We learned that a diagonal line in a coordinate plane can be measured by drawing horizontal and vertical line segments from it to form a right triangle. The Pythagorean Theorem can then be employed to find the length of the diagonal line. Of course if a line is already horizontal of vertical, its length can be found by counting squares. Given two points in a coordinate plane, we can find the length of any line segment, with or without the use of a graph. Since the diagonal line is always the hypotenuse of the right triangle, the horizontal and vertical lines we draw can be labeled 'a' and 'b'.

Examples of horizontal line problems:

(1) Find the distance between the points A: (3, 7) and B: (14, 7).

Begin by subtracting the smaller *x*-value from the larger to find the horizontal distance: 14 – 3 = 11

Then subtract the smaller *y*-value from the larger: Since 7 – 7 = 0, there is no change in the vertical distance, meaning it is a horizontal line with a length of 11 units.

(2) Find the distance between the points M: (-10, -4) and N: (2, -4).

Again, subtract the smaller *x*-value from the larger to find the horizontal distance, only this time we are subtracting a negative number: 2 – (–10) = ?

You'll recall from sixth grade that <u>subtracting a negative</u> number is the same as <u>adding a positive</u> number, so 2 – (–10) = 2 +(+10) = 12.

Since the *y*-values again are the same, the line segment is horizontal and its length is 12.

Examples of vertical line problems:

(1) Find the distance between the points G: (5, -4) and H: (5, -6).

In this case, the *x*-values are the same, meaning there is no horizontal movement between the points.

Subtract the smaller y-value from the larger; in this case, the larger of two negatives from the smaller: –4 – (–6) = –4 +(+6) = 2, the distance between the points.

(2) Find the distance between the points E: (-16, -3) and F: (-16, 12).

The *x*-values are the same, meaning the line will be vertical.

12 – (–3) = 15, the distance between the points.

Examples of diagonal line problems:

(1) Find the distance between the points Q: (4, 12) and R: (7, 8).

The difference is *x*-values is 7 – 4 = 3. We can call this side '*a*' or '*b*', so we will call it '*a*'.

The larger *y*-value minus the smaller is 12 – 8 = 4, side '*b*'.

$a^2 + b^2 = c^2$
$3^2 + 4^2 = c^2$
$9 + 16 = c^2$
$25 = c^2$
$5 = c$, the length of the line segment

Find the distance between the points, then circle whether the line segment is horizontal, vertical or diagonal. Hint: draw a rough draft of each graph.

A: (0, 0) and B: (5, 12) Distance: _____ horizontal vertical diagonal

C: (2, 6) and D: (6, 2) Distance: _____ horizontal vertical diagonal

E: (11, 7) and F: (16, 7) Distance: _____ horizontal vertical diagonal

G: (15, 12) and H: (21, 4) Distance: _____ horizontal vertical diagonal

J: (4, -5) and K: (4, 5) Distance: _____ horizontal vertical diagonal

L: (-8, 4) and M: (3, 10) Distance: _____ horizontal vertical diagonal

N: (-5, -3) and P: (0, -3) Distance: _____ horizontal vertical diagonal

Q: (94, 88) and R: (87, 88) Distance: _____ horizontal vertical diagonal

S: (8, 8) and T: (7, 9) Distance: _____ horizontal vertical diagonal

U: (-17, 21) and V: (-17, 30) Distance: _____ horizontal vertical diagonal

W: (-99, 6) and Z: (-103, 68) Distance: _____ horizontal vertical diagonal

D: (1.5, 7) and F: (1.5, -2) Distance: _____ horizontal vertical diagonal

K: (-5, -6) and L: (-12, -6) Distance: _____ horizontal vertical diagonal