
Key concepts of Computing in practice

with Scratch

Aims

- (Re)Teach Scratch
- Get ‘tight to’ computational thinking.
- “Transfer error”:
Using blocks means we understand them.

The Computational Thinker: Concepts & Approaches



Concepts

Logic
predicting & analysing

Algorithms
making steps & rules

Decomposition
breaking down into parts

Patterns
spotting & using similarities

Abstraction
removing unnecessary
detail

Evaluation
making judgement

Tinkering
experimenting & playing

Creating
designing & making

Debugging
finding & fixing
errors

Persevering
keeping going

Collaborating
working together

Approaches

What do you need to understand to 'get' Scratch?

Here's what I think...

1. Blocks are **instructions** (with 'meaning').
2. **Sequence** of blocks is a big deal.
3. Computers can **repeat** things lots of times.
4. Computers can make **decisions**.
5. We can make our own 'big' (**abstract**) blocks; we can make our own 'meaning'.

Here's what I think...

Key stage 2

Pupils should be taught to:

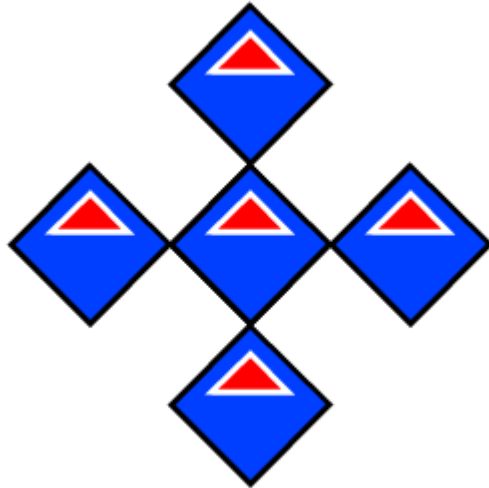
- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs

1. Blocks are instructions with meaning.

**DON'T CONNECT
THE BLOCKS!!!!!!!**

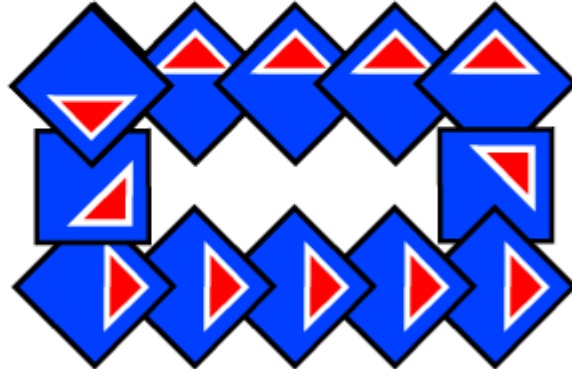
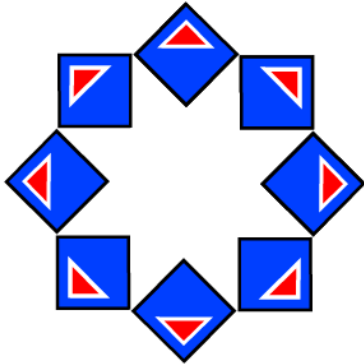
Challenge 1

- Open project: “1 Stamp Only”
- File > Make a copy > Save with your name.
- Make a pattern:



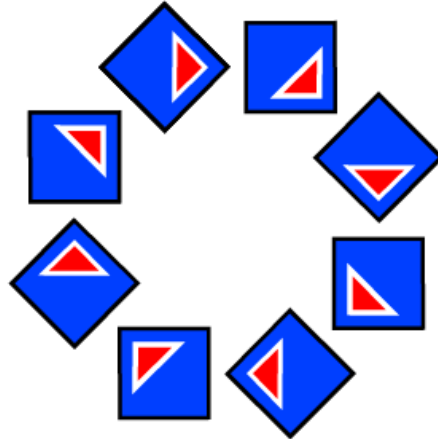
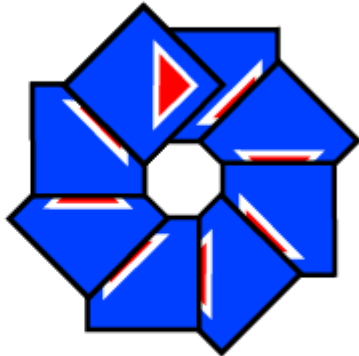
Challenge 2

- Open project: “2 Turn and Stamp”
- File > Make a copy > Save with your name.
- Make a pattern:



Challenge 3

- Open project: “3 Turn Move and Stamp”
- File > Make a copy > Save with your name.
- Make a pattern:



Can you make your own 'single block' activity?

