Polygons

greatest common divisor (G.C.D.)
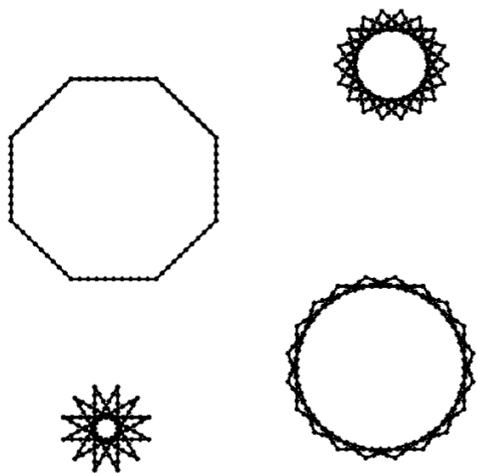
MATH

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1 Create a new object
(I. Embroidery-Objects tutorial).

When scene starts

Set variable
angle
to 36

Set variable
GCD
to 36

Start running stitch with length 10

Repeat 360 ÷ "GCD" times

Repeat 20 times

Move 10 steps

End of loop

Turn right "angle" degrees

End of loop

2 If it doesn't work, control the bricks.

Click „new" to make a new variable.

When scene starts
Set variable
new...

Click on the number to change the **angle**.

Adjust **GCD**:

To make sure the Polygon ends at the same point as it started, we have to calculate the **GCD** (**angle**, 360) and load it again.

What is the **GCD**?
Turn to backside.

You find the variable in the Formeleditor under „Data".

| Sensors | . | 0 | = | + |
| Data | | Abc | | OK |

Click on this number if you want to **change the size** of the pattern.

1

What is the greates common divisor (GCD)?

The GCD(a,b) is the biggest number that can divide a as well as b in a whole number.

2

How to calculate the GCD?

1. First determine the numbers in the set of divisors of both numbers.
2. The biggest number that ocurre in both sets is the GCD for both numbers.

   Example: GCD(12,18)=?

1. Set of divisors of 12 ={1,2,3,4,6,12}
   Set of divisors of 18 ={1,2,3,6,9,18}
2. The number 6 is the biggest number that occures in both sets. That means the GCD(12,18) is 6.

3

Why do you need the GCD?

To close the shape, you have to divide at least 360 by the GCD repetitions.

A good example is the triangle with an exterior angle of 120° or a square with an interior and exterior angle with 90°.

- Calculate the GCD(120,360°)=120
- Divide 360/120 = 3. That means we need 3 repetitions to close the shape. We turn three times 120° to the right to stitch the triangle.
- How many repetitions do we need to make a square?

Change the angle and try to find the right pattern for the numbers below on the right side.
45
54
90
100
120
132
144
160
165

Warning: always calculate the GCD new and adjust it in your code!