

These numbers model tree growth







And create the golden spiral

Assignment = worksheet

Math 10 Sequences (Day 1 Worksheet)

1) Use the provided formula to state the first 4 terms of sequence

a) $t_n = 4n - 3$

t_1 =

t_2 =

t_3 =

t_4 =

b) $t_n = 5n + 2$

t_1 =

t_2 =

t_3 =

t_4 =

c) $t_n = n^2 - 1$

t_1 =

t_2 =

t_3 =

t_4 =

d) $t_n = 5 - 9n$

t_1 =

t_2 =

t_3 =

t_4 =

e) $t_n = 2^n + 1$

t_1 =

t_2 =

t_3 =

t_4 =

f) $t_n = \frac{n-4}{n+3}$

t_1 =

t_2 =

t_3 =

t_4 =

2) Looking back at the questions you just answered – which sequences would be Arithmetic?

(Circle your choices) A B C D E F

3) Fill in the blanks and find the indicated terms of the arithmetic sequences below

a) If $t_n = 7n + 3$ a = ______ d= _______ t_{18} = _______ t_{101} = ________

b) If $t_n = 5 - 9n$ a = ______ d= _______ t_{58} = _______ t_{307} = ________

c) If $t_n = 6.4n - 18$ a = ______ d= _______ t_{33} = _______ t_{750} = ________

d) $t_n = 15 - 3n$ a = ______ d= _______ t_{99} = _______ t_{200} = ________

4) The following are called geometric sequences because the have a common multiplier 'r' and a first term 'a'

Fill in the blanks and find the indicated term of the geometric sequences below

a) If $t_n = 5(2)^{n-1}$ Sub in 1 to get t_1 = ______ Sub in 2 to get t_2 = ________

thus a = ______ r = _______ Find t_{10} = ______ t_{15} = _______

b) If $t_n = -40(0.5)^{n-1}$ Sub in 1 to get t_1 = ______ Sub in 2 to get t_2 = ________

thus a = ______ r = _______ Find t_8 = ______ t_{10} = _______

c) If $t_n = 256(0.25)^{n-1}$ Sub in 1 to get t_1 = ______ Sub in 2 to get t_2 = ________

thus a = ______ r = _______ Find t_8 = ______ t_{10} = _______

d) If $t_n = \frac{1}{2}(4)^{n-1}$ Sub in 1 to get t_1 = ______ Sub in 2 to get t_2 = ________

thus a = ______ r = _______ Find t_8 = ______ t_{12} = _______

5) Find the first 4 terms defined by the recursive sequence

a) $t_n = t_{n-1} + 6$ $t_1 = 10$ t_2 = ______ t_3 = ______ t_4 = ______

b) $t_n = 3t_{n-1} - 2$ $t_1 = 8$ t_2 = ______ t_3 = ______ t_4 = ______

c) $t_n = t_{n-1} + t_{n-2}$ $t_1 = 1$ $t_2 = 1$ t_3 = ______ t_4 = ______ t_5 = ______