Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Linear, Quadratic & Exponential Modeling | Algebra 1 | 8-Topic Bundle

8-topic bundle | 768 problems | Four activity formats

Included topics

The following pages list all 8 included resources in the suggested order, with a link to each product. Each resource retains its complete preview.

In every topic

Answer Bank Challenge	24 tasks
Grid Rounds	24 tasks
Match & Move	24 cards
Error Analysis & Strategy	24 tasks
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.

64 PDFs and 8 READMEs; 736 buyer PDF pages across the 8 products.

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

This is a fixed collection of the listed products. Purchase includes the existing individual resource files. To open a product's online preview, follow its title link and select View Preview.

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Math Practice & Worked Solutions

Algebra 1

Included topics

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01 **Linear Models from Initial Value and Rate**

View individual product and its full preview

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View individual product and its full preview

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View individual product and its full preview

07 **Linear, Quadratic, and Exponential Functions**

View individual product and its full preview

08 **Selecting Models from Data**

View individual product and its full preview

8 included resources | Complete resource previews follow this guide.

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Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Linear Models from Initial Value and Rate

Linear Models from Initial Value and Rate | A1-U05-P16

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for an exact affine rule, domain, interpretation, or corrected model.

8 PDFs and a README; 50 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 Models from Initial Value and Rate

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.

At use count $18,250$ grams remain and 15 grams are used per count. Construct an anchored linear model and then rewrite it to identify $Q(0)$. Do not treat the value at $t = 18$ as the intercept. Bank label: _____	At week 40, a fund is 1000 dollars and then changes -22 dollars per week. Construct an anchored linear model and then rewrite it to identify $Q(0)$. Do not treat the value at $t = 40$ as the intercept. Bank label: _____
A vertical coordinate starts at 3 units and changes by $-\frac{7}{3}$ units per step. Let t be the number of steps. Construct $Q(t)$ in units; identify the value at $t = 0$ and preserve the sign of the supplied rate. Bank label: _____	At $t = -8$ relative to calibration, a signal is 12 and rises $\frac{5}{2}$ per time unit. Construct an anchored linear model and then rewrite it to identify $Q(0)$. Do not treat the value at $t = -8$ as the intercept. Bank label: _____
An inventory starts at 100 and processes at most 8 whole orders. Use the supplied initial-rate rule $Q(t) = 100 - 12t$. State the valid domain for t in orders, combining input type with the process limit. Bank label: _____	For the contextual model $Q(t) = 4 - \frac{1}{3}t$ on domain $-6 \le t \le 0$, explain the intercept and slope in the original units and say whether $Q(0)$ is observed or extrapolated. Q is a historical offset and $t = 0$ is the end of the observation window. Bank label: _____
A process has initial value 9 miles and rate 45 miles per hour. Express its model using meters and input measured in seconds; output counts multiply by $\frac{201168}{125}$ and input counts by 3600. Bank label: _____	For the contextual model $Q(t) = 31 + 5t$ on domain $t \ge 7$, explain the intercept and slope in the original units and say whether $Q(0)$ is observed or extrapolated. Q is a quantity measured from a baseline date, but observations start seven periods later. Bank label: _____

Algebra 1

Linear Models from Initial Value and Rate

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.

A temperature deviation rises from -10 to a cutoff of 8. Use the supplied initial-rate rule $Q(t) = -10 + \frac{9}{4}t$. State the valid domain for t in hours, combining input type with the process limit.	A signed elevation is -5 meters at time zero and falls 2 meters per kilometer traveled. Let t be the number of kilometers. Construct $Q(t)$ in meters; identify the value at $t = 0$ and preserve the sign of the supplied rate.
A process has initial value 2 liters and rate 6 liters per package. Express its model using liters and input measured in items; output counts multiply by 1 and input counts by 3.	A process has initial value $\frac{13}{6}$ gallons and rate $-\frac{17}{9}$ gallons per hour. Express its model using quarts and input measured in minutes; output counts multiply by 4 and input counts by 60.
A process has initial value 12 liters and rate 5 liters per hour. Express its model using milliliters and input measured in minutes; output counts multiply by 1000 and input counts by 60.	At $t = \frac{3}{2}$ days, a total is 9 and grows 4 units per day. Construct an anchored linear model and then rewrite it to identify $Q(0)$. Do not treat the value at $t = \frac{3}{2}$ as the intercept.

