

Lesson 7: Graphs of Exponential Relations | Unit 4 – Exponential Relations

(A) Lesson Context

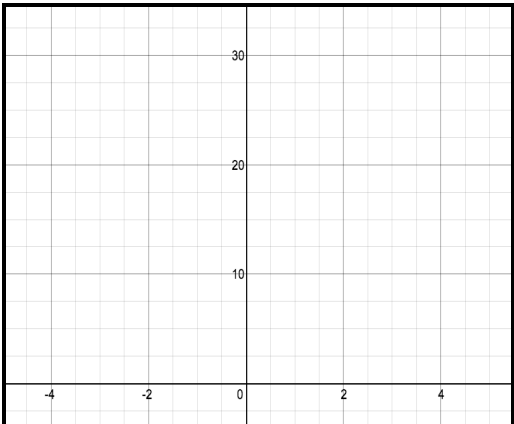
BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> How can I analyze growth or decay patterns in data sets & contextual problems? How can I algebraically & graphically summarize growth or decay patterns? How can I compare & contrast linear and exponential models for growth and decay problems. 		
CONTEXT of this LESSON:	Where we've been In Lessons 5 & 6, you looked at how exponential equations can be used to model real world scenarios	Where we are How do we interpret and analyze graphs of exponential equations that model growth & decay patterns	Where we are heading How can I use graphs & equations that will help me make predictions about scenarios which feature exponential growth & decay?

(A) Lesson Objectives:

- Understand the basic appearance and features of the graph of a simple exponential relation
- Make predictions/extrapolations through graphic analysis
- Understand the basic connection between the parameters in an equation and its appearance in a graph

(B) Graphs of Exponential Functions – REVIEW- The BASIC graph of $y = Ca^x + d$

- Use your TI-84 (or use DESMOS) to graph the equation $y = 2^x$. Then sketch the graph on the attached grid. Fill in the included data table as well.

