



Current Algebra PoW

The Math Forum's PoWs provide non-routine constructed response problems. The Algebra problems target concepts typically learned in an Algebra I class. Memberships and mentoring options are available at the individual, class, school, and district levels.

Ancestors - to be posted May 1, 2006

In history class one day, Gene started thinking about his ancestors. He wondered if he was related to any of the famous people from the Middle Ages. That night, he asked his father about it.

"Well," said Dad, "you were born in 1990. Let's assume that there is a new generation every 25 years. For each generation you go back, each ancestor leads to two more since each person also has a mother and father. Does that make sense?"

"I think so," said Gene. "So you and Mom are my two ancestors from the 1965 generation. If I go back one more generation to 1940 there were four ancestors from that generation, who are the parents of you and Mom, or my grandparents."

"You've got it," Dad replied. "Now try the following questions and see what you find."

1. If you go back to 1890, how many ancestors were there from that generation?
2. If you go back to 1790, how many ancestors were there from that generation?
3. Write a formula that will calculate the number of ancestors you have from any year in history.
4. Use your formula to calculate how many ancestors you have from the 1240 generation, during the Middle Ages.

Extra: The population of the world in 1240 is estimated to have been about 400 million people. How do you explain your answer to question 4? Do you think Gene is related to anyone famous from the Middle Ages?



Learn more about the Problems of the Week at <http://mathforum.org/pow/powcharges.html>

Win a t-shirt! In order to enter the drawings for t-shirts, write your answer and an explanation of your solution on this sheet, fill out the green entry card, and staple them together. Return it to Booth 630.

The Algebra Problem of the Week Scoring Rubric

A full-page version of this file is available to the public via the Scoring Guide link at <http://mathforum.org/algpow/>. Problem-specific scoring rubrics, as well as “Expected Solution” documents, are available to Teacher Members who choose to mentor their students’ work using our online environment.

For each category, choose the level that *best describes* your work

	Novice	Apprentice	Practitioner	Expert
Problem Solving				
Interpretation	I do not understand much of the problem.	I don't understand all of the math concepts in the problem. I didn't attempt to solve all of the parts.	I understand all of the math concepts in the problem. I attempted to solve all parts of the main problem.	I understand the Extra question and solved it correctly (and am at least a Practitioner in Strategy).
Strategy	I do not know how to set up the problem.	I picked an incorrect strategy. My strategy relied on luck to get the right answer. I used guess and check exclusively, with no algebraic techniques.	I used a sound strategy and solved the problem with skill, not luck. I used algebraic techniques, including variables, expressions, and equations.	I used two separate strategies or an unusual or sophisticated strategy.
Accuracy	I think I made many errors.	My work is mostly accurate, with a few errors, such as calculation mistakes or using incorrect units.	My work is accurate and contains no arithmetic mistakes. I used appropriate units. I left things in exact form if required.	[not possible for most problems]
Communication				
Completeness	I didn't write much, if anything, about how I found my answer.	I didn't define my variables. I didn't explain where my expressions or equations came from. I showed my work, but didn't explain it. I explained what I did without showing any of the actual work.	I defined my variables. I explained all of the steps taken to solve the problem. I stated any equations and formulas used and explained where most of those equations came from.	I added useful extensions and further explanation of some of the ideas involved.
Clarity	My explanation is very difficult to read and follow.	My explanation isn't entirely unclear, but another student wouldn't be able to follow it easily. My explanation is long and written entirely in one paragraph. My explanation has many spelling, grammar, and typing errors.	I explained all of the steps in such a way that another student would understand. I made an effort to check my formatting, grammar, spelling, and typing, though there may still be a few small mistakes.	My answer is very readable and it looks good! My organization makes my ideas especially clear.
Reflection	These items are reflective:	I showed how I checked my own answer. I explained why my answer is reasonable. I suggested a hint that I would give to another solver.	I connected the problem to another problem or experience. I explained where I'm stuck. I summarized my process.	I explained why I think the problem is easy or difficult. <i>I revised</i> and improved my work.
	I did nothing reflective.	I did one reflective thing.	I did two reflective things.	I did three or more reflective things or I did a great job with two of them.

Teacher Support for *Ancestors*

Each Current Problem of the Week (and consequently many in the library) includes a list of topics, pointers to related resources, and NCTM Standards correlation. This table is adapted from the full online Teacher Support page for this problem that includes links for all of the resources. These pages are available to members at <http://mathforum.org/pow/support/>.

Topics exponential decay exponential functions exponential growth mathematical modeling	NCTM Standards – 9-12 Algebra Reasoning and Proof Problem Solving Communication	Problems Library AlgPoW: The Bouncing Ball AlgPoW: Copying Conundrum AlgPoW: Paper and the Moon	Ask Dr. Math Arithmetic vs. Exponential Increases Exponential Decay Exponential Decay, again Exponential Growth in Dividing Bacteria Polynomial Function and Exponential Growth
Teacher2Teacher Algebra Help FAQ	Math Tools Algebra: Exponential Functions	Other Resources <i>Dr. Math Explains Algebra</i> Graphing Exponential Functions	