

Pro-Bot lessons from Simon Haughton, Parkfield Primary School

<http://www.simonhaughton.co.uk/pro-bot-lessons/>

Programming the Pro-Bot - Lesson 1

The *Pro-Bot* is the bigger brother of the *Bee-Bot* and whilst it has a similar colour and build-quality, offers some additional features to make it able to carry out more complex sequences of instructions that by Year 2, children are ready to progress onto.



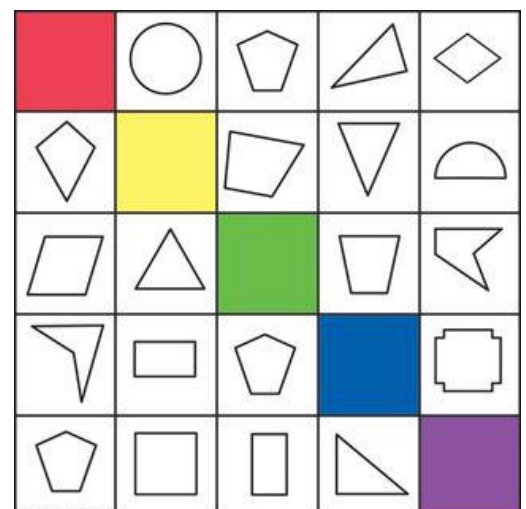
Discuss the main features of programmable floor turtles with the children:

- They only do what they are instructed to (follow commands exactly as they are given).
- Compare with wider-world technology devices which need to follow instructions eg remote-sensing devices such as a Mars rover, bomb disposal devices and medical equipment.

Introduce *Pro-Bot*:

- Demonstrate how to enter basic commands to make it move or turn in different directions. **The big difference here with the *Bee-Bot* is that quantity values must be added alongside each instruction - so instead of entering 'forward, forward, forward, forward, forward', they need to enter 'forward 5'.** This is much quicker than entering each command one at time (especially as the number of moves increases) and therefore also means that they are less likely to make a mistake.
- Point out the 'clear' button to them as the way to clear the *Pro-Bot*'s memory at the start of each new child's go.
- Children take turns at directing the *Pro-Bot* to different squares on a floor mat - all starting in the same grid square initially but later starting and ending at any grid square of their choosing.

The idea with this is to give them lots of practice at controlling the device in an activity they're already familiar with (having moved the *Bee-Bot* along many mats in 'L'-shaped movements the past) so that they gain confidence and accuracy in entering commands that include numerical instructions.



Talk about the little LCD screen which displays the commands that have been entered - **this helps to see where you are in the program and enables any errors to be easily spotted and corrected.**

The two most common mistakes I find children making are forgetting to press the 'clear' button at the start of their go and forgetting to press the 'forward' button before pressing the number of forward movements required (often not at the start, but in the later stages of a program).

Programming the Pro-Bot - Lesson 2

How to insert a pen into the device to enable it to draw a trail as it moves along a sheet of paper.

Felt tip pens work best for doing this - put it in with the pen holder set to the 'up' position before then twisting it to the 'down' position so that it sticks out from the underside of the car.



To let the children practice, provide them with a series of commands to program in to the *Pro-Bot* (of increasing complexity) which make it draw:

a line,
a corner,
a 'step'
an 'n' shape.

Change the *Pro-Bot's* units to centimetres so that their work isn't massive.

Copying commands isn't particularly difficult, but can convey how to get the *Pro-Bot* to draw as it moves and to understand how it can produce trails that involve turning commands to create corners.

<p>Name: _____</p> <h3>Drawing Lines</h3> <p>Put a pen inside the Pro-Bot. Enter each set of commands and get it to draw them on this sheet.</p> <p>1. (1) (5)</p> <p>2. (1) (4) S (1) (4)</p> <p>3. (1) (1) (0) S (1) (1) (0) S (1) (1) (0)</p>	<p>4. (1) (5) (1) (4) (1) (4) (1) (5)</p>
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[Download Drawing Shapes Worksheet](#) (copy to A3 for room for probot to draw on sheet)

Encourage children to look at the LCD screen to both see their instructions (i.e. their programs) appear as they press the buttons and to see how the different commands are highlighted/followed as the *Pro-Bot* moves around.

(This can lead into a nice little reminder about ways to remember left/right too - only your left hand thumb and index finger can make a 'L' shape when held out in front of you.

The children enjoy watching the lines being drawn to check that they've entered their instructions correctly and then really love the moment when they lift up the *Pro-Bot* to see their finished pictures (especially the challenge of trying to do so without creating a smudge).

Ensure a smooth surface and take care with the position where you start the *Pro-Bot*. You don't want its wheels or roller ball to 'get caught' on the edge of the paper and ruin your drawing.

