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.

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Algebra 1

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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: _____

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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

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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: _____

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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

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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.