

Day 1: Tennis Ball Challenge

Go through guidelines of communication in mathematics.

- Explain your thoughts fully.
- When possible use diagrams, pictures and mathematical expressions to help explain your ideas.

Math Experiments:

- Math experiments is the process of conjecturing and testing mathematical ideas. Experiments test ideas that the student has and do not always have to get the “right answer”. Instead experiments help you to think about the question and through experiments a student can develop his or her mathematical thinking abilities. This section may include calculations to determine different quantities. It may include diagrams or drawings which help to visualize the situation under study.

Thinking (Math Explanation):

- Math experiments show the calculations involved when dealing with a problem, but often cannot capture the reasoning or processes involved in solving the problem. A main goal of this instructional unit is to improve mathematical communication. It is essential that the students practice explaining “why” and “how”. Students should explain their reasoning and why they made certain conjectures. Explanations need to be clear. Students should be ask to review their explanations asking the following questions:
 - o Am I clear? Where do I need to clarify?
 - o Would this argument convince someone else?
- Students should also feel comfortable to explain ideas where they are unsure. What are the particular parts to the problem that confuse them? Why are there contradictions in their work? What questions does the student still have?

Hand-out the Tennis Ball Challenge Preview Sheet. The teacher may wish the students to use their own paper. This would allow students to explain their thinking as thoroughly as possible without the page restraints that may accompany a handout.

Note: Often questions are not printed on the student handouts, but should be placed up on an overhead or whiteboard by the teacher. The reason is that the students should think about each question thoroughly. Often students see a worksheet as a number of questions that should be completed as quickly as possible. By providing only one question at a time, students are invited to think and explain their ideas with more mathematical rigor.

In the first page:

- a) Estimate the height of the tube in centimetres and estimate the distance around the tube in centimetres.
- b) An estimate is not just a guess, it involves thoughtfulness. Describe your thoughtfulness or the thinking you used to make your estimate.
- c) Using your estimates, by what percent is the height of the tube larger than the distance around the tube? (Teacher’s note: most students will guess the height to be larger. This hypothesis may lead to contradictions later which help promote mathematical thinking).

In the second page:

- a) Imagine you were given only a ball and the tube. Describe what methods you could use to answer the question comparing the height of the tube to the distance around the tube.

Tennis Ball Challenge – Preview

a) Estimation (Math Experiments)

b) Thinking/Reasoning (Math Explanation) – Convince someone else!

c) Percentage

Math Experiments:

Thinking (Math Explanation)

Thinking about your method:

- a) Method: Math Experiments and Thinking

Tennis Ball Challenge:

By what percentage does the height of the tube exceed the distance around the tube?

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

Up to **100 points** will be awarded for a clear and precise solution.

Different resources and their costs:

A tube just large enough for three tennis balls	30 points
A tennis ball	10 points
A cloth measuring tape	10 points
A ruler	5 points
A 1-meter string	5 points
Pencil, paper and calculator	Free

Describe your choice of items and why.

Describe your method. Why does your description deserve 100 points for clarity and precision?