

## MA3K7 - Essay

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*“Jobs of the future will rely on AI for coding and problem solving. So, universities should now move away from teaching these skills, but instead focus on working with AI. For example, our department should be offering compulsory modules on writing ChatGPT prompts to solve maths problems.”*

**Do you agree or disagree with this statement and why?**

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In the last few years, the emergence of AI has surged to the top of everyone’s mind. From AI being used in creating controversial art to analysing legal documents, and to replacing entire personalities in the form of virtual celebrities, the question of whether it can replace a part of mathematical problem solving is an appropriate question we mathematicians should ask ourselves. Many would say that coming to university is about acquiring knowledge, as well as honing the skill of learning. Others would suggest that a university degree is a necessary step to securing a job. Where would AI fit into the idea of attending university? Throughout the essay, we will explore ideas of whether AI should be seen as a tool, as a potential personal teacher, or as a replacement for human thinking.

Addressing the first part of the statement, preparing our students to be more versatile with AI could make our students more sought after by employers. Filling the workforce with data scientists, consultants, and financial analysts who can solve mathematical problems with the use of AI will bolster productivity and innovation. Focusing on the problem-solving aspect, being AI-literate can definitely be beneficial to boost efficiency, complete tasks faster, and even produce higher-quality work (Dell’Acqua et al., 2023). The article stated that consultants at BCG were able to do over 12% more tasks at an increase of 25% the rate.

Despite these benefits, the same article highlights some of the shortcomings, mainly the amount of errors. AI can often mislead us with plain incorrect information presented as fact (Sanders & Wood, 2023) and this issue would not be entirely mitigated by writing more effective prompts. Problem solving can be seen as arriving at an outcome but checking our work is accurate is just as necessary as said result. A solution is not only the final answer but also the understanding and explanation surrounding it. An exam marker does not always give full marks for just an answer to a question for this very reason. Showing the working procedure is an extremely important part of this task; hence why we are taught to use keywords in the rubric writing part of this module.

Tackling the implementation of modules with an AI focus would be similar to Maths by Computer, but now instead of teaching coding, we would teach prompt writing. This gives a sound foundation for students to work with. If they are passionate enough and the university expands their AI modules, then they can partake in more of these courses, whereas those who are not interested may just ignore these other resources. Just as we have it now, many students who dislike programming would not take further coding modules.

A common saying is that “what AI is now, is the worst that it will ever be” and with how fast AI has improved in a short few years, it may be indicative that mastering ChatGPT prompt writing is an ever-evolving art. It could be that what we learn now would not be as effective within the same year. We already have two versions of ChatGPT that can give varying results on the same prompt (Myerson, 2023). Even within the same version, the same prompt does not always give the same answer. The university would have to set aside resources to properly teach this course instead of teaching us the fundamentals of problem-solving. Having AI be a secondary supporting tool rather than the primary focus seems to be a better compromise.

This leads us to the following point; the use of AI is analogous to the use of a calculator. Both are amazing tools to help support human understanding while being mindful of how we use them (Roberts, 2023). If we only taught students to take values from a sheet of paper and to calculate, we fail to properly educate them on why they are making such computations. Likewise, if we only taught students to input the ‘correct’ prompt, we would be no better off than a computer slaving away to find an answer. Reiterating the point above, we should treat AI as an assistive tool but not the final state for mathematical problem-solving.

Writing relevant prompts could make AI akin to a private tutor, like Aristotle to Alexander the Great, who can help give personalised feedback and advice. Maybe then we could all have the potential of having the title ‘the Great’. There is also a reduced barrier that many people may overlook. The anxiety of asking seemingly simple questions can now be removed as asking a robot (to most people) is easier and can even go as far as to guide our human intuition towards a better path. This helps create clarity in one's work and allows them to perform critical thinking better (Davies et al., 2021).

We must not forget the flaws of such a system; namely, the inaccuracies that a student may take for granted. It is not a perfect substitute for a human teacher, but there are always limitations to other methods. Time is a limited resource for us mere mortals but AI tools are constantly working as long as there is an internet connection to ChatGPT's servers. Therefore,

instead of focusing on writing better prompts, we should still focus on the foundational skill of discerning misinformation and actively exploring. As the famous quote goes “Maths is not a spectator sport” - Dave Wood.

In my Algebraic Number Theory module, our lecturer Simon L. Rydin Myerson highlights how ChatGPT 4 can answer our assignments to a surprisingly good degree (Myerson, 2023). He did so by copying and pasting our exact assignment question into the model and minimal editing of the prompt. Predictably, ChatGPT 4 performed better than its weaker counterpart, ChatGPT 3.5, with 3.5 giving noticeably more mistakes and even nonsense. He even highlights how ChatGPT is sensitive to the prompt. So there is credence to the idea that prompt writing should be formally taught but as there were minimal edits, maybe there would be diminishing returns to centre our attention on this area of improvement.

The issue arises when we look away from just ChatGPT and to other AI models. Should we really just stick to ChatGPT 4 to learn with? ChatGPT 4 is known to perform worse on the maths portion of the SAT while excelling at the writing portion (Madison, 2023). Are there other AI models that are better specialised for mathematical problem-solving? Otherwise, would the university teach a generic AI prompt writing course? These are many questions that would have to be answered before we can make an impactful decision to teach future students the relevant module. Poor execution reduces future critical thinking skills and can be detrimental to their education.

In conclusion, the original statement has merit but evidently, a single statement is not enough to describe the nuanced arguments for or against teaching AI prompt writing, and the greater idea of teaching AI in university. I would agree with the statement to a certain extent; mainly that it is obvious that the future workspace will rely on AI in one form or another and that we should place greater emphasis on how we interact with such an influential technology. However, I would say that the value of a mathematics degree is the fundamental understanding of topics that we possess. Simply chalking up our problem-solving ability to find an answer is not understanding that knowing how to achieve such a result with what method is equally important. This is where a single statement fails to encapsulate the subtleties of problem-solving. There needs to be a balance; we cannot reduce human cognition by replacing it with computational power but avoiding it completely would just be plain foolish and regressive. Overall, the best course of action would be to introduce a small module as a general introduction to AI as an aid.

[Word Count: 1294]

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