Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Comparing Linear, Quadratic & Exponential Models | Algebra 1 | 3-Topic Bundle

3-topic bundle | 288 problems | Four activity formats

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01 **Linear vs Exponential Models**

View individual product and its full preview

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03 **Selecting Models from Data**

View individual product and its full preview

In every topic

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Quick Answer Key and Full Worked Solutions	included
Teacher / Parent Use Guide and Terms of Use	included

Product previews

The following preview pages show the cover, all four activity formats, and worked examples for each included resource, in the listed order.

24 PDFs and 3 READMEs; 389 buyer PDF pages across the 3 products.

Preview pages are not included in the buyer page count. Check the list against resources you already own.

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Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Linear vs Exponential Models

Linear vs Exponential Models | A1-U07-P17

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Linear vs Exponential Models.

8 PDFs and a README; 70 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Linear vs Exponential Models

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

Use the equal-step behavior to classify this table, including its one-unit factor. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Precision of given values: exact

x	y
−2	1
−1	3
0	9

Bank label: ______

Classify the relationship and quantify its unit change. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Precision of given values: exact

x	y
−1	6
0	4
1	2

Bank label: ______

Determine the relationship class and distinguish its ratios from its differences. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Precision of given values: exact

n	A
0	100
1	90
2	81
3	72.9

Bank label: ______

Classify the table and report the rate per one x-unit. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Precision of given values: exact

x	y
0	2
3	14
6	26

Bank label: ______

Algebra 1

Linear vs Exponential Models

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Account for the unequal x-gaps and classify the relationship.

Precision of given values: exact

x	y
0	2
1	4
3	16

Use change per x-unit, not raw y-differences, to classify the table.

Precision of given values: exact

x	y
0	4
2	10
5	19

A student notices the first ratio is 2. Decide whether the whole table supports an exponential model.

Precision of given values: exact

x	y
0	10
1	20
3	50

State why these rows alone do not select uniquely between the two model classes.

Precision of given values: exact

x	y
0	2.5
2	2.5
5	2.5
9	2.5

Do not decide from the first pair alone. Classify using all intervals.

Precision of given values: exact

x	y
0	50
1	45
2	39
3	32

Can the table alone establish a global linear or exponential mechanism? Explain.

Model assumption: none

x	y
0	5
1	10

Algebra 1

Linear vs Exponential Models

Name: ____________ **Date:** ____________ **Class:** ____________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: Exponential decay with unit factor $\frac{1}{9}$.

Rewrite with one exponential base, then classify the change. Rule: $e(x) = 6\frac{2^x}{3^x}$

Your response: ____________

Incoming: The linear rule $L(x) = 5x$ predicts 15; the exponential rule $E(x) = 2.5(2)^x$ predicts 20.

Build decreasing linear and exponential candidates through the rows and compare the missing middle value. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Target x: 1

x	y
0	16
2	4

Your response: ____________

Incoming: $L(x) = 100 + 10.5x$ gives 110.5; $E(x) = 100(1.1)^x$ gives 110, a difference of 0.5.

Build the models and evaluate both one unit after $x = 0$. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Target x: 1

Input	Given output
0	8
3	64

Your response: ____________

Incoming: $L(x) = 6x + 10$ gives 10; $E(x) = 8(2)^x$ gives 8 at $x = 0$.

Build linear and exponential candidates and fill the missing middle value. Use the complete requested model pair and predictions, or the classification with its decisive numerical change/factor, as the matching response. Retain all original assumptions, units and evidence qualifications.

Target x: -1

x	y
-2	9
0	1

Your response: ____________

Algebra 1

Linear vs Exponential Models

Name: ______________ **Date:** ______________ **Class:** ______________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Classify the relationship as linear, exponential, neither, or ambiguous, and give the decisive equal-step pattern. Choose a first diagnostic test: compare output differences for equal input steps, or compare output ratios where division is defined. Explain why that test is useful for these exact rows, use it, and complete the original classification. If the first test is inconclusive, state what further check or model assumption is needed.