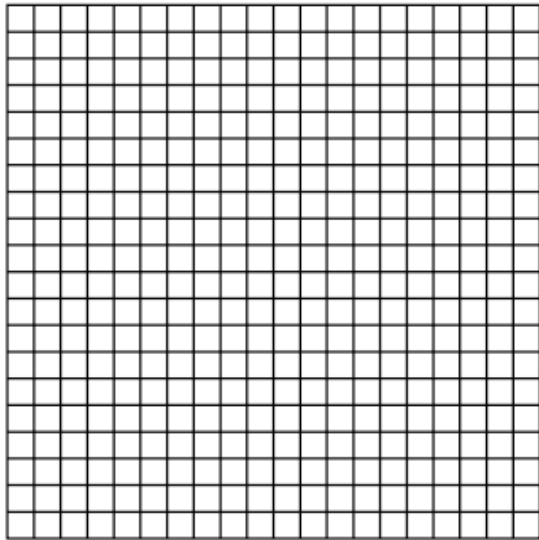
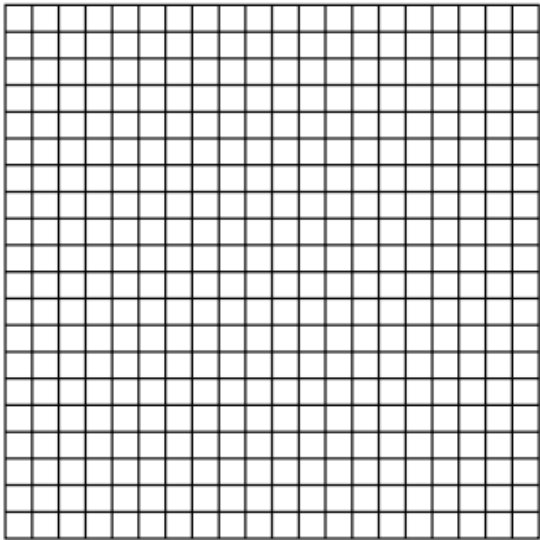
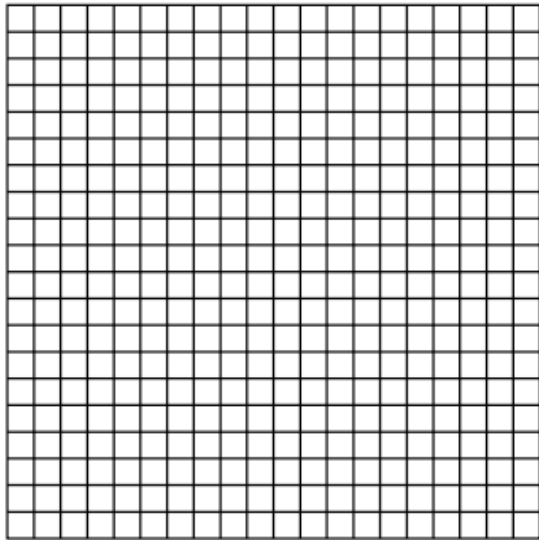
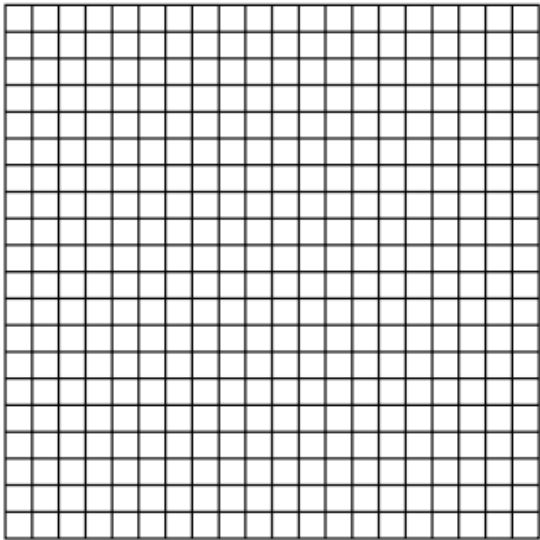
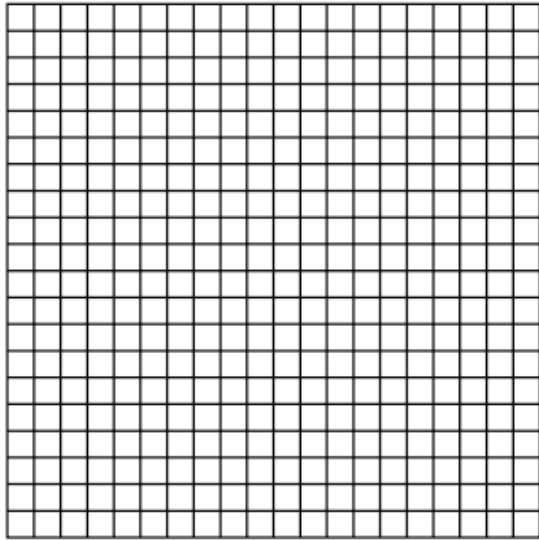
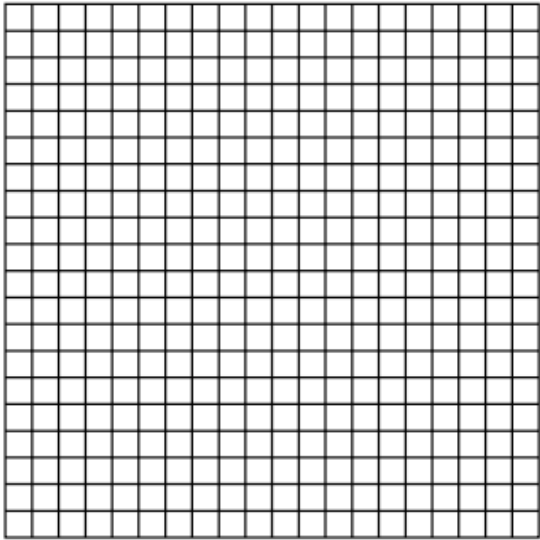
GRAPH: 	DATA TABLE: <table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr> <td>Y</td><td></td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width: 100%; text-align: center;"> <tr> <td>X</td><td>0</td><td>-1</td><td>-2</td><td>-3</td><td>-4</td></tr> <tr> <td>Y</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	X	0	1	2	3	4	Y						X	0	-1	-2	-3	-4	Y					
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Y																									
X	0	-1	-2	-3	-4																				
Y																									
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y-intercept →	asymptote →																								
Effect of Changing C → on graph:	on data table:																								
Effect of Changing d → on graph:	on data table:																								

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(C) Graphs of Exponential Functions - CONSOLIDATION of Skills – Changing the values of C & d in $y = Ca^x + d$

WITHOUT using your TI-84, graph the equation $y = 2^x$. Then on the same graph, graph the following equations in order to compare the appearance of the graphs & compare the data points.

