

Summer Transition Work for A Level Computer Science

It is important to keep practicing your coding skills throughout your A Level, so give a past GCSE NEA a try during the summer break. This one makes good use of string handling and multiple arrays. The aim with A Level NEA is that you do a significant amount of self-directed learning in order to create a project that you enjoy the process and come away with an increase in your technical skills. The more you explore and experiment, the greater the success is likely to be. Once you have completed this I encourage you to seek out more, and rather than me direct you, find something that piques your interest, the more you do that the more you are likely to find an NEA that really is enjoyable.

Everything you find below this point are the instructions to create the code.

Password Checker and Generator

A program needs to be created that allows the user to check the strength of passwords and to generate strong passwords.

The program should check the strength of a password based on a point-scoring system. When a password is entered, points are awarded based on the length of the password and the types of characters contained within the password. Points are deducted if characters are used in a limited way.

The program should also be able to generate a password that, when checked for strength, is classified as a strong password.

The program should work in the following way:

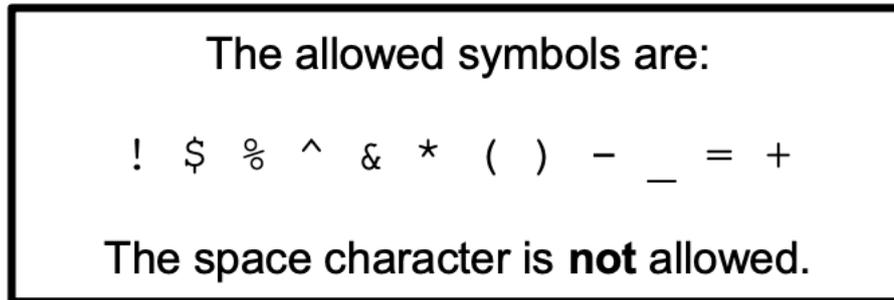
1. A menu is displayed allowing the user to select from the following options:
 - ● Check Password
 - ● Generate Password
 - ● Quit.
2. If the user selects the 'Check Password' option:
 - ● they are asked to enter a password
 - ● if the length of the entered password is less than 8 characters or greater than 24 characters then an appropriate error message is displayed and the user returned to the menu
 - ● the program checks that the password entered only contains allowed characters.

The allowed characters are:

- i. upper case letters (A to Z)
- ii. lower case letters (a to z)
- iii. digits (0 to 9)
- iv. allowed symbols (see Figure 1).

If the password contains a character that is not allowed then an appropriate error message is displayed and the user returned to the menu.

Figure 1



A point score is calculated for the entered password. The score is set to the length of the password. For example, if the password is 12 characters in length then the score is set to 12.

Points are added for the following:

- if the password contains at least one upper case letter (A to Z) then 5 points are added to the score
- if the password contains at least one lower case letter (a to z) then 5 points are added to the score
- if the password contains at least one digit (0 to 9) then 5 points are added to the score
- if the password contains at least one of the allowed symbols shown in Figure 1 then

5 points are added to the score

- if the password contains at least one upper case letter (A to Z) and at least one lower

case letter (a to z) and at least one digit (0 to 9) and at least one allowed symbol shown in Figure 1, then an additional 10 points are added to the score.

Points are subtracted for the following:

- if the password only contains upper and lower case letters (A to Z and a to z) then 5 points are subtracted from the score
- if the password only contains digits (0 to 9) then 5 points are subtracted from the score
- if the password only contains allowed symbols as shown in Figure 1 then 5 points are

subtracted from the score

- if the password contains three consecutive letters based on the layout of a UK QWERTY keyboard (see Figure 2) then 5 points are subtracted from the score for each set of three.

