Barney's Bakeries

Barney the Baker is opening 4 new bakeries. He has hired 5 new bakers. They are Adam, Betty, Carl, Dan and Ellen. Each baker will spend 1 week baking at each bakery. Only 1 baker works at a bakery at a time. Help Barney plan a training schedule for the 5 bakers. How many weeks will it take for all 5 bakers to train at each bakery?

Barney's Bakeries

Suggested Grade Span
Grades 3–5

Grade(s) in Which the Task Was Piloted
Grade 4

Task
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Alternative Versions of the Task

More Accessible Version:
Barney the Baker is opening 4 new bakeries. He has hired 4 new bakers. They are Adam, Betty, Carl and Dan. Each baker will spend 1 week baking at each bakery. Only 1 baker works at a bakery at a time. Help Barney plan a training schedule for the 4 bakers. How many weeks will it take for all 4 bakers to train at each bakery?

More Challenging Version:
Barney the Baker is opening 4 new bakeries. He has hired 5 new bakers to head up the bakeries. They are Adam, Betty, Carl, Dan and Ellen. Barney wanted each of the bakers to spend an equal amount of time at each of the 4 bakeries during the year, and for each to get a vacation. Only 1 baker works at a bakery at a time. Help Barney plan a work schedule for the year. How long will each baker spend at each bakery? How long of a vacation will each baker get?

NCTM Content Standards and Evidence

Geometry Standard for Grades 3–5

Instructional programs from Pre–Kindergarten through grade 12 should enable students to...

- Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them
  - ***NCTM Evidence***: Represent data using tables and graphs such as line plots, bar graphs and line graphs.
  - ***Exemplars Task Specific Evidence***: This task requires students use a table to make as a scheduling template that will lead to a solution.

Time/Context/Qualifiers/Tip(s) from Piloting Teacher
This is a short to medium length task. If students are able to go right to a solution without having to utilize problem–solving strategies, then this task is not an appropriate problem–solving assessment piece for this child.

Links
This task could link to a unit on cooking or to scheduling.

Common Strategies Used to Solve This Task
Most students will use a chart to solve this task.

Possible Solutions

Original Version:
It will take 5 weeks for each baker to get trained in all 4 bakeries. Here is a sample schedule:

A = Adam, B = Betty, C = Carl, D = Dan and E = Ellen

Week #	Bakery 1	Bakery 2	Bakery 3	Bakery 4
1	A	B	C	D
2	B	C	D	E
3	C	D	E	A
4	D	E	A	B
5	E	A	B	C

More Accessible Version:
It will take 4 weeks for each baker to get trained in all 4 bakeries. Here is a sample schedule:

A = Adam, B = Betty, C = Carl, D = Dan, and E = Ellen

Week #	Bakery 1	Bakery 2	Bakery 3	Bakery 4
1	A	B	C	D
2	B	C	D	A
3	C	D	A	B
4	D	A	B	C

More Challenging Version:
52 weeks in a year
It takes 5 weeks for each baker to work at each bakery for 1 week. 52 weeks ÷ 5 week intervals = 10.4 5–week rotations. Each baker only works 4/5 of the weeks. 4/5 of 10.4 = 8.32 weeks x 5 = 41.6 weeks working and 10.4 weeks vacation.

Task Specific Assessment Notes

General Notes: This task does not lend itself to students needing to use a lot of math language, so the student should not be penalized for not doing so. Most students will rely on creating a chart for problem solving and communication. These should be clear, accurate and well labeled.

Novice: The Novice will show little or no understanding of the task. Reference may be made to the four bakeries or the five bakers, but the solution will not proceed from there. Diagrams will be rudimentary, and will not assist in problem solving.

Apprentice: The Apprentice will show an approach that would work for solving the task, but will execute the approach inaccurately. Work will be fairly easy to follow, but there will be little regard for the audience.

Practitioner: The Practitioner will achieve a correct solution with supporting work. An awareness of audience will be present, and the approach and reasoning will be easy to follow.

Expert: The Expert will have a comprehensive solution that is correct and supported mathematically. Consideration for the audience will be evident. The approach and reasoning will be explained, and the solution well organized and labeled. The Expert will also show a deeper understanding of the task that can be used to extend the solution.

