

Making Maths Matter with TurtleStitch

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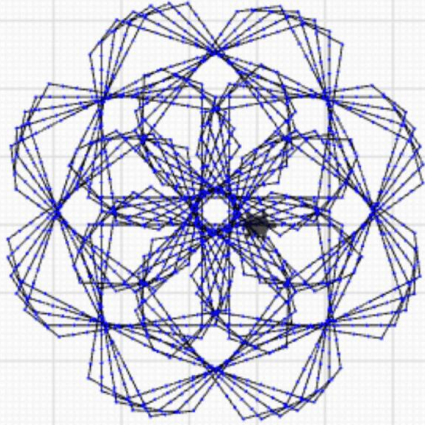
Statutory requirements

Pupils should be taught to:

- identify 3-D shapes, including cubes and other cuboids, from 2-D representations
- know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles
- draw given angles, and measure them in degrees ($^{\circ}$)
- identify:
 - angles at a point and one whole turn (total 360°)
 - angles at a point on a straight line and $\frac{1}{2}$ a turn (total 180°)
 - other multiples of 90°
- use the properties of rectangles to deduce related facts and find missing lengths and angles
- distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

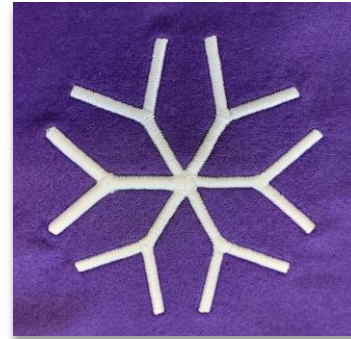
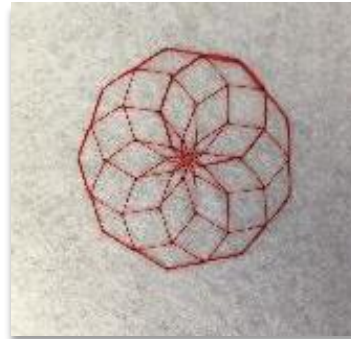
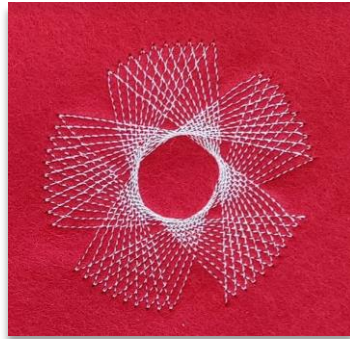
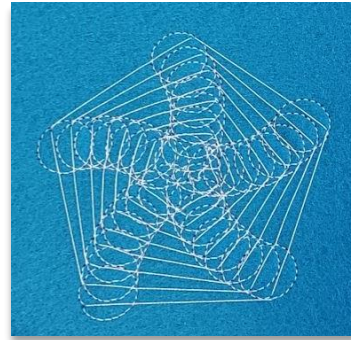
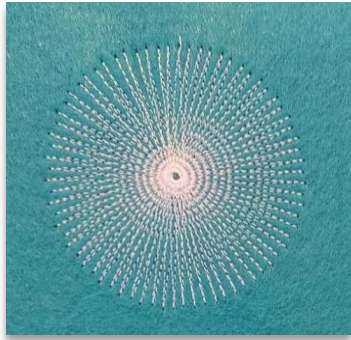
Introducing TurtleStitch: www.turtlestitch.org

```
reset
running stitch by 10 steps
repeat 8
  move 55 steps
  repeat 15
    turn 47 degrees
    move 32 steps
    turn 70 degrees
    move 124 steps
```



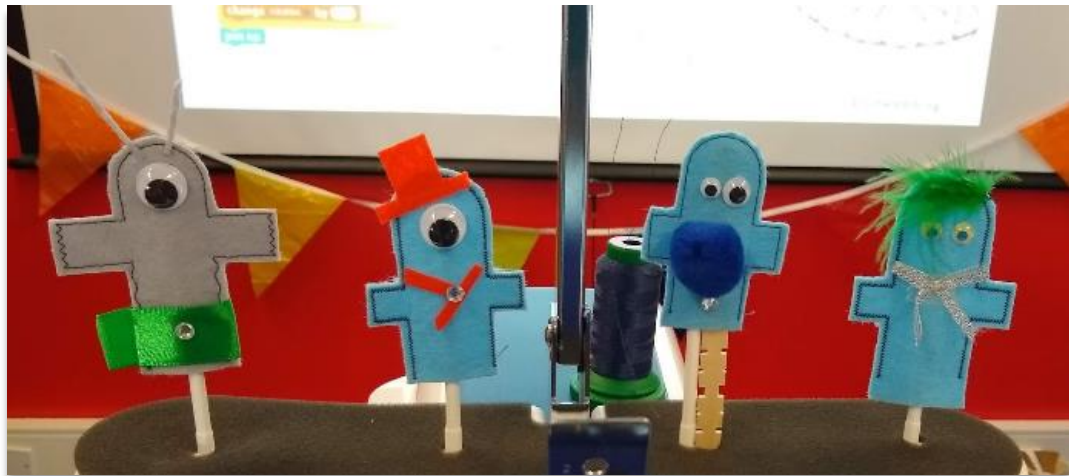
Our resources: warwick.ac.uk/turtlestitch