Precision of given values: exact

x	y
0	3
1	7
2	11

Determine the model class supported by all consecutive entries. Choose a first diagnostic test: compare output differences for equal input steps, or compare output ratios where division is defined. Explain why that test is useful for these exact rows, use it, and complete the original classification. If the first test is inconclusive, state what further check or model assumption is needed.

Precision of given values: exact

x	y
0	2
1	6
2	18
3	54

Linear vs Exponential Models

Full Worked Solutions - excerpt

Worked example

Problem. Rewrite q in coefficient-times-power form, then classify it. Rule: $q(x) = 2^{x+1}$

Answer. $q(x) = 2(2)^x$ is exponential with unit ratio 2.

Explanation and check.

The exponent rule $2^{x+1} = 2^x$ times 2 exposes the constant multiplicative factor.

Worked example

Problem. Simplify the formula and use a change calculation to classify it. Rule: $m(x) = 9\frac{x}{3} + 5$

Answer. $m(x) = 3x + 5$ is linear, and $m(x+1) - m(x) = 3$.

Explanation and check.

Dividing the x-term by 3 gives a constant coefficient of 3.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Linear, Quadratic, and Exponential Functions

Linear, Quadratic, and Exponential Functions | A1-U09-P15

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for correct transformed comparison, exact finite changes, rates, and justified comparison, finite evidence, assumption audit, and justified eventual conclusion, matching family rule and interval-aware evidence, quadratic curve and why sign alone fails and quadratic and exponential identifications.

8 PDFs and a README; 114 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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Algebra 1

Linear, Quadratic, and Exponential Functions

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and record the matching bank letter. Give exact values. A value without its unit is not a complete answer.

The input gaps in the exact table are unequal. The possible rules are $y = 2x + 1$, $y = x^2 + 1$, and $y = (2)^x$. Which rule generated the table, and what interval-aware evidence rules out using raw output changes alone? Normalize every change by its input gap. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

x	**y**
0	1
1	3
3	7
6	13

Input steps	1, 2, 3
Candidate rules	$y = 2x + 1$, $y = x^2 + 1$, $y = (2)^x$

Bank label: _______

The input gaps in the exact table are unequal. The possible rules are $y = 3x - 1$, $y = x^2$, and $y = (2)^x$. Which rule generated the table, and what interval-aware evidence rules out using raw output changes alone? Changing raw differences do not by themselves prove exponential behavior. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

x	**y**
0	0
1	1
3	9
4	16

Input steps	1, 2, 1
Candidate rules	$y = 3x - 1$, $y = x^2$, $y = (2)^x$

Bank label: _______

The input gaps in the exact table are unequal. The possible rules are $y = 4x - 1$, $y = x^2 + x + 1$, and $y = (2)^x$. Which rule generated the table, and what interval-aware evidence rules out using raw output changes alone? A gap of two should compound the per-unit factor twice. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

x	**y**
0	1
1	2
3	8
4	16

Input steps	1, 2, 1
Candidate rules	$y = 4x - 1$, $y = x^2 + x + 1$, $y = (2)^x$

Bank label: _______

The input gaps in the exact table are unequal. The possible rules are $y = -3x + 8$, $y = -x^2 + 2x + 8$, and $y = 8(\frac{1}{2})^x$. Which rule generated the table, and what interval-aware evidence rules out using raw output changes alone? Keep the signs in the interval rates. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

x	**y**
0	8
2	2
3	-1
6	-10

Input steps	2, 1, 3
Candidate rules	$y = -3x + 8$, $y = -x^2 + 2x + 8$, $y = 8(\frac{1}{2})^x$

Bank label: _______

Algebra 1

Linear, Quadratic, and Exponential Functions

Name: ______________ **Date:** ______________ **Class:** ______________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. A value without its unit is not a complete answer.

Classify the exact table generated on $x = 0, 1, 2, 3$ among linear, quadratic, exponential, or neither. Use first differences.

x	y
0	1
1	4
2	7
3	10

Equal input step	1

Classify the exact table generated on $x = 0, 1, 2, 3$ among linear, quadratic, exponential, or neither. A quadratic candidate must be considered.

x	y
0	0
1	1
2	4
3	9

Equal input step	1

Classify the exact table generated on $x = 0, 1, 2, 3$ among linear, quadratic, exponential, or neither. Compare ratios as well as differences.

x	y
0	2
1	4
2	8
3	16

Equal input step	1

Classify the exact table generated on $x = 0, 1, 2, 3, 4$ among linear, quadratic, exponential, or neither. Translation does not remove curvature.

x	y
0	3
1	4
2	9
3	18
4	31

Equal input step	1

Algebra 1

Linear, Quadratic, and Exponential Functions

Name: ____________ **Date:** ____________ **Class:** ____________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

START

On $x = 1$ to $x = 3$, which of the listed linear, quadratic, and exponential rules has the greatest net change? Report all three exact changes and justify the quadratic comparison. Evaluate endpoints exactly. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

Interval	1, 3
Rules	Linear: $y = 4x$; Quadratic: $y = 2x^2$; Exponential: $y = 2(2)^x$

Your response: ____________

Incoming: average rates: exponential: $\frac{211}{80}$; linear: 6; quadratic: 6; changes: exponential: $\frac{211}{16}$; linear: 30; quadratic: 30; descending change groups: linear and quadratic, exponential

Compute each model's average rate of change on $[-1, 5]$. Order the rates and explain why this finite comparison does not by itself settle eventual growth. Do not look only at the leading coefficient. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

Interval	−1, 5
Rules	Linear: $y = 4x - 2$; Quadratic: $y = 2x^2 - 7x + 1$; Exponential: $y = (2)^x$

Your response: ____________

Incoming: average rates: exponential: 6; linear: 5; quadratic: 6; changes: exponential: 12; linear: 10; quadratic: 12; descending change groups: quadratic and exponential, linear

Compare the signed changes of the three models from $x = -3$ through $x = 4$. Which increase, which decrease, and what does the quadratic change reveal? Show endpoint substitutions before ordering. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

Interval	−3, 4
Rules	Linear: $y = -\frac{3}{2}x + 5$; Quadratic: $y = -2x^2 + x + 5$; Exponential: $y = -(2)^x$

Your response: ____________

Incoming: average rates: exponential: $\frac{15}{4}$; linear: 4; quadratic: 4; changes: exponential: 15; linear: 16; quadratic: 16; descending change groups: linear and quadratic, exponential

Over the finite interval from $x = 0$ to $x = 3$, rank the changes in the three exact models from greatest to least. Then identify the changing-rate evidence specific to the quadratic model. Negative output levels do not determine the change order. Match the complete original model comparison, all requested predictions or changes/rates and ties. For unequal steps, include the full normalized interval-rate evidence with the selected rule and family.

Interval	0, 3
Rules	Linear: $y = 2x - 20$; Quadratic: $y = x^2 - 30$; Exponential: $y = -16(\frac{1}{2})^x$

Your response: ____________

Algebra 1

Linear, Quadratic, and Exponential Functions

Name: ____________________ **Date:** ____________________ **Class:** ____________________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Use the exact table and the stated long-term growth theorem to compare the quadratic and exponential models. What is supported eventually, and what is supported only at the sampled inputs? Do not turn four rows into a proof for every larger input. Compare the finite sampled evidence with the conclusion justified by the original long-term theorem conditions. State which claim each supports and retain the original comparison domain.

x	quadratic	exponential
0	5	1
2	13	4
4	37	16
8	133	256

Quadratic rule	$y = 2x^2 + 5$
Exponential rule	$y = (2)^x$
Comparison domain	all nonnegative real x

Audit whether eventual exponential dominance applies to these two rules on $x \geq 0$. Check every sign and base assumption before using the theorem. Both leading factors and the exponential base satisfy the theorem. Compare the finite sampled evidence with the conclusion justified by the original long-term theorem conditions. State which claim each supports and retain the original comparison domain.

x	quadratic	exponential
0	2	3
3	20	$\frac{81}{8}$
6	56	$\frac{2187}{64}$
12	182	$\frac{1594323}{4096}$

Quadratic rule	$y = x^2 + 3x + 2$
Exponential rule	$y = 3(\frac{3}{2})^x$
Comparison domain	$x \geq 0$

Linear, Quadratic, and Exponential Functions

Full Worked Solutions - excerpt

Worked example

Problem. A student calls the table $1, 4, 9, 16$ exponential because the increments grow. Diagnose and repair the argument.

