Lesson 1: Computational Thinking Basics

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BTEC Computing: Computational Thinking (Unit 18)

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Computers Are Stupid!

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- They cannot (yet) think for themselves.
- They speak a special language - *binary*.
- They are highly *logical*.

Recipes and Algorithms

- Programs are like *recipes*.

RECIPE: Tomato vegetable pasta

Serves: 5

Cost per portion: 32p

Ingredients:
500g prepared veg (carrots, broccoli, cabbage)
1 onion, peeled 2 cloves garlic, peeled
1 tbsp cooking oil 1kg passata
2 tbsp dried mixed herbs 100g spaghetti

Method:
1. Finely chop the veg, onion and garlic in a food processor.
2. Put the oil in a pan and add the vegetable mix. Fry for 5–10 minutes until they are soft.
3. Add the passata and herbs, stir and leave to simmer for 20 minutes.
4. Make up the spaghetti according to the package instructions.
5. Remove the sauce from the heat and pulse in a blender.

Star rating (out of 5): ★★★★★

Recipes and Algorithms

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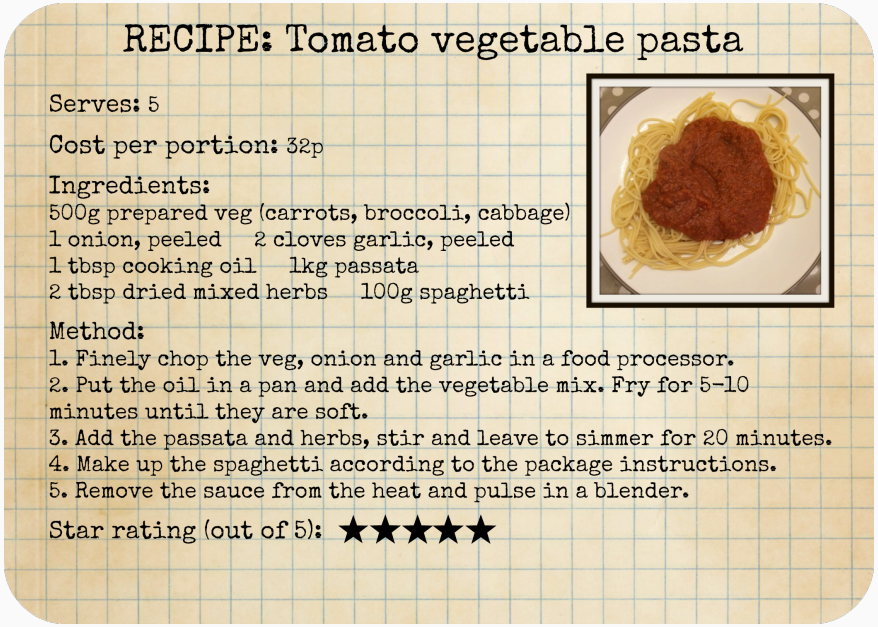

Recipes and Algorithms

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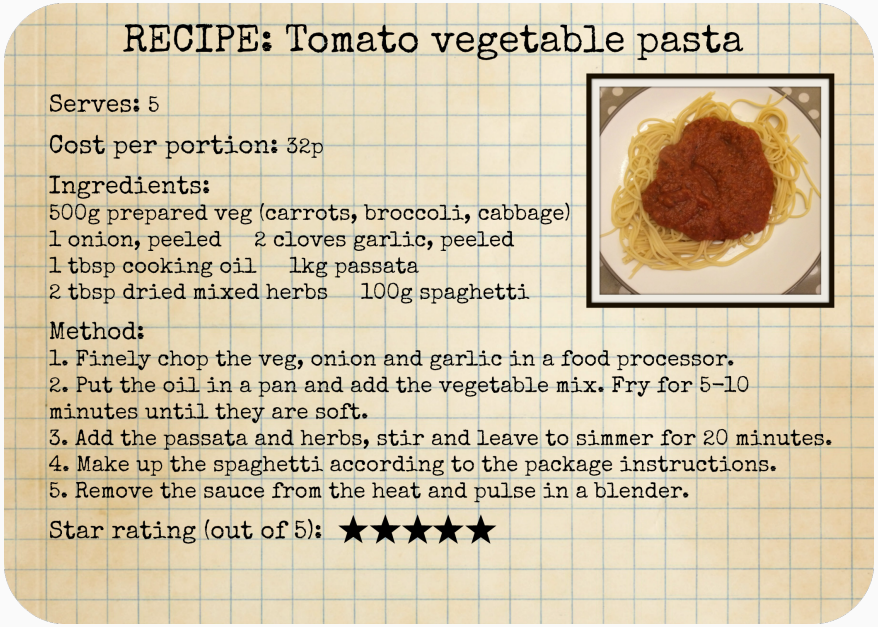

