Intro to Financial Math Unit

- Linear vs. Exponential Change
- Personal Spending Plan (Budget)

Linear vs. Exponential Change

Recall : Absolute vs. Relative Change

Examples in daily life :

Repeat again & again :

- constant absolute rate → ______ change
- constant relative rate → ___________ change

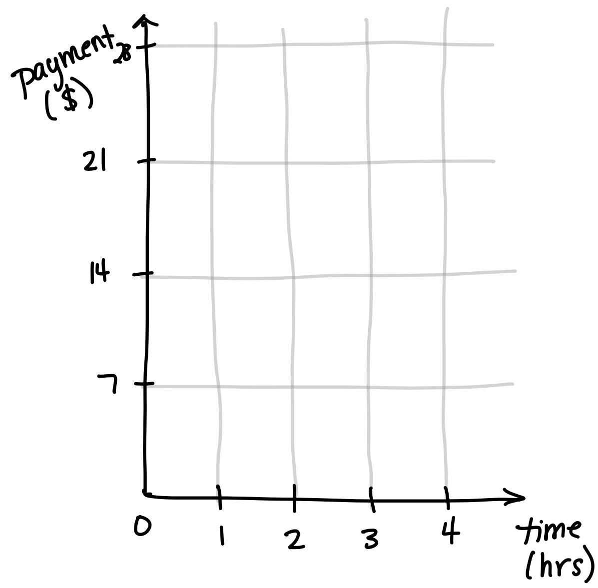
Example : Worker gets paid \$7/hour (_____)

Table :

# hours	amt. paid
0	\$ 0
1	$\boxed{\$\ 7}$
2	$\boxed{\$\ 14}$
3	$\boxed{\$\ 21}$
4	$\boxed{\$\ 28}$
⋮	⋮

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

Graph :

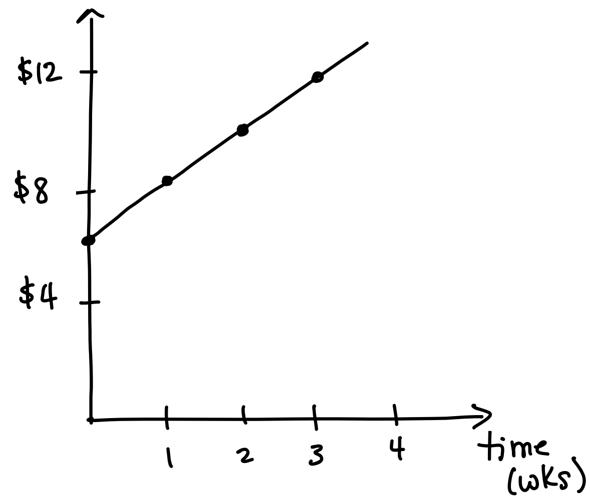


Formula : Payment for x hours is ____.

Ex Piggy bank has \$6.27. Put in \$2 a week for 6 weeks.

Amt. in bank after x weeks:

x weeks	Amt.
0	\$6.27
1	\$8.27
2	\$10.27
3	\$12.27
⋮	⋮



$\begin{pmatrix}\text{Amt. after} \\ x \text{ weeks}\end{pmatrix} = \boxed{}$

In general, linear change:

(Final Amt.) = (Initial Amt.) + (Const. Abs. Rate) × x

$\boxed{}$ $\boxed{}$

Example: Constant relative rate is exponential change

Savings account \$3000, 1% interest compounded annually.

After one year, initial amt + 1% interest:

$\$3000 + \boxed{} = \$3000 \times (\boxed{}) = \$3000 \times \boxed{} = \boxed{}$

After two years:

$\$3030 + \$3030 \times (.01) = \$3030(\boxed{}) = \$3030 \times \boxed{} = \boxed{}$

Notice pattern:

initial amt. + 1% interest $= \boxed{}$

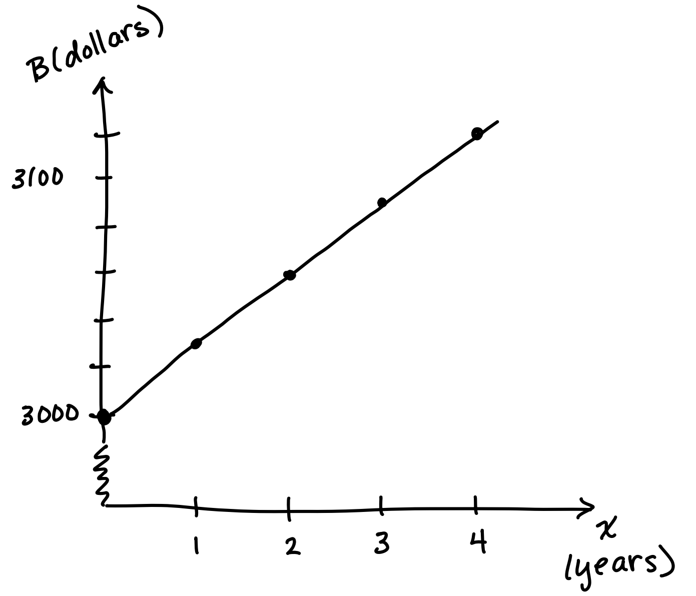
# years	balance
0	$ 3000
1	
2	
3	
4	

$\times 1.01$

$\times 1.01$

$\times 1.01$

$\times 1.01$



After x years, balance is $(\$3000) \times (1.01)^x$

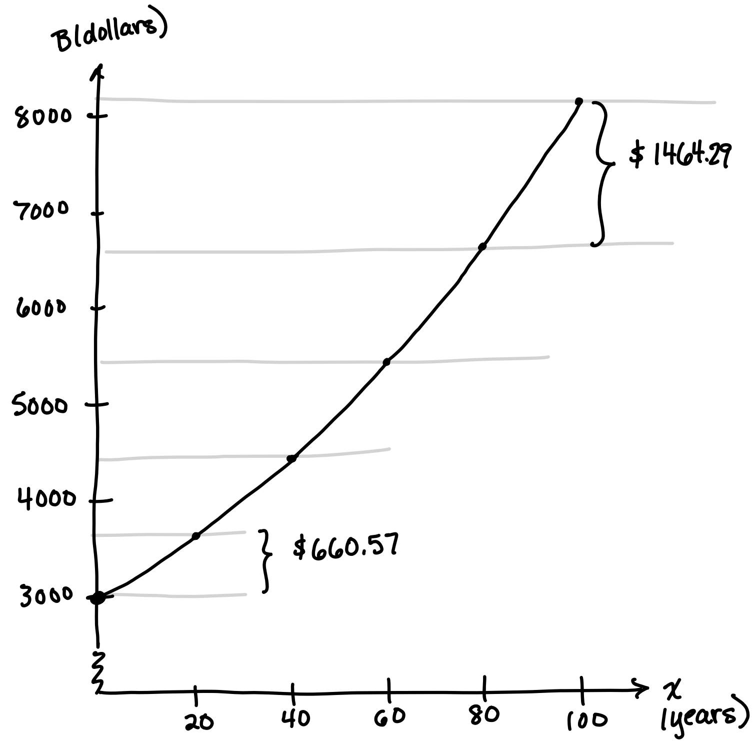
initial amount

growth factor: ______

growth rate: ______

In the short term, growth may look linear, but...

# years	balance
0	$ 3000
20	$ 3660.57
40	$ 4466.59
60	$ 5450.09
80	$ 6,650.15
100	$ 8,114.44



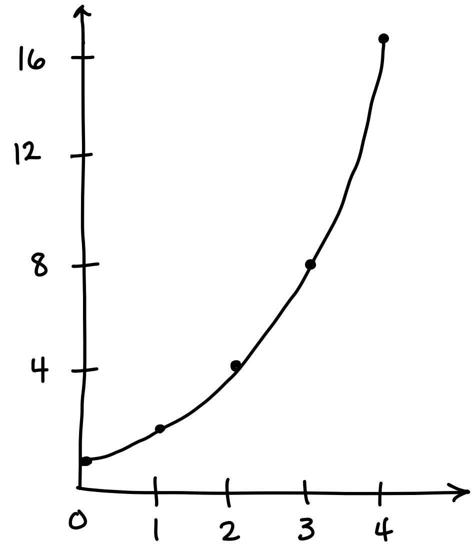
Relative growth rate per 20 years is:

$$\frac{3660.57 - 3000}{3000} = \_\_\_\_, \quad \cdots, \quad \frac{8114.44 - 6650.15}{6650.15} = \_\_\_\_$$

↳ ______ growth rate per 20 year time period

Example: Croissant Layers

# folds	# layers	
0	1	
		×2
1	2	
		×2
2	4	
		×2
3	8	
		×2
4	16	
⋮	⋮	



After x folds, $\boxed{}$ layers.

Constant factor of growth: ____

Constant relative change:

From 1 to 2: $\frac{2-1}{1} = \frac{1}{1} = \boxed{}$

From 2 to 4: $\frac{4-2}{2} = \frac{2}{2} = \boxed{}$

From 4 to 8: $\frac{8-4}{4} = \frac{4}{4} = \boxed{}$

From 8 to 16: $\frac{16-8}{8} = \frac{8}{8} = \boxed{}$

↳ Constant relative rate of change: ____

In general, exponential change:

(Final Amt.)

$= (\text{Initial Amount}) \times (\text{Factor of Change})^x$ $\boxed{}$

what you ______ by, again & again

factor > 1, ______

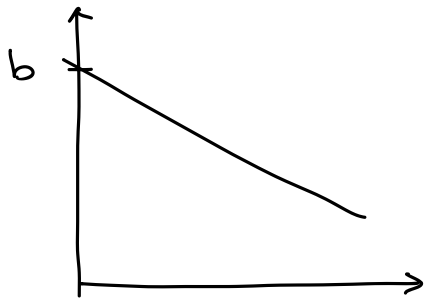
factor < 1, ______

$= (\text{Initial Amt.}) \times (1 + \text{Rel. Rate of Change})^x$

rate > 0, ______

rate < 0, ______

Linear Decrease:



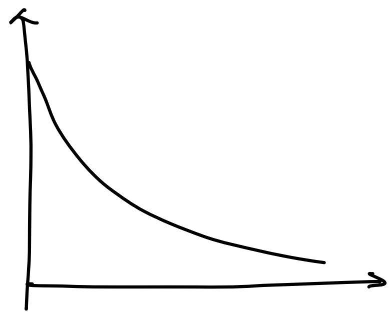
decr. by consistent

______, ex. lose $5 for

each person who doesn't pay

↳ absolute rate of change:

Exponential Decrease:



decr. by consistent ____

or ______, ex. lose 10%

of my agility every decade

↳ factor of change:

& rel. rate of change:

Brainstorm: Linear & Exp. Growth in Daily Life

Personal Spending Plan (Budget)

Prep for Friday's class

- Download Excel to personal computer (& bring to class)
- List of sources of income
  - categories
  - income per year from each category
- List of expenditures
  - categories
  - expenses per year
    - estimate per week & multiply by 52
    - or est. per month & multiply by 12

More details on Canvas

- Note: May use fictionalized numbers if you prefer.