A straightforward session but it does ensure that children understand the basics necessary for moving onto entering much more complex programs with greater independence.

Programming the Pro-Bot - Lesson 3

Building on the drawing lines lesson teach the children how to move onto the next logical step of **programming the *Pro-Bot* - to draw shapes onto a sheet of paper.**

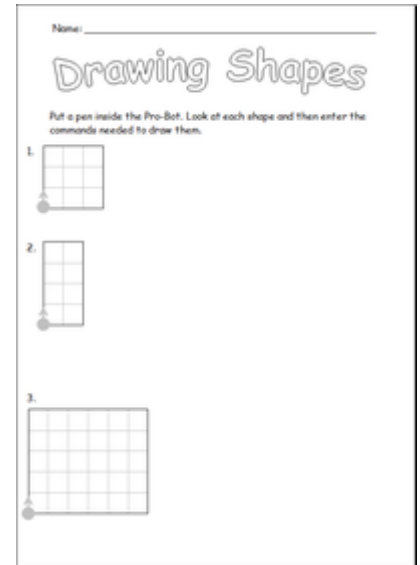
Understanding the differences between right and left turns is very important - especially the need to consider which way the *Pro-Bot* is facing at any particular moment in time. I therefore only let the children use turning movements of either 90° to the left or right at this level, - thus meaning that the shapes which I ask them draw are all rectilinear ones.

Build the confidence to draw a square and two rectangles - a task which seems to be pitched at an appropriate level of challenge when you consider the amount of commands which need to be entered to draw each one.

Give them a worksheet containing the three shapes for them to copy, again enlarged to A3 size. This allows them to press the buttons on the *Pro-Bot* whilst they can still see each shape (something which they do find helpful) and also gives the *Pro-Bot* sufficient room to manoeuvre without the metal ball underneath it getting caught on the edge of the paper as it turns around.

[Download Drawing Shapes Worksheet](#)

Whilst the LCD is useful for checking commands as they are being inputted, it can also help to display the commands which they need to enter on a nearby board for them to reference.



Work together as group (the children love having each line pointed to them either by myself or another child as they put it into the *Pro-Bot* so that they don't make any mistakes). Support individuals that make errors to help them modify and correct commands using the 'clear' button to make it correct.

[You can download copies of these command cards by clicking here - I cut them out and laminate them so that they can easily be blu-taked onto the board.](#)

As the pen draws on the paper as the *Pro-Bot* moves along, it's worth pointing out that it does rub a little bit and causes the *Pro-Bot* to slow down ever so slightly - this just means that **you have to give it a little nudge before you pick it up so that the shape you are drawing joins up and is completed.**

The children always like seeing their completed shapes and its nice seeing their confidence levels in entering the commands improve as they begin to realise that there is a pattern in all of the programs (forward, turn right, forward, turn right etc.)

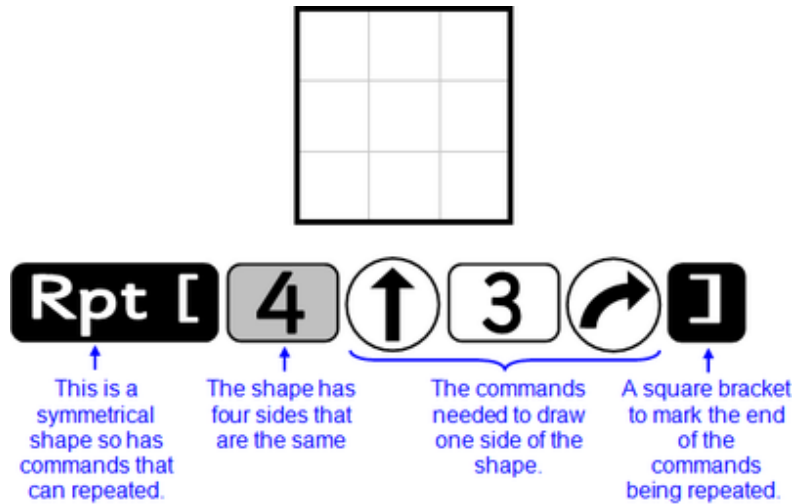
Take time to discuss the pattern in all of the programs.

Programming is something which can get quite complicated. **Getting children to appreciate the value of thinking carefully about what each instruction does in a sequence is therefore a fundamental skill in my opinion and this lesson hopefully shows them how to see the relationship between each instruction and the action (movement) it produces.**

Programming the Pro-Bot - Lesson 4

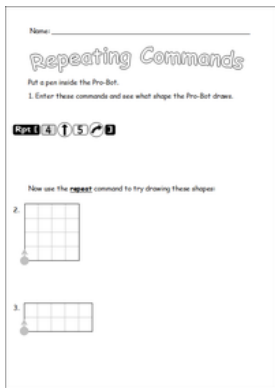
Having drawn shapes using the *Pro-Bot* last time, **teach the children how to enter commands more quickly (and therefore more accurately too) by using the repeat button.**

At first glance a program containing a repeat command can look a bit confusing but **if you take a moment to break it down and think about the function of each command in it, it's fairly straightforward.** (Refer to the patterns identified in the previous lesson.)



