Developing Maths through Scratch

Phil Bagge

Computing Inspector/Advisor (Hampshire)

CAS Master Teacher

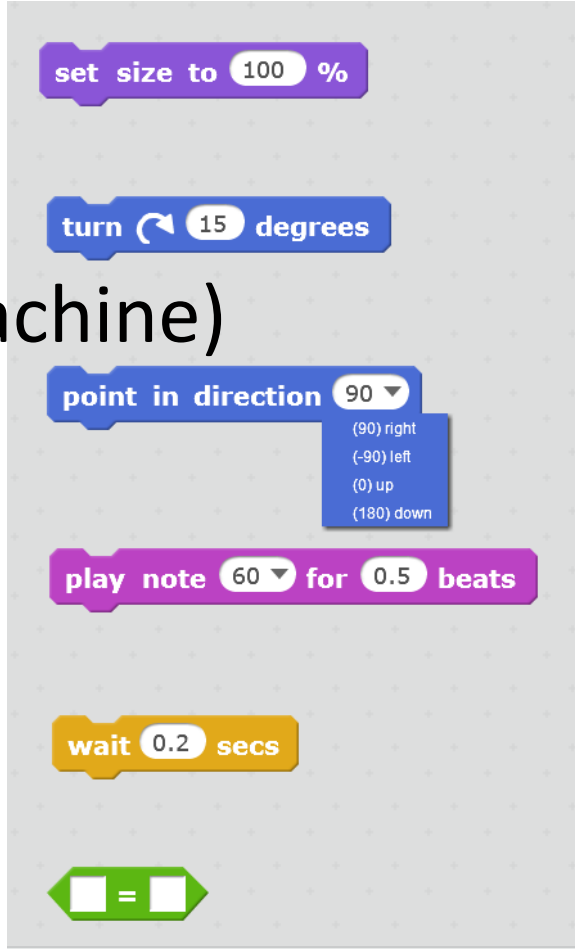
Teacher (Otterbourne Primary,
Calmore & Ringwood Junior Schools)

Author code-it.co.uk resources

Author How to teach Primary Programming using Scratch

Incidental Maths

- Angles (Smoking Car)
- Percentages
- Decimal Fractions (Music Machine)
- = Same as



Computational Thinking & Scratch

- Algorithms
- Algorithm Evaluation
- Decomposition
- Generalisation
- Abstraction

Train Your Computer To Do Maths

Module Learning Focus

By the end of the module children will be able to:

- Create and work with variables to store and manipulate numbers
- Convert simple maths problems into algorithms and then into code
- Generalise an algorithm to solve a different type of maths problem
- Use symbols in algorithms

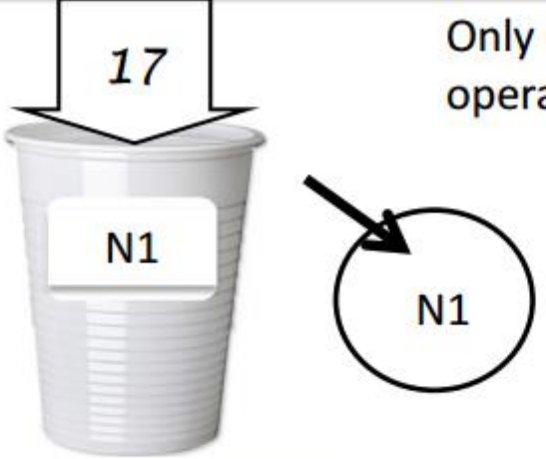
Computer Science Concepts

- Convert user input into a variable
- Write Algorithms
- Convert Algorithms into programs
- -Work with multiple variables

Module Aim: Write algorithms and convert them into programs to solve maths problems.

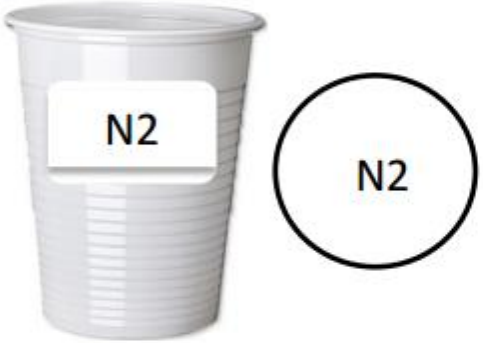
Rules

Numbers **must** be put in pots (variables)