Examples of work (ages 9 – 11)





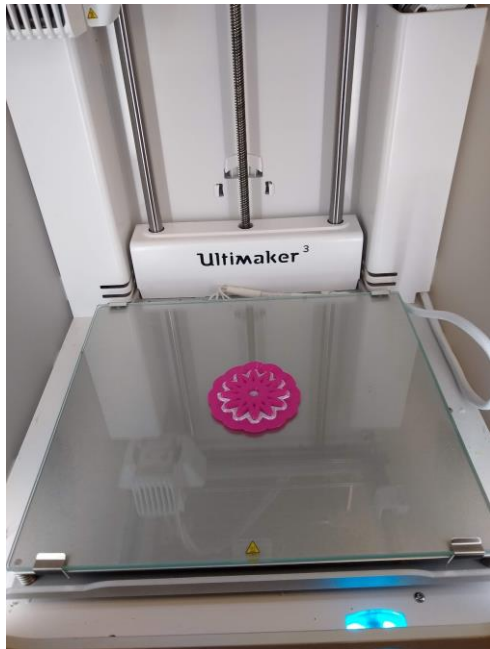
Accessible Manufacturing



Resources: warwick.ac.uk/turtlestitch



Accessible Manufacturing



← 1 hour



5 minutes →



Resources: warwick.ac.uk/turtlestitch





Careers in software and control



Resources: warwick.ac.uk/turtlestitch



Pattern design



"the resurrection of Coventry after the Blitz"

"a spinning football"



"bicycle wheels"



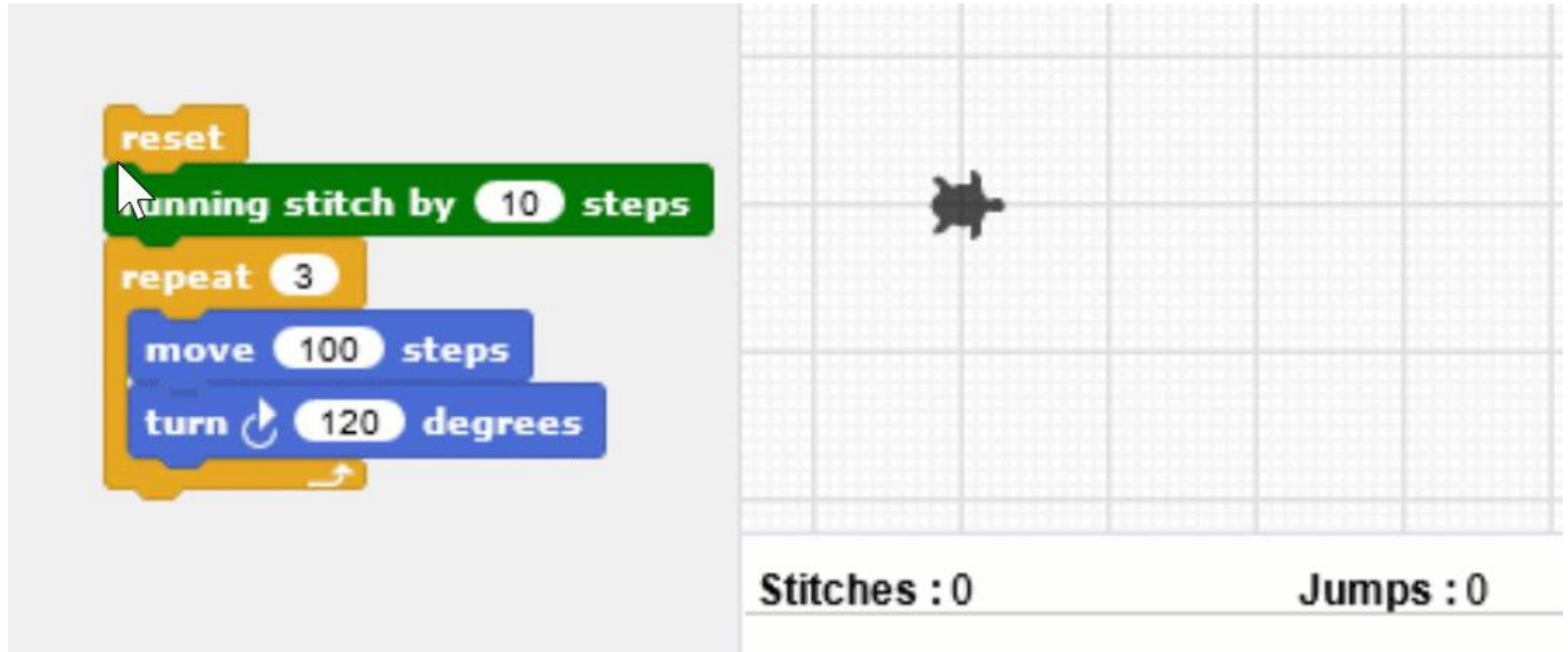
"pineapple designs when we were looking at the historic images"



