

Return of the Pandas

The giant panda is regarded as one of the world's rarest animals. Although pandas may live as long as 30 years, the important question is whether or not they are likely to become extinct in the near future. There are several issues which may affect this outcome, one being reproduction. The female panda gives birth to only 1 cub every 2nd year.

In China, scientists are keeping track of 4 pregnant female pandas. After a gestation period of 5 months, the females will give birth to their young. Sometimes giant pandas give birth to twins, but the 2nd cub seldom survives. Single births seem to be the rule. When each young female panda reaches the age of 5 years old, she will start a family of her own.

Question:

If scientists keep track of all these pandas, how many will there be in 15 years?

Grade Levels 3 - 5

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Context

We have been studying endangered species. This is an integrated unit that covers all curriculum areas. Most recently we have been learning about why animals become endangered. One issue we have discussed is reproduction rates. The day before this task was given to the children we watched a National Geographic video on the Giant Panda.

This task was done in a homeroom setting, not in a math class.

What This Task Accomplishes

This task allowed children to deal with a meaningful yet complicated task. The culminating activity for this unit of study is a trip to Park Safari, so the children are aware of some of the problems that occur with trying to breed animals in captivity. This task forced children to break down a large task into smaller parts and stay organized.

Mathematically this task encompasses a number of areas children were not very familiar with, such as probability. The children were amazed with their results and how small they were.

What the Student Will Do

Most students seemed to have a fairly easy time understanding that the four pandas had cubs every other year. The part that was difficult for them was the fact that the female cubs had cubs every other year after five years.

We did some group brainstorming of things we needed to know and possible strategies, this

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seemed to help a lot. At first, most children did not try to break the task down into smaller parts; they tried to deal with all four pregnant pandas at once and got very confused.

For the most part, students either used manipulatives set up to be pandas and their cubs or colored markers for different generations.

The students engaged in great dialogue and debated with each other over different strategies and solutions.

Time Required for Task

2.5 - 3 hours

Interdisciplinary Links

This was a great problem to do with our endangered species unit. It made the problem meaningful and the time spent on it covered an array of curriculum areas including math, science and social studies.

I could see this problem being easily adaptable for many different content areas. Although it could be used for probability, I feel the kids need to be truly invested in the outcome to get the best results. It was a long and difficult problem for the third and fourth graders.

Teaching Tips

We started off reading through the problem together and brainstorming things to think about. This included strategies we might use, materials we might want to use and information that was important to keep in mind while solving the problem. I feel this helped kids initially get going in the right direction. Some of the things the kids brainstormed are:

Materials: blocks, beans, dice, graph paper, markers, animal stamps and stamp pads.

Information to remember and questions:

- Baby every second year...what does that mean?
- How many babies in 15 years?
- Pandas live to be 30 and can mate after they are 5 years old.
- 50% chance of babies being male, they cannot have any cubs.
- BUT, cubs may not survive, pandas may not mate, twin pandas might survive.

The kids worked in pairs or small groups if they wanted to, although in the end each group ended up separating. The students worked for about an hour initially and then we regrouped and answered questions and discussed trouble spots, etc.

This second gather or "meeting of the minds" was very helpful for most kids. Children shared things they had discovered and strategies that had worked and not worked for them.

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Suggested Materials

- Graph paper
- Markers
- Dice
- Bear manipulatives
- Coins
- Blocks
- Animal stamps
- Stamp pads

Possible Solutions

The solutions will vary.

There are several things to keep in mind when assessing this problem:

- Pandas have cubs every other year, most often only single births.
- Pandas can mate at five years old and can live to be 30 years old.
- Did the student take into account that some cubs are male and some are female? How?
- Does s/he realize that male cubs do not count for further reproduction?
- Did the student account for all four pandas initially mentioned in the problem?

Benchmark Descriptors

Novice

This piece contains no solution. The student could not make any progress in solving the problem.