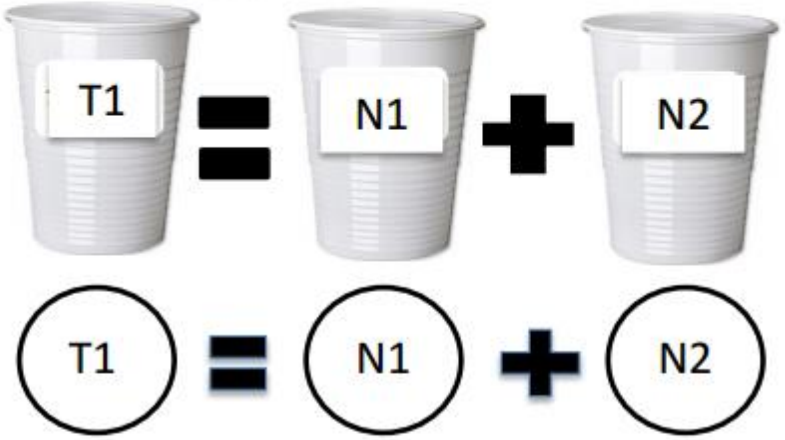


Only one maths operation per line

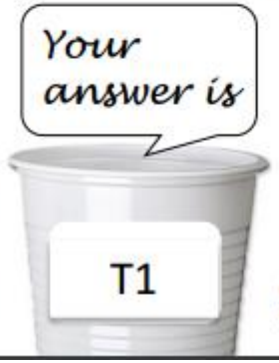
All pots **must** have different names (n1, n2, t1, t2)

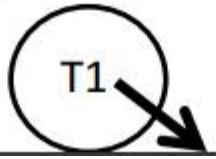


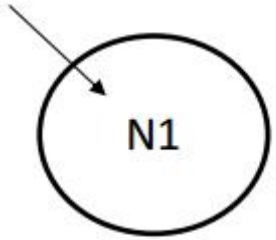
You can add + subtract –
Multiply * Divide / pots

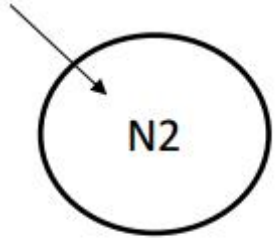


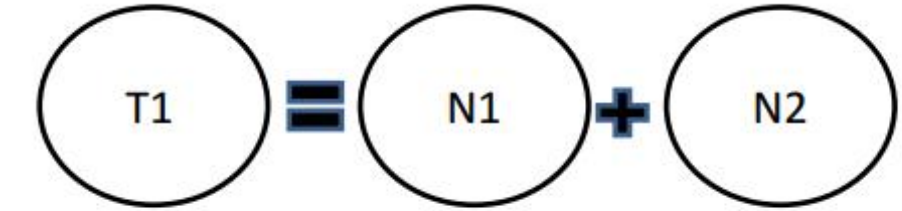
You can look in the pot to see what is in it

