

CLO: SWBAT write and evaluate exponential expressions to model growth and decay situations.

WARM - UP:

***You will need to get a calculator out!**

Let's Imagine

Think about what your dream job would be- working for any person or company, any profession

Payroll Options

You must decide what payment option you would like before beginning your dream job:

Option 1: You receive \$35,000 a day for the next 30 days

Option 2: You make \$0.01 on the first day, and then your salary will double every day for the next 30 days (You receive \$0.01 on the first day, \$0.02 on the 2nd day, \$0.04 on the third, etc.)

Circle the option that you would choose and explain why.

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Getting Paid

Why did you choose Option 1?


Why did you choose Option 2?

Let's see who would get paid more by the end of the 30 days.

Option 1

30 days x \$35,000 a day = \$1,050,000

CONGRATULATIONS, you are a MILLIONAIRE!!!



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Option 2

Paycheck for Week 1		
Day	Pay for the Day	Total Pay
1	\$0.01	\$0.01
2	\$0.02	\$0.03
3	\$0.04	\$0.07
4	\$0.08	\$0.15
5	\$0.16	\$0.31
6	\$0.32	\$0.63
7	\$0.64	\$1.27

This means for 7 days worth of work you earned \$1.27.

If you worked 40 hours in week 1, a typical number of hours for a work week, how much money have you made per hour? .032

Do you want to keep this payroll option?

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Week 2

Paycheck for Week 2		
Day	Pay for the Day	Total Pay
8	\$1.28	\$2.55
9	\$2.56	\$5.11
10	\$5.12	\$10.23
11	\$10.24	\$20.47
12	\$20.48	\$40.95
13	\$40.96	\$81.91
14	\$81.92	\$163.83

Although this is more money than the previous week, this is still a small amount of money for working 7 days.

Anyone want to change to Option 1?!?

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Let's Keep Going

Paycheck for Week 3		
Day	Pay for the Day	Total Pay
15	\$163.84	\$327.67
16	\$327.68	\$655.35
17	\$655.36	\$1,310.71
18	\$1,310.72	\$2,621.43
19	\$2,621.44	\$5,242.87
20	\$5,242.88	\$10,485.75
21	\$10,485.76	\$20,971.51

What patterns/trends do you notice with this payment plan?

What do you predict will happen by day 30?

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Week 4

Paycheck for Week 4		
Day	Pay for the Day	Total Pay
22	\$20,971.52	\$41,943.03
23	\$41,943.04	\$83,886.07
24	\$83,886.08	\$167,772.15
25	\$167,772.16	\$335,544.31
26	\$335,544.32	\$671,088.63
27	\$671,088.64	\$1,342,177.27
28	\$1,342,177.28	\$2,684,354.55

After 30 days, those that chose payment Option 1 will only have \$1,050,000.

After 4 weeks we are up to \$2,684,354.55 for payment Option 2 and we still have two more days to get paid!

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Two More Days of Pay!!!

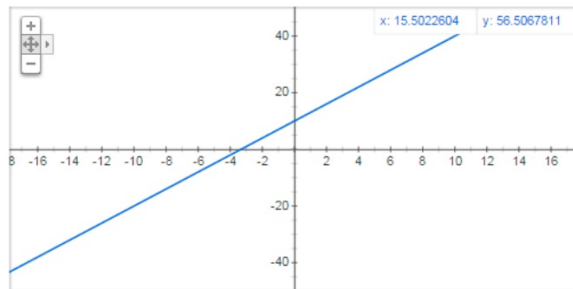
Paycheck for Week 5		
Day	Pay for the Day	Total Pay
29	\$2,684,354.56	\$5,368,709.11
30	\$5,368,709.12	\$10,737,418.23

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Linear Growth vs. Exponential Growth

Linear Growth: A constant rate of change over a given interval

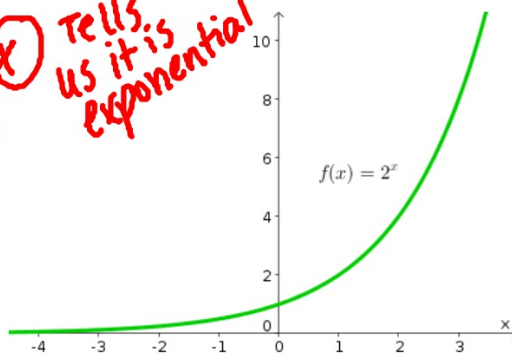
Example: $y = 3x + 10$



Exponential Growth: The rate of change increases at a constantly growing rate

Example:

$y = 2^x$ Tells us it is exponential



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Examples of real-life situations that involve **exponential growth** are:

savings accounts

interest rates on credit cards

bacterial growth

This is called **appreciation** (increasing in value)

Exponential Growth Formula:

NEW SOLUTION $\rightarrow y = A(1 + r)^x$ TIME

Percentages

↑

ORIGINAL START VALUE

↙

RATE (as a decimal)

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Example

The equation for the yearly growth of the rabbit population in a farmer's field is:

$$y = 5(2^x)$$

What do x , y , 5 and 2 represent in this equation?

x	Number of years
y	Number of bunnies
5	Initial amount of bunnies
2	Growth factor

How many rabbits will be in the farmer's field after 3 years?

$$y = 5(2^3) = 5 \times 2^3 = 40$$

$2 \cdot 2 \cdot 2$

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John deposits \$200 in a savings account . The account pays 5% annual interest. Assuming that he makes no more deposits and no withdrawals, calculate his new balance after 10 years.

$$y = A(1+r)^x$$

A = start value = 200
r = rate = 5% = $\frac{5}{100} = 0.05$
x = time = 10
y = total = ?

$$y = 200(1+0.05)^{10}$$
$$y = 200(1.05)^{10}$$
$$y = 200(1.63)$$
$$y = \$326$$

Determine the current balance of a savings account that was opened 7 years ago with \$200, earning 2.5% interest per year.

$$y = 200(1+0.025)^7$$
$$= 200(1.025)^7$$
$$= 200(1.19)$$
$$y = 238$$

Exit Slip

In 1981, the Australian humpback whale population was 350 and increased at a rate of 14% each year since then. Write a function to model population growth.