1. **(POGIL)** A ***password scheme*** consists of a minimum password length and the different types of symbols (i.e., letters, numbers, specials) that can be used in the password. Using the Password Strength Calculator, determine the ***optimal scheme*** for withstanding a brute force attack of at least 10 years by an ordinary PC performing 100 million tests per second.
2. **(POGIL)** According to [this 2020 article](https://www.extremetech.com/extreme/316266-the-nvidia-rtx-3090-gpu-can-probably-crack-your-passwords), a password-cracking computer can try 669 billion passwords per second. How would you have to modify your scheme to withstand a 10-year attack by this specially designed computer?
3. **(POGIL)** After you’ve calculated the estimated number of passwords that can be checked per second for the next year, use the Password Strength Calculator to determine an optimal password scheme.
   1. How long should the password be?
   2. What combination of characters should it include?
4. This lesson introduces the concept of an intractable problem.
   1. Explain in your own words what it means for a problem to be intractable.
   2. Why is that a good thing when it comes to passwords?
5. **(POGIL)** For the routes starting and ending at Trinity College, identify the nearest neighbor route and the optimal route. What does this show you about the nearest neighbor heuristic?
6. Describe a heuristic you use in your everyday life. Why is a heuristic needed for this situation?

**Portfolio Reflection Questions**

**Make a copy** of this document in your Portfolio Assignments folder and answer these questions in the spaces below. Once complete, turn in this assignment according to the steps given by your teacher.

[5.8 Limits of Algorithms Curriculum Page](https://runestone.academy/runestone/books/published/mobilecsp/Unit5-Algorithms-Procedural-Abstraction/Limits-of-Algorithms.html)

Answer the following questions:

Questions for the Classroom Activity

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**Answer**

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| --- |

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**Answer**

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3. (**POGIL**) After you’ve calculated the estimated number of passwords that can be checked per second for the next year, use the Password Strength Calculator to determine an optimal password scheme.

a. How long should the password be?

b. What combination of characters should it include?

**Answer**

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4. This lesson introduces the concept of an intractable problem.

Explain in your own words what it means for a problem to be intractable.

Why is that a good thing when it comes to passwords?

**Answer**

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5. (**POGIL**) For the routes starting and ending at Trinity College, identify the nearest neighbor route and the optimal route. What does this show you about the nearest neighbor heuristic?

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| --- |

6. Describe a heuristic you use in your everyday life. Why is a heuristic needed for this situation?

**Answer**

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