One-dimensional Array

Question 1:

A program is being developed in Python to simulate a card game.

Throughout the game each player always has 100 cards. Each card displays a number.

Players take it in turns to swap one of their cards with another random card from a set of cards until a player has a run of five numbers in sequence within their 100 cards.

There are 500 cards within the game in total. Each card is numbered from 1 to 250 and each number appears twice in the whole set of cards.

The player's 100 cards are always stored in numerical order.

When a player has a valid run of five cards within their 100 cards they have won the game.

A valid run:
- consists of five cards
- can start from any position in the player's 100 cards
- the second card's value is one more than the first card's value, the third card's value is one more than the second card's value, the fourth card's value is one more than the third card's value, and the fifth card's value is one more than the fourth card's value.

Below are examples of valid runs which means a player has won.

Valid run example 1

| ... | 2 | 3 | 4 | 5 | 6 | ... |

Valid run example 2

| ... | 99 | 100 | 101 | 102 | 103 | ... |
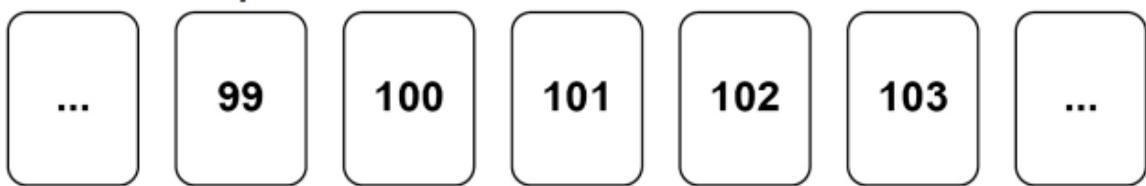
Below are examples of invalid runs.

Invalid run example 1

| ... | 4 | 5 | 9 | 10 | 11 | ... |

Invalid run example 2

| ... | 51 | 52 | 52 | 53 | 54 | ... |
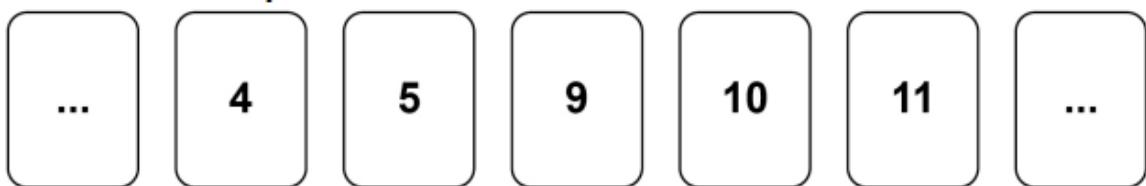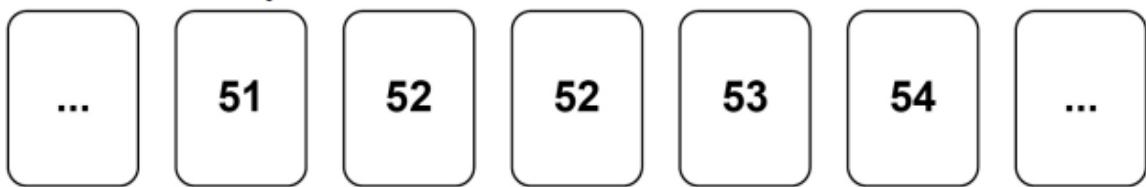
Invalid run example 3

| ... | 2 | 3 | 3 | 4 | 5 | 6 | ... |
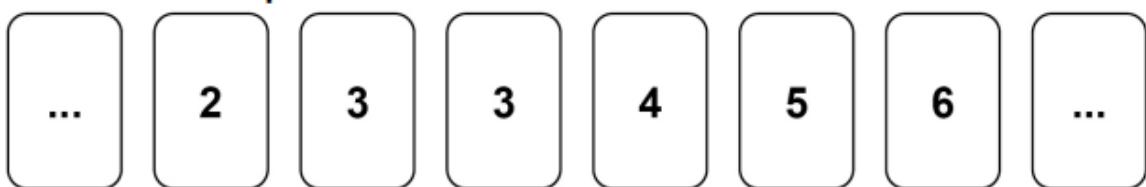
Write a Python program to check if a player has a valid run of five cards within their 100 cards.