Apprentice

Although this student's work is well organized, his/her solution is not complete. S/he seemed to carry out the proper procedure for keeping track of some of the cubs born, but did not follow through for all the cubs born, indicating that part of the problem was not understood.

Practitioner

This student solves the problem using appropriate representation and a clear explanation. S/he explains the reasoning used in an organized way. The actual student representation was color-coded, which made it easy to read.

Expert

This student clearly understood all aspects of the problem. S/he solved the problem in a straightforward way. The explanation this student provides is clear and leaves the reader with no questions about the decisions made.

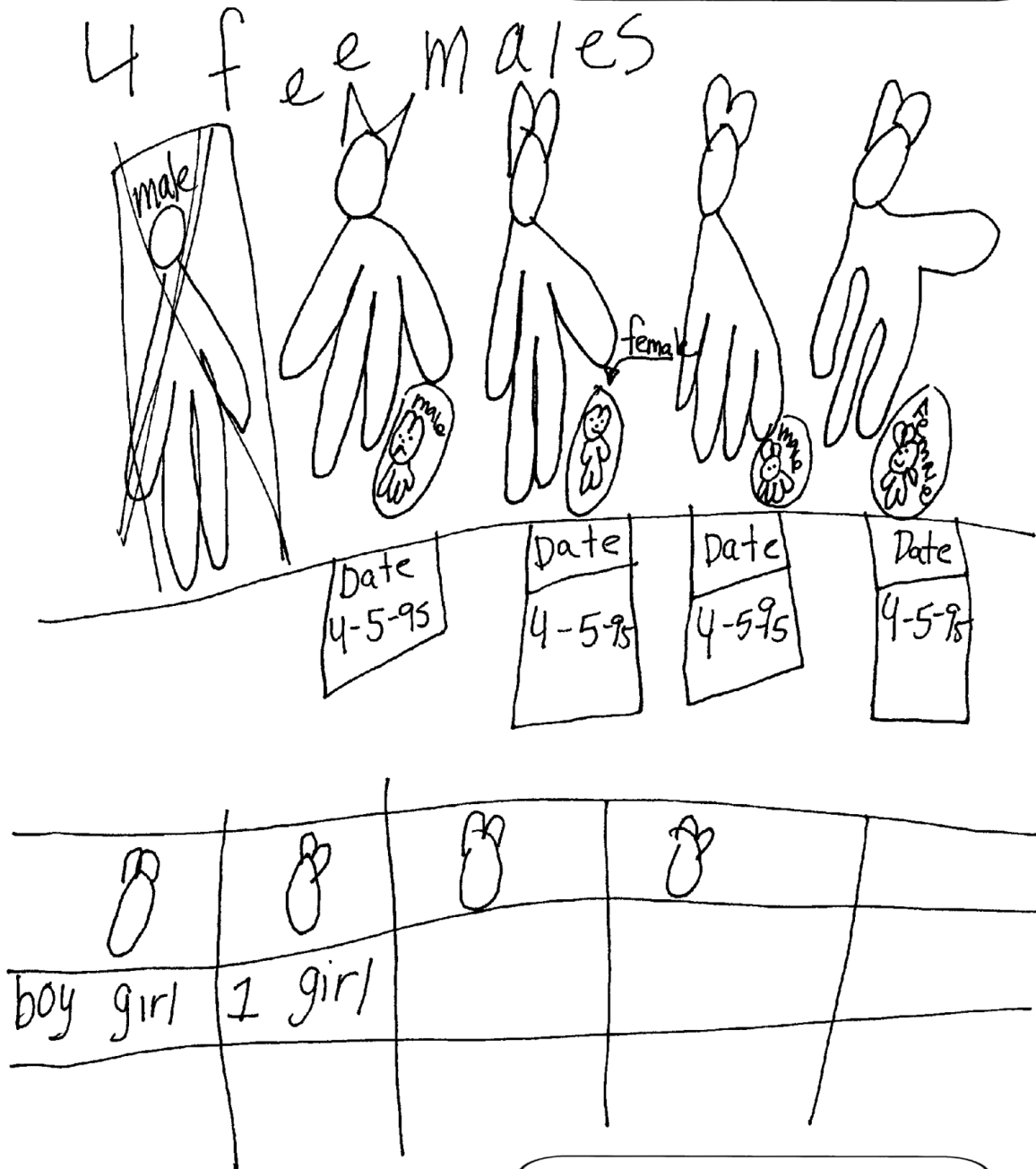
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Novice

The student shows limited awareness of the problem.

