Math Investigation

Sarah Tedford

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My first step to solving this problem was writing down the questions, and then thinking about them. There were a few ideas that came to mind for answering the first question. The first one was the Pythagorean Theorem, then I decided to look at the problem solving strategies we learned about in class to see if it seemed like Small Number could have used any of them to come to his answer. While looking at these problem solving strategies, I found connections to estimation, which is another method Small Number could have used to get to 5 metres. I also used some of the problem solving strategies in my answer for the second question.

1. Why did Small Number think the posts were five meters long each?

Pythagorean Theorem

* A2 + B2 = C2
* His grandfather estimated that it was 8 m across the pithouse, and the fall from above to the ground of the pithouse was 3 m
  + This leaves the posts for the roof that Small Number thinks are 5 m long
* When using the theorem, you get:
  + 32 + 42 = C2
    - The second number is a 4 because 8 m is across the whole floor, but this triangle only uses half of that.
  + 9 + 16 = C2
  + 25 = C2
  + √25 = √C2
  + 5 m = C

5m

3m

5m

3m

4m

8m

4m

After doing some more thinking about this problem, I realized that it is unlikely that Small Number used this method because he did not have anything to write with or calculate with when he fell. It is possible that he did a very quick calculation in his head using the estimated numbers, if he was very good at math or at eyeing measurements and estimating, but this is not the likely answer.

Problem Solving Strategies

Next I looked at some of the problem solving strategies that children may use when trying to figure out answers to their math problems. There are many different strategies that can be used, however, I mainly looked at few I thought were more likely to be used that the others.

* Existing knowledge
  + Small Number may have looked at the posts of the pithouse and compared the length to something he already knew the length of, or to something that looks about the same size.
  + Comparing to something that he already knows and is familiar with can be very useful, even if he does not know the exact measurements, having a close idea makes the estimation easier and closer to the actual answer.
  + He could have compared the posts to:
    - His height or the height of his family members
    - Trees
    - His house
    - A metre stick (may know the approximate length from school)
    - Some totem poles can be 5 metres tall, so Small Number is likely familiar with heights of different totem poles.
    - If he knew the Pythagorean Theorem and recognized that he could make a triangle with the ground and the poles, he may have used the estimated numbers of 3 m and 8 m to solve the triangle.
* Draw a diagram or make a model
  + This could have worked, but I do not think Small Number used this strategy because I do not think he had any resources to write, draw, or make a model with when he fell in the pithouse.
* Guess and check
  + Since there were likely no ways to measure the posts after falling in the pithouse, Small Number could have also guessed at the measurement, and then used his grandfathers estimates to compare to.
  + Once again, if he knew the Pythagorean Theorem, he could have guessed the measurements, and then checked them using the mathematical calculations.

One other method that Small Number could have used to come to his answer of 5 metres is estimation. Estimation is connected to both of the strategies I have already discussed. For the Pythagorean theorem, his grandfather estimated the measurements of 8 metres across and 3 metres down, so those may not be the exact measurements, but they are likely close. He would have had to come to those numbers from some prior knowledge of what those lengths look like. Since proper and exact measurements were not done and could not be done after the fall, Small Number likely used estimation to get his answer. Estimation is also connected to the problem solving strategy of existing knowledge. Being familiar with the size of an object and connecting it to the size of another object, allows you to make a very close and accurate estimate, as you may know the exact size of something similar. As well, the strategy of guess and check uses estimations that you then check to find out how accurate the estimates are.

Another resource I looked at when thinking about this question, is the document with the Curricular Competencies for Kindergarten to grade 9. We were not told exactly how old Small Number is, but he would have either already learned some of these competencies or he would be learning them now. Some of the competencies are:

Reasoning and analyzing

* Estimate reasonably
  + He would likely have learned how to estimate reasonably, and use prior knowledge to make good, reasonable estimates.
* Develop mental math strategies and abilities to make sense of quantities
  + If he used the Pythagorean theorem, Small Number would have most likely done it using mental math, as he did not have resources to write down the calculations.

Understanding and solving

* Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
  + Whether he estimated, calculated, or compared the posts to something, Small Number showed mathematical understanding by solving the problem of the length of the posts.
* Engage in problem-solving experiences that are connected to place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures
  + This story and problem are connected to First Peoples communities and different aspects of their culture. The pithouses are something that has been around for a long time and ancestors have been building them for years. When Small Number was figuring out the measurements of the posts, he was engaging in problem-solving experiences.

Connecting and reflecting

* Connect mathematical concepts to each other and to other areas and personal interests
  + He connected the numbers and measurements to a real life situation, which is an area outside of math class.
* Incorporate First Peoples worldviews and perspectives to make connections to mathematical concepts
  + Using mathematical concepts to connect to and find information about a First Peoples pithouse.

From all of the information and strategies I looked at during this investigation, I believe that Small Number came to his answer of the posts being 5 metres long using the problem solving strategy of existing knowledge, combined with estimation. There are objects all around us that have different measurements, so it would be very possible that Small Number has come across something that is 5 metres long, and would therefore be familiar with that length and would be able to make a reasonable estimate for something that is close to that length.

2. I wonder how our ancestors knew how many posts they needed to build the roof?

For this second question, I did not use any mathematical calculations to come to my answer. However, it does connect to the problem solving strategies discussed earlier. Indigenous ancestors have been building pithouses for a very long time. This means that they have had lots of experience with building them. Indigenous people have a deep connection to nature, and therefore have a lot of knowledge about it. This provides them with information on which materials would be the best to use for building, and also on how to build the structures.

At the beginning, a long time ago, when their ancestors were first learning to build the pithouses, they would have likely used guess and check, or trial and error to figure out how many posts they needed and to find what would work best. Once they figured it out, they knew what worked and continued to build them in this way. This is a part of Indigenous culture that has been passed down through generations, and the knowledge on how to build them will continue to be passed down. They would have needed to use estimation for the measurements to find the correct height and length they needed. Also, estimation along with trial and error would have been needed to discover how much weight the materials they chose to use could hold.

Another area that the Indigenous ancestors would have gotten knowledge from is tents and tipis. These structures show and teach that in order to stand up and be well supported, they need more than two posts holding the shelter up. Using at least three to hold it up and open is necessary, but the more posts used, the more supported the structure is.

Another idea I had was that perhaps Small Numbers grandfather answered this question with “our ancestors had their ways” because he was not entirely sure on the answer himself. I am sure he knows how to build them, but he may not know exactly how it all began and how they first figured out how many posts were needed.

Reflection

I found this investigation assignment interesting. I have never done an assignment like this before, where we have to show why we believe someone got the answer they did. It is not the typical math problem because we are not solving any problem in order to come to a concrete answer. However, I like it because we are able to play around with different ideas and methods, and show what we are trying to work with. I also think this is a great assignment for us as future educators because we are required to think about how a child might be thinking about a problem, and what methods or strategies they might be using to try to solve it. This will be a useful skill because our future students will learn in different ways and therefore use different strategies to solve problems. We may need to think about the problem in a different way and look at different methods to understand how the student solved it or got their answer, and help them in a way that works best for them.

When working on this assignment, I sometimes felt that I did not know where to start or where to go from where I was. Since there was not much guidance as to the method or strategies we should look at, I found myself stuck a couple of times. I had to stop and think and then I decided to look at the video and question again. I also thought about what we have discussed in class, and went back to look at some of those resources, which helped me keep working.