HW tally

WARM UP

Pick it up.
Do both sides.

and pick up New Recording Sheet.

---

Handout

Arithmetic Sequences

$\boxed{1}$

A

$7 + \cancel{10}^{n-1}$

-3, 7, 17, 27, 37, ...

0 1 4

**zero term format** $t(n) = -3 + 10n$

**first term format** $t(n) = 7 + 10(n-1)$

$t(50) = -3 + 10(50) = 497$

$t(50) = 7 + 10(50-1) =$

B

$d$ 95 (0) 90 (1), 85, 80, 75 (21), .....

$$t(n) = 90 - 5(n-1)$$ ← first

or $$t(n) = 95 - 5n$$ ← 0 term

$$t(26) = 95 - 5(26) = -35$$

C

| $n$ | $t(n)$ | |
|---|---|---|
| 1 | 5.75 | |
| 2 | 6.00 | +.25 |
| 3 | 6.25 | +.25 |
| 4 | 6.50 | +.25 |
| 5 | 6.75 | |

$0^{\text{term}}$ $t_n = 5.50 + .25n$

$1^{st}$ term $t_n = 5.75 + .25(n-1)$

## 2 Consider the sequence $t(n) = -4, -1, 2, 5, \ldots\ldots 42$

$-7$

A. Write the equation for the sequence, *t(n)*.

$\underline{1}^{st}$ term $t(n) = -7 + 3n$

$t(n) = -4 + 3(n-1)$

B. Is it possible for *t(n)* to equal 42 ?

$42 = -7 + 3n \qquad 49 = 3n \qquad n = \frac{49}{3} \approx 16.33$

$\therefore$ 42 is not term of the sequence

C. For the function *f(x) = 3x -7*, is it possible for f(x) to equal 42 ?

$t(n) = -4, -1, 2, 5, \ldots\ldots$

Is it possible for $t(n) = 42$

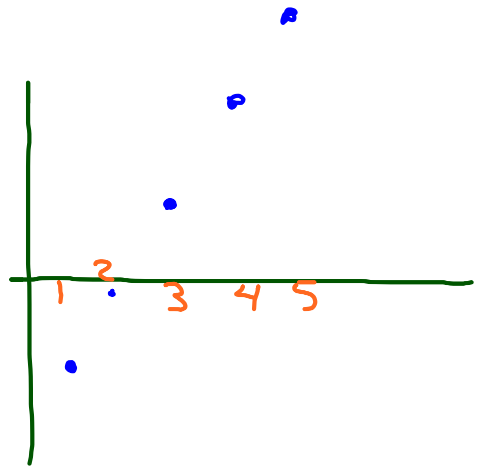
$$t(n) = 3n - 7$$

$$42 = 3n - 7$$

$$+7 \qquad\qquad +7$$

$$49 = 3n$$

$$n = \frac{49}{3} \approx 16.\overline{3}$$




c) Is it possible for $t(n) = 42$

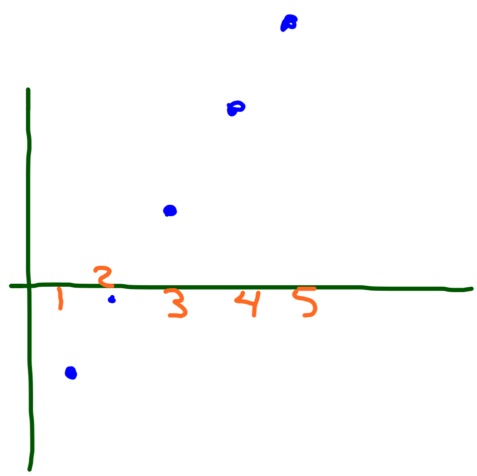
$$t(n) = 3n - 7$$

$$42 = 3n - 7$$

$$+7 \qquad\qquad +7$$

$$49 = 3n$$

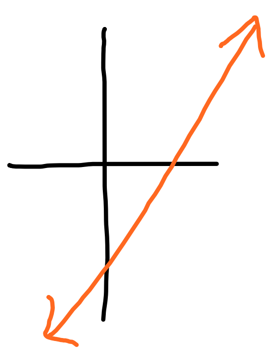
$$n = \frac{49}{3} \approx 16.\overline{3}$$




So, NO, the domain of a sequence onlyincludes positive nubmers.

# On the other hand....

(c) Is it possible for the function $f(x) = 42$ ?



