*Break into POGIL teams of 4 and assign each team member one of the following roles.*

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| --- | --- | --- |
| **Student Name** | **Role** | **Responsibility** |
| Cole Swierczek | Facilitator | Records the details of the team’s optimal password scheme. |
|  | Spokesperson | Reports the team’s results. |
|  | Quality Control | Uses the online calculator to test the team’s ideas or creating secure passwords. |
|  | Process Analyst | Assesses the team’s performance and records the team’s answers. |

1.) (**Portfolio**) 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.

The optimal scheme for a password is to have, Uppercase Letters, Lowercase letters, Numbers, and Special characters at a password length of 9 characters. This provides around 219.6 years of safety by a brute force program.

2.) (**Portfolio**) According to [this 2012 article](http://arstechnica.com/security/2012/12/25-gpu-cluster-cracks-every-standard-windows-password-in-6-hours/) (http://tinyurl.com/ARSTechnica-25-GPU ClustCracks), a password-cracking computer can try 350 billion passwords per second. How would you have to modify your scheme to withstand a 10-year attack by this specially designed computer?

To withstand an attack of 10 plus years would be to have a password with a length 12 characters. In this password, you would have to have numbers and uppercase and lowercase letters.

3.) (**Portfolio**) That article was written in 2012. Password cracking technology has probably gotten a lot better. Suppose the number of passwords that can be checked per second doubles every year, use the Password Strength Calculator to determine an optimal password scheme for the year 2020?

To withstand a brute force attack of 10 years from a modern computer running at 44800000000000 guesses per second. You need a password with a length of 12 and including, numbers, uppercase, and lower case letters, and special characters. This will allow your password to withstand 433.7 years of brute force from a modern computer.

4. (**Portfolio**) For routes starting and ending at Trinity College, you have identified the nearest neighbor route and the optimal route. What does this show you about the nearest neighbor heuristic?

The nearest neighbor route and the optimal route are close in distance but optimal route is still less distance than the neighboring route but it took much longer to find, to the point where it is more practical to find the heuristic route because finding the optimal route will give you more time in the end.