Algebra 1

Linear Models from Initial Value and Rate

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: At t = 4, $A = 18$ and $B = 17$. Both initial value and rate change, so neither parameter alone explains the output gap.

For the contextual model $Q(t) = -5 - 4t$ on domain $-2 \le t \le 6$, explain the intercept and slope in the original units and say whether $Q(0)$ is observed or extrapolated. Q is position relative to a marker and $t = 0$ is a chosen clock reference.

Your response: _____

Incoming: In $Q(t) = -5 - 4t$, -5 is observed at the chosen zero; -4 is the signed output change per one input unit. Context: Q is position relative to a marker and $t = 0$ is a chosen clock reference.

Models $A(t) = 18 - \frac{1}{2}t$ and $B(t) = 18 - \frac{3}{4}t$ have the same starting value. Explain how the changed rate affects later outputs and compare them at $t = 10$.

Your response: _____

Incoming: In $Q(t) = 72 - 9t$, 72 is observed at the chosen zero; -9 is the signed output change per one input unit. Context: Q is percentage points remaining, not a multiplicative percent change.

Compare the redesigned affine models $A(t) = -10 + 7t$ and $B(t) = 5 + 3t$. Separate the start change from the rate change before checking $t = 4$.

Your response: _____

Incoming: At t = 6, $A = 100$ and $B = 120$. Both initial value and rate change, so neither parameter alone explains the output gap.

For the contextual model $Q(t) = 500 + 20t$ on domain $0 \le t \le 6$, explain the intercept and slope in the original units and say whether $Q(0)$ is observed or extrapolated. Q includes a fixed setup contribution plus production over hours.

Your response: _____

Incoming: At t = 7, $A = 44$ and $B = 65$. The models start together, and their rate difference changes the gap with t.

For the contextual model $Q(t) = 90$ on domain $0 \le t \le 12$, explain the intercept and slope in the original units and say whether $Q(0)$ is observed or extrapolated. Q is a fixed sensor reading and t is hours.

Your response: _____

Incoming: $Q(t) = 0 + \frac{7}{3}(t - 12)$, equivalently $Q(t) = -28 + \frac{7}{3}t$; therefore $Q(0) = -28$.

A process has initial value 0 items and rate 300 items per hour. Express its model using items and input measured in minutes; output counts multiply by 1 and input counts by 60.

Your response: _____

Algebra 1

Linear Models from Initial Value and Rate

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.

Choose an efficient method, explain why it fits the given representation, and then complete the task exactly. Compare the redesigned affine models $A(t) = 500 + 20t$ and $B(t) = 450 + 25t$. Separate the start change from the rate change before checking $t = 4$.

Choose an efficient method, explain why it fits the given representation, and then complete the task exactly. Both parameters differ in $A(t) = 8 + \frac{3}{2}t$ and $B(t) = 12 + \frac{1}{2}t$. Compare the exact rational starts and rates, then evaluate each at $t = 6$.

Models $A(t) = 10 + 3t$ and $B(t) = 16 + 3t$ share one rate. Isolate the effect of changing the initial value, then check the fixed gap at $t = 4$.

Models $A(t) = 6 + 12t$ and $B(t) = 9 + 12t$ share one rate. Isolate the effect of changing the initial value, then check the fixed gap at $t = \frac{5}{2}$.

Linear Models from Initial Value and Rate

Full Worked Solutions - excerpt

Worked example

Problem. At use count $18,250$ grams remain and 15 grams are used per count. Construct an anchored linear model and then rewrite it to identify $Q(0)$. Do not treat the value at $t = 18$ as the intercept.