When writing your program you should assume:
- there is an array called `cards` that contains the values of the player's 100 cards
- `cards[0]` will contain the value of the first card and `cards[99]` will contain the value of the last card
- the values in `cards` are already stored in numerical order
- there is a Boolean variable called `gameWon` that has a value of `False`.

Your program should set `gameWon` to `True` if there is a valid run.

You **should** use indentation as appropriate, meaningful variable name(s) and Python syntax in your answer.

The answer grid below contains vertical lines to help you indent your code.

[6 marks]

Python Example 1 (fully correct)
All design marks are achieved (**Marks A and B**)

```
count = 1                                    (Part of E)
for i in range(99):                          (C)
  if cards[i] + 1 == cards[i + 1]:           (D, Part of E)
    count = count + 1                        (Part of E)
    if count == 5:                           (Part F)
      gameWon = True                         (Part F)
  else:
    count = 1                                (Part of E)
```

Python Example 2 (fully correct)
All design marks are achieved (**Marks A and B**)

```
count = 0                                    (Part of E)
i = 0                                        (Part of C)
while i < len(cards) - 1:                     (Part of C)
  if cards[i] + 1 == cards[i + 1]:           (D, Part of E)
    count = count + 1                        (Part of E)
    if count == 4:                           (Part F)
      gameWon = True                         (Part F)
  else:
    count = 0                                (Part of E)
  i = i + 1                                  (Part of C)
```

Question 2:

(a) A teacher researches the length of time students spend playing computer games each day.

Data for one week (Monday to Friday) is stored in a 2D array with the identifier `minsPlayed`.

The following table shows part of this array, containing 4 students.

			Students			
			Stuart	Wes	Victoria	Dan
			0	1	2	3
Days of the week	Mon	0	60	30	45	0
	Tue	1	180	60	0	60
	Wed	2	200	30	0	20
	Thu	3	60	10	15	15
	Fri	4	100	35	30	45

The teacher wants to output the number of minutes Dan (column index 3) played computer games on Wednesday (row index 2). The following code is written:

```
print(minsPlayed[3,2])
```

Write a line of code to output the number of minutes that Stuart played computer games on Friday.

You must use **either**:
- OCR Exam Reference Language, **or**
- a high-level programming language that you have studied.

....

.... **[1]**

(b) The teacher writes a program to add up and print out the total number of minutes student 2 played computer games over 5 days (Monday to Friday).

```
total = 0

total = total + minsPlayed[2,0]

total = total + minsPlayed[2,1]

total = total + minsPlayed[2,2]

total = total + minsPlayed[2,3]

total = total + minsPlayed[2,4]

print(total)
```

Refine the program to be more efficient. Write the refined version of the algorithm. **(4)**

Answer:

(a)

`print (minsPlayed[0,4])`	**1** **(AO3 2b)**	**High-level programming language / OCR Exam Reference Language response required** Do not accept pseudocode / natural English. `print` may be a suitable output command word that could be found in a HLL e.g. `print` (Python), `console.writeline` (VB), `cout` (C++) The array elements may be accessed together `[0,4]` (VB.NET) or separately `[0][4]` (Python)

(b)

• Initialises total as 0 **and** prints out total the end (as per original program)
• Uses iteration, e.g. FOR, WHILE
• …that repeats 5 times
• …correctly adds up values using loop index
 	
e.g.
`total = 0`
`for x = 0 to 4`
`    total = total + hoursplayed[2, x]`
`next x`
`console.writeline(total)`
 	
e.g.
`total = 0`
`for x in range (0, 4)`
`    total += hoursplayed[2][x]`
`next x`
`print (total)`
	4
	(AO3 2c)
		High-level programming language / OCR Exam Reference Language response required
		
		Do not accept pseudocode / natural English.
		
		MP1 must have appropriate identifier, = and then the numeric 0
		MP2 must have `for` or `while`
		MP3 must have the for stopping condition 4/5
		MP4 must have the same identifier for MP1 and equal and + to add the data in the array (using either `[x,y]` or `[x][y]`. This could be `total = total + ....` Or `total += ....`