Olympic Trophy Design

Midtown Middle School had been chosen to host the first ever, Annual Mathematical Olympics. Teams of students from all across the state will gather and test their mathematical skills as they vie for the grand prize trophy.

Ms. Maple's middle grades math class has been charged with the task of selecting a design for the grand prize trophy. They know that they want it to be a thing of beauty, able to stand beside the sports trophies in any school's awards showcase, and make the winning math team proud! They also know that they want the trophy topped with a replica of a typical middle grades mathematician.

They are coming to you for help since they want to be certain that the replica is correctly scaled and looks just right atop the trophy.

Using what you know about body proportions and trophies you have seen, please submit a plan for the trophy so Ms. Maple's class can choose a winning design. Be sure to let the class know about the decisions you made in coming up with your design. Who knows, maybe they will learn something from you.

Grade Levels 6 - 8

Olympic Trophy Design

Midtown Middle School had been chosen to host the first ever, Annual Mathematical Olympics. Teams of students from all across the state will gather and test their mathematical skills as they vie for the grand prize trophy.

Ms. Maple's middle grades math class has been charged with the task of selecting a design for the grand prize trophy. They know that they want it to be a thing of beauty, able to stand beside the sports trophies in any school's awards showcase, and make the winning math team proud! They also know that they want the trophy topped with a replica of a typical middle grades mathematician.

They are coming to you for help since they want to be certain that the replica is correctly scaled and looks just right atop the trophy.

Using what you know about body proportions and trophies you have seen, please submit a plan for the trophy so Ms. Maple's class can choose a winning design. Be sure to let the class know about the decisions you made in coming up with your design. Who knows, maybe they will learn something from you.

Context

This assessment task followed several measurement lessons where students practiced linear metric measurement by measuring themselves, making "half-sized me" cutouts on newsprint and "micro-me" sketches on index cards.

What This Task Accomplishes

I wanted to see if students were internalizing the skills needed to use ratio and proportion to create scale models. They had to scale their body measurements down to a figurine that would fit atop their trophy. Further, they needed to scale the entire trophy down to fit on 8 1/2" x 11" paper.

What the Student Will Do

Students should be expected to use prior knowledge gathered from the "micro-me" lesson to create a scale model figure for the top of the trophy. My students spent a fair amount of energy designing the actual trophy based on observation of school sports trophies, consideration of the size of the school's trophy case, and their thoughts of what a "typical middle school mathematician" looks like.

Time Required for Task

Most students spent between three and four hours working on this task. We devoted two, 45-minute classes to this task, and then kids worked during independent study time to complete the write-up.

Interdisciplinary Links

This task could easily be incorporated as a part of a unit on sports. With the Summer Olympics coming up, many teachers are planning such units. Kids could design a trophy for a particular sport they are studying. You could also do this at Academy Awards time, requiring students to create an "Oscar®"-type award for the best performance in a problem-solving event.

Teaching Tips

Students need basic skills in creating scales, ratios and proportions, prior to undertaking this task. Borrowing samples from the school trophy case helped students get some idea of what a "Grand Prize" trophy might look like.

We talked about the fact that any props on the trophy also needed to be made to scale, e.g. pencils and calculators held by the figurines.

Suggested Materials

- Measuring tapes/meter sticks
- String
- Newsprint paper
- Graph paper
- Calculators
- Samples of trophies

Possible Solutions

Most students used a ratio somewhere between 1:12 and 1:16 to scale their body measurements to the mathematician on the trophy. They then reduced the actual trophy by half or one third to fit it on the paper. Some students drew the actual trophy size, although this would not be a very impressive trophy!

Benchmark Descriptors

Novice

This student seemed to understand that the task was to create a trophy. However, one wonders what "guy" was measured. Why is the scale 26 cm if the "guy" is now 6.5 (not 6.75) cm after he was reduced to "half-sized"? There are no labels on the representation to offer any clues. The scale is improperly written. There is not enough evidence of mathematical reasoning for the

reader to understand what was done in solving this task.