Answer. $Q(t) = 250 - 15(t - 18)$, equivalently $Q(t) = 520 - 15t$; therefore $Q(0) = 520$.

Explanation and check.

Start from the reference form using $(t - 18)$ and rate -15. Expanding gives the initial value

$250 - (-15)(18) = 520$

Worked example

Problem. At week 40, a fund is 1000 dollars and then changes -22 dollars per week. Construct an anchored linear model and then rewrite it to identify $Q(0)$. Do not treat the value at $t = 40$ as the intercept.

Answer. $Q(t) = 1000 - 22(t - 40)$, equivalently $Q(t) = 1880 - 22t$; therefore $Q(0) = 1880$.

Explanation and check.

Start from the reference form using $(t - 40)$ and rate -22. Expanding gives the initial value

$1000 - (-22)(40) = 1880$

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Evaluating Linear Models in Context

Evaluating Linear Models in Context | A1-U05-P17

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for an exact prediction with a context-qualified conclusion.

8 PDFs and a README; 50 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

Evaluating Linear Models in Context

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.

A newly appended row has input 4 and output $\frac{47}{6}$. Test it against $Q(t) = -\frac{5}{2} + \frac{7}{3}t$ with absolute tolerance $\frac{1}{2}$, and say what an out-of-band result establishes. Bank label: _____	A supporting table covers inputs -8 through -1, and the rule's domain is $-10 \le t \le 3$. Locate $t = -5$ relative to the evidence and classify this within-span prediction. Bank label: _____
For the supplied rule $Q(t) = \frac{11}{3} + \frac{13}{7}t$, evaluate at $t = 14$ and compare with observed value 29. Use $\lvert\text{observed-predicted}\rvert \le \frac{2}{3}$ as the consistency rule. Bank label: _____	A supporting table covers inputs 0 through 18, and the rule's domain is $0 \le t \le 20$. Locate $t = 11$ relative to the evidence and classify this within-span prediction. Bank label: _____
The supplied model is $Q(t) = 18 + 7t$ on t in $\{0, 1,...,12\}$. At what t, measured in batches, does Q reach 60? Solve and verify that the predicted input is admissible. Bank label: _____	For the forecast $Q(t) = 18 + 5t$ at $t = 12$, the intercept changes by 7 and the rate changes by -1. Combine the two effects exactly and state the net prediction change. Bank label: _____
The supplied model is $Q(t) = 25 + 11t$ on t in $\{0, 1,...,10\}$. At what t, measured in days, does Q reach 102? Solve and verify that the predicted input is admissible. Bank label: _____	The supplied forecast is $Q(t) = \frac{9}{2} + \frac{7}{3}t$. At $t = 3$ it is being used under this condition: completed packages must be whole. Compute the output and decide whether the contextual interpretation is feasible; identify the decisive condition. Bank label: _____

Algebra 1

Evaluating Linear Models in Context

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.

The supplied forecast is $Q(t) = -15 + 11t$. At $t = 12$ it is being used under this condition: domain is $2 \le t \le 9$ and capacity is 80. Compute the output and decide whether the contextual interpretation is feasible; identify the decisive condition.	Check observation $Q = -1$ at $t = 9$ against $Q(t) = 12 - \frac{3}{2}t$, allowing error of at most 1. Report the signed and absolute residual before judging agreement.
The established rule is $Q(t) = 320 - 18(t - 12)$, where Q measures stored energy in kilowatt-hours and t is days. Within $0 \le t \le 18$, predict $Q(5)$ and interpret the reference shift $t = 12$.	A decreasing model for reservoir depth is $Q(t) = 51 - 5t$. Its modeled domain is $0 \le t \le 9$, Q is measured in feet, and t in days. Evaluate the admissible forecast at $t = \frac{13}{2}$ and state what the sign means.
A decreasing model for candle height is $Q(t) = 24 - 3t$. Its modeled domain is $0 \le t \le 8$, Q is measured in centimeters, and t in hours. Evaluate the admissible forecast at $t = 5$ and state what the sign means.	The supplied forecast is $Q(t) = 72 - 9t$. At $t = 8$ it is being used under this condition: inventory must be nonnegative. Compute the output and decide whether the contextual interpretation is feasible; identify the decisive condition.