Given evidence	equal-step outputs $1, 4, 9, 16$
Student claim	The model is exponential because its increments grow.

Answer. correction: the data support a quadratic pattern; decisive check: first differences $3, 5, 7$ have constant second difference 2; error: growing increments are not the same as constant ratios

Explanation and check.

The first differences are $3, 5, 7$ and their differences are 2. Ratios are not constant, so quadratic—not exponential—is supported.

Worked example

Problem. Repair the claim that $E(x) = 20(\frac{1}{2})^x$ must eventually exceed $Q(x) = x^2$ merely because E is exponential.

Given evidence	$E(x) = 20(\frac{1}{2})^x$ and $Q(x) = x^2$
Student claim	Every exponential eventually exceeds every quadratic.

Answer. correction: this exponential tends toward zero and does not eventually dominate Q; decisive check: verify positive coefficient and base greater than one before applying the theorem; error: the exponential base is below one

Explanation and check.

The dominance theorem requires a growing positive exponential with base above 1. Here E decays, while Q grows.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Selecting Models from Data

Selecting Models from Data | A1-U10-P17

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for qualified model preference with decisive evidence.

8 PDFs and a README; 205 buyer pages.

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Algebra 1

Selecting Models from Data

Name: ____________ **Date:** ____________ **Class:** ____________

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

The equally spaced observations for measured heights along an arch are $(0, 5)$; $(1, 17)$; $(2, 23)$; $(3, 18)$; $(4, 6)$. Use approximate first differences, second differences, and meaningful ratios to suggest a plausible family; qualify the choice because the data are measured, not exact.

Observed domain: horizontal positions on the physical arch

Input	Observed response
0	5
1	17
2	23
3	18
4	6

Bank label: ______

The equally spaced observations for a savings balance with fixed deposits are $(0, 102)$; $(1, 127)$; $(2, 151)$; $(3, 178)$; $(4, 201)$. Use approximate first differences, second differences, and meaningful ratios to suggest a plausible family; qualify the choice because the data are measured, not exact.

Observed domain: months before the deposit plan ends

Input	Observed response
0	102
1	127
2	151
3	178
4	201

Bank label: ______

The equally spaced observations for water height in a fountain arc are $(0, 2)$; $(1, 11)$; $(2, 16)$; $(3, 13)$; $(4, 3)$. Use approximate first differences, second differences, and meaningful ratios to suggest a plausible family; qualify the choice because the data are measured, not exact.

Observed domain: only while the water stream is above its basin

Input	Observed response
0	2
1	11
2	16
3	13
4	3

Bank label: ______

The equally spaced observations for a bacterial colony estimate are $(0, 25)$; $(1, 34)$; $(2, 46)$; $(3, 65)$; $(4, 86)$. Use approximate first differences, second differences, and meaningful ratios to suggest a plausible family; qualify the choice because the data are measured, not exact.

Observed domain: before nutrients become limiting

Input	Observed response
0	25
1	34
2	46
3	65
4	86

Bank label: ______

Algebra 1

Selecting Models from Data

Name: ____________ **Date:** ____________ **Class:** ____________

Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

The equally spaced observations for model-rocket height samples are $(0, 0)$; $(1, 18)$; $(2, 27)$; $(3, 21)$; $(4, 2)$. Use approximate first differences, second differences, and meaningful ratios to suggest a plausible family; qualify the choice because the data are measured, not exact.