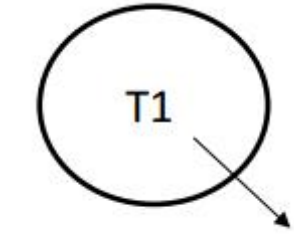


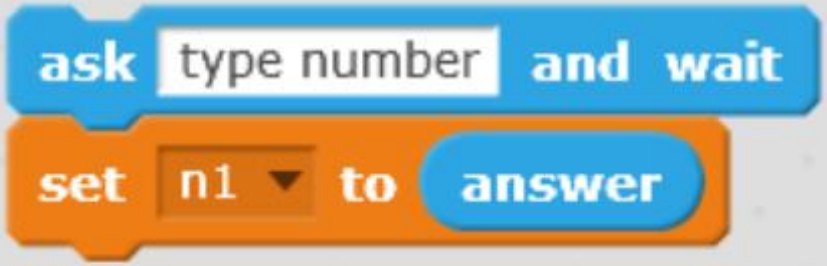


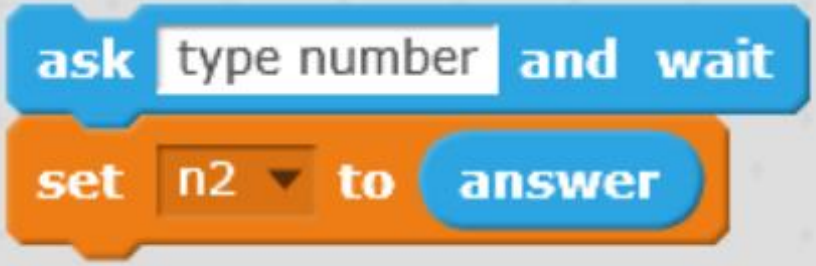

N1


N2

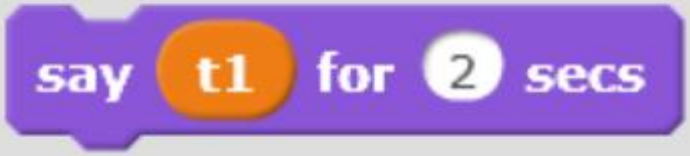

T1
N1
N2


T1


ask type number and wait
set n1 to answer


ask type number and wait
set n2 to answer

set t1 to n1 + n2


say t1 for 2 secs

Maths Quiz

Example Question

What is 3x3?

After a count of 3 all shout out your answer

1 2 3

If you shouted 9 then well done and give yourself a point.

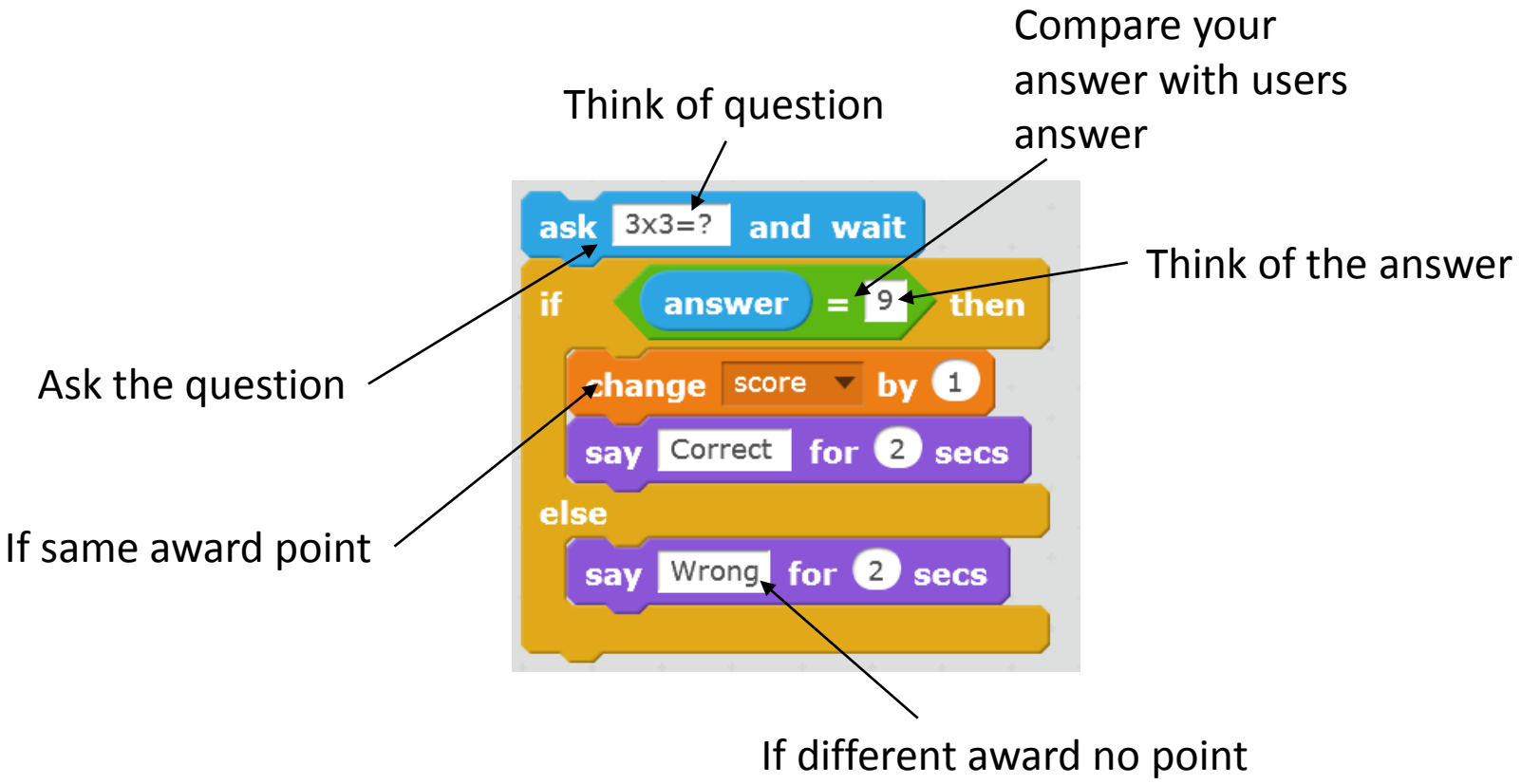
If you shouted anything else you are wrong and receive no points.