Recipes and Algorithms

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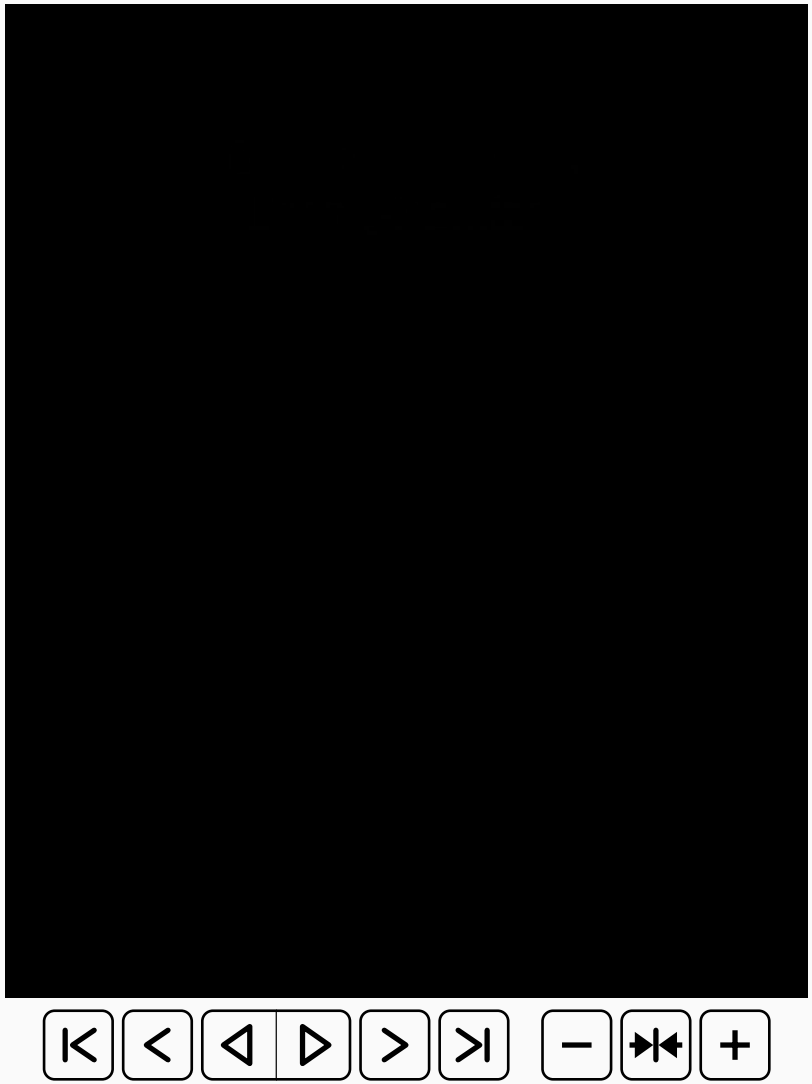
What does this do?

```
1 N = 10
2
3 for j in range(1,N):
4     if j == 1:
5         print(j-1)
6     else
7         print(j)
8
```

