



ELEC 390 – Lab 01

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Question 1)

The native Python operator '+' combines two lists as displayed in Figure 1.

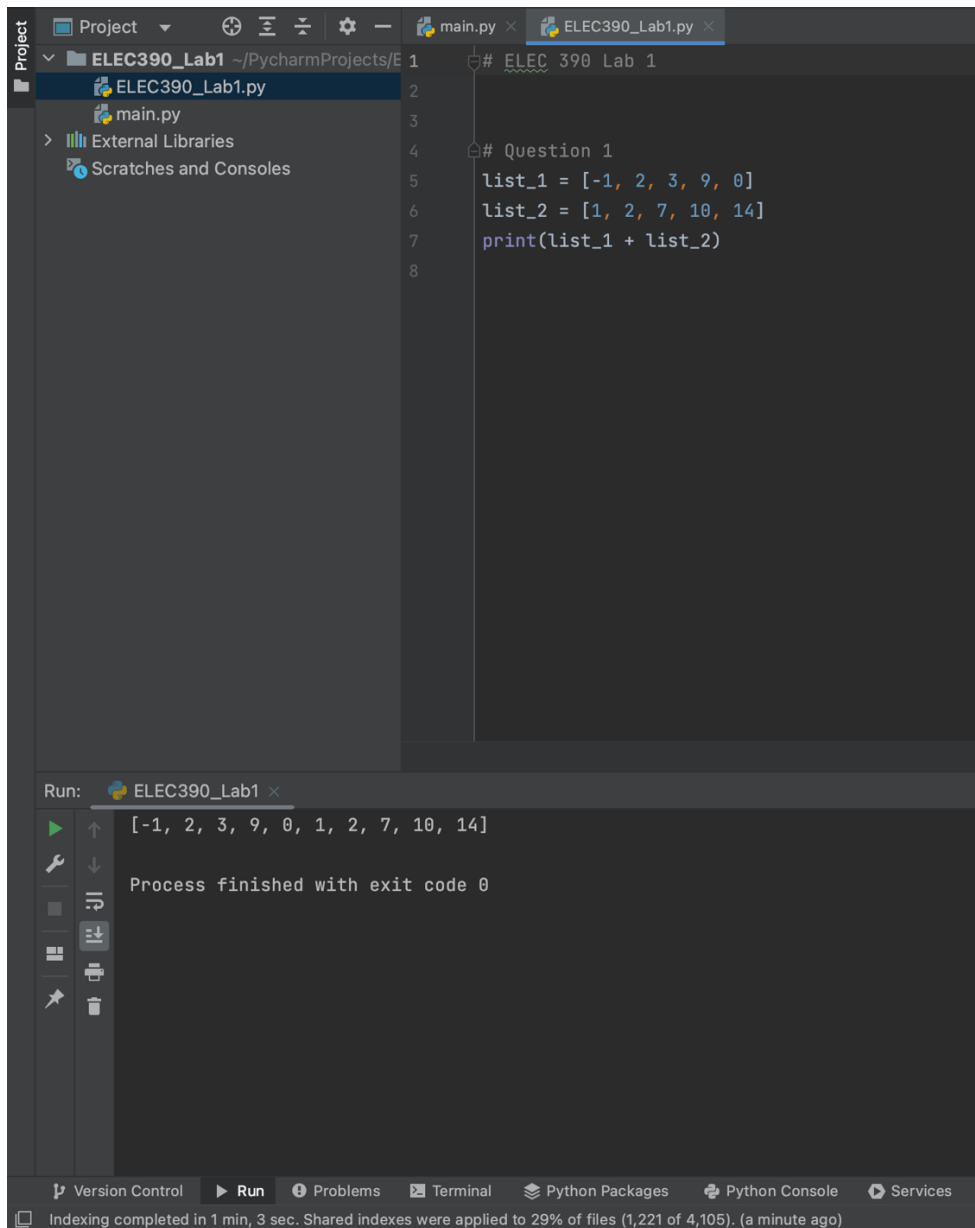
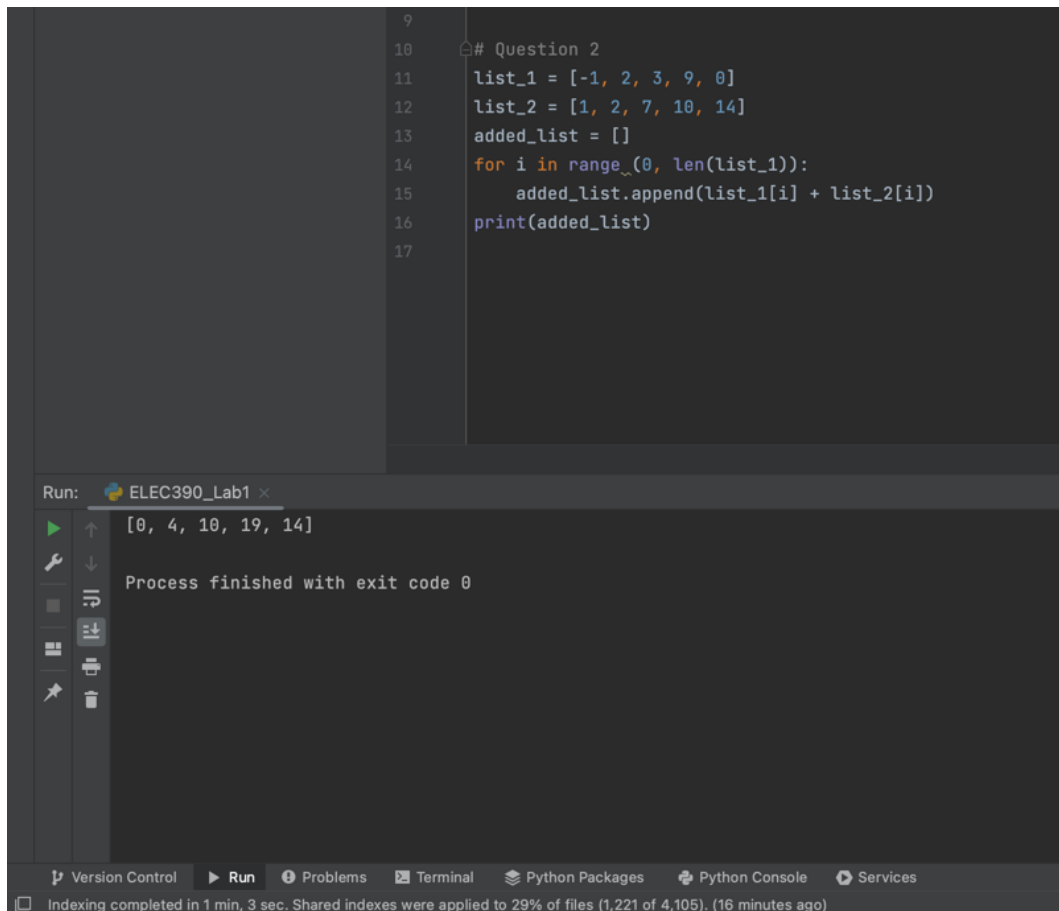


