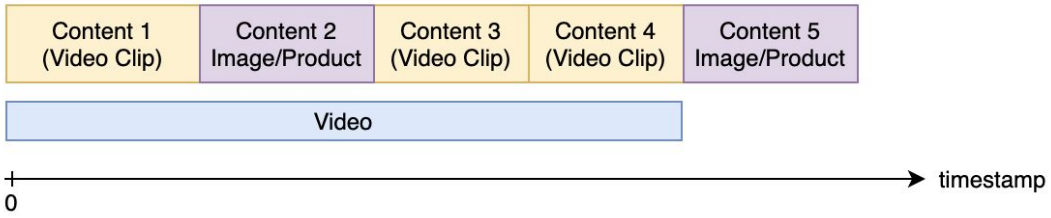
p-e-n-c-i-l

Want to be part of our Algorithms team? Here's your technical interview task.

Background:

We can express a video ad in terms of sequences of scenes such as the one illustrated below:

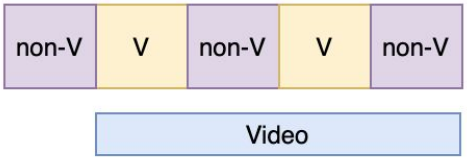


Where each scene is a short clip containing either animated images & products, or short fragments of a video clip. In the example above, we have an ad where we have a source video (the blue bar) that is being fit into the ad sequence. This video will start playing at its designated timestamp, and for scenes denoted 'video clip', the source video will be shown, while scenes denoted 'Image/Product' will not show the source video, but instead some animation of product/text/images of a limited duration, though the audio track of the source video will continue playing. We can have multiple video sources which cannot overlap.

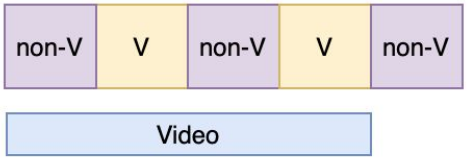
As such, we need to find all possible arrangements of source videos that will fit into an ad of N scenes, given that we already know which scenes are video scenes (yellow boxes) and non-video scenes (purple boxes)

Task Details

Given a list of source videos, each with its duration T, and an ad sequence of length N with a fixed scene pattern (i.e. we know the positions of video & non-video scenes), find all possible positions the source videos can take such that they must always start with a video scene - i.e. the video must start at the position of a video scene (yellow box):



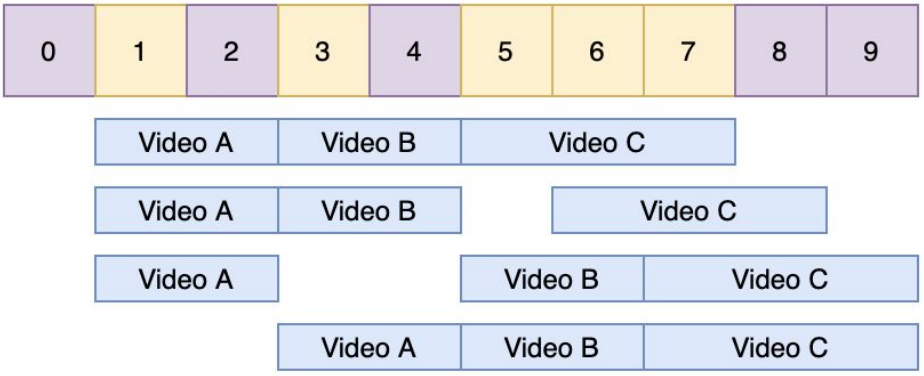
OK - Video starts at a video scene (yellow box)



not OK - video starts at a non-video scene (purple box)

Assume that if you have >1 source video, that you can keep the order of these source videos without needing to permute between them (i.e. if you have videos [A, B, C], always fit them in that sequence, and do not swap their relative positions). For simplicity, assume that all scenes have the same duration and that we have videos that can fit nicely in an integral number of scenes.

Example configurations possible for 10 scenes, 3 source videos:



Please write a function **`foobar(sequence, video_list)`** given:

- **`sequence`** = boolean array of ad scenes, where True = video scene and False = non-video scene (in the example above it is [F, T, F, T, F, T, T, T, F ,F])
- **`video_list`** = dictionary of integers where each integer represents the 'length' of the video - in the example above it would be {'A': 2 'B': 2, 'C': 3}

where the expected output should be:

- a list of dicts of start indices of each video - e.g. for the 4 possible configs shown the output will be [{'A': 1, 'B': 3, 'C': 5}, {'A': 1, 'B': 3, 'C': 6}, {...}, ...]

Note: we must always start a video with a video scene, but a video can subsequently span non-video scenes

Coding up a solution that can meet these functional specifications is required, and we prefer it to be written in Python using any supporting libraries of your choice. Articulating how you would carry out integration tests and unit tests is a plus point. Please provide us a link to your repository with clear instructions on how to get started.

Please submit your response in advance of your interview, You should spend no longer than 6-8 hours on this task. Please list any assumptions you've made. At the interview you will present and then defend your response.

Can't wait to see what you suggest! Submit your task to sumukh@trypencil.com