Drawing shapes



JOE

2. Sequence

3. Repeats

Challenge

- Open project: “4 Basic Drawing”
- File > Make a copy > save with your name.

Draw a square and a triangle



Extension: Draw these:



Hexagon



Heptagon



Octagon

Colour

Can you change the colour?

set pen color to 

Tip: You might need some of these blocks.

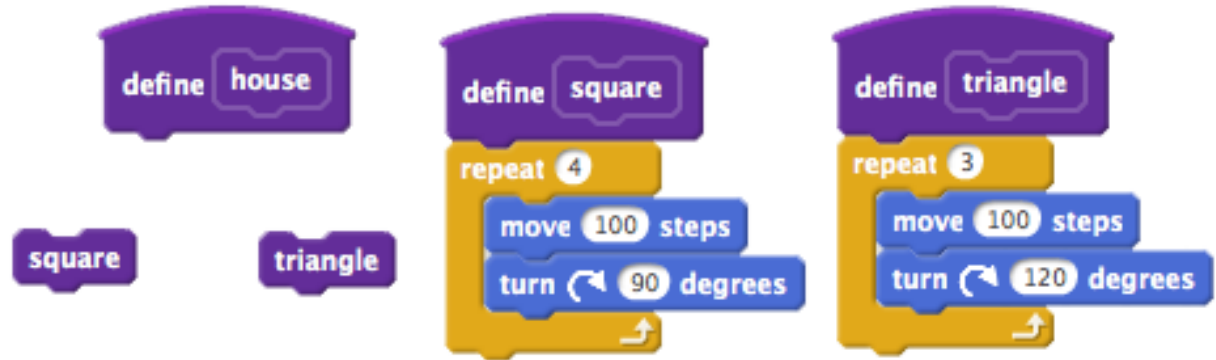
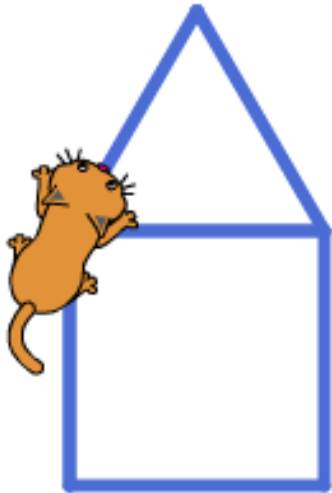
change pen color by

set pen color to

Extension: Draw a shape where each side is a different colour.

5. We can make our own 'big' (abstract) blocks

Draw a house



Extension: Draw a terrace of houses.

Why does 'More blocks' help?

```
define bad house
  move 100 steps
  turn 90 degrees
  move 100 steps
  turn 90 degrees
  move 100 steps
  turn 90 degrees
  move 100 steps
  turn 90 degrees
  move 100 steps
  turn 30 degrees
  move 100 steps
  turn 120 degrees
  move 100 steps
  turn 120 degrees
  move 100 steps
  turn 120 degrees
```

VS

```
define house
  square
  move 100 steps
  turn 30 degrees
  triangle
```

```
define square
  repeat 4
    move 100 steps
    turn 90 degrees
```

```
define triangle
  repeat 3
    move 100 steps
    turn 120 degrees
```

How do we know they understand?

```
stamp
stamp
move 40 steps
move -80 steps
move 40 steps
turn 15 degrees
turn 35 degrees
stamp
```

Simplify this script?

```
set pen color to
set pen size to 5
pen down
repeat 4
  move 50 steps
  move -50 steps
  turn 90 degrees
```

Draw this?