Figure 1: PyCharm code for Question 1 using the '+' operator to combine two lists.

Question 2)

In order to sum two lists a with the '+' operator a for loop is necessary. The for loop iterates through each index of the array adding the two values found at corresponding indices of each list. Figure 2 displays the loop as well as the output.



```
9
10 # Question 2
11 list_1 = [-1, 2, 3, 9, 0]
12 list_2 = [1, 2, 7, 10, 14]
13 added_list = []
14 for i in range(0, len(list_1)):
15     added_list.append(list_1[i] + list_2[i])
16 print(added_list)
17
```

Run: ELEC390_Lab1 x

[0, 4, 10, 19, 14]

Process finished with exit code 0

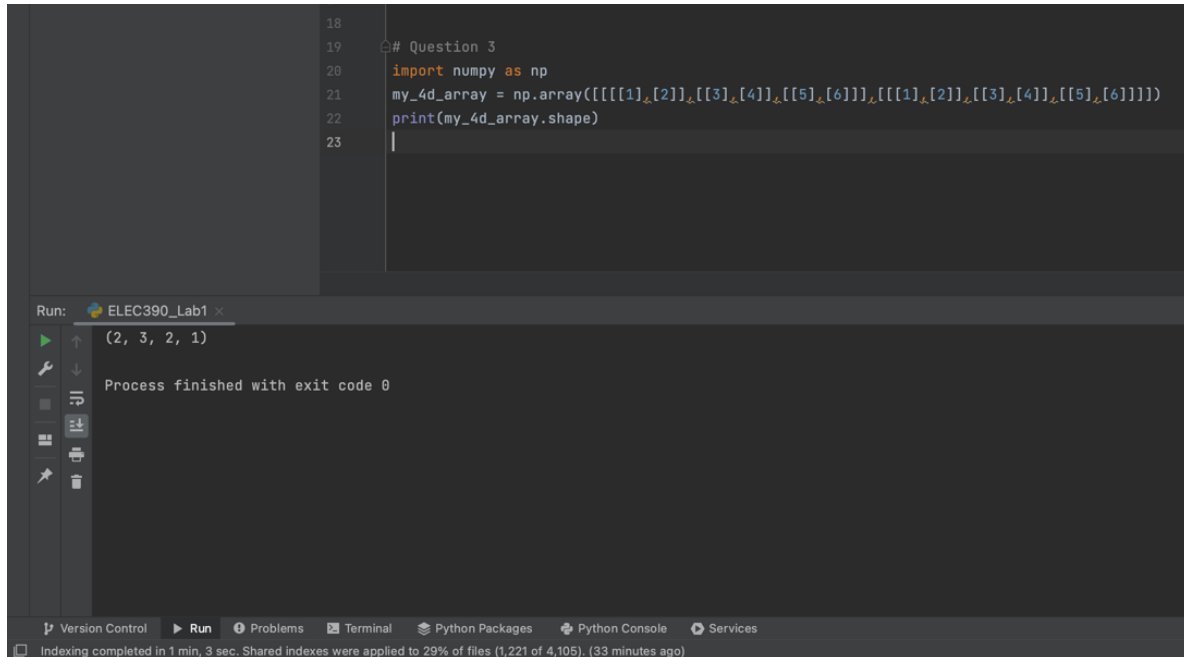
Version Control Run Problems Terminal Python Packages Python Console Services

Indexing completed in 1 min, 3 sec. Shared indexes were applied to 29% of files (1,221 of 4,105). (16 minutes ago)

Figure 2: PyCharm code for Question 2 summing the values of two lists.

Question 3)

In Figure 3 shown below a 4D array is created with values ranging from 1 through 6. This 4D array takes the shape (2,3,2,1) which can be seen printed as the output below.



The image shows a PyCharm IDE window with a code editor and a run console. The code editor contains the following Python code:

```
18  
19 # Question 3  
20 import numpy as np  
21 my_4d_array = np.array([[[[1],[2]],[3],[4]],[5],[6]],[[1],[2]],[3],[4]],[5],[6]])  
22 print(my_4d_array.shape)  
23 |
```

The run console shows the output of the code:

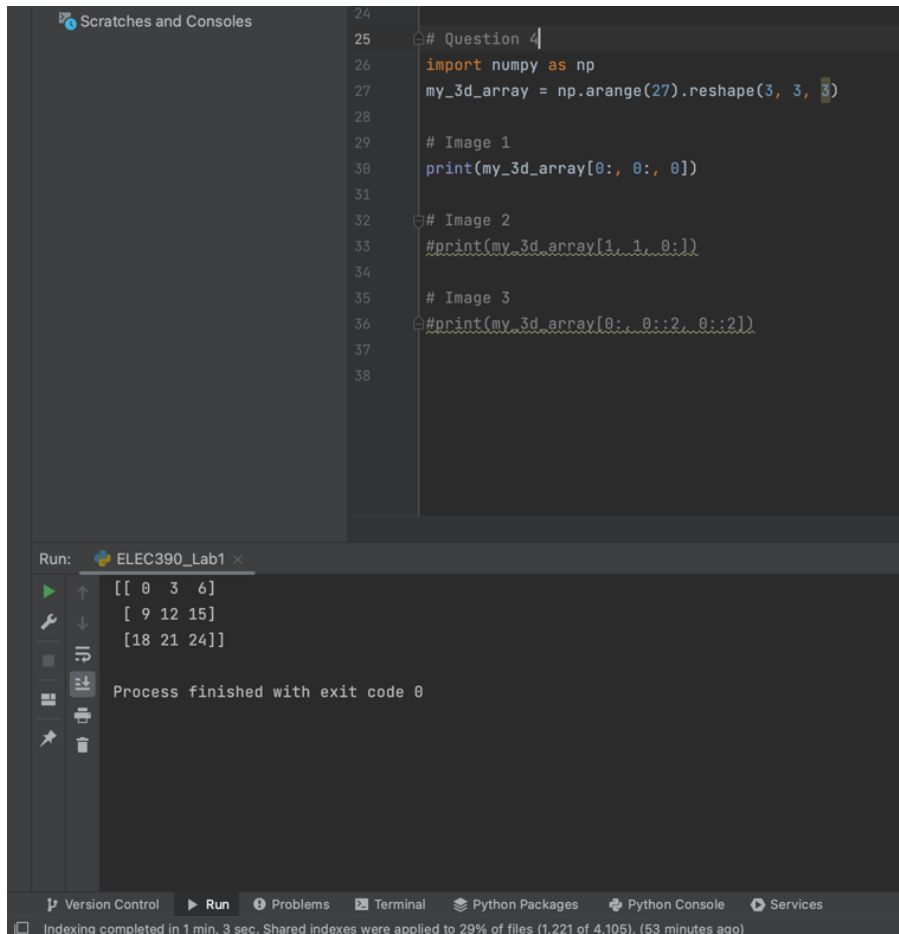
```
Run: ELEC390_Lab1 x  
(2, 3, 2, 1)  
Process finished with exit code 0
```