Yes, because the domain of $f(x) = 3n - 7$ is all real numbers

so $\frac{49}{3}$ can be an answer

3 **Complete the table for the geometric sequence. Then, write sequence formulas in both first term and zero term formats.**

| | |
|---|---|
| 0 | $\frac{1}{7}$ |
| 1 | 1 |
| 2 | 7 |
| 3 | 49 |
| 4 | 343 |
| 5 | 2401 |
| 6 | 16807 |
| 7 | 117,649 |

$\left.\begin{matrix}49\\343\\2401\\16807\end{matrix}\right\} b\ b\ b$

$49 \cdot b \cdot b \cdot b = 16807$

$49b^3 = 16807$

$b^3 = 343$

$\sqrt[3]{\ }\quad \sqrt[3]{\ }$

$b = 7$

$f(n) = 1(7)^{n-1}$

4 **Benjamin is stuck on the problem shown below. Examine his work so far and help him by showing and explaining the remaining steps.**

Original problem: Simplify $(3a^{-2}b)^3$.

He knows that $(3a^{-2}b)^3 = (3a^{-2}b)(3a^{-2}b)(3a^{-2}b)$. Now what?

Original problem: Simplify $(3a^{-2}b)^3$.

He knows that $(3a^{-2}b)^3 = (3a^{-2}b)(3a^{-2}b)(3a^{-2}b)$. Now what?

$3 \cdot a^{-2} \cdot b \bullet 3 \cdot a^{-2} \cdot b \bullet 3 \cdot a^{-2} \cdot b$

Pull out your HW

check your answers
with the solutions

pens

## After Test Assignment

Name ____________ Date _____

*this will count as the first assignment for the next Unit.*

1. Find the missing terms of the sequence and write a sequence formula in both *zero term* and *first term* format.

a) ____, ____, 125, ____, ____, .... (hint: the multiplier is 1.25)

first term format: $t_n =$ __________ zero term format: $t_n =$ __________

b) 4000, 1000, 250, ____, ____, ....

first term format: $t_n =$ __________ zero term format: $t_n =$ __________

## After Test Assignment

Name Key Date _____

*this will count as the first assignment for the next Unit.*

1. Find the missing terms of the sequence and write a sequence formula in both *zero term* and *first term* format.

a) 80, 100, 125, 156.25, 195.3125, .... (hint: the multiplier is 1.25)

first term format: $t_n = 80(1.25)^{n-1}$ zero term format: $t_n = 64(1.25)^n$

b) 4000, 1000, 250, 62.5, 15.625, ....

$\frac{1000}{4000} = \frac{1}{4}$ $\frac{250}{1000} = \frac{1}{4}$

first term format: $t_n = 4000\left(\frac{1}{4}\right)^{n-1}$ zero term format: $t_n = 16{,}000\left(\frac{1}{4}\right)^n$

or $4000(0.25)^{n-1}$

(2) Several customers at a fancy restaurant were reporting food poisening. A biologist named Tina was recording bacteria growth on the cooking surfaces. She is trying to predict the amount of bacteria after 20 hours. Unfortunately she lost the count after the first hour and forgot to record count at six hours.

a) Determine the missing counts.

b) Write a sequence formula, using the notation, "$t_n =$" that models the growth after $n$ hours.

c) Use your formula to calculate the predicted bacteria counts after 20 hours.

| hours | # bacteria |
|---|---|
| 1 | |
| 2 | 10 |
| 3 | 25 |
| 4 | 62.5 |
| 5 | 156.25 |
| 6 | |

(2) Several customers at a fancy restaurant were reporting food poisening. A biologist named Tina wa recording bacteria growth on the cooking surfaces. She is trying to predict the amount of bacteria hours. Unfortunately she lost the count after the first hour and forgot to record count at six hours.

a) Determine the missing counts.

b) Write a sequence formula, using the notation, "$t_n =$" that models the growth after $n$ hours.

$$t_n = 4(2.5)^{n-1}$$

c) Use your formula to calculate the predicted bacteria counts after 20 hours.

$$t_{20} = 4(2.5)^{20-1} = 145{,}519{,}152$$

| hours | # bacteria |
|---|---|
| 1 | 4 |
| 2 | 10 |
| 3 | 25 |
| 4 | 62.5 |
| 5 | 156.25 |
| 6 | 390.625 |

(3) Challenge:
Determine a formula for the geometric sequence:

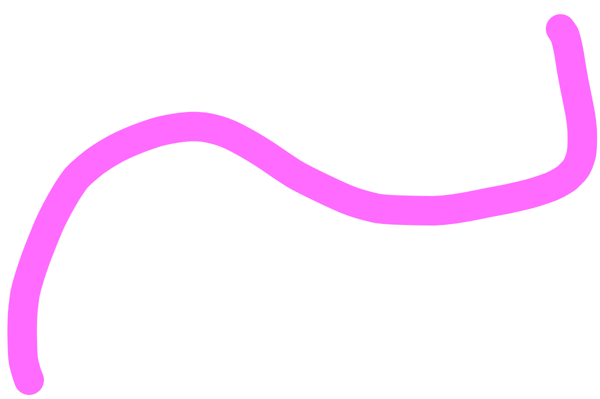
| $n$ | $t_n$ |
|---|---|
| 1 | |
| 2 | 68 |
| 3 | |
| 4 | ~~768.08~~ 786.08 |
| 5 | |

$$68 \cdot r \cdot r = 786.08$$

$$68r^2 = 786.08$$

$$r^2 =$$

$$r = 3.4$$



GDC tidbit

battery usage

**Four Day Unit**

Transfer Skill Review from Alg/Geom

before starting Chapter 2

# Today's AIM:

- Percent Growth
  (as related to sequences and exponential functions)
  requires geometric thinking

- Exponential "Boot Camp"

example A

**Force the following sequence to grow by 15 %**

has a multiplier

$\underset{1}{\underline{\ 120\ }}$, $\underset{2}{\underline{\quad\quad}}$, $\underset{3}{\underline{\quad\quad}}$, . . . . . . .

120, ___, ___, ___, ......

How can we increase any number by 15% ?

We multiply by a <u>growth factor</u>

Start with 100%  $100\% + 15\%$

Add  $115\%$

convert to a decimal  $1.15$

$\underline{120}, \underline{138}, \underline{\quad}, \underline{\quad}, \underline{\quad}$

$120 \times 1.15 = 138$

$\underset{1}{\underline{120}}, \underset{2}{\underline{138}}, \underset{3}{\underline{158.7}}, \underset{4}{\underline{182.505}}, \ldots$

$t_n = 120(1.15)^{n-1}$

example (B)

10,000 zero term

3% decrease

$100\% - 3\%$

$97\%$

$.97$

$\underset{0}{10{,}000}, \underline{9700}, \underline{9409}, \underline{9126.73}$

$t(n) = 10000(.97)^n$

example (C)

Start with 1000 ← Zero term
at 6.5% growth

Write a formula.

$t_n = 1000(1.065)^n$

$t_n = 1065(1.065)^{n-1}$

How many weeks would it take to reach 80,000

$80\,000 = 100$

$t(n) = 1000(1.065)^n$

$80\,000$

$\frac{80\,000}{1000} = \frac{1000}{1000}(1.065)^n$

$80 = 1.065^n$

$Y_1$ $Y_2$

example D

GDC

option I 100, 11% growth

option II 2000, 4% growth

How many weeks before option I overtakes option II

B.B.

Notes

what if exponents are negative ????

What if there were negative exponents ?

$$\left(\frac{3}{5}\right)^{-1} = \left(\frac{5}{3}\right)^{1} = \frac{5}{3}$$

$$5^{-1} = \left(\frac{5}{1}\right)^{-1} = \frac{1}{5}$$

$$\left(\frac{a}{de}\right)^{-1} = \left(\frac{de}{a}\right)^{1} = \frac{de}{a}$$

$$\left(\frac{1}{x}\right)^{-1} = x$$

$\left(\frac{1}{4}\right)^{-2} = \left(\frac{4}{1}\right)^{2} = \frac{16}{1} = 16$

$\left(\frac{x}{y}\right)^{-3} = \left(\frac{y}{x}\right)^{3} = \boxed{\frac{y^3}{x^3}}$

$\left(\frac{3x}{y}\right)^{-2} = \left(\frac{y}{3x}\right)^{2} = \boxed{\frac{y^2}{9x^2}}$

$\frac{1}{3^{-1}} = \frac{1}{3^{-1}}$ $3^1 = 3$

$\frac{1}{x^{-2}} = \frac{x^2}{1} = \boxed{x^2}$

$\frac{3}{e^{-2}} = \boxed{3e^2}$

$a^4 b^{-2} \cdot a^3 \cdot b^4 = \boxed{a^7 b^2}$

$x^4 y^{-2} \cdot x^{-5} y^2 = x^{-1} \cancel{y^0} = \boxed{\frac{1}{x}}$

$\frac{n^8}{n^{-2}} = \frac{n^8 n^2}{1} = \boxed{n^{10}}$

$\frac{5x^{-3}}{x^6} = \frac{5}{x^6 x^3} = \boxed{\frac{5}{x^9}}$

Each pair should pick up
and work on one handout.

**Assignment:**

**is in Appendix A in the back Appendix**

**A.....10, 23, 88, 91, 92, 116, 119, 120**

+ EBC