

Katherine Staltare Pattern, Patterns Everywhere Grade level: 9-12 Subject:: mathematics Time required: 30- 45 minutes

# Title: Patterns, Patterns Everywhere!

# Author: Katherine Staltare

# Title: Patterns, Patterns Everywhere

#### Activity overview:

Given you were offered a million dollars in salary for a 30 day period or be given a salary doubled each day, beginning with a penny on day one, how could we figure out a function that we could utilize for an instant salary output?

## **Concepts:**

Exponents & Patterns Exponential Growth

NYS Standards:

A.PS.5: Choose an effective approach to solve a problem from a variety of strategies including numeric, graphic and algebraic.

#### **Classroom management tips**

This lesson could be given as a group or individual activity. It should be presented as a discovery type of activity.



Step 1:

Let's look at a section of the spreadsheet from the "Shall I Double Up or Keep the Million activity.

Look very closely at the pay on days 1-5.

Do you notice any patterns in the pay column:

.01	
.02	

.04

.08

.16

ſ	1.1	RAD /	AUTO REAL 🛛 🗎
	Α ()	В <sub>рау</sub>	C <sub>total</sub>
٠			
1	1	.01	.01
2	2	.02	.03
3	3	.04	.07
4	4	.08	.15
5	5	.16	.31
A	7 1		

Let's look at days 6-10:

.32	
.64	
1.28	
2.56	
5.12	

•	1.1	RAD AUTO REAL			
	A ()	В <sub>рау</sub>		C <sub>total</sub>	
٠					
6	6		.32		.63
7	7		.64		1.27
8	8		1.28		2.55
9	9		2.56		5.11
10	10		5.12		10.23
Bž	10   5.	12			

## Patterns, Patterns Everywhere

Katherine Staltare Grade level: Secondary Subject: Mathematics Time required: 30-45 minutes



Did you notice the Powers of 2:

Pay for the Day in Pennies
$2^0 = 1$
$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^{5}=32$
$2^6 = 64$
$2^7 = 128$
$2^8 = 256$
$2^9 = 512$

Question: What is the relationship between the day number and the exponent? Answer: Obviously it is one less...so

If n = any particular day

Then  $2^{n-1}$  will give you the value of the pay scale on that day.

For example: Day  $16 = 2^{16-1} = $327.68$  or 32768 pennies

Lets look at another representation:

Does  $f(x) = 2^{n-1}$  look familiar? Is it in the form of an exponential growth function? Let's look at the graph to see if it is so.

The graphing steps are via screen shots.

Screen 1





Screen 2



Patterns, Patterns Everywhere

Katherine Staltare Grade level: Secondary Subject: Mathematics Time required: 30-45 minutes

#### SCREEN 3

**SCREEN 5** 

**x**€ day

13.29

2

•

1.1 1.2

-20

👁 🏼 s3

1: Tools	RAD AUTO REAL	Î
	¥ 4: Function 4: 2: Parametric 3: Scatter Plot 2	x 20
$\ll \mathbb{R} f_1(x) =$		*

RAD AUTO REAL

 $\gamma$ 

2

γ€

•



## **SCREEN 4**

#### SCREEN 6

Î	1.1 1.2	2	R	AD AUTO F	REAL
x		i	13 <b>.</b> 29 2	. <b>y</b>	
20	-20			2	
*	🕸 🎇 s7	X€	•	<i>Y</i> € pay	•

\_\_\_\_\_ 20

\$

# TEXAS INSTRUMENTS

Patterns, Patterns Everywhere

Katherine Staltare Grade level: Secondary Subject: Mathematics Time required: 30-45 minutes

SCREEN 7

1: Tools	RAD AUTO REAL
At: 3: Graph Type	- † <i>ν</i>
t⊼ 4: Window	🛂 1: Window Settings
/ <u>1, 5: Trace</u>	2: Zoom – Box
<ul> <li>6: Points &amp; Lines</li> <li>7: Measurement</li> </ul>	9 3: 200m - In 9 4: Zoom - Out
⊙ 8: Shapes	🕂 5: Zoom – Standard
→ 9: Construction	रूम् 6: Zoom – Quadrant । फ्रि. 7: Zoom – User
	🐳 8: Zoom – Trig
	19: Zoom – Data
$\gg \equiv f2(x)=$	×

SCREEN 8



And so it is.

This activity can be continued with a linear regression as well!