

TEMPLATE for BEST PRACTICE EXAMPLES - SOLVED TASK



1. **Name of the task:** Drawings To Remember Passwords
2. **Why did you choose this task?** Digital security is very important in today's world. Unfortunately, there are many situations in the virtual world that students should be aware to stay safe.
3. **Subjects covered from STEAM areas:** mathematics, combinatorics, art, internet safety
4. **Target group (age range and size of the group):** 15-18 years, group size 20 students
5. **Duration of the activity:** 90 minutes
6. **Key words:** password, safety, art
7. **Key sentence describing context of the activity, followed by short description (200 words):**

This activity connects art activities to raise awareness about internet safety. Since we have faced educational shift towards the digital environment due to global pandemic, we have met both the advantages and difficulties of this kind of teaching and learning. There are many challenges in the digital communication, especially when the communication is not going in the good direction. A new way of communication could bring many unwanted situations, so students need to know how to react in the case of unpleasant situations, and in the worst-case - digital violence. That is why we decided to react in advance and empower our students' skills in the field of digital violence prevention. During this project students will gain knowledge how to avoid digital violence and how to react in case they experience it. We used formal lessons to connect educational content with the soft skills development and creative activities to achieve that. We included teachers and peer learning, but also other institution, professionals, and parents to work on the topic. Creation of a password is a mathematical task and number of possible passwords depends on the number of combination of words, numbers, and special characters. Keeping passwords secret is an essential step to internet safety. There are many ways to make passwords safe, and one is visual representation, which can be an interesting artistic and creative activity. To remember a password, one can make a visual representation by combining shapes and colors. During this activity, students create their own algorithms to make visual representation of passwords.

8. **Description of the activity environment, including the list of materials and tools needed:**

Students work in their classroom and use the Internet for research. For the creative activities students use paper and different colors. Students use rulers or compasses for art activities.

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9. Step by step, detailed description of the activity, including teaching and learning strategies:

- In the first activity students are introduced to Internet safety, and they are given the information about the possible dangers on the Internet and recommendations on how to keep safe. For example, students can get information about weak and strong passwords. Also, students can research about Internet safety in their own school. They can research if students in their school have ever experienced any problems in regard to Internet safety.
- During the second activity, students calculate combinatorics of creating passwords. One can create different passwords using words, special characters, and numbers. Students are introduced with the following mathematical task:

If you create six lower case letters, there are $26^6=308915776$ possibilities.

If you create twelve characters long password that include uppercase letters (26), lowercase (26), digits (10), symbols (12) there are $72^{12}=19408409961765342806016$ possibilities ($72=26+26+10+12$).

If your computer is spending a second to visit your six characters space it would need two million years to examining each of the password in 12 characters space.

T-is the size of possibility space based on the length

A-is the list of valid characters in the password

N-number of characters

Then the size of this space is $T=A^N$

- The third activity is to create visual representations of passwords to easily remember and protect from hacking. Students get the following instructions for the art activities:

To remember a password, one makes a visual representation by combining shapes and colors. One way to create a visual representation of a password is presented below.

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We have chosen a word password to illustrate the idea. The position of the letter (character) is represented with the size of the shape, while the color is representing letter (character). Filled shapes represent lowercase, while empty shapes represent upper case.

10. Learning objectives/competencies:

In this activity students will learn

- how to be safe on the Internet;
- how to calculate combinatorics with numbers, words, and special characters;
- how to make passwords safe;
- how to create visual representations of passwords;
- how to create their own algorithms to visualize passwords;
- how to make artwork connected to passwords and patterns.

11. Evaluation/Assessment guidelines:

Students can research about Internet safety in their school. The results of the research can be put on the school website.

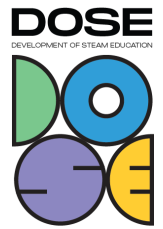
Students can calculate the number of different combinations of words, numbers, and special characters in the password requests. The evaluation can be made in form of a test with tasks related to combinatorics.

Students make artwork that visually represents their passwords. At the end of the activity students will make an exhibition of their work.

12. Lessons learned:

Students respond very well to the connection of math and art activities. Students can see that the curriculum content they learn in their lessons is applicable and important. Digital safety is very important for students since they are spending a lot of time on the Internet.

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13. **Additional information/Links:**

<http://math4all4math.blogspot.com/2022/03/take-care-of-clics.html?view=classic>

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