Algebra 1

Evaluating Linear Models in Context

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: The target $\frac{95}{18}$ is reached at $t = \frac{31}{7}$ seconds, an allowed input in $0 \le t \le 6$.

A newly appended row has input 12 and output 28. Test it against $Q(t) = 80 - 5t$ with absolute tolerance 2, and say what an out-of-band result establishes.

Your response: _____

Incoming: The model predicts 20; residual observed-predicted is 8, whose absolute value is 8. That is outside the tolerance 2, so the observation is not consistent with the model at this tolerance. This comparison alone does not establish a cause.

Audit this forecast statement: A model for completed shipments reaches a target algebraically at $t = 4.6$, and the report claims the target occurs during shipment 4.6. Identify the first unjustified step and write a repaired, qualified conclusion.

Your response: _____

Incoming: The prediction changes by 6, from 26 to 32. A positive value means an increase and a negative value a decrease.

The supplied model is $Q(t) = \frac{11}{6} + \frac{7}{9}t$ on $0 \le t \le 6$. At what t, measured in seconds, does Q reach $\frac{95}{18}$? Solve and verify that the predicted input is admissible.

Your response: _____

Incoming: The target 132 is reached at $t = 7$ cycles, an allowed input in $0 \le t \le 15$.

The initial value in $Q(t) = -5 + 7t$ is recalibrated by 11 while the rate stays fixed. Quantify the prediction change at $t = 6$ and explain whether the horizon amplifies it.

Your response: _____

Incoming: This is extrapolation: -5 lies outside the observed input interval $[-2, 6]$. It is inside the declared model domain, but the classification alone does not guarantee empirical accuracy; continued linear behavior is an assumption wherever direct observations are absent.

The supplied forecast is $Q(t) = 5 + \frac{3}{2}t$. At $t = 5$ it is being used under this condition: output counts people and must be whole. Compute the output and decide whether the contextual interpretation is feasible; identify the decisive condition.

Your response: _____

Incoming: $Q(8) = 53$ dollars. It predicts balance relative to zero of 53 dollars at 8 payments.

The zero-rate rule $Q(t) = -7$ is used on $-4 \le t \le 9$. Identify all allowed t in seconds for which $Q(t) = 5$, or explain why none exist.

Your response: _____

Algebra 1

Evaluating Linear Models in Context

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.

Evidence in a table stops at the span $[0, 7]$, and the model itself is restricted to $0 \le t \le 12$. Assess the proposed forecast input 16 against both limits.

Audit this forecast statement: A rule gives distance in miles with t in hours. A student evaluates it correctly but reports the result as miles per hour. Identify the first unjustified step and write a repaired, qualified conclusion.

The first and last tabulated inputs are 9 and 27. For domain $0 \le t \le 35$, classify use of the rule exactly at $t = 27$ and distinguish an endpoint from beyond-range use.

A student states a conclusion from the visible representation without preserving all stated associations, constraints, or units. Diagnose the specific reasoning error, then complete the original task: Audit this forecast statement: A rate 2.46 is rounded to 2 before multiplying by 18, and the final forecast is reported to the nearest tenth. Identify the first unjustified step and write a repaired, qualified conclusion.

Evaluating Linear Models in Context

Full Worked Solutions - excerpt

Worked example

Problem. A newly appended row has input 4 and output $\frac{47}{6}$. Test it against $Q(t) = -\frac{5}{2} + \frac{7}{3}t$ with absolute tolerance $\frac{1}{2}$, and say what an out-of-band result establishes.

Answer. The model predicts $\frac{41}{6}$; residual observed-predicted is 1, whose absolute value is 1. That is outside the tolerance $\frac{1}{2}$, so the observation is not consistent with the model at this tolerance. This comparison alone does not establish a cause.