Apprentice
The student gives a scale for downsizing the trophy to fit the paper, but does not address the scale for creating the mathematician replica. This student selects the trophy size based on what is easy to draw, rather than what would make an impressive award. There is evidence of mathematical reasoning and understanding in the reference to halving to create a scale and the correctness of the scale 1 cm = 2 cm being equivalent to half. The representation has labeling, perhaps too much, but the scale is not properly identified. The student uses minimal mathematical language in this piece.

Practitioner
This student understood the need to downscale a middle school person to an appropriate size for the trophy top. There was also an understanding of the need to further downscale the entire trophy to fit on the paper. There is sound reasoning behind the choice of model for the replica. The student used the 1:16 scale to downsize the props on the trophy, too. This student makes the connection from this task to the last one done in class and utilizes skills from one to apply to the other. The explanation of the solution is clear. An appropriate mathematical representation is used on page three. There is good use of mathematical language throughout the solution.

Expert
This student took seriously the charge of representing the typical middle school mathematician and actually measured several students and found an average height to use as the model for measurements. The student gave thought to the relationship of the figurine to the overall trophy size and incorporated this into the design. The student does an excellent job of explaining exactly what was done at every step of the way. There is no need for the reader to infer how and why any decisions were made. The mathematical language is precise and the mathematical representation is carefully done and accurately labeled, with all parts appropriately scaled. It is obvious that this student was engaged and had invested much thought, time and energy, as well as mathematical knowledge in completing this task.

Novice

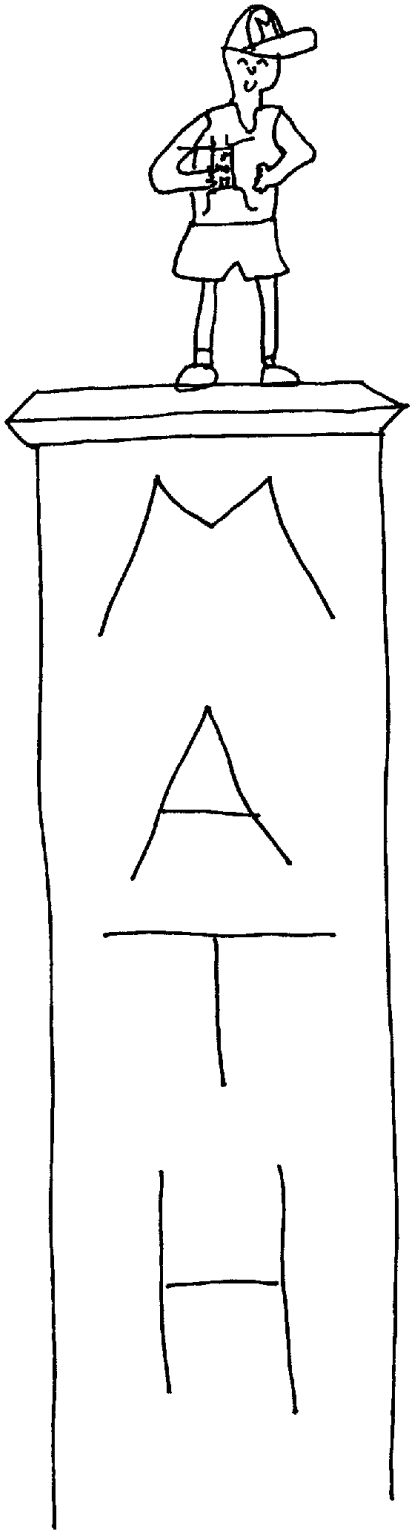
My scale is 26 cm =
My guy is 6.75 cm big

What is this scale for?

Scale 26cm= What? "My guy" is really 6.5cm tall. What does "did him half sized" mean?

I mechered my guy and I did him half sized and now he is half the size of my trophy.
Scale 1cm = 2 cm

Novice



Olympic Trophy Design

Apprentice

1cm=2cm scales trophy to fit paper but does not address scaling down person.