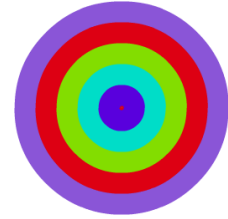
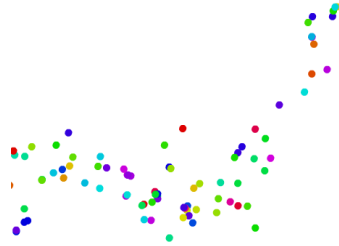
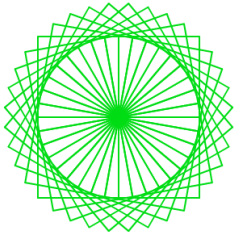
```
stamp
stamp
move 40 steps
move -80 steps
move 40 steps
turn 15 degrees
turn 35 degrees
stamp
```

```
stamp
turn 45 degrees
stamp
```

```
set pen color to
set pen size to 5
pen down
repeat 4
  move 50 steps
  move -50 steps
  turn 90 degrees
```



Mix and match.



```
when space key pressed
  set pen color to 0
  set pen size to 10
  repeat 100
    pen down
    pen up
    set pen color to pick random 1 to 200
    move pick random 1 to 50 steps
    turn pick random 1 to 360 degrees
```

```
when space key pressed
  set pen color to purple
  set pen size to 500
  repeat 10
    pen down
    change pen size by -50
    change pen color by 50
```

```
when space key pressed
  set pen color to purple
  set pen size to 5
  pen down
  repeat 12
    move 100 steps
    turn 150 degrees
```

```
when space key pressed
  set pen color to 70
  set pen size to 2
  pen down
  repeat 36
    repeat 4
      move 100 steps
      turn 90 degrees
    turn 10 degrees
```

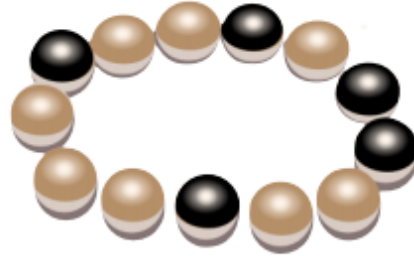
Do I have to write loads of tests?

UK Bebras Challenge

<http://www.beaver-comp.org.uk/>

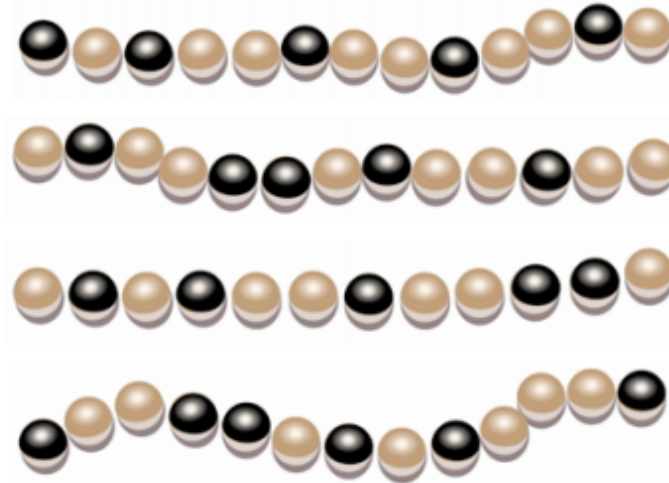


A princess has a magical bracelet that looks like this:



When she stores her bracelets in her drawer she first opens them.

Which of the four bracelets in her drawer is the magical one ?



How do we encourage understanding?