Explanation and check.

Prediction $\frac{41}{6}$ and observation $\frac{47}{6}$ have absolute gap 1, larger than allowed tolerance $\frac{1}{2}$.

Worked example

Problem. A supporting table covers inputs -8 through -1, and the rule's domain is $-10 \le t \le 3$. Locate $t = -5$ relative to the evidence and classify this within-span prediction.

Answer. This is interpolation: -5 lies strictly between observed inputs -8 and -1. It is inside the declared model domain, but the classification alone does not guarantee empirical accuracy; continued linear behavior is an assumption wherever direct observations are absent.

Explanation and check.

The requested input lies between -8 and -1, so the prediction uses the model within the observed span.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Exponential Growth Models

Exponential Growth Models | A1-U07-P15

96 problems · Four activity formats

Topic focus

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

8 PDFs and a README; 62 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

Exponential Growth Models

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.

Write the culture size $C(t)$ after t hours, assuming the percent update applies once per hour. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Initial: 200 Origin: $t = 0$ at observation Given rate: 20% per hour Bank label: _____	Build $F(t)$ when the known value 90 occurs at $t = -1$. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Input: cycle-time coordinate t Given rate: 10% per cycle Value at t minus1: 90 Bank label: _____
The clock labels the observation time as $t = -2$. Write a rule valid across $t = 0$. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Input: signed hour t Given rate: 10% per hour Value at t minus2: 300 Bank label: _____	Build a model that uses $n = 0$ before the first update and matches the observed value 120 at $n = 1$. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Domain: n nonnegative integers Input: n intervals from pre-update time Given rate: 20% per interval Value after interval1: 120 Bank label: _____

Algebra 1

Exponential Growth 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. Give the whole requested response, including any reasoning the question asks for.

Find the multiplier for each statement and explain why the phrases are not equivalent. Given statements: A: next value is 18% of current B: next value is 18% more than current	A trial's output increases by 140% after each launch. Determine the factor and interpret it as a percent of the preceding output. Given rate: 140% increase per launch
Give the quarterly factor for 2.5% growth as both a decimal and a fraction. Given rate: 2.5% per quarter	A quantity grows by 200% each interval. Is its factor 2 or 3? Justify. Given rate: 200% increase per interval
Find the multiplier, and state the implied percent increase. Given statement: the next count is 120% of the current count	Find the final amount after the two successive growth intervals. Initial: 100 Rates: 10%, 20%

Algebra 1

Exponential Growth 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.

START

A quantity increases by 5% each interval. What multiplier represents one interval of growth? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Given rate: 5% per interval

Your response: _____

Incoming: 1.05

Membership grows 12% per month. Give the monthly growth factor. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Given rate: 12% per month

Your response: _____

Incoming: 100

Determine the cycle-0 quantity. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Cycles: 2

Later: 675

Given rate: 50% per cycle

Your response: _____

Incoming: $A(t) = 500(1.20)^{t-3}$.

Under the continuous interval model, find $F(\frac{1}{2})$. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Model: $F(t) = 180(1.44)^t$ for real $t \geq 0$

Time: $\frac{1}{2}$ interval

Your response: _____

Incoming: 1.0004

What multiplier implements the stated update after one round? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Given statement: add 30% of the current amount after each round

Your response: _____

Incoming: 1.75

A measurement increases 0.1% each hour. What hourly multiplier should be used? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Given rate: 0.1% per hour

Your response: _____

Algebra 1

Exponential Growth 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.

Find the modeled amount after two periods. Choose a calculation route: substitute the elapsed update count directly into the model, or track successive interval multiplications when the stated time and domain permit complete updates. Explain why the selected route fits these givens, use it, and preserve the original time origin and rounding instruction.

Model: $A(n) = 100(1.10)^n$

Time: 2

What is the modeled quantity after three complete cycles? Choose a calculation route: substitute the elapsed update count directly into the model, or track successive interval multiplications when the stated time and domain permit complete updates. Explain why the selected route fits these givens, use it, and preserve the original time origin and rounding instruction.

