
Unit 2 - illustrative programs

Write the Python program for calculating the distance between two points.

```
1 from math import sqrt
2
3
4 def distance_between(pointA, pointB):
5     x1, y1 = pointA
6     x2, y2 = pointB
7
8     distx = x1 - x2
9     disty = y1 - y2
10
11     return sqrt(distx**2 + disty**2)
```

Coordinate Geometry Terms

Coordinate Geometry Definition - It is one of the branches of geometry where the position of a point is defined using coordinates.

What are the Coordinates?

SEE ANSWER

Coordinate Geometry Terms

Coordinate Geometry Definition - It is one of the branches of geometry where the position of a point is defined using coordinates.

What are the Coordinates?

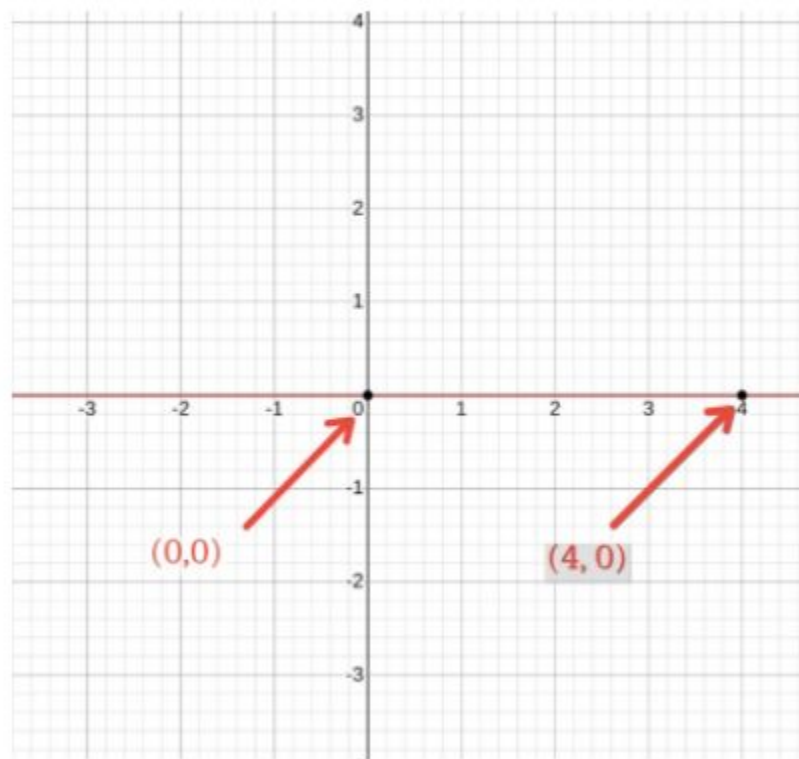
Coordinates are a set of values which helps to show the exact position of a point in the coordinate plane.

Coordinate Plane Meaning - A coordinate plane is a 2D plane which is formed by the intersection of two perpendicular lines known as the x-axis and y-axis.

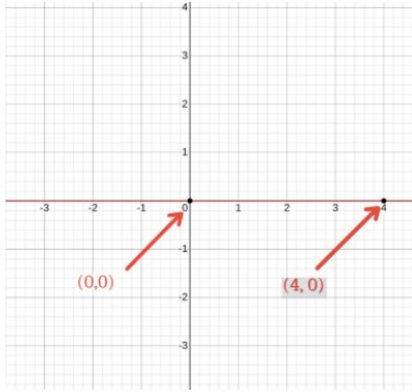
What is the Distance Formula?

It is used to find the distance between two points situated in $A(x_1, y_1)$ and $B(x_2, y_2)$

What is the distance between $(4, 0)$ and $(0, 0)$?



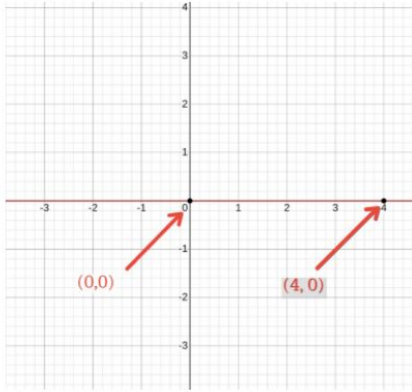
What is the distance between (4, 0) and (0, 0)?



```
def test_the_distance_from_04_to_00_returns04():  
    '''distance from (4,0) to (0,0) is 4'''  
    assert distance_between((4, 0), (0, 0)) == 4
```

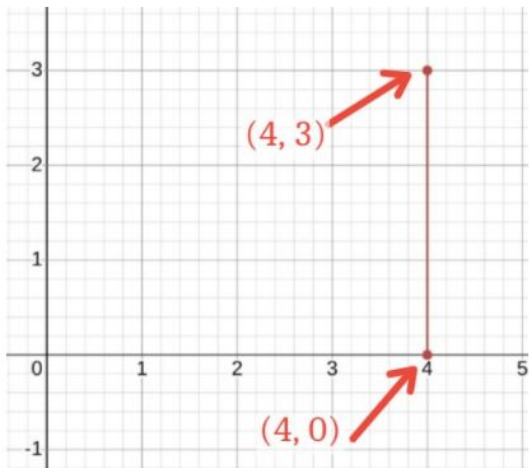
```
def distance_between(pointA, pointB):  
    return 4
```

What is the distance between (4, 0) and (0, 0)?



```
def distance_between(pointA, pointB):  
    x1, y1 = pointA  
    x2, y2 = pointB  
  
    return x1 - x2
```


What is the distance between $(4, 3)$ and $(4, 0)$?