"ribbons manufacturing"

"intertwined circles to represent all people of different cultures who came together as citizens of our multicultural city"





The image shows a Scratch script on the left and a turtle on a grid on the right. The script consists of the following blocks:

- reset** (orange block)
- running stitch by 10 steps** (green block)
- repeat 3** (orange block) containing:
 - move 100 steps** (blue block)
 - turn 120 degrees** (blue block)

The turtle is positioned at the center of a 10x10 grid. Below the grid, the text "Stitches : 0" and "Jumps : 0" is displayed.

Introducing Turtle Geometry: Create a closed shape



The image shows the TurtleStitch software interface. At the top, the title bar reads "TURTLE STITCH" and "untitled". The interface is divided into several sections:

- Left Panel (Library):** A vertical list of categories: Motion, Sensing, Pen, Embroidery, Other, Control, Operators, Variables, and Colors. Below this is a scrollable list of blocks including "reset", "when clicked", "when space key pressed", "when I am clicked", "when", "when I receive", "broadcast", "broadcast and wait", "broadcast to all", and "message".
- Script Area:** A workspace where blocks are assembled. The current script consists of:
 - "reset" block
 - "running stitch by 10 steps" block
 - "repeat 3" block containing:
 - "move 100 steps" block
 - "turn 120 degrees" block
- Canvas:** A large grid with a small black turtle icon in the center.
- Bottom Panel (Status and Controls):** Displays "Stitches : 0", "Jumps : 0", and "Size : 0.00 x 0.00 cm". It also includes controls for "Reset View", "Zoom to fit", "X-Ray", and "Turbo mode".

Teaching the Turtle a new word

The screenshot shows the TURTLE STITCH software interface. On the left is a sidebar with a category menu (Motion, Sensing, Pen, Embroidery, Other) and a list of code blocks. The main workspace contains a code editor with the following blocks: a 'reset' block, a 'running stitch by 10 steps' block, and a 'Triangle' block. A mouse cursor is positioned over the 'Triangle' block. To the right of the code editor is a grid canvas with a black star at the top-left vertex and a blue triangle drawn on the grid. At the bottom of the interface, there is a status bar showing 'Stitches : 30', 'Jumps : 0', and 'Size : 2.00 x 1.73 cm'. Below the status bar are controls for 'Reset View', 'X-Ray', 'Turbo mode', and 'Zoom to fit'.

Introducing parameters: little and large

TURTLE STITCH untitled

Motion Control
Sensing Operators
Pen Variables
Embroidery Colors
Other

reset
when clicked
when space key pressed
when I am clicked
when
when I receive
broadcast
broadcast and wait
broadcast to all
message

reset
running stitch by 10 steps
Triangle

Stitches : 0 Jumps : 0 Size : 0.00 x 0.00 cm

+ - Reset View X-Ray Turbo mode
Zoom to fit

Going for a spin



TURTLE STITCH untitled

Motion Control
Sensing Operators
Pen Variables
Embroidery Colors
Other

move 10 steps
turn 15 degrees
turn 15 degrees
point in direction 90
point towards mouse-pointer
point towards x: 0 y: 0
go to x: 0 y: 0
go to random position
random position
arc radius: 50 degrees: 30
arc radius: 50 degrees: 30

reset
running stitch by 10 steps

Stitches : 0 Jumps : 0 Size : 0.00 x 0.00 cm

+ - Reset View X-Ray Turbo mode
Zoom to fit

Recursion – first create Step block

The image shows the Turtle Stitch software interface. On the left is a sidebar with category menus: Motion (Control), Sensing (Operators), Pen (Variables), Embroidery (Colors), and Other. Below these are several code blocks: 'set x to 0', 'change y by 10', 'set y to 0', 'draw text hello with size 21', 'text length of hello with size 21', and an 'if on edge, bounce' block with sub-blocks for 'x position', 'y position', and 'direction'. A 'Make a block' button is also present. The main workspace is a grid with a needle icon in the center. The code editor shows three blocks: 'reset', 'running stitch by 10 steps', and 'Step 100'. The bottom status bar displays 'Stitches : 0', 'Jumps : 0', and 'Size : 0.00 x 0.00 cm'. There are also buttons for '+ - Reset View', 'Zoom to fit', 'X-Ray', and 'Turbo mode'.