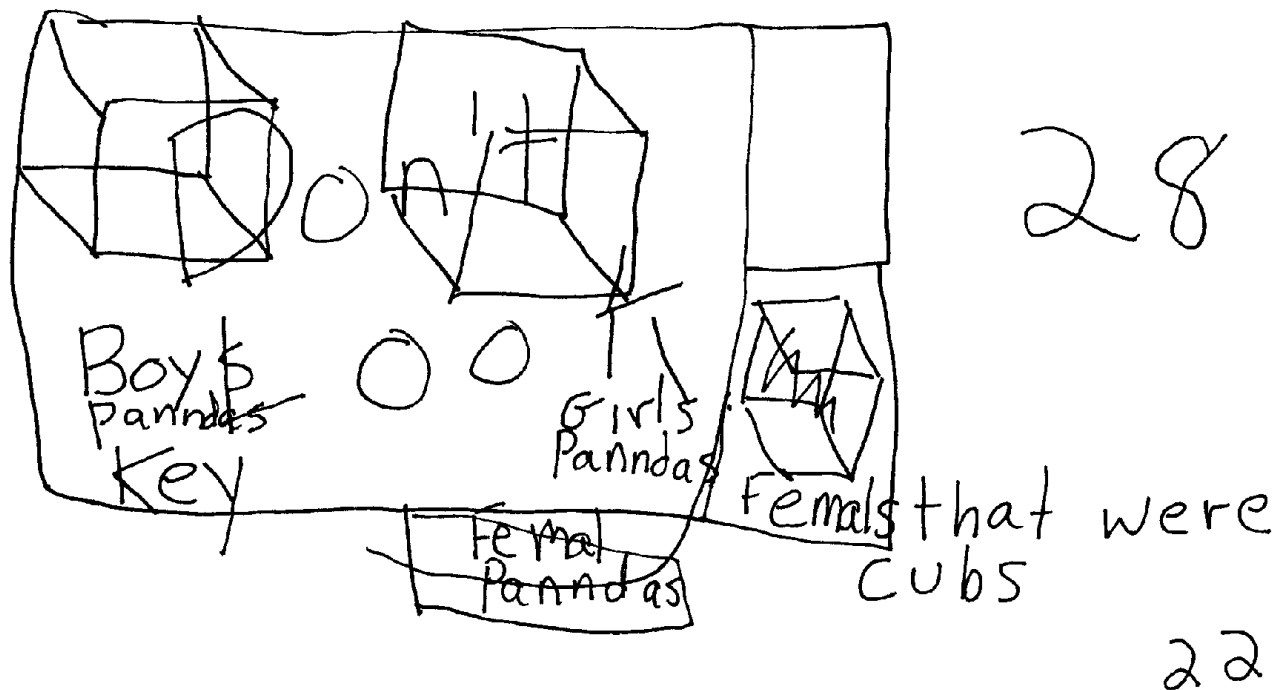
The student is unable to find an approach to begin solving the problem.



The student attempted to create a chart in which to record his/her work.

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Practitioner



$22 \times 4 = 88$ because $4 \times 2 = 8$ and $20 \times 4 = 80$

The student uses accurate and appropriate math language.