<p>Equation to graph: $y = -(2)^x + 3$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3								<p>Equation to graph: $y = (2)^{-x} - 2$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3							
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<p>Equation to graph: $y = 4(2)^x + 5$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3								<p>Equation to graph: $y = -1 + \frac{1}{3}(2)^x$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3							
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<p>Equation to graph: $y = -2(2)^x + 6$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3								<p>Equation to graph: $y = \frac{1}{2}(2)^{-x} - 4$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3							
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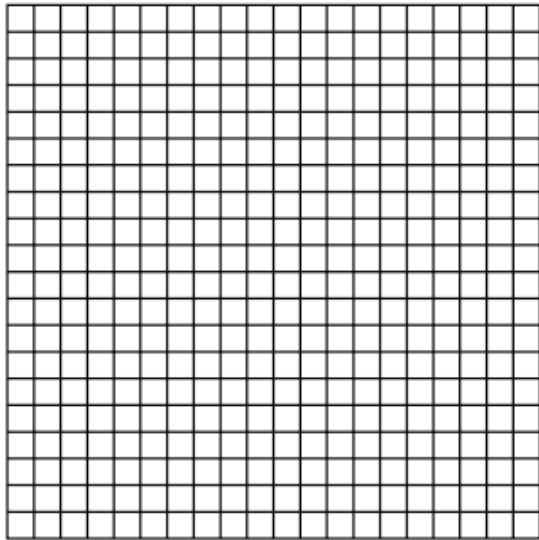
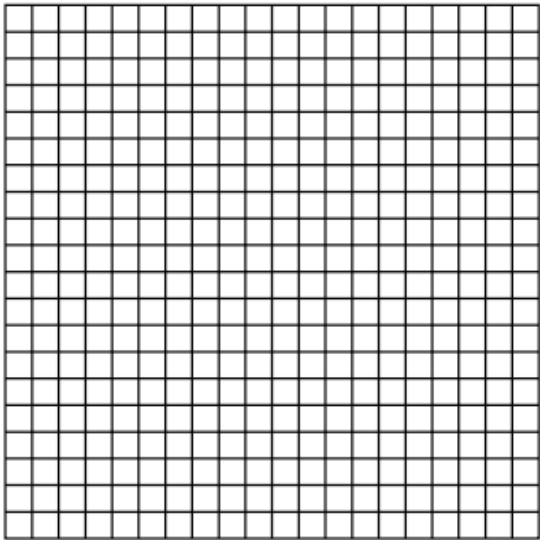
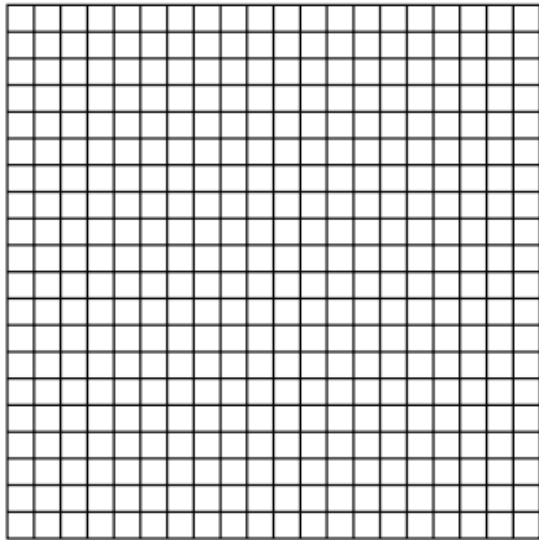
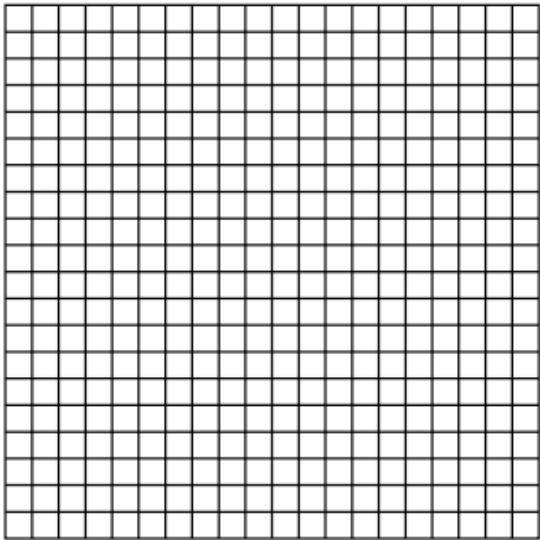
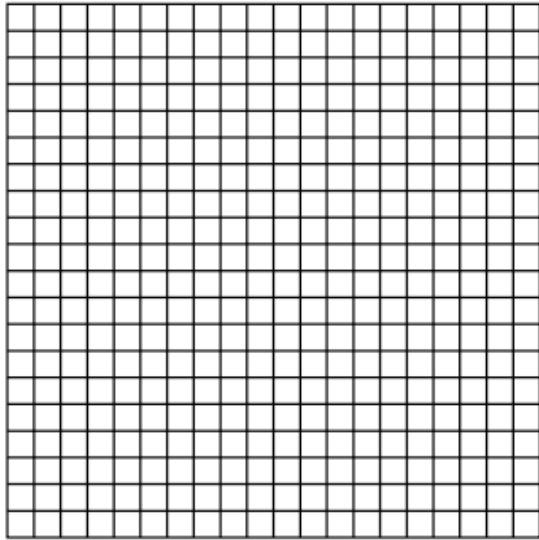
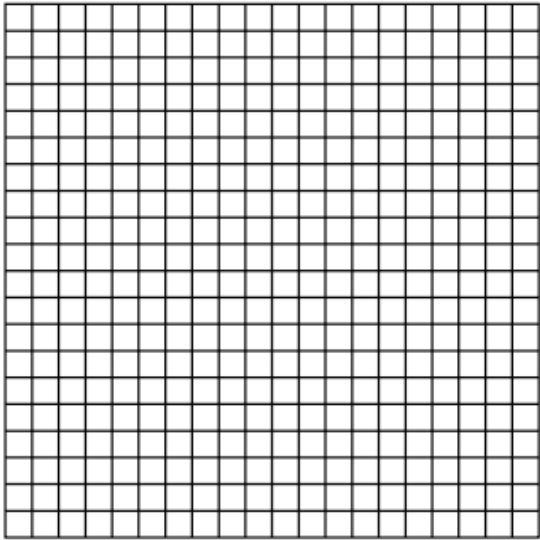