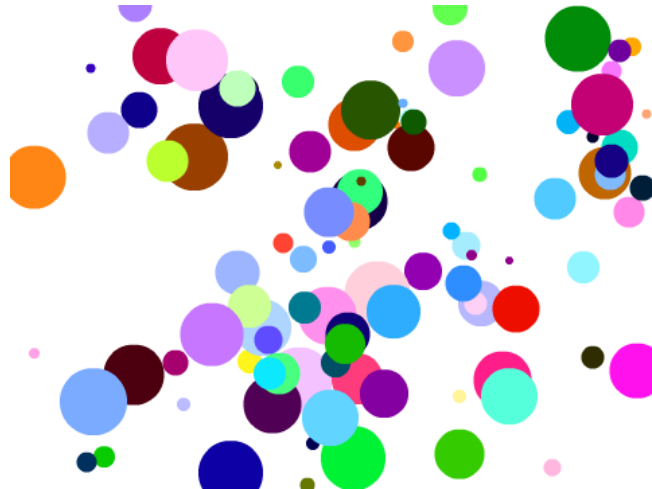
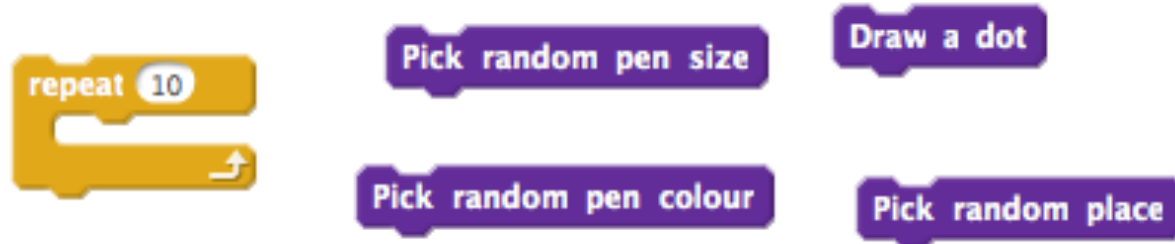
Challenge

- Open project: “5 Random Drawing”
- File > Make a copy > save with your name.

Make a random line pattern



Make a random dot pattern

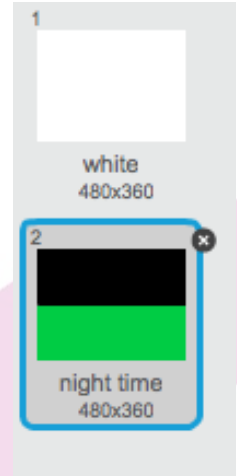


4. Computers can make decision.

Challenge

Switch background to 'Nighttime'.

Can you only draw stars in the sky?



What have you made?

What have you learnt?

Big ideas

1. Blocks are **instructions** (with 'meaning').
2. **Sequence** of blocks is a big deal.
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Other useful resources

A dark chalkboard background with several colorful sticky notes (pink, yellow, orange, blue) scattered on the left side. Faint chalk drawings, including a large 'X' and a heart, are visible on the board. A small wooden box with a metal knob is on the right side, containing a pink object.

AN INTRODUCTORY COMPUTING CURRICULUM USING SCRATCH

[download the guide](#)

Phil Bagge Logo & Scratch

Computer Science A Journey to discover how technology works



Junior

omputer



cience



CAS Wessex Primary Conference 2015

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Logo Tree

Using logo to program a tree which redraws itself differently every time the program is run. There is a Scratch version of this but I think Logo type drawing is better in Logo than Scratch. Pupils have less choice of commands and the procedures really help pupils understanding of decomposition. Scratch does however do variable in an easier manner.

Planning

[Logo Tree planning as PDF](#)

Success Criteria

[Success criteria as PDF](#)

[Success criteria as DOCX](#)

Starting from Scratch

Starting from Scratch

This is the first in a series of resources developed by the RSE and the BCS Academy of Computing that exemplify a subset of the Computing Science-related outcomes of Curriculum for Excellence at Levels 3 & 4 and beyond.

The resource introduces learners to Computing Science via MIT's 'Scratch' programming environment. Since its launch, Scratch has received widespread acclaim as an ideal environment through which to introduce learners to computer programming and computational thinking.

As well as lessons, exercises and sample answers, this resource contains suggested supplementary activities and interdisciplinary learning opportunities.

Above all, this resource should not be seen as prescriptive. It contains guidance and suggestions which can make learning more engaging, while fostering computational thinking and greater understanding of Computing Science concepts in learners.

This resource was partially funded by a grant from Education Scotland.

Course Material

Download PDF copies of the course material below. (Word versions are available in the full download)



Joe's Scratch Handout

[Click here](#)