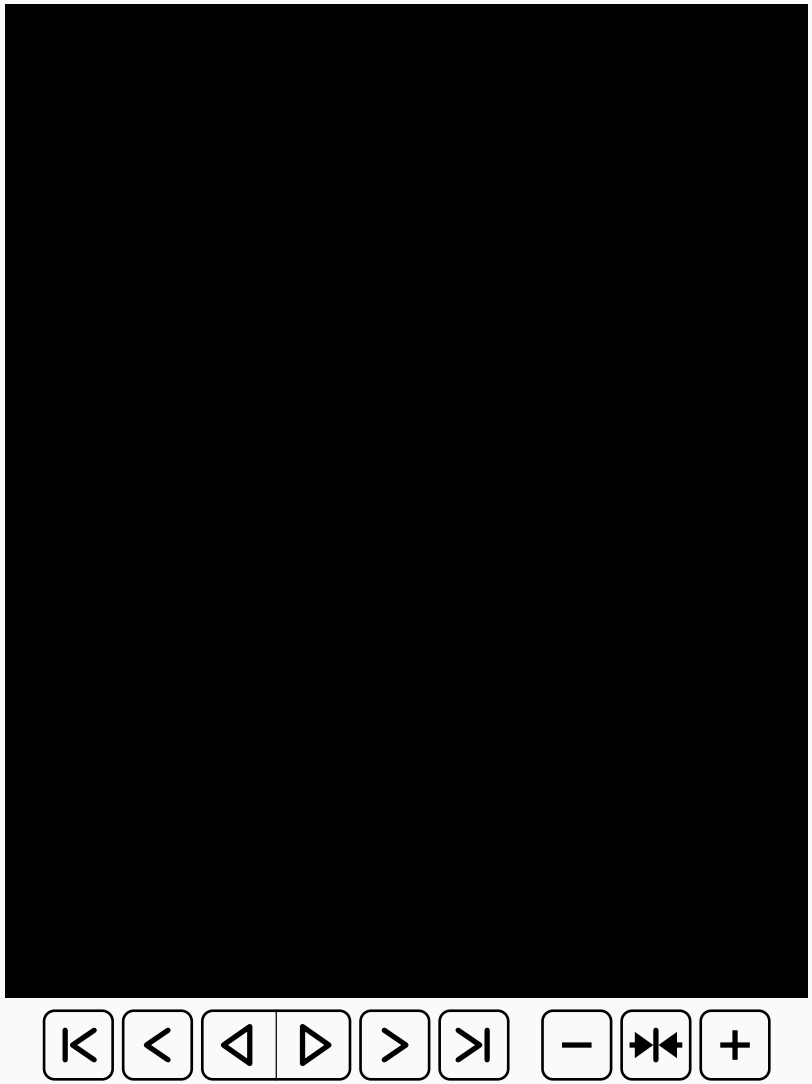
Computers Need Rules

- Computers take an input, follow some rules, and give an output.



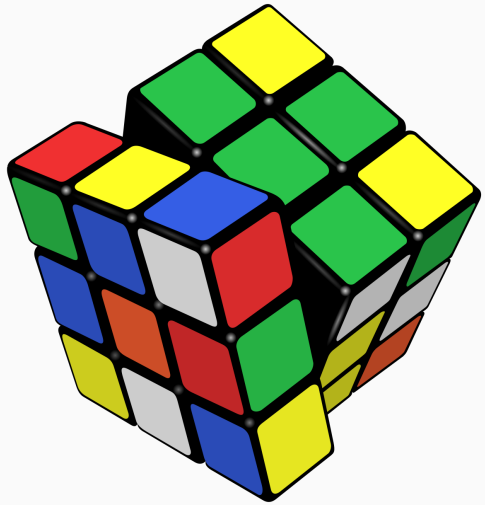
Computers Need Rules

- Computers take an input, follow some rules, and give an output.
- Based on minimal input, computers can be *trained* to excel at certain tasks.



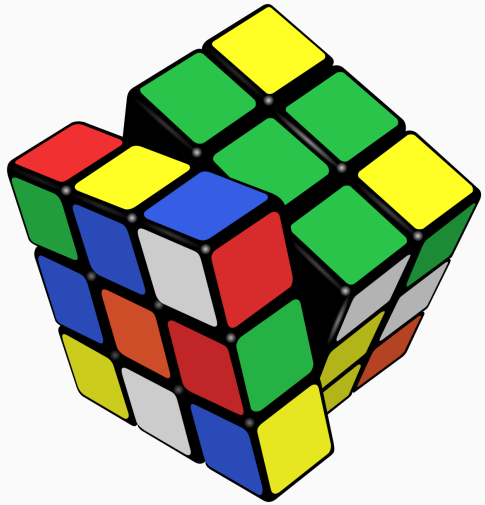
Algorithmic Thinking

- Break large problem into small tasks.



Algorithmic Thinking

- Break large problem into small tasks.
- Assemble small tasks to solve large problem.



