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

| **Student Name** | **Role** | **Responsibility** |
| --- | --- | --- |
|  | 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.

2.) (**Portfolio**) According to [this article](http://arstechnica.com/security/2012/12/25-gpu-cluster-cracks-every-standard-windows-password-in-6-hours/) (<https://arstechnica.com/information-technology/2012/12/25-gpu-cluster-cracks-every-standard-windows-password-in-6-hours/>), a password-cracking computer using a cluster of graphics cards 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?

3.) 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. Complete the table below to calculate the estimated number of passwords that can be checked per second for next year (e.g. if the current year is 2021, calculate the number of passwords checked per second for 2022).

| **Year** | **Number of Passwords/Second** |
| --- | --- |
| 2012 | 350 billion |
| 2013 |  |
| 2014 |  |
| 2015 |  |
| 2016 |  |
| 2017 |  |
| 2018 |  |
| 2019 |  |
| 2020 |  |
| 2021 |  |
| 2022 |  |

*Note: add more rows as needed*

4.) (**Portfolio**) 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. How long should the password be? What combination of characters should it include?