The bottom status bar of the IDE indicates: "Indexing completed in 1 min, 3 sec. Shared indexes were applied to 29% of files (1,221 of 4,105). (33 minutes ago)".

Figure 3: PyCharm code for Question 3 building a 4D array with the shape of (2,3,2,1)

Question 4)

The first step of this question was assembling a 3D array containing values 0 through 26 in a (3, 3, 3) shape. We were given three specific images in which different array elements were shaded. The goal was to print the each of the shaded elements which were specified in the image using the originally constructed array. Below in Figure 4 is the code and output for the first given Image.



The image shows a PyCharm IDE window with a Python script and its execution output. The script, titled "# Question 4", imports numpy as np and creates a 3D array my_3d_array of shape (3, 3, 3) containing values from 0 to 26. It then prints the first image (my_3d_array[0:, 0:, 0:]), which is a 3x3 matrix of values: [[0, 3, 6], [9, 12, 15], [18, 21, 24]]. The output window shows this matrix and a message "Process finished with exit code 0".

```
24
25 # Question 4
26 import numpy as np
27 my_3d_array = np.arange(27).reshape(3, 3, 3)
28
29 # Image 1
30 print(my_3d_array[0:, 0:, 0])
31
32 # Image 2
33 #print(my_3d_array[1, 1, 0:])
34
35 # Image 3
36 #print(my_3d_array[0:, 0::2, 0::2])
37
38
```

Run: ELEC390_Lab1 x

```
[[ 0  3  6]
 [ 9 12 15]
 [18 21 24]]

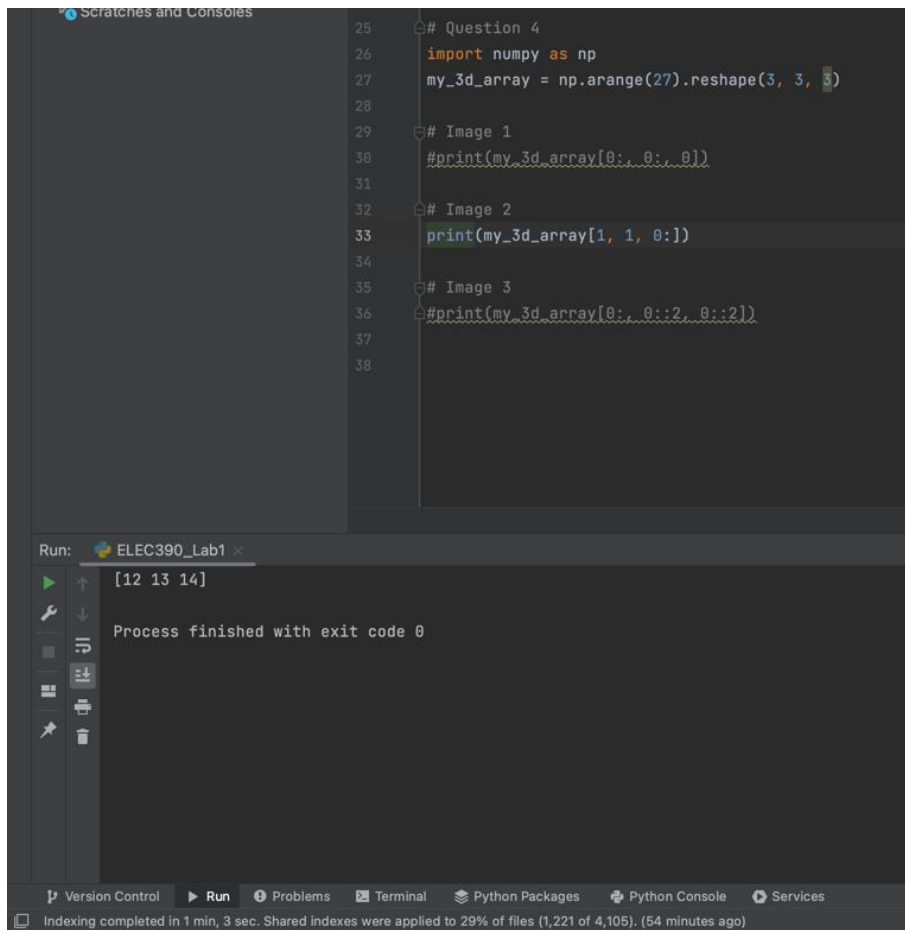
Process finished with exit code 0
```

