One Planar Graph Formula?

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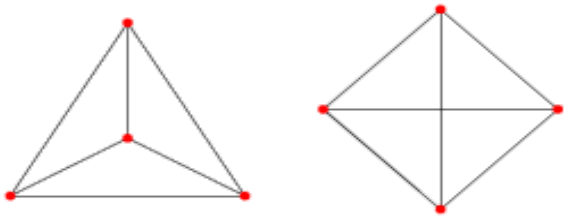
Introduction

Before I explain my problem, you need to understand what a planar graph is. To understand a planar graph think about the connect-the-dots pictures that you did or have seen people do before. A planar graph is that except it has shapes and the connections between the dots must never overlap. Take this planar graph for example:



The left graph is planar because none of the connections are overlapping and the right graph is in a nonplanar configuration because the two connections in the middle are overlapping. Also, as you can see there isn't just one way to shape a planar graph you just have to remember this one rule and this one rule alone the connection mustn't cross each other.

Question

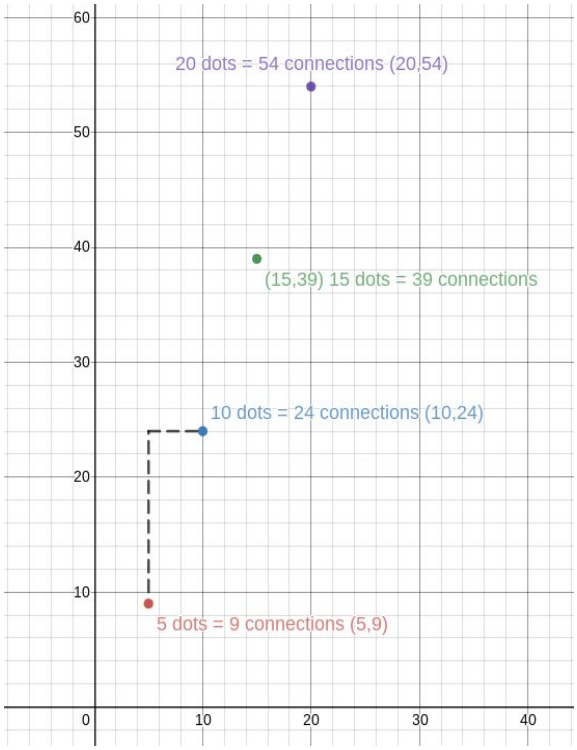
Is there a function which gives the maximum number of connections in a planar graph with N nodes? Can I use the same function that has been made for a planar graph when the dots are multiples of 5 and when the dots are multiples of 15 and 8?

Result

I created a function to check and justify my work with the number of dots to connections. I first created a graph with 15 dots to see how many connections I could conduct. But I started to ask myself how can I prove this with mathematical prove. So I then made a table of multiples of 5 to see if the connection that they had could help me prove that my graph was correct. When I saw that all the numbers had a difference of 15 that means that they are all connected.

# dots	# connections
5	9
10	24
15	39
20	54

After I wrote my calculations down I made a linear graph to find the exact function I can use to prove my theory is true. I used the formula for slope-intercept form(y=mx+b) to find the formula. The slope is 3 because the rise is 15 and the run is 5 which means 15/5 equals 3. And b=-6 because for (0,-6) to reach (5,9) we have to rise by 15 and shift to the right 5 times. Thus states my function is 3(x)-6.

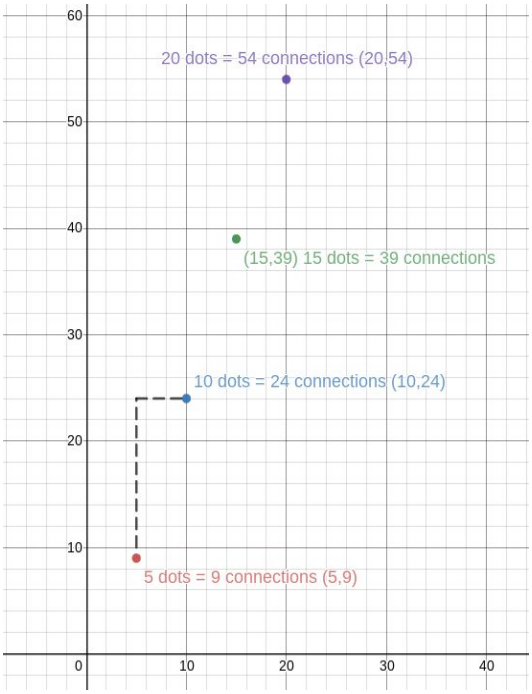


I used the slope-intercept form to insert my function: y=3(x)-6

Multiples of 5

# of Dots(x)	# of Connections(y)
5	9
10	24
15	39
20	54
25	69

I know that my function is true because, 3(5)-6=9, I can check my work because it passes through all the points as you can see below,