3

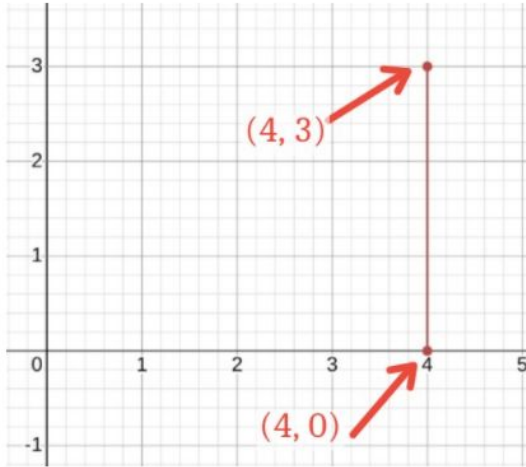
$$d = (x_1 - x_2) + (y_1 - y_2)$$

$$= (4 - 4) + (3 - 0)$$

$$= 0 + 3$$

$$= 3$$

What is the distance between (4, 3) and (4, 0)?

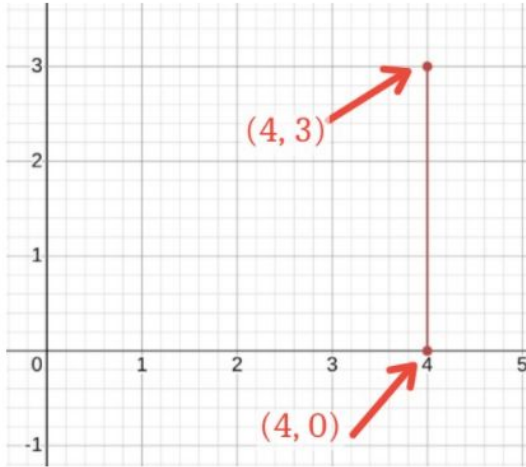


```
6 def distance_between(pointA, pointB):  
7     x1, y1 = pointA  
8     x2, y2 = pointB  
9  
10 -     return x1 - x2  
10+     return (x1 - x2) + (y1 - y2)
```

3

```
d = (x1 - x2) + (y1 - y2)  
  = (4 - 4) + (3 - 0)  
  = 0 + 3  
  = 3
```

What is the distance between (4, 3) and (4, 0)?

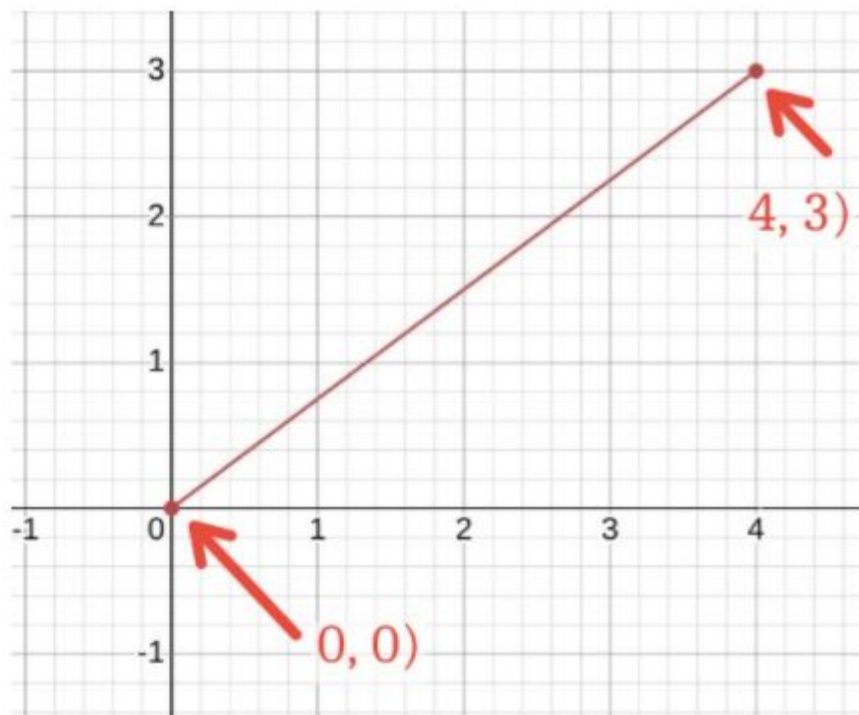


```
6 def distance_between(pointA, pointB):  
7     x1, y1 = pointA  
8     x2, y2 = pointB  
9  
10 -     return (x1 - x2) + (y1 - y2)  
10 +     distx = x1 - x2  
11 +     disty = y1 - y2  
12 +  
13 +     return distx + disty
```

3

```
d = (x1 - x2) + (y1 - y2)  
  = (4 - 4) + (3 - 0)  
  = 0 + 3  
  = 3
```

What is the distance between $(4, 3)$ and $(0, 0)$?



