Exercises

This is a collection of 100 numpy exercises. The goal of this collection is to offer a quick reference for both old and new users.

1. Import the numpy package under the name `np` (★☆☆)

In [ ]:

2. Print the numpy version and the configuration (★☆☆)

In [ ]:

3. Create a null vector of size 10 (★☆☆)

In [ ]:

4. How to find the memory size of any array (★☆☆)

In [ ]:

5. How to get the documentation of the numpy add function from the command line? (★☆☆)

In [ ]:

6. Create a null vector of size 10 but the fifth value which is 1 (★☆☆)

In [ ]:

7. Create a vector with values ranging from 10 to 49 (★☆☆)

In [ ]:

8. Reverse a vector (first element becomes last) (★☆☆)

In [ ]:

9. Create a 3x3 matrix with values ranging from 0 to 8 (★☆☆)

In [ ]:

dices of non-zero elements from [1,2,0,0,4,0] (★☆☆)

In [ ]:

11. Create a 3x3 identity matrix (★☆☆)

In [ ]:

12. Create a 3x3x3 array with random values (★☆☆)

In [ ]:

13. Create a 10x10 array with random values and find the minimum and maximum values (★☆☆)

In [ ]:

14. Create a random vector of size 30 and find the mean value (★☆☆)

In [ ]:

15. Create a 2d array with 1 on the border and 0 inside (★☆☆)

In [ ]:

16. How to add a border (filled with 0's) around an existing array? (★☆☆)

In [ ]:

17. What is the result of the following expression? (★☆☆)

```
0 * np.nan
np.nan == np.nan
np.inf > np.nan
np.nan - np.nan
np.nan in set([np.nan])
0.3 == 3 * 0.1
```

In [ ]:

18. Create a 5x5 matrix with values 1,2,3,4 just below the diagonal (★☆☆)

In [ ]:

19. Create a 8x8 matrix and fill it with a checkerboard pattern (★☆☆)

In [ ]:

20. Consider a (6,7,8) shape array, what is the index (x,y,z) of the 100th element? (★☆☆)

In [ ]:

21. Create a checkerboard 8x8 matrix using the tile function (★☆☆)

In [ ]:

22. Normalize a 5x5 random matrix (★☆☆)

In [ ]:

23. Create a custom dtype that describes a color as four unsigned bytes (RGBA) (★☆☆)

In [ ]:

24. Multiply a 5x3 matrix by a 3x2 matrix (real matrix product) (★☆☆)

In [ ]:

25. Given a 1D array, negate all elements which are between 3 and 8, in place. (★☆☆)

In [ ]:

26. What is the output of the following script? (★☆☆)

```
# Author: Jake VanderPlas

print(sum(range(5),-1))
from numpy import *
print(sum(range(5),-1))
```

In [ ]:

27. Consider an integer vector Z, which of these expressions are legal? (★☆☆)

```
Z**Z
2 << Z >> 2
Z <- Z
1j*Z
Z/1/1
Z<Z>Z
```

28. What are the result of the following expressions? (★☆☆)

```
np.array(0) / np.array(0)
np.array(0) // np.array(0)
np.array([np.nan]).astype(int).astype(float)
```

In [ ]:

29. How to round away from zero a float array ? (★☆☆)

In [ ]:

30. How to find common values between two arrays? (★☆☆)

In [ ]:

31. How to ignore all numpy warnings (not recommended)? (★☆☆)

In [ ]:

32. Is the following expressions true? (★☆☆)

```
np.sqrt(-1) == np.emath.sqrt(-1)
```

In [ ]:

33. How to get the dates of yesterday, today and tomorrow? (★☆☆)

In [ ]:

34. How to get all the dates corresponding to the month of July 2016? (★★☆)

In [ ]:

35. How to compute ((A+B)*(-A/2)) in place (without copy)? (★★☆)

In [ ]:

36. Extract the integer part of a random array of positive numbers using 4 different methods (★★☆)

In [ ]:

37. Create a 5x5 matrix with row values ranging from 0 to 4 (★★☆)

In [ ]:

38. Consider a generator function that generates 10 integers and use it to build an array (★☆☆)

In [ ]:

39. Create a vector of size 10 with values ranging from 0 to 1, both excluded (★★☆)

In [ ]:

40. Create a random vector of size 10 and sort it (★★☆)

In [ ]:

41. How to sum a small array faster than np.sum? (★★☆)

In [ ]:

42. Consider two random array A and B, check if they are equal (★★☆)

In [ ]:

43. Make an array immutable (read-only) (★★☆)

In [ ]:

44. Consider a random 10x2 matrix representing cartesian coordinates, convert them to polar coordinates (★★☆)

In [ ]:

45. Create random vector of size 10 and replace the maximum value by 0 (★★☆)

In [ ]:

46. Create a structured array with `x` and `y` coordinates covering the [0,1]x[0,1] area (★★☆)

In [ ]:

47. Given two arrays, X and Y, construct the Cauchy matrix C (Cij =1/(xi - yj)) (★★☆)

In [ ]:

48. Print the minimum and maximum representable value for each numpy scalar type (★★☆)

In [ ]:

49. How to print all the values of an array? (★★☆)

In [ ]:

50. How to find the closest value (to a given scalar) in a vector? (★★☆)

In [ ]:

51. Create a structured array representing a position (x,y) and a color (r,g,b) (★★☆)

In [ ]:

52. Consider a random vector with shape (100,2) representing coordinates, find point by point distances (★★☆)

In [ ]:

53. How to convert a float (32 bits) array into an integer (32 bits) in place?

In [ ]:

54. How to read the following file? (★★☆)

```
1, 2, 3, 4, 5
6,  ,  , 7, 8
 ,  , 9,10,11
```

In [ ]:

55. What is the equivalent of enumerate for numpy arrays? (★★☆)

In [ ]:

56. Generate a generic 2D Gaussian-like array (★★☆)

In [ ]:

 randomly place p elements in a 2D array? (★★☆)

In [ ]:

58. Subtract the mean of each row of a matrix (★★☆)

In [ ]:

59. How to sort an array by the nth column? (★★☆)

In [ ]:

60. How to tell if a given 2D array has null columns? (★★☆)

In [ ]:

61. Find the nearest value from a given value in an array (★★☆)

In [ ]:

62. Considering two arrays with shape (1,3) and (3,1), how to compute their sum using an iterator? (★★☆)

In [ ]:

63. Create an array class that has a name attribute (★★☆)

In [ ]:

64. Consider a given vector, how to add 1 to each element indexed by a second vector (be careful with repeated indices)? (★★★)

In [ ]:

65. How to accumulate elements of a vector (X) to an array (F) based on an index list (I)? (★★★)

In [ ]:

66. Considering a (w,h,3) image of (dtype=ubyte), compute the number of unique colors (★★☆)

In [ ]:

67. Considering a four dimensions array, how to get sum over the last two axis at once? (★★★)

68. Considering a one-dimensional vector D, how to compute means of subsets of D using a vector S of same size describing subset indices? (★★★)

In [ ]:

69. How to get the diagonal of a dot product? (★★★)

In [ ]:

70. Consider the vector [1, 2, 3, 4, 5], how to build a new vector with 3 consecutive zeros interleaved between each value? (★★★)

In [ ]:

71. Consider an array of dimension (5,5,3), how to mulitply it by an array with dimensions (5,5)? (★★★)

In [ ]:

72. How to swap two rows of an array? (★★★)

In [ ]:

73. Consider a set of 10 triplets describing 10 triangles (with shared vertices), find the set of unique line segments composing all the triangles (★★★)

In [ ]:

74. Given a sorted array C that corresponds to a bincount, how to produce an array A such that np.bincount(A) == C? (★★★)

In [ ]:

75. How to compute averages using a sliding window over an array? (★★★)

In [ ]:

76. Consider a one-dimensional array Z, build a two-dimensional array whose first row is (Z[0],Z[1],Z[2]) and each subsequent row is shifted by 1 (last row should be (Z[-3],Z[-2],Z[-1]) (★★★)

In [ ]:

 negate a boolean, or to change the sign of a float inplace? (★★★)

In [ ]:

78. Consider 2 sets of points P0,P1 describing lines (2d) and a point p, how to compute distance from p to each line i (P0[i],P1[i])? (★★★)

In [ ]:

79. Consider 2 sets of points P0,P1 describing lines (2d) and a set of points P, how to compute distance from each point j (P[j]) to each line i (P0[i],P1[i])? (★★★)

In [ ]:

80. Consider an arbitrary array, write a function that extract a subpart with a fixed shape and centered on a given element (pad with a `fill` value when necessary) (★★★)

In [ ]:

81. Consider an array Z = [1,2,3,4,5,6,7,8,9,10,11,12,13,14], how to generate an array R = [[1,2,3,4], [2,3,4,5], [3,4,5,6], ..., [11,12,13,14]]? (★★★)

In [ ]:

82. Compute a matrix rank (★★★)

In [ ]:

83. How to find the most frequent value in an array?

In [ ]:

84. Extract all the contiguous 3x3 blocks from a random 10x10 matrix (★★★)

In [ ]:

85. Create a 2D array subclass such that Z[i,j] == Z[j,i] (★★★)

In [ ]:

86. Consider a set of p matrices wich shape (n,n) and a set of p vectors with shape (n,1). How to compute the sum of of the p matrix products at once? (result has shape (n,1)) (★★★)

87. Consider a 16x16 array, how to get the block-sum (block size is 4x4)? (★★★)

In [ ]:

88. How to implement the Game of Life using numpy arrays? (★★★)

In [ ]:

89. How to get the n largest values of an array (★★★)

In [ ]:

90. Given an arbitrary number of vectors, build the cartesian product (every combinations of every item) (★★★)

In [ ]:

91. How to create a record array from a regular array? (★★★)

In [ ]:

92. Consider a large vector Z, compute Z to the power of 3 using 3 different methods (★★★)

In [ ]:

93. Consider two arrays A and B of shape (8,3) and (2,2). How to find rows of A that contain elements of each row of B regardless of the order of the elements in B? (★★★)

In [ ]:

94. Considering a 10x3 matrix, extract rows with unequal values (e.g. [2,2,3]) (★★★)

In [ ]:

95. Convert a vector of ints into a matrix binary representation (★★★)

In [ ]:

96. Given a two dimensional array, how to extract unique rows? (★★★)

In [ ]:

97. Considering 2 vectors A & B, write the einsum equivalent of inner, outer, sum, and mul function (★★★)

In [ ]:

98. Considering a path described by two vectors (X,Y), how to sample it using equidistant samples (★★★)?

In [ ]:

99. Given an integer n and a 2D array X, select from X the rows which can be interpreted as draws from a multinomial distribution with n degrees, i.e., the rows which only contain integers and which sum to n. (★★★)

In [ ]:

100. Compute bootstrapped 95% confidence intervals for the mean of a 1D array X (i.e., resample the elements of an array with replacement N times, compute the mean of each sample, and then compute percentiles over the means). (★★★)

In [ ]: