When Doubling Catches Up

Extend a table and graph to compare linear and exponential growth

Name: _____ Date: _____

Part 1: Build the comparison table

Fictional classroom model. Before you begin, listen as your teacher reads the two growth rules. Let *w* be the number of weeks.

Steady Plan: starts at 30 units and gains 12 units each week. **L(w) = 30 + 12w**

Doubling Plan: starts at 3 units and doubles each week. **$E(w) = 3(2^w)$**

1. Complete the table. Show the amount in each plan at every week.

Week, w	Steady Plan, L(w)	Doubling Plan, E(w)
0	30	3
1		
2		
3		
4		
5		
6		
7		
8		

2. At which first whole week is the Doubling Plan greater than the Steady Plan? State the crossing interval using the two whole weeks on either side. Use the amounts from both weeks as evidence.

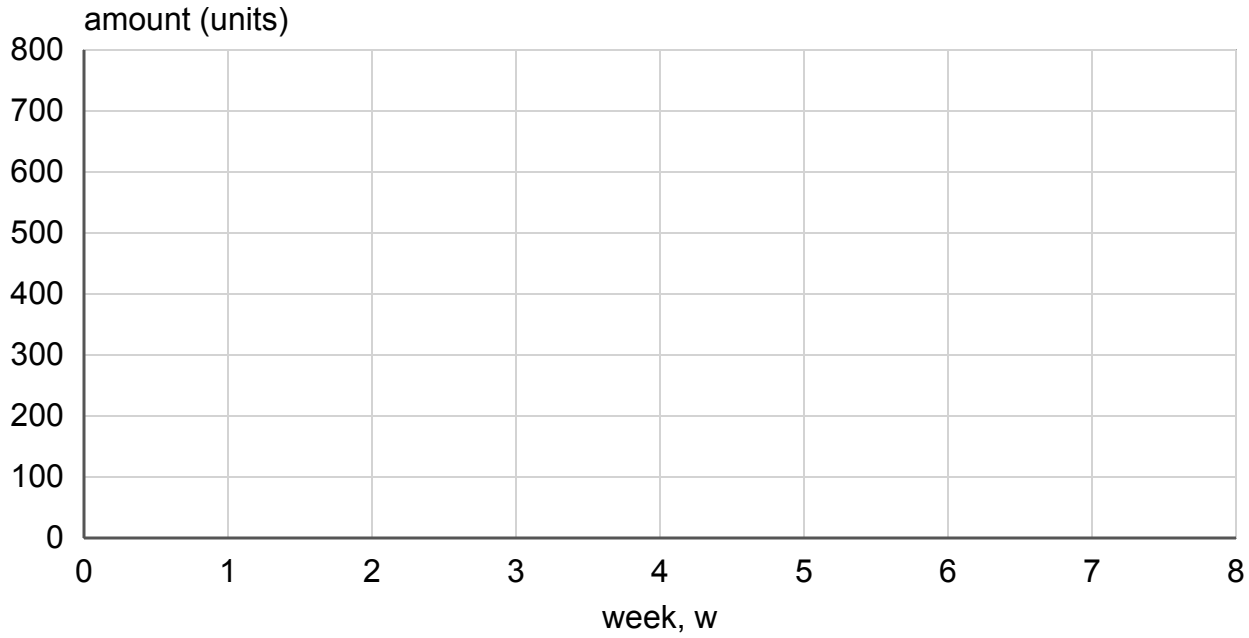
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Part 2: Graph and explain

3. On the shared grid, plot both plans from your completed table. Connect the Steady Plan points with solid segments. Connect the Doubling Plan points with dashed segments. Label each graph near its right end.



4. Explain how your table and graph illustrate the broader idea that exponential growth can eventually exceed linear, quadratic, or other polynomial growth. Also state what this one comparison does *not* prove.

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Answer key: calculations and graph

1. Completed table

w	L(w) = 30 + 12w	E(w) = 3(2^w)
0	30	3
1	42	6
2	54	12
3	66	24
4	78	48
5	90	96
6	102	192
7	114	384
8	126	768

2. The first whole week when the Doubling Plan is greater is week 5: 96 > 90. The crossing interval is between weeks 4 and 5, because at week 4, 48 < 78, and at week 5, 96 > 90.

3. Accept accurately plotted table points, with solid segments for (0,30) through (8,126) and dashed segments for (0,3) through (8,768). Labels should identify both plans. Small placement differences are acceptable because the vertical scale is 100 units per labeled tick.

4. Sample response: The exponential plan doubles, so its increases become larger over time. In this example it begins below the linear plan but exceeds it between weeks 4 and 5. This illustrates the broader claim, but one linear comparison does not by itself prove the result for every quadratic or other polynomial rule.

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Teaching companion

Materials supplied: two student pages with one shared coordinate grid and a partially blank table. **Additionally needed:** pencil and straightedge. A calculator is not needed.

Setup: Give each student both pages face down. Have students place a straightedge beside the graph page. Read the script below before students turn over Part 1. Students work independently on the table, then graph from their own completed table.

Teacher script: “Today we will compare two fictional growth rules. The Steady Plan starts at 30 units and adds 12 units every week. The Doubling Plan starts at 3 units and doubles every week. Complete each row carefully. Do not decide which plan wins until you compare the values. Then graph every table value using a solid line for Steady and a dashed line for Doubling. Finally, use weeks 4 and 5 as evidence for the crossing interval.”

Observation method: As students work, check whether they add 12 repeatedly for the linear column and multiply by 2 repeatedly for the exponential column. On the graph, look for all table points, distinct solid/dashed connections, and labels. For item 4, accept an explanation only if it identifies increasing exponential changes and says this example illustrates, rather than proves, the broader polynomial claim.

Quick feedback prompts: “What operation repeats in this column?” “At week 4, which amount is larger?” “What changes by week 5?” Do not confirm the crossing week before students compare both rows.

Source note: All quantities and plans are original fictional classroom-model data created for this worksheet; no external source is used.