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Math 101 Students
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Dear Calculus Students:

You did a fabulous job of helping me prove that "Moe" was indeed running a gambling scam – your evidence helped shut him down for good (or so we hope). They've promoted me to junior CSI now – I get to help on the cases for real! This time, we've got a murder on our hands. While the senior CSIs are out in the field searching for evidence, they've got me investigating the alibis of two female suspects– and once again, I sure could use your help.

Two nights ago, the body of Charity Nicely was discovered by her new fiancé Rich Swellguy and his fellow volunteer firefighters. The two main suspects are Goldie Digger and Sorel L'Öser, both of whom had allegedly expressed interest in a closer relationship with Mr. Swellguy.

As we understand it, Mr. Swellguy was aware that both Ms. Digger and Ms. L'Öser were interested in him, and wanted to gently let them know that he and Ms Nicely had become engaged. To that end, he arranged to meet each of them Saturday night at the dock of his island estate. He offered to send a boat to bring them to the island, but they both declined, each saying that they'd appreciate the chance to swim there – both are competitive swimmers. Ms L'Öser was the first to arrive at Mr. Swellguy's dock, where he was waiting. When he told her that he and Charity had become engaged, she rather icily congratulated him and then immediately dove back into water. Shortly thereafter, Ms Digger arrived. Upon hearing the news of the engagement, she burst into tears. Mr. Swellguy comforted her for a bit, but then had to leave – he was called to join his fellow volunteer firefighters in battling a blaze on the mainland. After he left, Ms Digger stared toward the mansion on the island for a bit, and then she also dove in to the lake for the swim back to the mainland.

Mr. Swellguy was met at the mainland by the other volunteer firefighters. After they put out the blaze (it turned out just to be a small fire), the whole crew swung by Ms. Nicely's home on the way back to the fire station to get the chocolate chip cookies she always had waiting for them. When they got

there, however, they found not the usual fresh-out-of-the-oven cookies but Ms. Nicely on the floor, foully slain.

Suspicion immediately fell on Mr. Swellguy and the two rejected women. Mr. Swellguy's alibi is ironclad – every minute of his time is accounted for. Both the women have fuzzier alibis – the type hardest to break, because they are so vague. The heart of both of their alibis is that each claims she wouldn't have had time to get from the dock on Swellguy's island to Ms. Nicely's home and then on over to her own home in the unaccounted-for time.

Because their alibis are based on time, we needed to pin down when as many of these events occurred as possible. Thank goodness for security systems! Mr. Swellguy has a time-stamped security camera at his dock, and the two women have home alarm systems which record the time of entry. (The security camera on the dock not only supported Mr. Swellguy's story, but let us know how long Ms. Digger lingered after he left the island, showed us that she left by diving off the dock, and that neither suspect later returned to the island to get a boat.)

Here are the times we've discovered. All the alarm systems and cameras are calibrated to the national atomic clock, so you don't have to worry about whether different clocks agree.

- Mr. Swellguy left the island at 6:59:15 pm. His call to the police upon finding the body was received at 7:57:40 pm.
- Ms L'Öser left the island at exactly 6:49:45 pm and entered her home at 7:50:05.
- Ms Digger left the island at exactly 7:03:05 pm and entered *her* home at 7:53:40.
- Several witnesses saw Ms Nicely helping an elderly lady cross the street near her house at about 7:20. No one has come forward admitting to having seen her alive after that.

My question is: can we use these times to eliminate one or both as suspects? Did either one of them actually have time to go from Mr. Swellguy's to Ms. Nicely's, kill her, and then return home? (The heinous deed itself wouldn't have taken much more than a minute – she was taken by surprise; I won't disturb you by going into the gory details.) This is where I need your assistance.

I have tried to anticipate any information you may need: I am attaching a scale map of the area, with the homes of Mr. Swellguy, Ms. Nicely, Ms.

Digger, and Ms. L'Öser marked. It also happens that we know both suspects' personal best running and swimming rates, as they regularly compete in the Passion Lake Triathlon.

	Speed Running	Speed Swimming
Goldie Digger	6 mph	3 mph
Sorel L'Öser	8.5 mph	2 mph

As you can see, seconds could mean the difference between catching a criminal or implicating an innocent person! I've tried to give you as precise times and speeds as possible, because I'm afraid round-off error could let the murderer walk free. I'm hoping that since I'm giving you exact times, you can give me exact results. Someone in the lab suggested doing something with a graph, and zooming in on it, but I thought that technique sounded too rough a method for this finicky a situation.

While not having a good alibi doesn't make anybody a murderer, *having* a solid alibi is pretty convincing evidence that a person is *not* a murderer. Thus your response will help us determine whether either of the women can be eliminated from consideration as a suspect. Furthermore, if and when we find evidence that one of these women did do the deed, we will need to be able to convince first the D.A. and later the judge and jury that she had the opportunity to do so. Thus your response may well be used as evidence, so please explain your results as clearly as possible. I need to hear back from you by Monday November 21 at the latest!

Sincerely yours,
Jill Grissom