Recursion – Step Larger

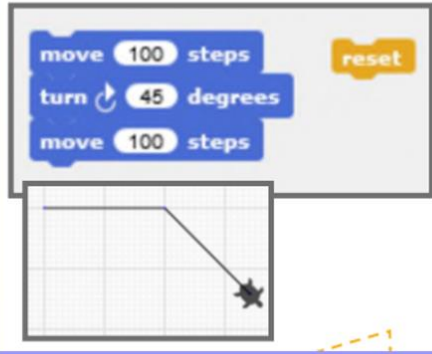


The screenshot shows the TURTLE STITCH software interface. The title bar reads "TURTLE STITCH" and "untitled". The left sidebar contains a category menu with "Motion", "Sensing", "Pen", "Embroidery", and "Other". The "Operators" category is selected, showing a list of mathematical and logical blocks including "+", "-", "x", "/", "^", "mod", "round", "sqrt of 10", "PI", "pick random 1 to 10", and comparison operators "<", "=", ">". The main workspace contains a script with three blocks: an orange "reset" block, a green "running stitch by 10 steps" block, and a blue "Step 100" block. The workspace also features a grid and a star-shaped cursor. At the bottom, a status bar displays "Stitches : 0", "Jumps : 0", and "Size : 0.00 x 0.00 cm". Below the status bar are controls for "Reset View", "Zoom to fit", "X-Ray", and "Turbo mode".

Recursion – introduce end condition

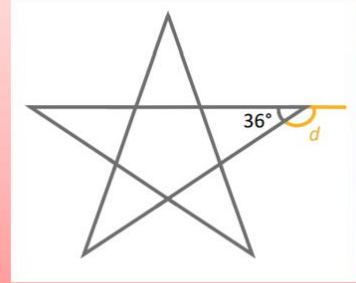
Basic Skills

- Getting started
- Creating Patterns
- Build a block
- Parameters/
Variables
- Shapes



Maths (years 5 and 6)

- Calculate missing angles
- Properties of shapes
- Highest Common Factor
- Using variables
- Coordinates
- Lesson Plans for teachers



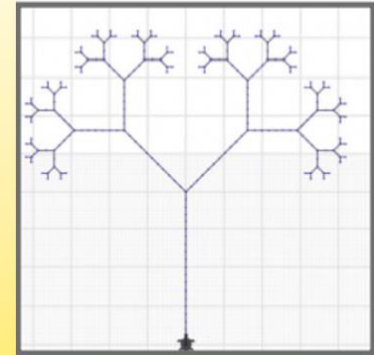
Projects

- Coasters
- Finger puppets
- Key rings
- Light/lamp panels



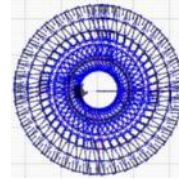
Investigations

- Recursion
- Spin patterns



Motivation

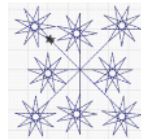
"resilience to keep going when their ideas didn't quite work as expected"



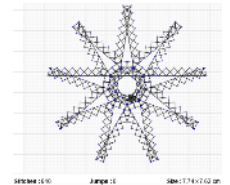
"excited by the prospect of seeing their work on a computer turn into something 'real'."



"enjoyed applying mathematical thinking to a practical activity"



"to use an applied computing skill was inspiring for our children"



"several children were inspired to try Turtlestitch for themselves at home and come back to school with even more developed design ideas."

"motivated to experiment with programming skills, review and refine their work."

Skills

"co-operating and taking turns"



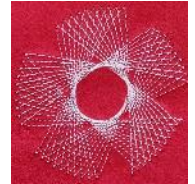
"problem-solving skills improved"

"Having the planning done for us... helped us to feel confident with delivering the project... knowledge I can use again when I'm teaching KS2 [ages 9-11] next year."

"I found out I was more resilient than I had thought."



"When you mess up you just don't get frustrated you try again."



"applying mathematical thinking to a practical activity"





Stitch in Time: programming + textiles + culture
www.warwick.ac.uk/stitchintime