KEY

- MOM
- = BABY

(The Mom's and babies can be any color)

F = Female

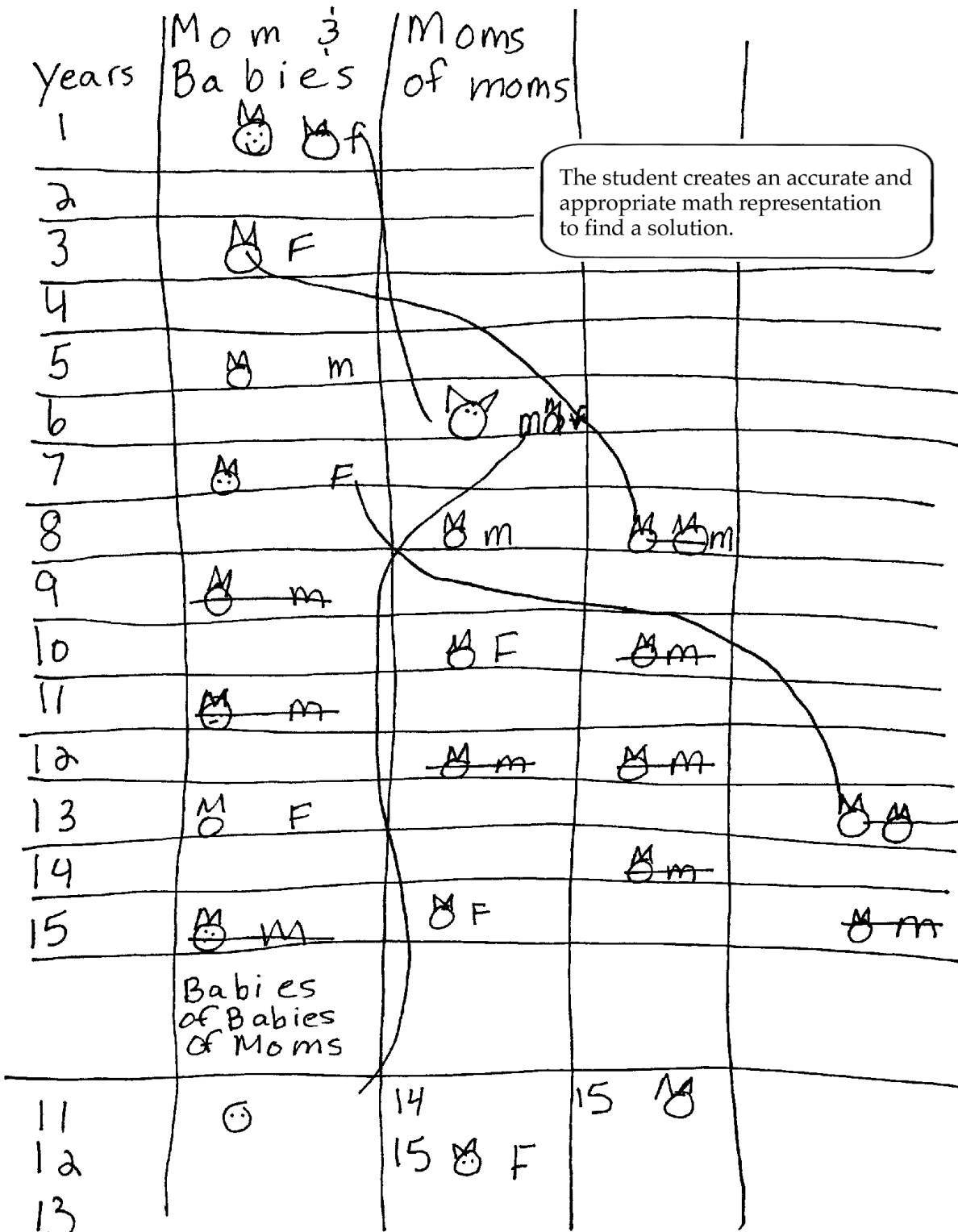
M = Male

The student explains his/her approach and reasoning.

