What's Going On?

Checking In

Minds on Linear, Quadratic or Neither?

Action! Reading Tables and Graphs

Consolidation I am exponential because...

Learning Goal - I will be able to identify and work with exponential models.

Minds on

Linear, Quadratic or Neither?

Time (years)	Value (\$)
0	1,000
1	2,000
2	3,000
3	4,000
4	5,000
5	6,000

+1000 If ist differences we constant

Minds on

Time (years)	Value (\$)
0	500
1	550
2	605
3	665
4	730
5	800

Minds on

Time (years)	Value (\$)
0	600
1	650
2	700
3	750
4	800
5	850

Time (years)	Value (\$)	not quadradic
0	640	320 - 160 - 6
1	960	5 460 = 24h / 546
2	1440	5 720 = 210 2 129 860
3	2160	F (040 E CUO Z 180
4	3240	1620 6 5 TU
5	4860 ∠	

Linear, Quadratic or Neither?

$$V = 600 + 50t$$

variable has

Minds on

Linear, Quadratic or Neither?

$$V = 2.5t^2 + 47.5t + 500$$

 $V = 2.5t^2 + 47.5t + 500$

$$V = 1000(t+1)$$

$$V = 1000(t+1)$$

$$V = 1000 + 1000$$

Minds on

Linear, Quadratic or Neither?

$$V = 640 * 1.5^{t}$$

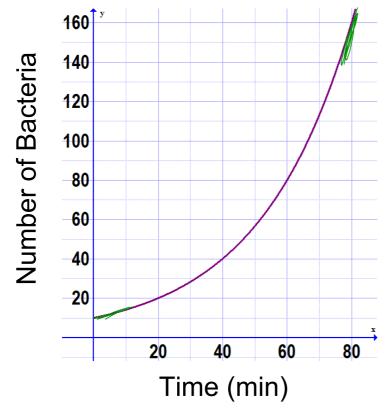
 $V = 640 * 1.5^{t}$

$$V = 2.5(t^2 + 19t + 200)$$

$$V = 640(1+0.5)^{t}$$

Action!

Reading Tables and Graphs

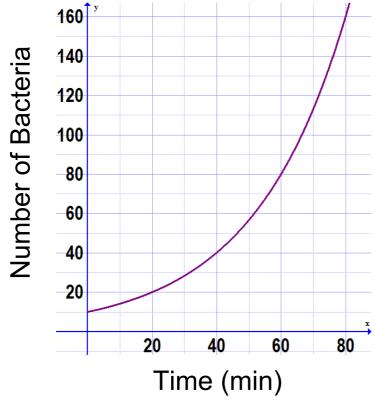


1. Describe the relationship between number of bacteria and time.

As time increases,
the number of
bacteria also
increases. The rate
of change is
increasing.

Action!

Reading Tables and Graphs



2. Does this relationship appear to be linear, quadratic or neither? Explain.

It appears to be quadratic because the rate of change is increasing over time. Obviously it can't be linear!

Action!

Reading Tables and Graphs

Time (min)	Number of Bacteria		
0		First Differences	Second Differences
20	20	70	
40	40	<u> </u>	20
60	80	40	90
80	160		

3. Complete the table of values and determine the first and second differences. Is this relationship linear, quadratic, or neither? Explain.

This relationship is not linear because the first differences are not constant. It is not quadratic because the second differences are not constant.

Action!

Reading Tables and Graphs

4. Use your table of values to determine the ratios of the number of bacteria present after 0, 20, 40, 60 and 80 minutes. (Divide number of bacteria present after 20 minutes by number present after 0 minutes. Divide number of bacteria present after 40 minutes by number present after 20 minutes, etc...).

What happens to the number of bacteria every 20 minutes?

doubles.

The growth 15 exponentia. number of bacteria

Action!

Reading Tables and Graphs

Years	Mass Remaining (μg)	First		
0	200	Differences	Second	Ratios
	200	-30	Differences	170 = 15
100	170		+5	200 -0.0
		-25		145 = 1.8F
200	145		+ 4	170
		- ' _	,	0,86
300	124	10	+'-	605
400	105	_ / 0	<u> </u>	0,67
400	103	_15	7 9	2,46
500	90		+	0700
		_ 4	, ,	10,44
600	76	, ,	+5	
		-	,	10,40 1
700	65	10	+	6/15
800	55		47	10.4
800	33	- 4		n 45
900	47	U	1 1	<i>U</i> , <i>v</i> ,
		-7	1	10.45
1000	40			
		not lineal		

1. Describe the relationship between the mass of Americium remaining and time.

As time increases, the mass of Americium decreases.