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(D) Graphs of Exponential Functions - CONSOLIDATION of Skills – Changing the values of C & d in $y = Ca^x + d$

WITHOUT using your TI-84, graph the equation $y = 2^x$. Then on the same graph, graph the following equations in order to compare the appearance of the graphs & compare the data points.

<p>Equation to graph: $y = -\left(\frac{1}{2}\right)^x + 1$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3								<p>Equation to graph: $y = \left(\frac{1}{2}\right)^{-x} - 3$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3							
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<p>Equation to graph: $y = 8\left(\frac{1}{2}\right)^x - 4$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3								<p>Equation to graph: $y = -2 + \frac{1}{4}\left(\frac{1}{2}\right)^x$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3							
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<p>Equation to graph: $y = 5 - 3\left(\frac{1}{2}\right)^x$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3								<p>Equation to graph: $y = \frac{3}{2} + \frac{1}{2}\left(\frac{1}{2}\right)^{-x}$</p> <p>Data table:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td> </tr> <tr> <td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td> </tr> </table>	-3	-2	-1	0	1	2	3							
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(E) Consolidation of Concepts

Without a graphing calculator, use your understanding of the concepts that you learned in order to prepare a (i) data table and a (ii) graph of the following equations:

$Y = -3(2)^x + 5$	$Y = -4 + \frac{1}{2}(2)^{-x}$