Using previous formula, we get

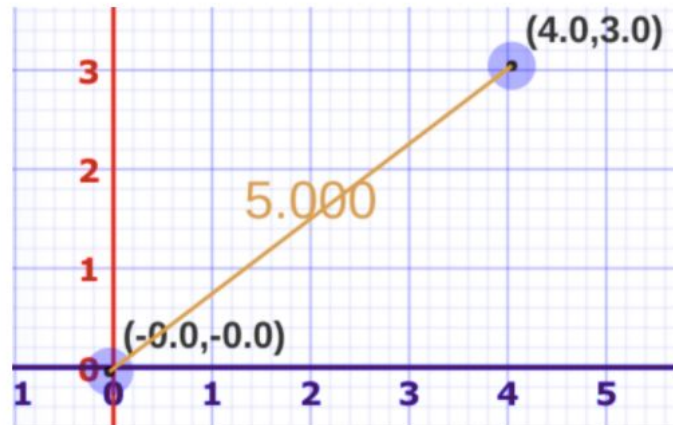
$$d = (x_1 - x_2) + (y_1 - y_2)$$

$$= (4 - 0) + (3 - 0)$$

$$= 4 + 3$$

$$= 7$$

But we know from <https://www.mathsisfun.com/algebra/distance-2-points.html>



Using previous formula, we get

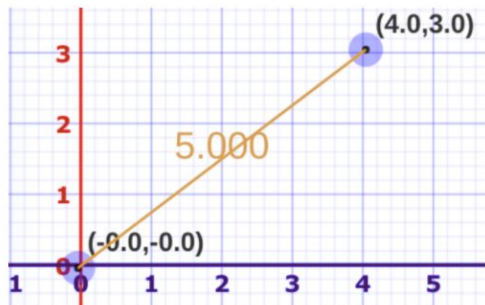
$$d = (x_1 - x_2) + (y_1 - y_2)$$

$$= (4 - 0) + (3 - 0)$$

$$= 4 + 3$$

$$= 7$$

But we know from <https://www.mathsisfun.com/algebra/distance-2-points.html>



If $(x_1 - x_2) + (y_1 - y_2)$ is giving a higher value than what is correct,

What can the **distance formula** be?

Why not square the x component and square the y component, and then reduce it down by using square root?

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Let's see if it works...

$$\begin{aligned} d &= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \\ &= \sqrt{(4 - 0)^2 + (3 - 0)^2} \\ &= \sqrt{16 + 9} \\ &= \sqrt{25} \\ &= 5 \end{aligned}$$

```
6 def distance_between(pointA, pointB):
7     x1, y1 = pointA
8     x2, y2 = pointB
9
10    distx = x1 - x2
11    disty = y1 - y2
12
13 -    return distx + disty
13+    return (distx**2 + disty**2)**.5
```

```
6+ from math import sqrt
7+
8  def distance_between(pointA, pointB):
9      x1, y1 = pointA
10     x2, y2 = pointB
11
12     distx = x1 - x2
13     disty = y1 - y2
14
15 -     return (distx**2 + disty**2)**.5
15+     return sqrt(distx**2 + disty**2)
```



```
test_solution.py::test_the_greeting_is_correct PASSED
test_solution.py::test_the_distance_from_04_to_00_returns04 PASSED
test_solution.py::test_the_distance_from_03_to_00_returns_value_3 PASSED
test_solution.py::test_the_distance_from_43_to_00_returns_value_5 PASSED
- test_solution.py::test_the_distance_from2minu1_to53_returns_value_5 FAILED
- test_solution.py::test_the_distance_from2minu1_to53_returns_value_5 PASSED
```

```
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4 def distance_between(pointA, pointB):
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11     return sqrt(distx**2 + disty**2)
12
13
14 # main program
15
16 # tuple packing allows for assigning
17 # multiple inputs in one statement
18
19 pointA = int(input("Enter xcoordinate for PointA ")), \
20          int(input("Enter ycoordinate for PointA "))
21
22 pointB = int(input("Enter xcoordinate for PointB ")), \
23          int(input("Enter ycoordinate for PointB "))
24
25 print(distance_between(pointA, pointB))
26
```

Post Unit Assignment

- Practice your solution at <http://j.mp/twoPoints>
 - **repl.it** or **Guvi** - links also to be added
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