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Indexing completed in 1 min, 3 sec. Shared indexes were applied to 29% of files (1,221 of 4,105). (63 minutes ago)

Figure 4: PyCharm code for Question 4a printing shaded values specified in the first Image.

Figure 5 is the code and output for the second Image.



The image shows a PyCharm IDE window with a Python script and its execution output. The script, titled "Question 4", imports numpy as np and creates a 3D array my_3d_array of size (3, 3, 3) using np.arange(27).reshape(3, 3, 3). It then prints three specific slices of the array, each labeled as an "Image". The first image is my_3d_array[0:., 0:., 0], the second is my_3d_array[1, 1, 0:], and the third is my_3d_array[0:., 0::2, 0::2]. The output window shows the result of the second print statement: [12 13 14]. The process finished with exit code 0.

```
25 # Question 4
26 import numpy as np
27 my_3d_array = np.arange(27).reshape(3, 3, 3)
28
29 # Image 1
30 #print(my_3d_array[0:., 0:., 0])
31
32 # Image 2
33 print(my_3d_array[1, 1, 0:])
34
35 # Image 3
36 #print(my_3d_array[0:., 0::2, 0::2])
37
38
```

Run: ELEC390_Lab1 x

[12 13 14]

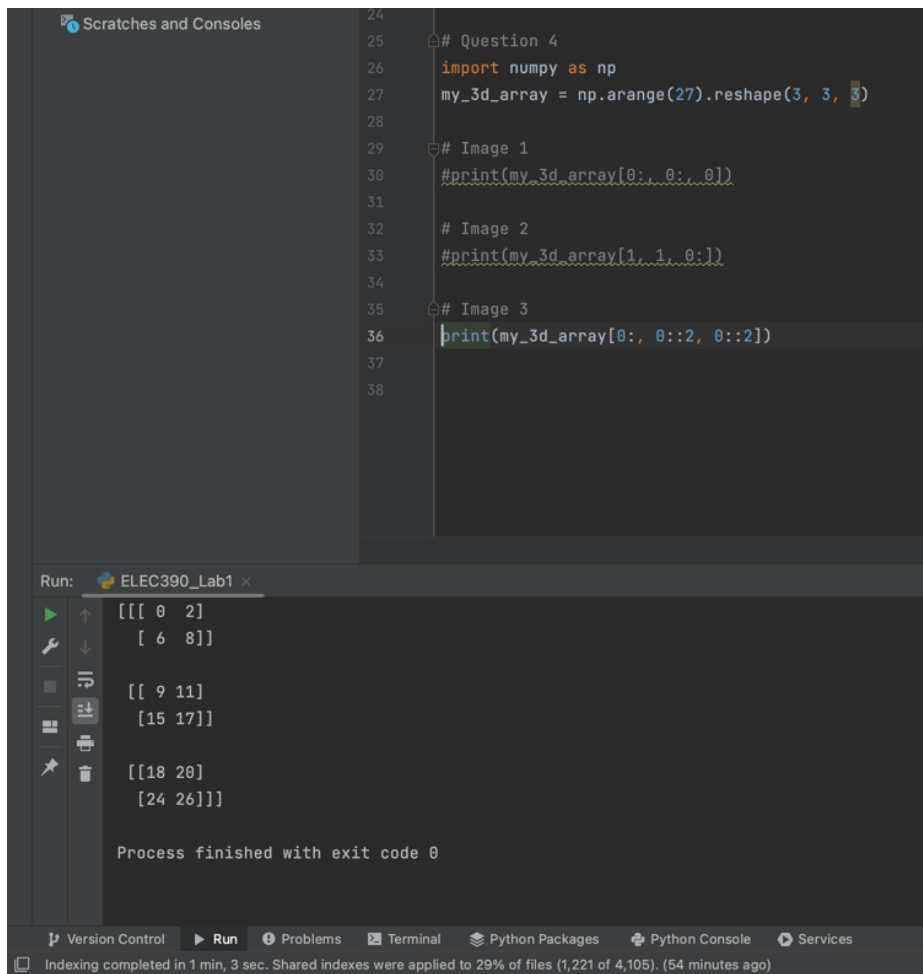
Process finished with exit code 0

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Indexing completed in 1 min, 3 sec. Shared indexes were applied to 29% of files (1,221 of 4,105). (54 minutes ago)

Figure 5: PyCharm code for Question 4b printing shaded values specified in the second Image.

Figure 6 is the code and output for the third Image.



The image shows a PyCharm IDE window with a Python script and its execution output. The script, titled "Question 4", imports numpy and creates a 3D array of size (3, 3, 3) containing values from 0 to 26. It then prints specific slices of this array, labeled as "Image 1", "Image 2", and "Image 3". The output in the Run console shows the resulting 2D arrays for each image.

```
24
25 # Question 4
26 import numpy as np
27 my_3d_array = np.arange(27).reshape(3, 3, 3)
28
29 # Image 1
30 #print(my_3d_array[0:, 0:, 0])
31
32 # Image 2
33 #print(my_3d_array[1, 1, 0:])
34
35 # Image 3
36 print(my_3d_array[0:, 0::2, 0::2])
37
38
```

Run: ELEC390_Lab1 ×

```
[[[ 0  2]
  [ 6  8]]

 [[ 9 11]
  [15 17]]

 [[18 20]
  [24 26]]]

Process finished with exit code 0
```

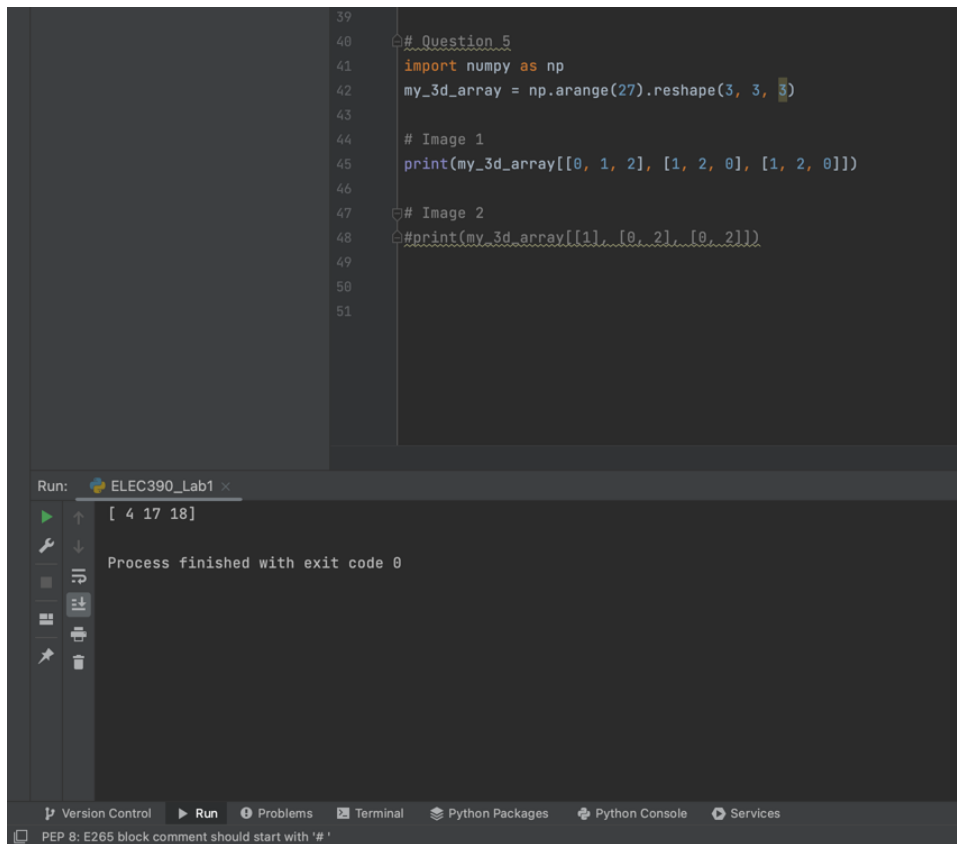
Version Control Run Problems Terminal Python Packages Python Console Services

Indexing completed in 1 min, 3 sec. Shared indexes were applied to 29% of files (1,221 of 4,105). (54 minutes ago)

Figure 6: PyCharm code for Question 4c printing shaded values specified in the third Image.

