

Hypnotic Squares: A Trigonometric Approach - #CSandMath



Lesson Credit:

Lesson was inspired by [@SelimTezel](#) and his work with [Hypnotic Squares](#)

Project Goal:

Students will use their understanding of inverse trigonometry and the Pythagorean Theorem to make a spiraling square pattern

Standards:

9.3.4.3 Use calculators, tables or other technologies in connection with the trigonometric ratios to find angle measures in right triangles in various contexts.

9.3.3.4 Apply the Pythagorean Theorem and its converse to solve problems and logically justify results.

Blocks:



Student Handout

Teacher Guide:

This lesson should be done after students have demonstrated understanding of both right triangle trigonometry and more advanced algebraic examples of the Pythagorean Theorem.

The first task is entry level and works to get students understanding how they can use inverse trig functions to turn angles. The second task takes it up a notch, so be sure to work through it yourself before running with students ;)



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Possible Solutions:

Task 1: The 90-120-150 triangle

```
when clicked
  pen down
  move 90 steps
  turn 90 degrees
  move 120 steps
  turn 180 - atan of 0.75 degrees
  move 150 steps

when space key pressed
  clear
  pen up
  point in direction 90
```



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Task 2: The Hypnotic Square



```
when clicked clicked
  clear
  pen up
  point in direction 90
  go to x: -148 y: 164
  set x to 300
  set d to 10
  pen down
  repeat 4
    move x steps
    turn 90 degrees
  set theta to atan of d / x - d
  set hypotenuse to sqrt of x - d * x - d + d * d
  repeat 60
    move d steps
    turn theta degrees
    repeat 4
      move hypotenuse steps
      turn 90 degrees
    set long_leg to hypotenuse - d
    set theta to atan of d / long_leg
    set hypotenuse to sqrt of long_leg * long_leg + d * d
  change pen color by 10

when space key pressed
  clear
  pen up
  point in direction 90
  go to x: -148 y: 164
```

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