Algorithm

Think of a question
Think of the answer
Ask the question
Compare your answer with users answer
If same award point
If different award no point

All programming is an algorithm turned into code.

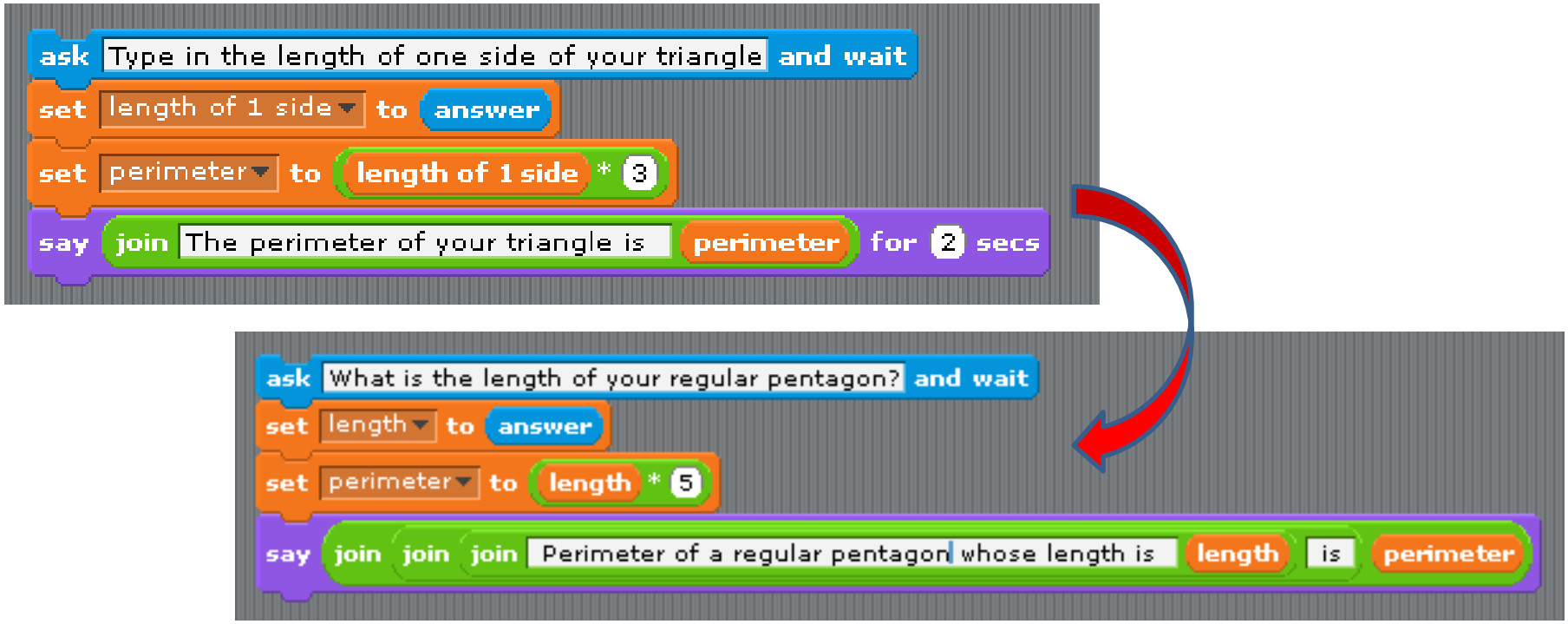
Turning Algorithm into Code



All programming is an algorithm turned into code.