1. I made a chart that showed how many babies one Mother Panda had and how many babies her babies had.
2. Then I decided that if I would roll a dice and if it was even then the baby was a girl if the dice had an odd number it was a boy.
3. Then I went back and multiplied 22 by 4 because that is how many babies one mother and her babies had and because there were 4 mothers instead of 1.

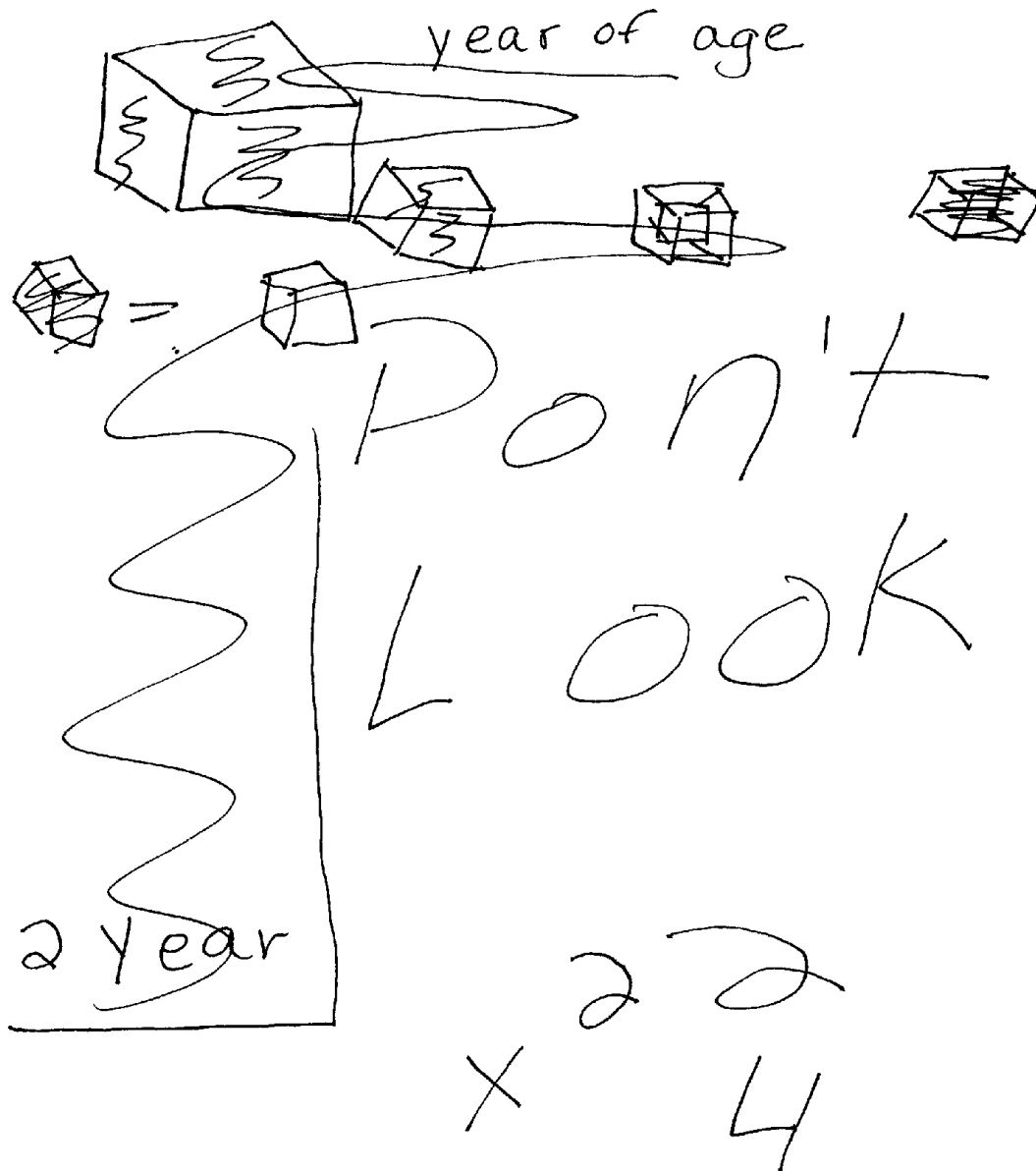
Exemplars

Practitioner



Exemplars

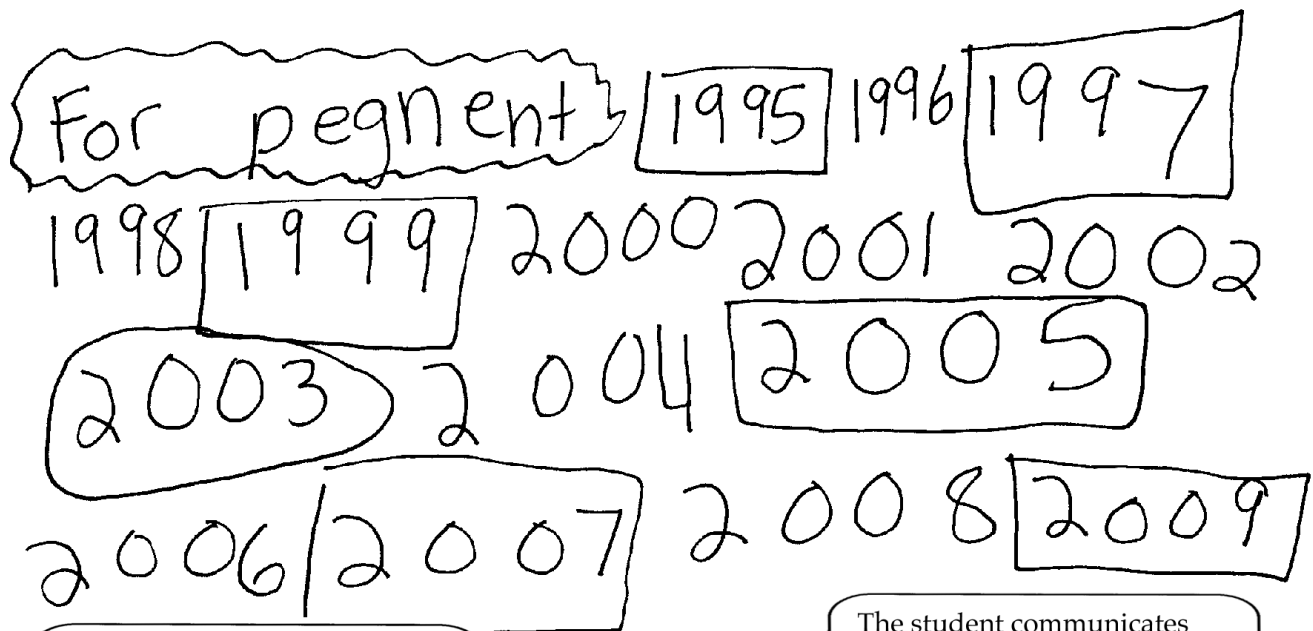
Practitioner



$$\begin{array}{r} 4 \times 2 = 8 \\ 4 \times 20 = 80 \\ \hline 88 \end{array}$$

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Expert



The student uses a sophisticated strategy for determining the sex of the pandas.

The student communicates using accurate and appropriate math language.

The student explains his/her approach and reasoning behind decisions.

I made a chart to keep track of one of the four pregnant pandas and her babies for 15 years and then multiplied the total number of pandas by 4 because there were 4 adults at the beginning of the problem. To solve the problem I rolled two dice. I decided that all pandas had only one cub at a time and the dice helped me decide if the cubs were boys or girls. If the sum of the dice was even, the cub was a girl. If the sum was odd it was a boy. I counted the total number of babies and the mother after 15 years, it was 31. I multiplied 31 by four and got 124.

This assumes that all pandas survived and mated whenever possible.

Exemplars

Expert

