

Sign Up Debug

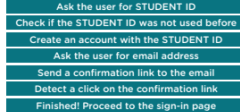
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Sara is developing a website for her friends to share their art projects.

She designed a sign-up process so a user can first create an account with a unique STUDENT ID as a username and then enter a valid email address for further communication.

The diagram to the right shows the steps of her design.

During testing she found a critical design bug. If a user mistypes their email address, they do not receive the email with a confirmation link and consequently they cannot sign-in. On the other hand, they cannot start the process all over again as their STUDENT ID has already been submitted and it is not available any longer.



Question

Which step should be moved to remove the critical error?



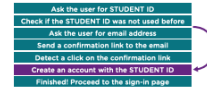
This question comes from Iran



Answer

'Create an account with the student ID'

Moved from 3rd position to 6th position (second last position).



Explanation

In the initial system design, when the STUDENT ID is chosen it locks that particular STUDENT ID. The second phase, the lock release, happens when the confirmation is received by the system. Unfortunately, according to the initial design, this can never happen. The updated design avoids this problem, as the lock phase does not happen before the e-mail is confirmed.

Computational Thinking:
Evaluation



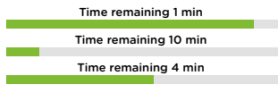
Downloads

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When downloading files from a server, the download speed is limited. For example, when 10 files are downloaded simultaneously, the download speed for each file is 10 times slower than it would be for only one file.

A user simultaneously downloads three files from a server. The picture below shows the current download state.

Note that the time remaining for each file is computed based only on the current speed and does not depend on any history.



Question

How many minutes will it take to download all the files?

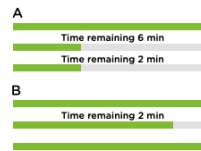


This question comes from Russia



Answer

5 minutes



Explanation

After one minute the first file will be downloaded, so the speed will increase by a factor of 3/2 (that is, the 3 downloading files became 2 downloading files). The progress will look like image A.

After a further two minutes the third file will be downloaded, and the progress will look like image B.

There are two more minutes needed to download the last file. So, after $1 + 2 + 2 = 5$ minutes all the files will be downloaded.

Computational Thinking:
Decomposition



Passcode

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Beaver Daniel received a chest of gold that is locked with an electronic lock. The lock can be opened by entering a code of 9 digits. Daniel has received the following hints about the code:

- The only digits in the code are 2, 6, 7 and 9.
- The digit with the highest value is used the lowest number of times in the code.
- The digit with the lowest value is used the highest number of times in the code.
- The code looks the same in reverse.
- All consecutive digits are different.
- The last digit entered is odd.



Question

With the information given above, what is his passcode?



This question comes from Malaysia



Answer

7 2 6 2 9 2 6 2 7



Explanation

From the given information we know that 9 appears once, number 6 and 7 appears twice and number 2 appears 4 times.

If the code looks the same in reverse, the number 9 can only be the middle digit and as 7 appears twice and the last digit is odd, it must be at the beginning and the end

Hint 5 tells us that the number 2 must be at places 2, 4, 6, 8. The 6s fill the remaining spaces.

Computational Thinking:
Algorithms



Popularity

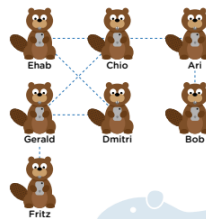
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Seven beavers are in an online social network called Instadam.

Instadam only allows them to see the photos on their own and their friends' pages.

In this diagram, if two beavers are friends they are joined by a line.

After the summer holidays everybody posts a picture of themselves on all of their friends' pages.



Question

Which beavers' picture will be seen the most?



This question comes from Canada



Answer

Chio

Explanation

The following table summarises the information and helps us to see whose picture will be seen the most.

Beaver	Direct friends	Friends' friends	Total
Ari	Bob, Chio	Ehab, Gerald	4
Bob	Ari	Chio	2
Chio	Ari, Ehab, Gerald	Bob, Dmitri, Fritz	6
Dmitri	Ehab, Gerald	Chio, Fritz	4
Ehab	Chio, Dmitri	Ari, Gerald, Fritz	5
Fritz	Gerald	Chio, Dmitri	3
Gerald	Chio, Dmitri, Fritz	Ari, Ehab	5

Computational Thinking:
Decomposition

