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Course > Week 1... > Home... > Week 1...

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Week 1 Homework: Exercise 2 Exercise 2

Consider a circle inscribed in a square. The ratio of their areas (the ratio of the area of the circle to the area of the square) is \(\frac{\pi}{4}\). In this six-part exercise, we will find a way to approximate this value.

Exercise 2a

1/1 point (graded)

Using the math library, calculate and print the value of \(\frac{\pi}{4}\).

What is the value of \(\frac{\pi}{4}\)? Report your answer to 6 decimal places.

0.7853981633974483



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Submit

You have used 1 of 10 attempts

✓ Correct (1/1 point)

Exercise 2b

1/1 point (graded)

Using random.uniform(), create a function rand() that generates a single float between -1 and 1.

Call rand() once. For us to be able to check your solution, we will use random.seed() to fix the seed value of the random number generator.

We include some sample code to get you started:

```
import random
random.seed(1) # Fixes the seed of the random number generator.

def rand():
    # define `rand` here!

rand()
```

What is the value you get from calling rand()?

-0.7312715117751976

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Submit

You have used 2 of 10 attempts

✓ Correct (1/1 point)

Exercise 2c

1/1 point (graded)

The distance between two points x and y is the square root of the sum of squared differences along each dimension of x and y. Write a function distance(x, y) that takes two vectors as its input and outputs the distance between them. Use your function to find the distance between (x=(0,0)) and (y=(1,1)).

What is the distance between x and y?

1 4142135623730951

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Submit

You have used 1 of 10 attempts

✓ Correct (1/1 point)

Exercise 2d

1/1 point (graded)

Write a function <code>in_circle(x, origin)</code> that determines whether a point in a two dimensional plane falls within a unit circle surrounding a given origin.

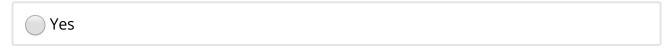
Your function should return a boolean True if the distance between x and origin is less than 1 and False otherwise.

Use distance(x, y) as defined in Exercise 2c.

Use your function to determine whether the point (1,1) lies within the unit circle centered at (0,0):

```
def in_circle(x, origin = [0,0]):
    # Define your function here!
```

Does the point (1,1) lie within the unit circle centered at (0,0)?







Submit

You have used 1 of 1 attempt

✓ Correct (1/1 point)

Exercise 2e

1/1 point (graded)

Create a list inside of R=10000 booleans that determines whether or not a point falls within the unit circle centered at (0,0).

Set the seed to 1 using random.seed(1).

Use the rand function from Exercise 2b to generate R randomly located points.

Use the function <u>in_circle</u> to test whether or not a given pint falls within the unit circle.

Find the proportion of points that fall within the circle by summing all True values in the inside list; then divide the answer by R to obtain a proportion.

Print your answer. This proportion is an estimate of the ratio of the two areas!

What is the proportion of points within the unit circle?



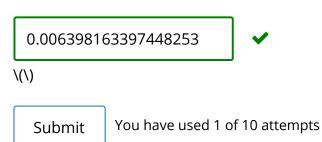
✓ Correct (1/1 point)

Exercise 2f

1/1 point (graded)

Calculate the difference between your estimate from Exercise 2e and math.pi / 4. Note: inside and R are defined as in Exercise 2e.

What is the difference between our estimate from 2e and the true value of (π) ?



✓ Correct (1/1 point)

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