I Know So far that I need to make a replica of a real trophy that we make and it has to fit on a 8 By 10" piece of paper and the real thing has to fit in a trophy case, which is 91cm tall. I also have to have a scale.

I need to Know how Big it's going to Be, I need to Know the scale.

first, I decided how Big I wanted the real one to Be, 50cm. I cut it in half and then it would fit on the 28cm piece of paper. So my scale was 1cm = 2cm. Then we drew the real trophy on Big paper, and we then divided the sizes of every-thing By two which will cut the real sizes in half then it will fit on the paper and it will be a replica.

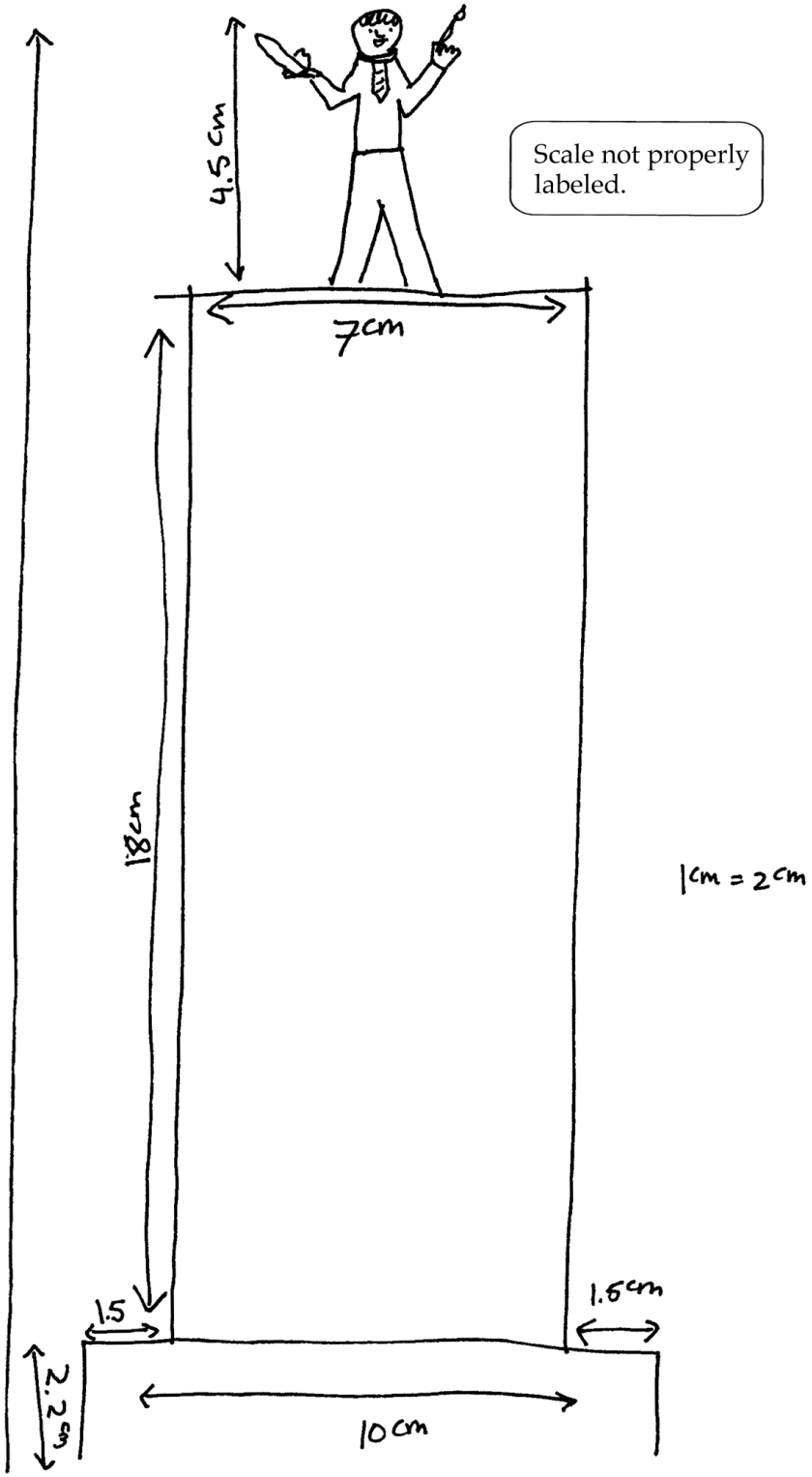
I chose to have the real trophy to Be 50cm tall Because then I just cut it in half

Student needed a scale for the mathematician but does not use one.

Apprentice

and the scale would Be 1/2.
So what if a girl won.
then there would have to Be
a girl on top/and the trophy
would Be wrong.
I decided how Big I wanted
It on the real drawing then
dawn Scaled it to fit on the
Piece of Paper.

Apprentice



Olympic Trophy Design

Practitioner

Good choice of "average" or typical model for replica.

Olympic Trophy Design

In this task I was asked to submit a design for a trophy which will be awarded to the team who wins the Annual Mathematical Olympics. I know that Ms. Maples Middle Grades math class has been choosen with the task of choosing a design. They want it to be a thing of beauty, that can make the winning team proud. Also, the class wants a replica of a typical Middle Grades Mathematician on the trophy. What I need to know what the trophy is going to look like. Also I will need to know the height, width, arm length, etc. of the Mathmatician replica.

For the trophy I just made a base that was bigger than the trophy part so the trophy wouldn't tip over. For the replica, I took my height and down sized it so it would fit on the trophy. I picked my height because in August I went to the doctor's and I am the average height for kids 12 years old. I also had to down size the trophy so it would fit on the page. I was going to make the stand a replica of a calculator, but I

Practitioner

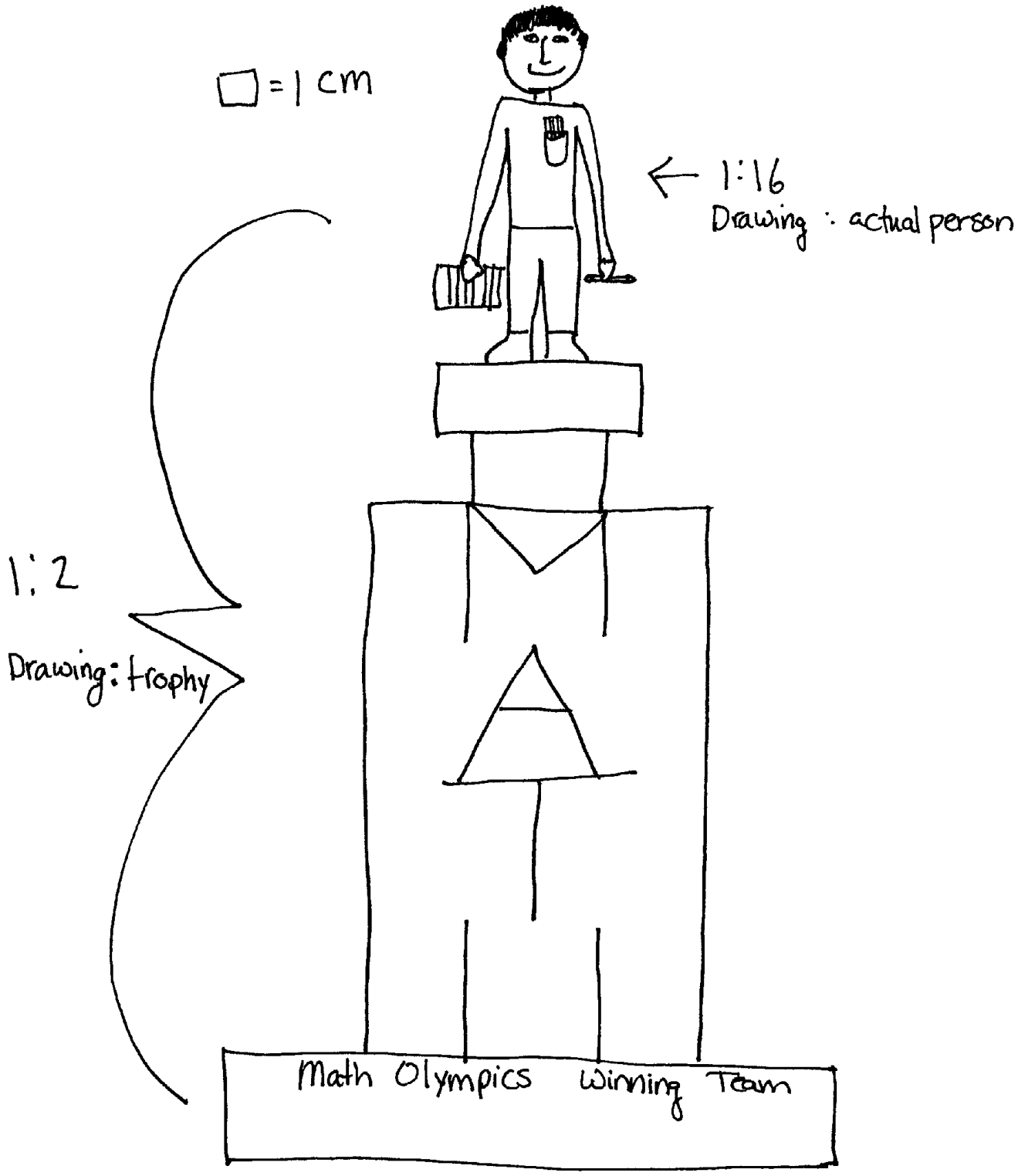
Makes the connection between scale and ratio.

