

General Characteristics of Good Problems for Undergraduate Research in Mathematics and Computer Science

The research problem is of interest to the students, the mentoring professor, and the mathematics community; that is, it has potential to be published.

The undergraduate student needs a limited amount of background material to understand the research topic and begin working on the problem. This does not mean that the topic cannot be in an advanced area of mathematics, but if it is then the topic can be reduced to essential material that the students can grasp quickly.

The research problem is more of a specific and concrete nature rather than a general theoretical and abstract nature.

The research problem leads itself to explorations by computations or by creating specific examples or by using a computer. So the undergraduate student can begin by exploring several examples to get an intuitive feel for the area, then make a conjecture, and try to prove it mathematically.

The research problem is composed of several layers in both of stating the problem and in getting results ranging from easy to very challenging, so the students can definitely solve some aspects in the initial layers and then proceed to more advanced layers; that is, partial results are very likely.

The mentoring professor does not know exactly how to prove the problem, but he/she has a good idea on how to start proving the problem and some idea on how to carry a proof to the end.

There is a standard technique used to prove such problems but this technique has not yet been applied to this specific research problem.

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