Cycles: 3

Initial: 80

Given rate: 50% per cycle

Exponential Growth Models

Full Worked Solutions - excerpt

Worked example

Problem. Find the multiplier for each statement and explain why the phrases are not equivalent.

Given statements: A: next value is 18% of current B: next value is 18% more than current

Answer. A uses 0.18; B uses 1.18.

Explanation and check.

Percent of names the entire next amount, while percent more names an addition to the retained original.

Worked example

Problem. A quantity grows by 200% each interval. Is its factor 2 or 3? Justify.

Given rate: 200% increase per interval

Answer. The factor is 3.

Explanation and check.

The increase is two copies of the current amount; adding the retained copy makes three copies total.

Sets & Steps
Math Practice & Worked Solutions

Algebra 1

Exponential Decay Models

Exponential Decay Models | A1-U07-P16

96 problems · Four activity formats

Topic focus

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

8 PDFs and a README; 59 buyer pages.

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Published by Tusils LLC.

Algebra 1

Exponential Decay Models

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.

After one 20% loss, 80 remains. What amount was present immediately before the loss? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____	A quantity is 45 just after it is halved. Find its value just before that event. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____
What input amount gives 306 after multiplication by the retention factor 0.85? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____	If 72 is 60% of the amount that existed before a loss, what was that earlier amount? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____
A modeled amount is 240 after one 4% decrease. Find the amount one interval earlier. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____	Find the amount two decay steps before 128 when each step retains 80%. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____
After three successive halvings, a quantity is 18. What was it before any halving? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____	An amount is 81 after four steps that each retain 75%. Find its value before the four steps. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation. Bank label: _____

Algebra 1

Exponential Decay 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. Give the whole requested response, including any reasoning the question asks for.

For this fictional mathematical model, write $V(y)$. The initial amount is 15000 and loses 12% per year. Let y be the elapsed years.	Construct $I(w)$ for w weeks after the reference count. The amount is 1200 at week 0 and loses 8% per week.
Model the amount after n completed filter passes and state the domain. The initial amount is 250 and loses 12% per pass. Let n be a nonnegative integer.	Write the model in hours without turning the rate into an hourly rate. The initial amount is 40 and loses 5% every 2 hours. Let t be elapsed hours.
Construct the model in years. The initial amount is 900 and loses 3% per half-year. Let y be elapsed years.	Construct the decay rule in elapsed days. The initial amount is 240 and loses 9% every 3 days. Let d be elapsed days.

Algebra 1

Exponential Decay 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: 12.5% per step.

A constant retention factor acts twice. Determine the exact fraction lost on each action.

The amount changes from 144 to 100 after two steps.

Your response: _____

Incoming: 36% per step.

What percent is lost during each of the four equal periods? Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

period	**0**	**4**
quantity	256	16

Your response: _____

Incoming: 13%.

Solve for q, then state the percent loss for the update. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Use $250q = 232.5$, where q is the retention factor.

Your response: _____

Incoming: 40% per period.

Determine the constant loss percentage for each of the two equal time intervals. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

time	**0**	**2**
value	400	225

Your response: _____

Incoming: 25% per interval.

Solve for the admissible q and express the corresponding percent loss. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Use $1000q^3 = 729$ with $0 < q < 1$.

Your response: _____

Incoming: $\frac{1}{3}$ is lost per period.

For the positive decay factor q, state the percent lost per step. Use the complete requested model, rate with its interval, or amount with its units and required precision as the matching response. Retain the original time definition and explanation.

Use $250q^2 = 40$.

Your response: _____

Algebra 1

Exponential Decay 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.

Choose the correct factor and state the loss represented by each rejected choice.

The amount loses 0.08% per hour. Choose among 0.92, 0.992, and 0.9992.

Audit the claimed pair and correctly interpret factor 0.23.

A student pairs $a23\%$ loss with a factor of 0.23.