Question 5)

This question used the same 3D array as specified in Question 4. We were given two specific images in which different array elements were shaded. The goal is the same as Question 4; to print those shaded array elements from the original 3D array. Below in Figure 7 is the code and output for the first Image.



```
39
40 # Question 5
41 import numpy as np
42 my_3d_array = np.arange(27).reshape(3, 3, 3)
43
44 # Image 1
45 print(my_3d_array[[0, 1, 2], [1, 2, 0], [1, 2, 0]])
46
47 # Image 2
48 #print(my_3d_array[[1], [0, 2], [0, 2]])
49
50
51
```

Run: ELEC390_Lab1 x

[4 17 18]

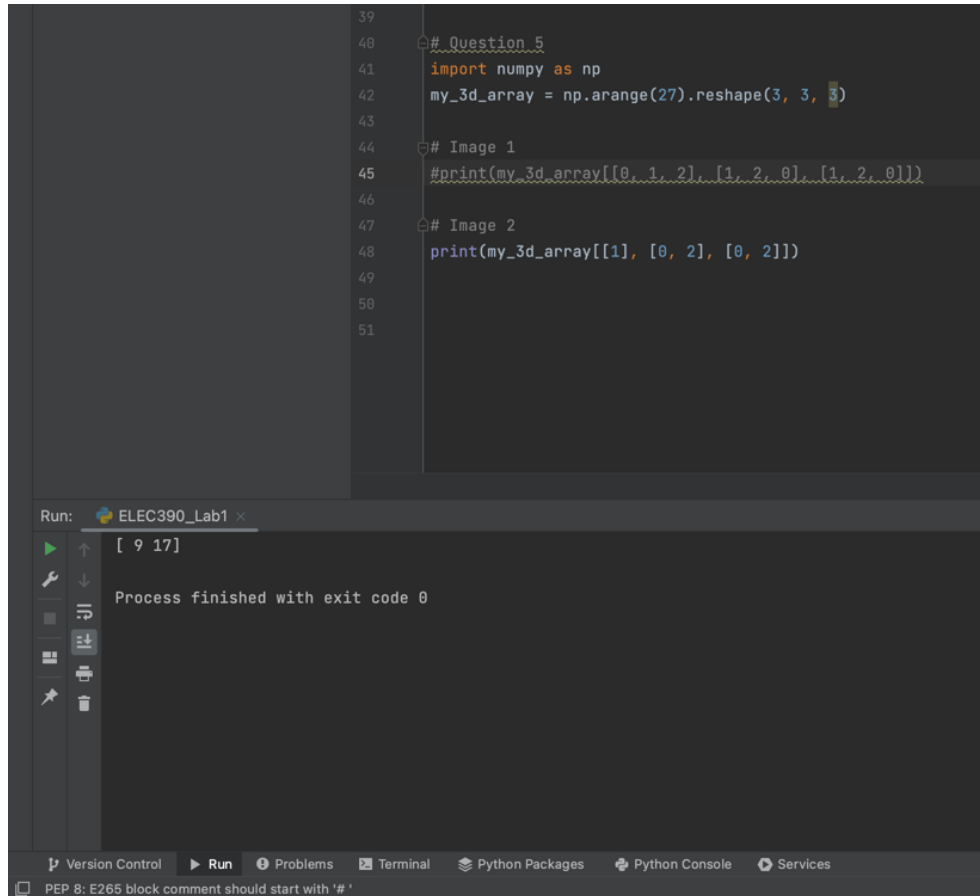
Process finished with exit code 0

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PEP 8: E265 block comment should start with '#'

Figure 7: PyCharm code for Question 5a printing shaded values specified in the first Image.

Figure 8 is the code and output for the second Image.