Action!

Reading Tables and Graphs

Years	Mass Remaining (μg)	First		
0~	200	Differences	Second	Ratios
		-30	Differences	170 = 15 E
100 🗸	170		+5	200 -00
		1-25	/	143 - 0.80
200 <	145	2	+ 4	170 0
	/			0,86
300	124	10	<u> </u>	605
400	105		1 + U	0,0)
100)	- 15	, , , , , , , , , , , , , , , , , , ,	0,46
500 <	90		+	
)	_ 4	1 20	0,44
600 <	76	, ,		6/1/0
700	65	_		0,40
700)	<u> </u>		045
800<	55	10	+2	
		- 4	1	0.45
900 <	47		+	0/16
1000	/	I - +		10.47
1000	40	not lineal	ı	

2. Verify that the values of the independent variable are equally spaced. Then, determine the first and second differences. Is the relationship linear, quadratic or neither? Explain.

The relationship is neither linear nor quadratic because the first and second differences are not constant.

Action!

Reading Tables and Graphs

Years	Mass Remaining (μg)	First		
0~	200	Differences	Second	Ratios
)		-30	Differences	170 -085
100 <	170		+5	
200	145	- 75	1 1 /	176-0.85
200 〜	145	-71	<i>+</i> 9	691
300	124		+7	0,00
)	_ 9		0.85
400 <	105	16	1 + Y	2/1/
F00	00			0,60
500 <	90	14	T	n.44
600 <	76		+5	0701
				0.46
700	65	110	+	6 / 6
200		-10	17	(),45
800 <	55	- 4		645
900 <	47	U	+	0,0
		-7	/	10.45
1000 /	40			
		not lineal		

3. Determine the ratios of the values of the dependent variable. Do the ratios imply an exponential relationship? Explain.

The ratios imply an exponential relationship because the ratios are nearly constant.

The mass remaining is decreasing at a rate of ______% every 100 years.

every 100 years.
$$|-0.45 = 0.15$$

$$|00 - 45 = |5$$

Consolidation

Exponential Models

The rate of change of an exponential model changes over time (either increases, or decreases).

- A curved line can be drawn through points on a graph
- Neither First nor Second differences are constant
- The **ratios** between values of the dependent variable are constant when values of the independent variable are equally spaced
 - There is a constant percent increase or decrease over equal intervals

Consolidation

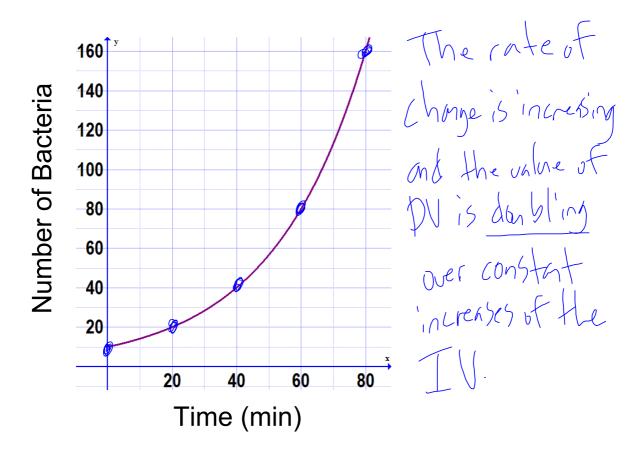
Exponential Models

An exponential model can be represented by an exponential relation in the form $y = a(b^x)$.

- y represents the dependent variable
- x represents the independent variable
- a is the initial value
- b is the rate of growth or decay
- the equation can be used to make predictions about future behaviour

Consolidation

I am exponential because...



Consolidation

I am exponential because...

Years	Mass Remaining (μg)
0	200
100	170
200	145
300	124
400	105
500	90
600	76
700	65
800	55
900	47
1000	40

Consolidation

I am exponential because...

 $V = 1000(1.05)^{t}$ V represents value of an investment t represents time passed in years