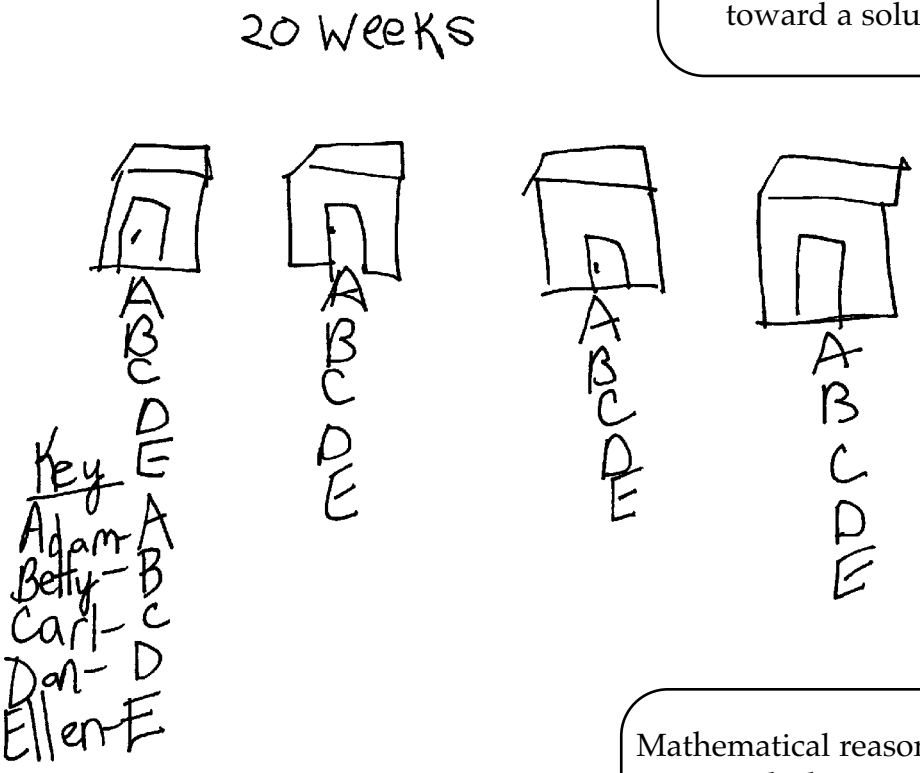
Author

Deb Armitage, Pre–K–8 Mathematics Assessment Consultant at the Vermont Department of Education, wrote this task. Teachers and students in Vermont piloted the task.

Novice

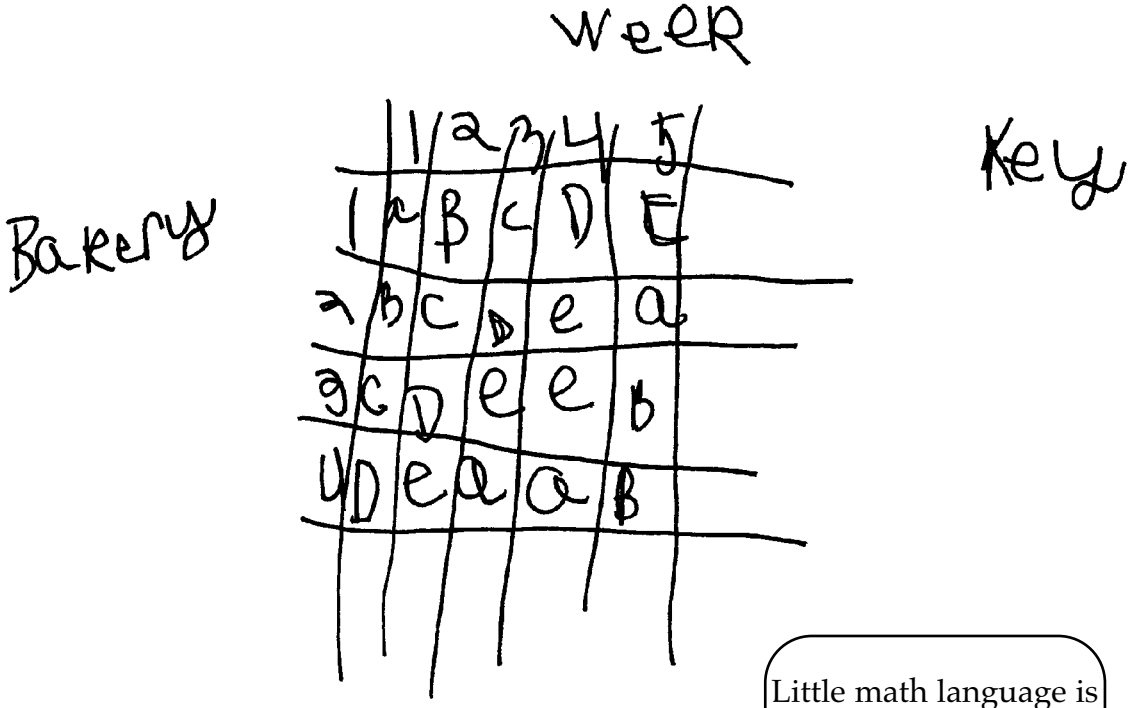
The student demonstrates no understanding of the task.

Diagrams do not assist the student in working toward a solution.