Observed domain: launch through landing

Input	Observed response
0	0
1	18
2	27
3	21
4	2

Algebra 1

Selecting Models from Data

Name: ______________ **Date:** ______________ **Class:** ______________

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: context: pages completed in a reading plan; horizon: 10; predictions: exponential: 590.126; linear: 156.0; quadratic: 162.0; qualified preference: linear until the book is finished

For yeast volume during early proofing, all three candidates fit the observed inputs 0 through 4 closely enough to remain under discussion. Evaluate each at $x = 7$, compare the divergence, and decide what the context domain temperatures and times in the experiment permits you to claim.

Observed domain: temperatures and times in the experiment

Candidate	Supplied rule
linear	predicted $y = 5 + 7$ times x
exponential	predicted $y = 8$ times 1.45 to the x power
quadratic	predicted $y = 1.2$ times x squared + 1.8 times $x + 8$

Input	Observed response	linear	exponential	quadratic
0	8	5	8.0	8.0
1	11	12	11.6	11.0
2	17	19	16.82	16.4
3	24	26	24.389	24.2
4	36	33	35.364	34.4

Your response: ______________

Incoming: context: mold-covered area in a dish; horizon: 9; predictions: exponential: 395.255; linear: 55.8; quadratic: 133.5; qualified preference: exponential with a capacity warning

For water height in a fountain arc, all three candidates fit the observed inputs 0 through 4 closely enough to remain under discussion. Evaluate each at $x = 6$, compare the divergence, and decide what the context domain only while the water stream is above its basin permits you to claim.

Observed domain: only while the water stream is above its basin

Candidate	Supplied rule
linear	predicted $y = 9 + 0.1$ times x
exponential	predicted $y = 4$ times 1.2 to the x power
quadratic	predicted $y = -3.6$ times x squared + 14.5 times $x + 2$

Input	Observed response	linear	exponential	quadratic
0	2	9.0	4.0	2.0
1	11	9.1	4.8	12.9
2	16	9.2	5.76	16.6
3	13	9.3	6.912	13.1
4	3	9.4	8.294	2.4

Your response: ______________

Algebra 1

Selecting Models from Data

Name: ____________ **Date:** ____________ **Class:** ____________

Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

Repair this model-selection claim for weekly equipment rentals: 'largest correlation automatically proves the nonlinear family.' Use the supplied noisy data and candidate provenance to identify the ignored evidence and write a qualified replacement.

Observed domain: weeks 0 through 10 before inventory changes

Candidate	**Supplied rule**
linear	predicted $y = 21 + 4.5$ times x
exponential	predicted $y = 21$ times 1.17 to the x power
quadratic	predicted $y = 0.15$ times x squared + 3.9 times $x + 21$

Input	**Observed response**	**linear**	**exponential**	**quadratic**
0	21	21.0	21.0	21.0
1	25	25.5	24.57	25.05
2	30	30.0	28.747	29.4
3	34	34.5	33.634	34.05
4	39	39.0	39.352	39.0

Selecting Models from Data

Full Worked Solutions - excerpt

Worked example

Problem. A candidate for a downward projectile arc is quadratic predicted $y = -4.9$ times x squared + 18 times $x + 1$. The contextual constraint is explicit in the description. Decide admissibility from coefficient sign, initial value, exponential base, orientation, and stated domain; do not infer any unstated physics.

Answer. context: a downward projectile arc; decision: admit; reason: negative leading coefficient matches a maximum

Explanation and check.

For a downward projectile arc, the decisive parameter fact is that negative leading coefficient matches a maximum. Therefore the decision is to admit the candidate under the stated constraint.

Worked example

Problem. A candidate for a proportional decay process is exponential predicted $y = 75$ times 0.91 to the x power. The contextual constraint is explicit in the description. Decide admissibility from coefficient sign, initial value, exponential base, orientation, and stated domain; do not infer any unstated physics.

Answer. context: a proportional decay process; decision: admit; reason: positive initial value and base between zero and one

Explanation and check.

For a proportional decay process, the decisive parameter fact is that positive initial value and base between zero and one. Therefore the decision is to admit the candidate under the stated constraint.