Determine Q_0 and verify it by a forward substitution.

Use $Q(n) = Q_0(0.9)^n$ with the observation $Q(2) = 243$.

Exponential Decay Models

Full Worked Solutions - excerpt

Worked example

Problem. Solve $X(0)(0.8)^3 = 64$ for $X(0)$.

Answer. $X(0) = 125$.

Explanation and check.

Because $(0.8)^3 = 0.512, X(0) = \frac{64}{0.512} = 125$.

Worked example

Problem. A sequence has constant ratio 0.9 and $A_7 = 196.83$. Find A_4.

Answer. $A_4 = 270$.

Explanation and check.

There are three forward factors from index 4 to 7, so $A_4 = \frac{196.83}{(0.9)^3} = 270$.

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

Quadratic Word Problems

Quadratic Word Problems | A1-U09-P12

96 problems · Four activity formats

Topic focus

This topic is a focused set of 96 practice tasks on Quadratic Word Problems.

8 PDFs and a README; 126 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.

Published by Tusils LLC.

Algebra 1

Quadratic Word Problems

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.

A rectangular herb plot has 46 meters of edging. Let w be its width. Build the area function, state its square-meter unit, and give the open domain that keeps both dimensions positive. Match the complete original model with its requested units, meaningful domain and interpretation or verification. The coefficient polynomial alone is not the complete contextual response.

Context	A rectangular herb plot uses all 46 meters of edging on four sides.
Variable definition	w is the width in meters
Length unit	meters
Area unit	square meters

Bank label: _____

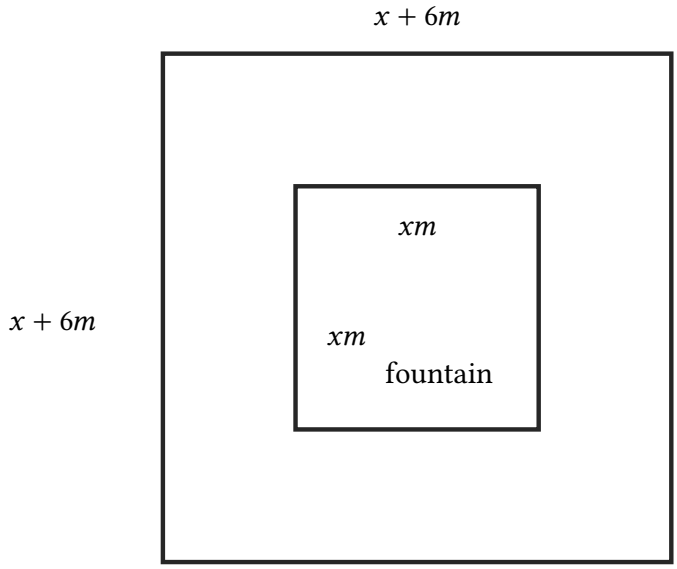
Algebra 1

Quadratic Word Problems

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.

A centered square fountain has side x, and the surrounding square plaza has side $x + 6$ meters. Build the walkable ring-area model by distinguishing the two dependent squares.



Context	A square plaza of side $x + 6$ meters surrounds a centered square fountain of side x meters.
Variable definition	x is the fountain side length in meters
Length unit	meters
Area unit	square meters

Algebra 1

Quadratic Word Problems

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: feasible domain: $0 \le x \le 20$; x is an integer; model: $R(x) = (12 + x)(180 - 9x)$; output unit: dollars

A concert forecast pairs each 2-dollar discount with 16 additional ticket sales, starting from 30 dollars and 240 sales. Model revenue by discount count d and prevent a negative ticket price. Match the complete original model with its requested units, meaningful domain and interpretation or verification. The coefficient polynomial alone is not the complete contextual response.