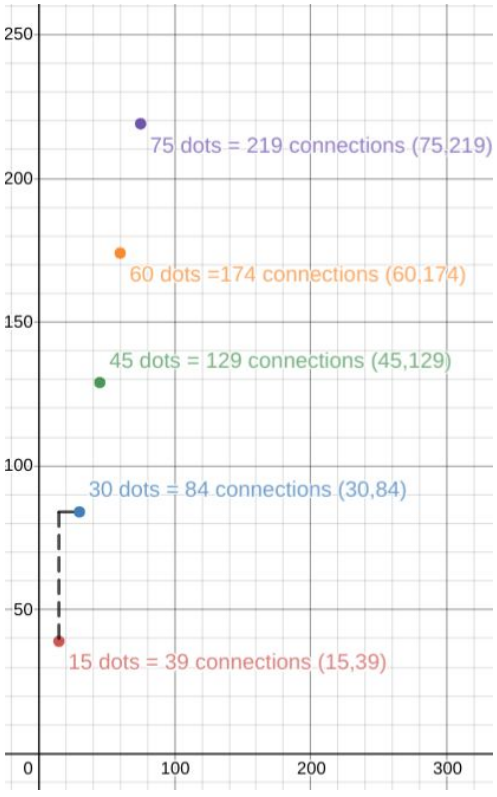


I used the same formula on multiples of 15 as you can see below,

Multiples of 15

# of Dots (x)	# of Connections (y)
15	39
30	84
45	129
60	174
75	219

When I used the formula for the multiples of 5 on multiples of 15 the equation 3(x)-6=y and the equation is still true, seen below.

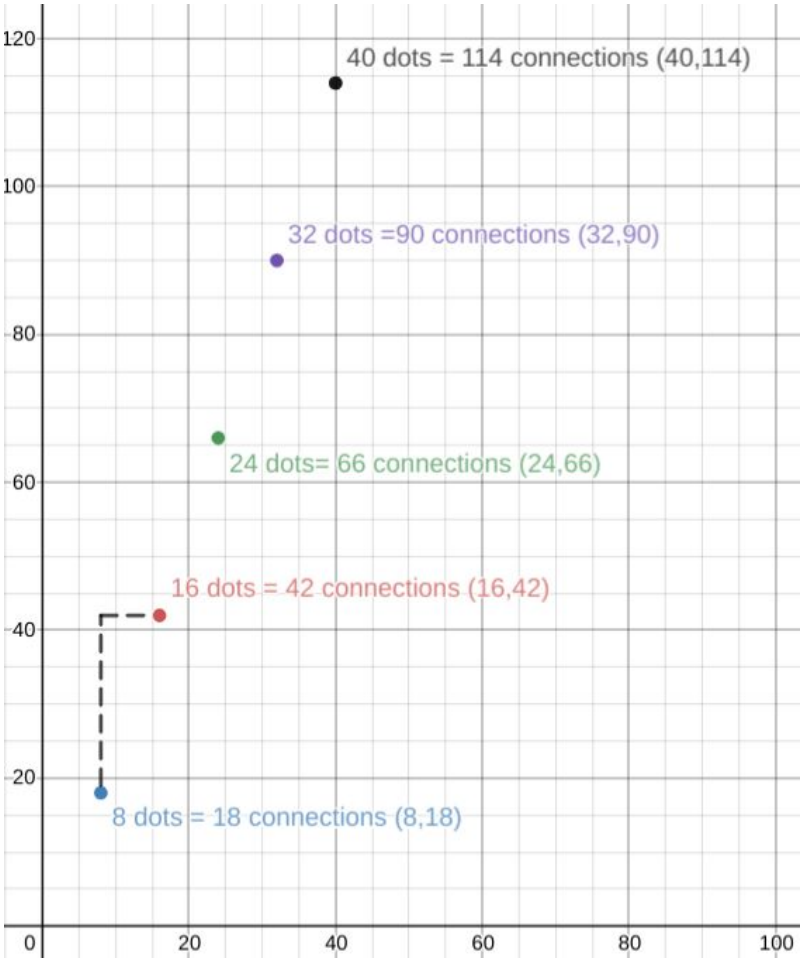


So, to make sure that my planar graph formula is true in any case I did one final test with the formula 3(x)-6. I used the multiples of 8

Multiples of 8

# of Dots (x)	# of Connections (y)
8	18
16	42
24	66
32	90
40	114

As you can see below my function is a reasonable function.



Conclusion

When investigating my question I learned that the function 3(x)-6 is a way check and justify my work. This states that

when you make a planar graph that you can use the planar graph function to justify or check you work. If I could continue working on this project I would find other planar graph formulas to check and justify my work.