

Introduction to Mathematical Modeling

Professor:

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OFFICE: DUKE 209

Project 1

Question: How many ping pong balls will fit in a University of Redlands classroom? Your goal is to build a model that answers this question as accurately as possible for any classroom and then applies the model to our classroom.

In your write-up:

1. Make sure you look at the Project Checklist and include all of the important sections: Introduction and Formulation, Results, Discussion and Conclusion.
2. Describe your thought process, different models you may have tried to begin with and why you chose your model, measurements made (table of parameters), equations used and why they work, and how your final calculation was obtained when you apply the model to our classroom. What assumptions are you making about objects in the room, how the balls fill the space, and the physics of the space.
3. Define variables **clearly and write down a general equation that can be used in any classroom**. Be sure to explain the solution in diagrams, words, AND symbols. You should include drawings where appropriate, such as a diagram of the room with measurements or sketches of volume for strangely shaped objects.
4. Discuss the error in your model. If some of your assumptions changed how much would your final answer change? Give upper and lower bounds to better define your error. For example, what if you under/overestimated the size of the ball by 10% vs. what if you under/overestimated the size of the furniture in the room by 10%. Discuss how you would change your assumptions if you had unlimited resources.
5. Discuss the level of accuracy of your model as a function of the resources available. How might you use more resources to improve your model still further? What would be the cost (in terms of time and labor) of increasing the level of accuracy in your model?

DUE DATE:

NOTE:

In class we discussed possible solutions to this problem, one a complete guess and one with 5 minutes of “modeling”. Your job now is to refine your model, or create a new one, using more resources and with much greater accuracy.

Now that you have a longer time frame than we had in class, a much higher level of accuracy is expected. You should carefully choose and defend your assumptions. If you find yourself making assumptions because you don’t feel like measuring something or it would just make the calculations super easy, it’s probably not a good assumption. Remember **there is not a single correct answer, if you ask me what the answer is I will say “I don’t know!”**

HOW TO HAND IN YOUR PROJECTS:

1. Save the final version of the project as a .pdf. This often means you need to export the document as a .pdf. The final name should read:

FirstLast_FirstLast_FirstLast_Project1.pdf

where you replace FirstLast with the first and last names of the group members.

2. Every member of the group should proof read the final version of the project before it is submitted and check that everything shows up correctly.
3. Submit the file on Canvas.
4. Do the Self Assessment. (worth 10 points)

Your project will be considered incomplete until all of these things are done. Links for the Google Drive and Self Assessment can be found on our course website.

NOTE: Math Modeling Open Lab, Wednesday from 6-8pm, Duke 209 and in the hallways - BE THERE!