The image shows a PyCharm IDE window with a Python file named 'ELECC390_Lab1'. The code is as follows:

```
39
40 # Question 5
41 import numpy as np
42 my_3d_array = np.arange(27).reshape(3, 3, 3)
43
44 # Image 1
45 #print(my_3d_array[[0, 1, 2], [1, 2, 0], [1, 2, 0]])
46
47 # Image 2
48 print(my_3d_array[[1], [0, 2], [0, 2]])
49
50
51
```

The output console shows the result of the print statement in Image 2:

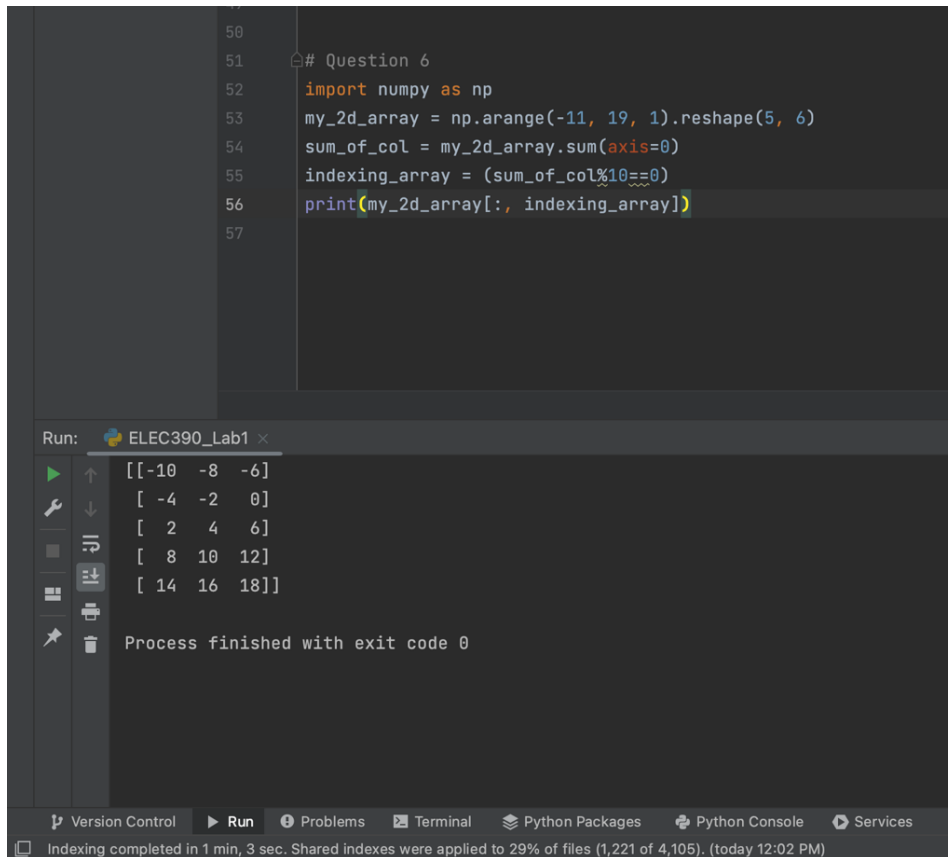
```
Run: ELECC390_Lab1 x
[ 9 17]
Process finished with exit code 0
```

The bottom status bar shows a warning: 'PEP 8: E265 block comment should start with '#''. The bottom toolbar includes buttons for Version Control, Run, Problems, Terminal, Python Packages, Python Console, and Services.

Figure 8: PyCharm code for Question 4a printing shaded values specified in the second Image.

Question 6)

This question involved creating a 2D array with values ranging -10 through 19. The following code seen in Figure 9 sums each of the columns of the array. After the sums are obtained an indexing_array is created to check if each sum is divisible by 10. If the column gets flagged as true, then it will be printed. As you can see from the output in Figure 9 each of the columns seen add up to a multiple of 10.



```
50
51 # Question 6
52 import numpy as np
53 my_2d_array = np.arange(-11, 19, 1).reshape(5, 6)
54 sum_of_col = my_2d_array.sum(axis=0)
55 indexing_array = (sum_of_col%10==0)
56 print(my_2d_array[:, indexing_array])
57
```

Run: ELEC390_Lab1 x

```
[[ -10  -8  -6]
 [  -4  -2   0]
 [   2   4   6]
 [   8  10  12]
 [  14  16  18]]
```

Process finished with exit code 0

Version Control Run Problems Terminal Python Packages Python Console Services

Indexing completed in 1 min, 3 sec. Shared indexes were applied to 29% of files (1,221 of 4,105). (today 12:02 PM)

Figure 9: PyCharm code for Question 6 printing columns of a 2D array if the column values sum to a multiple of 10.