Figure 2

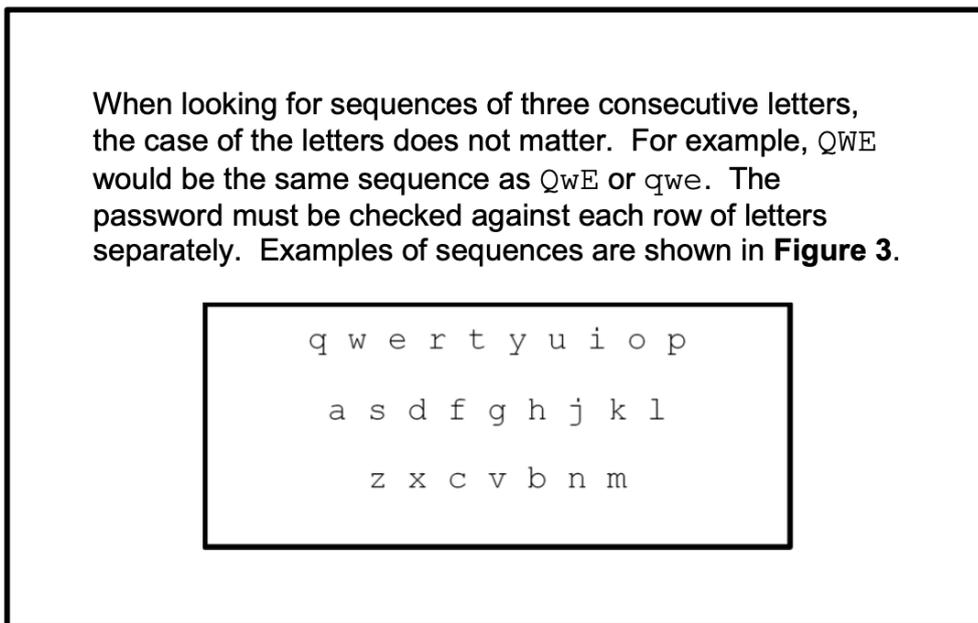


Figure 3

Example sequence	Explanation
tYu	Three letters are next to each other on the top row of the QWERTY keyboard, therefore 5 points are subtracted from the score of any password that contains this sequence.
asdFG	Five letters are next to each other on the second row of the QWERTY keyboard. In this case there are three sets of three consecutive alphabetic letters: asd, sdF, and dFG, therefore 15 points are subtracted from the score of any password that contains this sequence.
ZxcTyui	Three letters are next to each other on the bottom row of the QWERTY keyboard, Zxc. Four letters are next to each other on the top row of the QWERTY keyboard, Tyui. This gives three sets of consecutive letters: Zxc, Tyu and yui, therefore 15 points are subtracted from the score of any password that contains this sequence.

4. The point score is then used to determine if the password strength is weak, medium or strong. If the point score is over 20 then the password is strong. If the point score is zero or less then the password is weak. The password strength and the point score should be displayed to the user. The user should then be returned to the menu.
5. If the user selects the 'Generate Password' option:
 1. a) the program generates a random number between 8 and 12 inclusive. This number will be the length of the password
 2. b) the program then generates a random sequence of characters using letters, digits and/or allowed symbols to create a password of the length set in a)
 3. c) the point score for the password is then calculated (in the same way as for a user-entered password)
 4. d) parts a) to c) should be repeated until the password strength is strong
 5. e) the generated password and point score should then be displayed and the user returned to the menu.
6. If the user selects the 'Quit' option then a suitable message should be displayed and the program ends.

The following examples show how the 'Check Password' option should work.

EXAMPLE 1

Entered password: aSD7V^&*gS77+

Initial score	Points
Length is 13	13
Additions	Points
At least one upper case character (S, D and V)	5
At least one lower case character (a and g)	5
At least one symbol (^ and & and * and +)	5
At least one digit (7)	5
One of each of the above types	10
Subtractions	Points
Sequence of letters (aSD)	-5

Point score for password aSD7V^&*gS77+ is $13 + 30 - 5 = 38$ so this is a strong password.

EXAMPLE 2

Entered password: qwerty123

Initial score	Points
Length is 9	9
Additions	Points
At least one lower case character (q, w, e, r, t and y)	5
At least one digit (1, 2 and 3)	5
Subtractions	Points
Consecutive alphabetic characters (qwe, wer, ert and rty)	-20

Point score for password qwerty123 is $9 + 10 - 20 = -1$ so this is a weak password.