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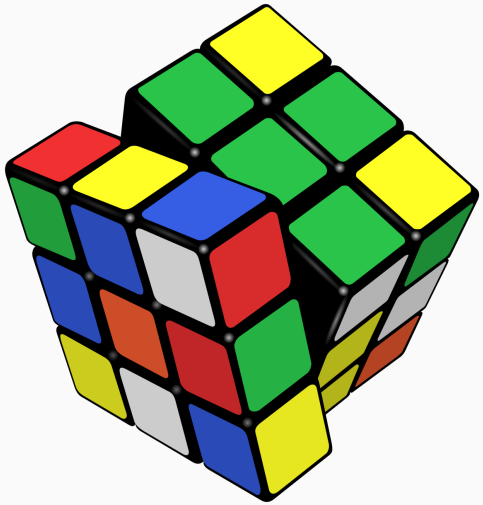

1. Solve top white face.

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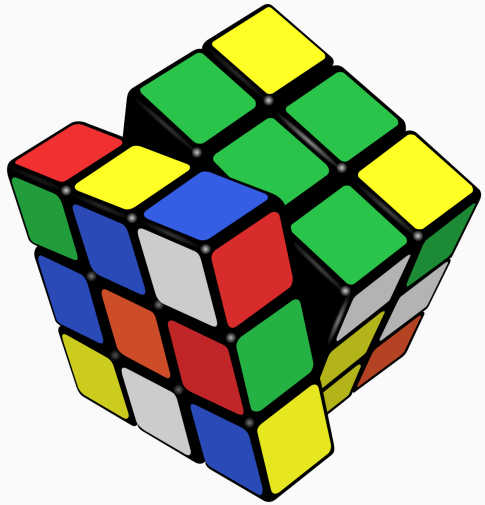

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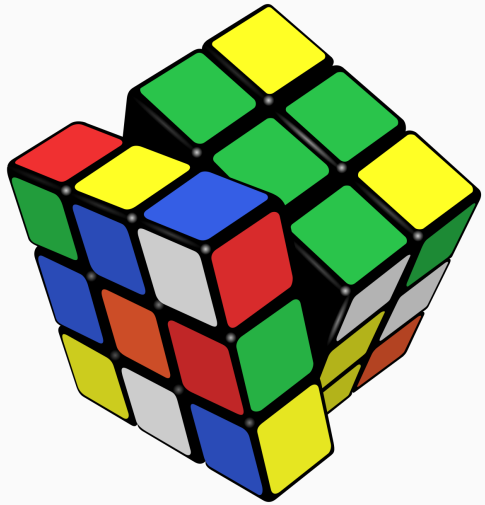

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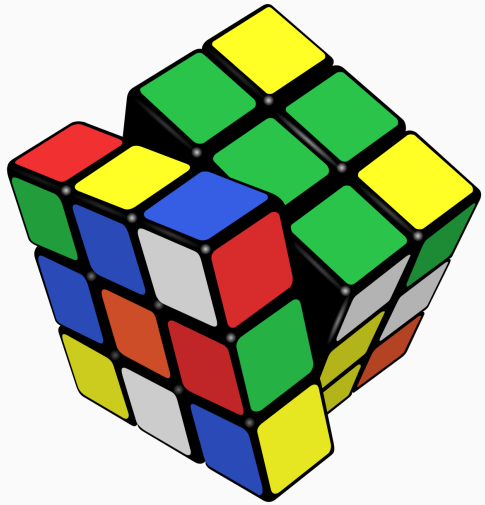

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2. Position corner pieces.
3. Solve side faces.
4. Solve underside.

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- **Making mistakes is how you learn here! No one (EVER) gets it right the first time!**

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- Use the *gitter* chat for this!

Task

Experimenting with Python (15 mins)

Follow the instructions for Computaitonal Thinking - Lesson 1 at scott3142.com/btec

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Experiment with the notebook. Change the variable names. Change the numbers. Play around. Make mistakes and fix them. Remember **Read-Search-Ask***!*

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- *Break down into small pieces that are easy to manage.*
- *Think logically!*

Formulaic Thinking

- What is the point of formulae?

$$y = mx + c$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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- What is the point of formulae?
- Where are they used in computing?

$$y = mx + c$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$E = mc^2$$

$$e^{i\pi} + 1 = 0$$

What's the Point of Formulae?

- $2^n - 1$

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Why is this important? What if we were writing code to solve this?