Mathematical reasoning is lacking.

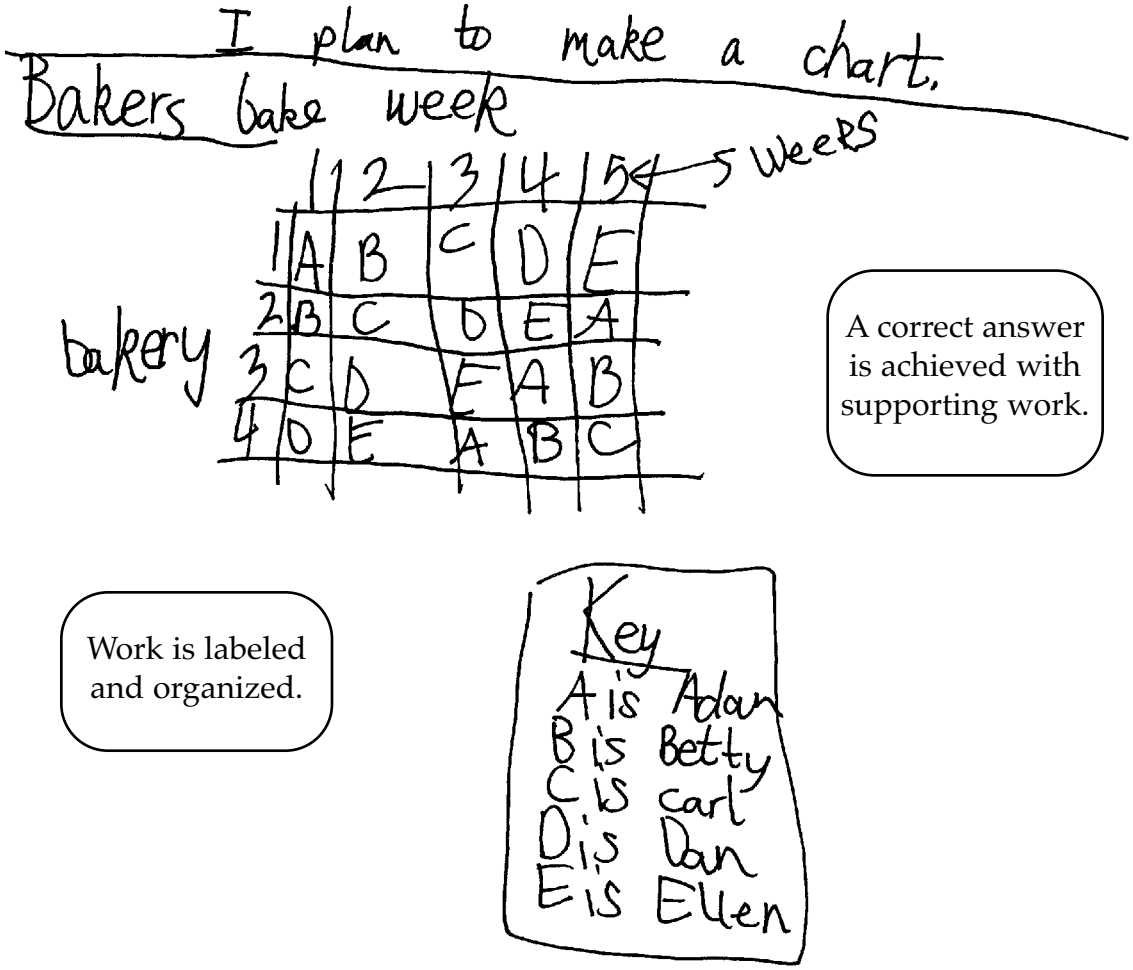
Apprentice



Little math language is used, but work is organized.

The student's approach of making a chart would work, but the student double-scheduled bakers to work in two different bakeries during the same week.

Practitioner



A correct answer is achieved with supporting work.

Work is labeled and organized.

Expert

A correct answer is achieved.

All work is shown and labeled.

5

week

Bakery	1	2	3	4	5
	A	B	C	D	E
	B	C	D	E	A
	C	D	E	A	B
	D	E	A	B	C
	E	A	B	C	D

Key

Adam-A
Betty-B
Carl-C
Dan-D
Ellen-E

same answer - order doesn't matter

Bakery

week	1	2	3	4
1	A	B	C	D
2	E	A	B	C
3	D	E	A	B
4	C	D	E	A
5	B	C	D	E

I need to find out how many weeks will it take for all five Bakers to train at each bakery. I will make a chart to help me. I saw a diagonal pattern Since order doesn't matter there are many possible answers, but all will need only 5 weeks.

Mathematically relevant observations are made. Math language is used to communicate.

The approach and reasoning are explained. Consideration for the audience is evident.