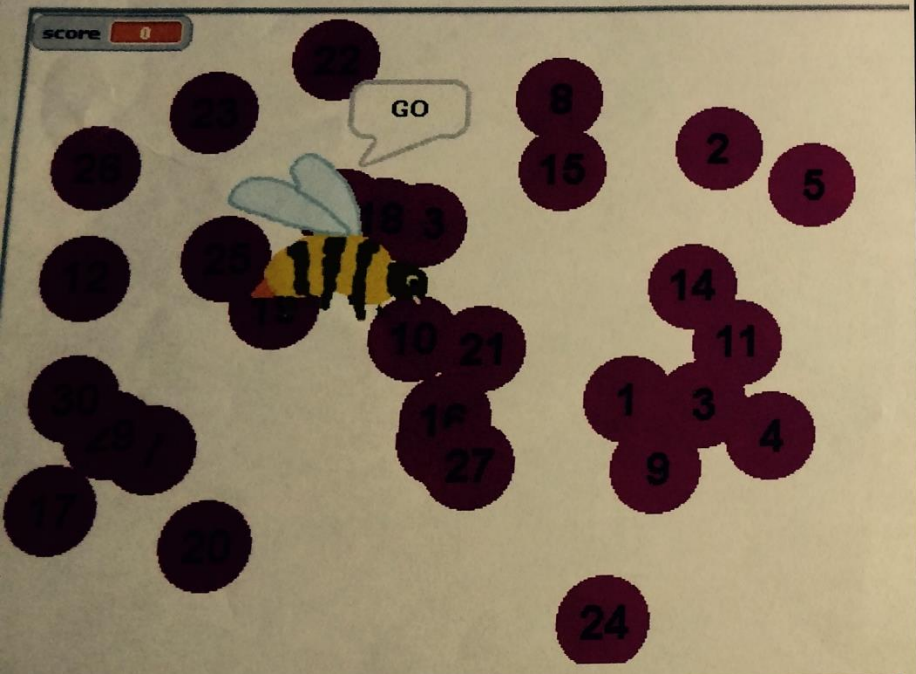
Generalisation

Adapting a solution that solved one problem to solve another.



What do you need to make?

Number Sprits
Say block
Bee spirt
move blak
Score block
Timer block



mes Tables Game Algorithm

ame Sophia

What do you need to make **all** the number sprites do?

You need to make sprits disappear when kicked. Make them move. Only number which are right + a point if wrong - a point. Say then disapper then come back and tell score

What do you need to make **only the correct numbered** sprites do? Add a point when they kick on a number in the 2X tables. subtract a point each time they kick on a wrong.

What do you need to make **only the wrong numbered sprites** do? when the kick on a wrong answer subtract 1 point

What do you need to make the **start** (bee) **sprite** do?

When you finish a game reappear because of there set to hide.

The says what is progarmed to do then reapper after game with points

Examples of programming decomposition

Counting Machine

Module Aim: Create and adapt a counting machine.

Module Learning Focus

By the end of the module children will be able to:

- Solve simple maths problems using Scratch code
- Understand the benefit of changing a variable within a loop
- Investigate and modify a simple program that changes a variable
- Begin to look for ways to generalise this idea elsewhere

Computer Science Concepts:

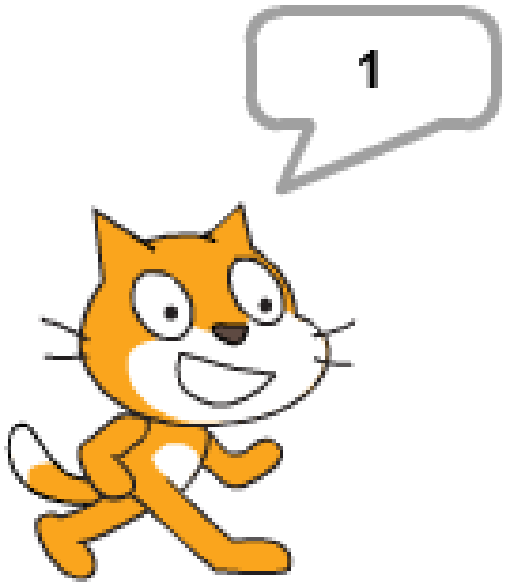
- Repeat x times loops
- Variables in a loop
- Reporting a variable by using it within a say command

Maths Concepts

- Counting in multiples, counting backwards, counting in halves, counting in tenths, counting in hundredths, counting from a different starting number