I would have had to up size the calculator when I was already down sizing my height so I decided to just stick with downsizing and not do the calculator replica. In the Mathematician's hands there is a pencil and paper. Also in his pocket there is a calculator in it. On my model one grid square is equal to one centimeter, and the scale on my model is 1cm equals 16 cm on my body. The ratio is 1:16 (sketch:body).

I thought that this math task was very fun to solve and enjoyed it a lot. This problem is a bit like the micro-me problem we had to do. The micro-me problem was that we had to draw ourselves down sized to proportion to fit on a 5x3 note card. That was also very fun.

Connects to other mathematics.

Practitioner



Olympic Trophy Design

Expert

Excellent reasoning in finding "typical" model.

Good reasoning on selecting size for trophy in relation to statue.

Olympic Trophy Design

I know that I need to come up with an idea for a math trophy with a to scale replica of a typical math student of the middle grades. To do this problem I had to find out exactly what size a middle grade student might be. That is exactly the first step I took in this problem. To do this I took down the height of several other classmates. Then I found the average height of a middle grade student, by finding the total of each kids height put together then divided that by the amount of students I had listed. The average height that I got was approximately 5 feet tall. The next step I took was to find a person that was really close to the average height. Then take down all of the proportions that I needed to make my sketch. The next thing that I had to do was to down scale those proportions so that it would fit on top of a trophy because it would be rather tough to find a 5 foot person on top of a trophy. To down scale this person I had to take all of the proportions and divide them by a number that would make the person small enough to fit on my trophy the number that used was the number 14 when I divided my persons height by 14 my person was about 11 centimeters that would be the perfect size for my replica. So the scale I used was 1:14 scale that means that one centimeter on my drawing was equal to 14 in real life. After I finished all of that, I had to make a trophy base to place my replica on. Some of the things that I had to think about while doing this was to make sure that I had a wide enough base of the trophy. I was almost finished all I had to do was label each main part of the trophy so that if they did decide to use my idea they would know exactly what size to make it.

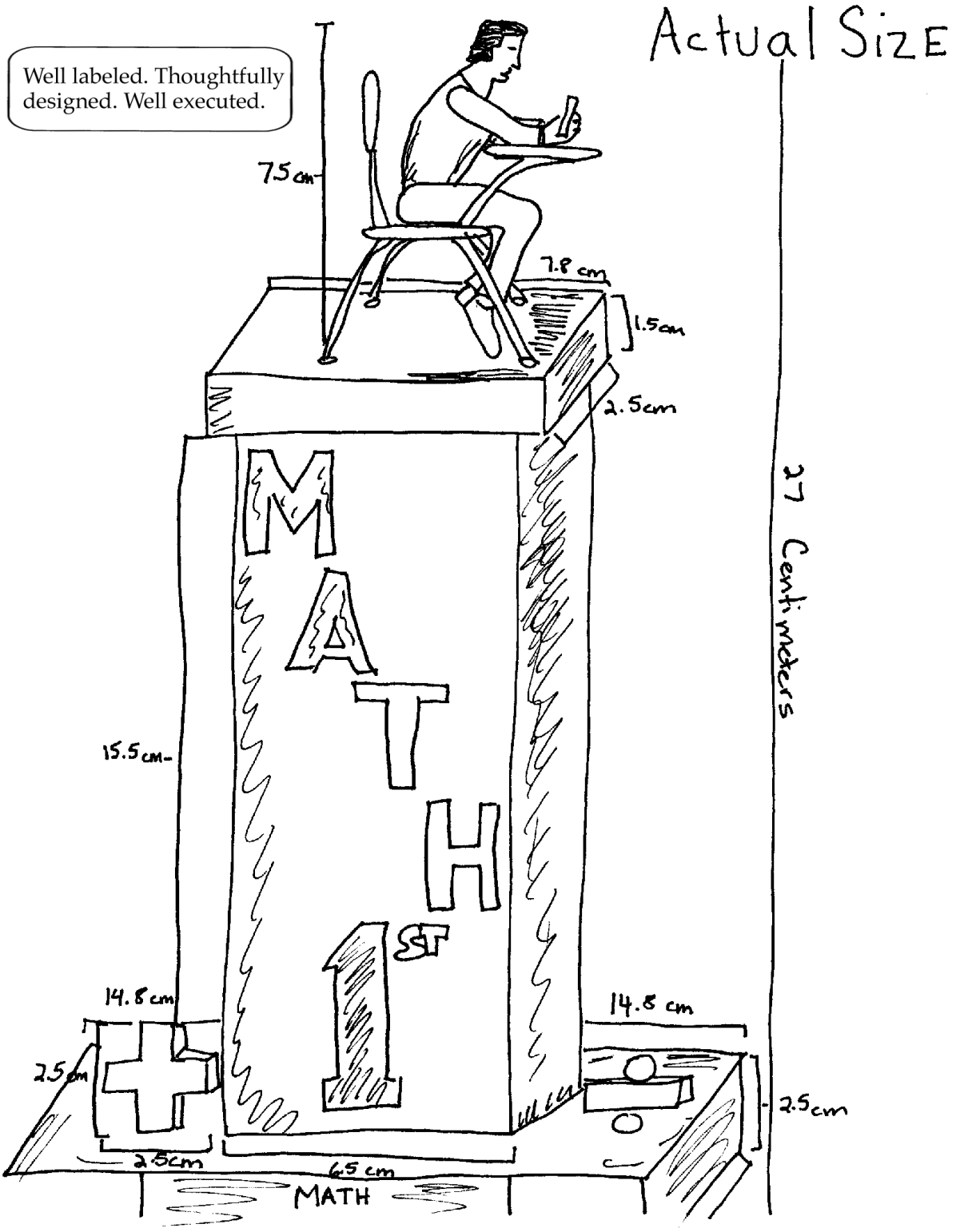
In conclusion the most tricky part of this task was to draw the replica to scale and not to make it look funny with extra long legs or arms. These skills that I learned in this task would be very useful to me when I am an adult because I am hoping to be an architect since I really like to draw things out and work with

Expert

computers. If I go into that profession these skills will be handy when I need to down scale or up scale things to make blue prints. These skills will be handy in my life today when I need to make school projects of famous buildings or land structures the windows and doors would fit the size of the building.

Connects task to real life in present and future.

Expert



Olympic Trophy Design