Context	A fictional concert sells 240 tickets at 30 dollars; every 2-dollar discount adds 16 predicted sales.
Variable definition	d is the number of 2-dollar discounts
Factor relations	price=$30 - 2d$ dollars, tickets=$240 + 16d$
Output unit	dollars

Your response: _____

Incoming: feasible domain: $0 \le d \le 15$; d is an integer; model: $R(d) = (30 - 2d)(240 + 16d)$; output unit: dollars

A table is organized by blocks of five extra tour visitors. Starting from 20 visitors at 28 dollars each, every added block lowers everyone's rate by 1 dollar. Write total income in b and preserve the block-count domain. Match the complete original model with its requested units, meaningful domain and interpretation or verification. The coefficient polynomial alone is not the complete contextual response.

additional blocks	visitors	rate (dollars/visitor)	income (dollars)
0	20	28	560
4	40	24	960
12	80	16	1280

Context	A fictional museum tour charges 28 dollars per visitor for 20 visitors and lowers the per-person rate by 1 dollar for each additional block of 5 visitors.
Variable definition	b is the number of additional 5-visitor blocks
Factor relations	visitors=$20 + 5b$, rate=$28-b$ dollars per visitor
Output unit	dollars

Your response: _____

Algebra 1

Quadratic Word Problems

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.

The exact table has $R(0) = 2, R(1) = 6$, and $R(2) = 14$. Given $R(x) = ax^2 + bx + 2$, recover a and b and verify the row at $x = 2$. Choose a calibration setup: use the known initial value to reduce the coefficient unknowns first, or write the full observation equations and eliminate systematically. Explain which setup is more economical for these data, then complete the original model and verification requirements.

input	output (response units)
0	2
1	6
2	14

Context	A sensor response follows $R(x) = ax^2 + bx + 2$.
Variable definition	x is the input setting
Known initial value	$R(0) = 2$
Measurement unit	response units

For $Q(x) = ax^2 + bx + 5$, the table gives $Q(-1) = 4$ and $Q(1) = 8$. Add and subtract the equations to recover the even and odd contributions. Choose a calibration setup: use the known initial value to reduce the coefficient unknowns first, or write the full observation equations and eliminate systematically. Explain which setup is more economical for these data, then complete the original model and verification requirements.

input	output (calibration units)
-1	4
0	5
1	8

Context	A calibration curve is $Q(x) = ax^2 + bx + 5$.
Variable definition	x is signed control offset
Known initial value	$Q(0) = 5$
Measurement unit	calibration units

Quadratic Word Problems

Full Worked Solutions - excerpt

Worked example

Problem. A model multiplies 2 meters by x centimeters and labels $2x$ as square meters. Repair the unit conversion and area rule.

Context	A panel is 2 meters wide and x centimeters tall.
Supplied rule	area equals width times height
Proposed argument	$A(x) = 2x$ square meters.

Answer. correction: convert x centimeters to $\frac{x}{100}$ meters, so $A(x) = \frac{x}{50}$ square meters; defect: the factors use incompatible length units; evidence: x centimeters = $\frac{x}{100}$ meters, $2(\frac{x}{100}) = \frac{x}{50}$

Explanation and check.

Convert the height before multiplying: x centimeters is $\frac{x}{100}$ meters. The area is $2(\frac{x}{100}) = \frac{x}{50}$ square meters.

Worked example

Problem. A student treats $A(15) = -45$ as a possible rectangular area for $A = x(12 - x)$. Identify the first contextual failure and repair the domain.

Context	A rectangle has width x meters and length 12-x meters.
Supplied rule	$A(x) = x(12 - x)$
Proposed argument	Use $x = 15$ because the algebra returns $A(15) = -45$.

Answer. correction: restrict the geometry to $0 < x < 12$; negative area is not a physical rectangle; defect: x = 15 makes the dependent length -3 meters; evidence: $12 - 15 = -3$ meters, valid dimensions must be positive

Explanation and check.

At $x = 15$ the other side is -3 meters, so no rectangle exists. The correct model domain is $0 < x < 12$; the negative algebraic output is outside that domain.

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.

Published by Tusils LLC.

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.

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.

Published by Tusils LLC.

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.