Counting Machine

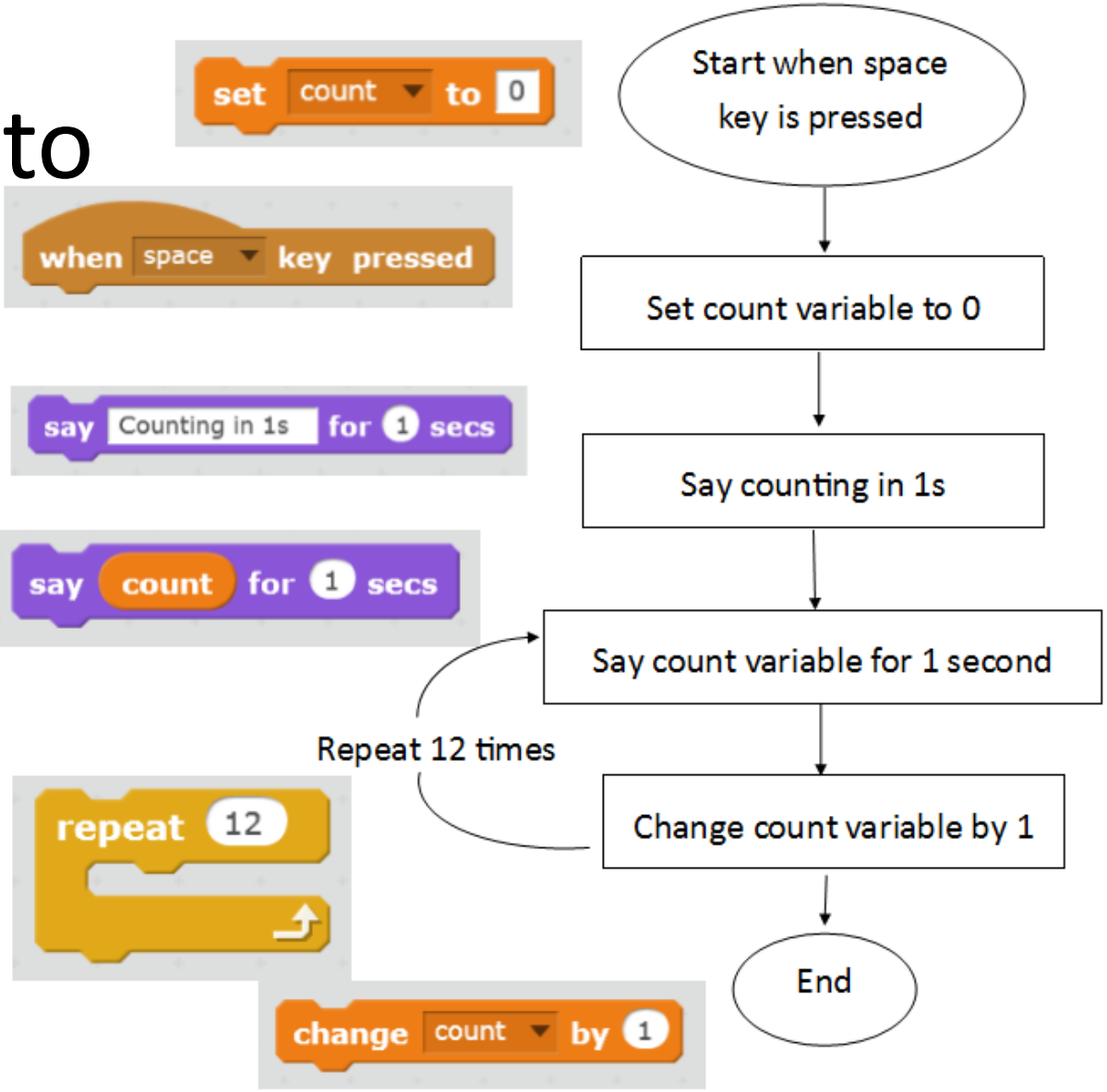
Can you get the cat to count?



Modelling a better solution

https://youtu.be/_26bc5twFRg

From Algorithm to Code



Which two blocks go inside the repeat loop?

Counting Machine Challenges

- Can you count faster?
- Can you count in multiples of 7?
- Can you count backwards?
- Can you count in tenths or hundredths?
- Can you start from 30 and count down to 0?
- Can the user say how long they want the countdown timer to last for?

Maths Related Projects

- Training Computer to do Maths
- Maths Quiz
- Counting Machine
- Coin Program
- Times Table Game
- Perimeter Program
- Angle Sorter (Book Only)
- Cartesian Coordinates
- Clock

Sample code can be found here
http://code-it.co.uk/?attachment_id=1901

Planning can be found here

http://code-it.co.uk/scratch/scratchplan

However latest version is here

http://www.amazon.co.uk/Teach-Primary-Programming-Using-Scratch/dp/1908684534