Ask children to draw rectangular shapes because they only contain right-angle turns (no use of degrees).

As with the previous sessions, the children take it in turns to program the *Pro-Bot* to solve three challenges I've set them on an A3 worksheet:

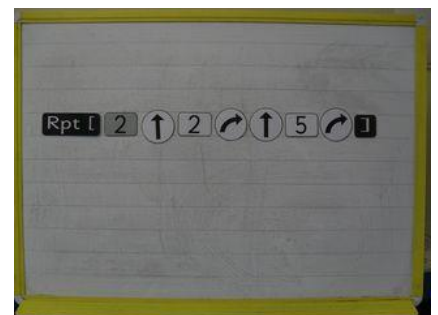


- the first shape to draw is a square and I already have the commands printed on the sheet for them to copy to introduce to them what the correct syntax is;
- the second shape to draw is a square again but this time slightly smaller and they have to work out how to amend the previous program they entered to draw this new one accurately;
- the third shape to draw is a rectangle which they have to work out what commands to enter by themselves (as only two sides match this time, the repeating commands will only loop twice).

[Download Repeating Commands Worksheet](#)

The trick with this lesson is to not rush through it - I've found if you take your time and carefully explain to the children why each different command in the sequence is required then they are much more likely to understand it.

The final *Pro-Bot* lesson recaps on how to program repeating movements to help them consolidate the skills taught in this activity, but in a (hopefully) much more fun way.



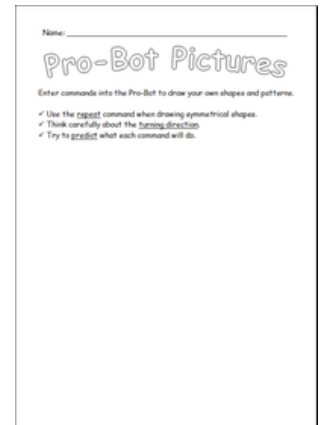
[Programming the Pro-Bot - Lesson 5](#)

Let the children have another go at practicing using the repeat command to ensure that they all fully understand how the Pro-Bot operates. To make things a little more interesting however, let them choose which shape/pattern they want to draw (from my selection of cards) and in which pen colour.

Give them an A3 sheet with a title and a brief summary of the activity on - this means that they can also have the choice of where they draw each shape/pattern too.

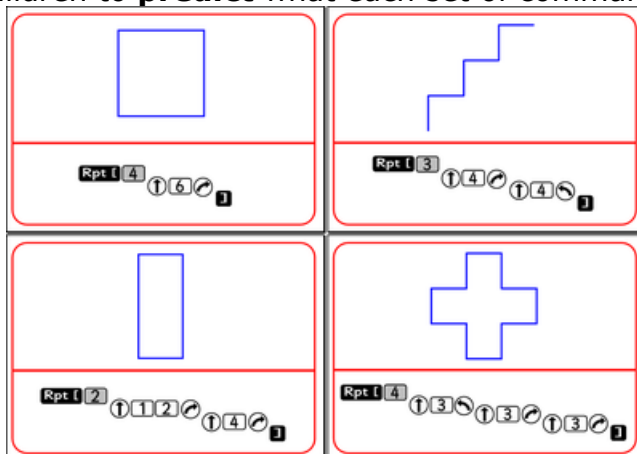
[Download Predicting Shapes Worksheet](#)

The things which I let them choose to draw are: a square, a rectangle, a set of steps and a cross as these are probably the most straightforward and quickest rectilinear shapes/patterns that can be drawn using the repeat command.



Cut the picture of the shape/pattern up so that it is separate from the list of commands needed to draw it (like a jigsaw) so that the children have to think carefully about which go together.

Ask children to **predict** what each set of commands would draw based on the options given.



[Download Lesson 5 Patterns/Shapes](#)

When doing the activity with the children, whilst they can choose where to start the *Pro-Bot* from, it is worth reminding them to consider the size and direction in which the pattern/shape will be drawn as you obviously don't want the *Pro-Bot* driving off the paper!

The children seem to enjoy the greater freedom that they are given in this lesson and like being given the challenge of trying to predict the pattern/shape that each set of commands will draw.

Over the five lessons they've learnt how to carefully program a floor robot/turtle using numerical instructions (e.g. forward 5) and how to use the repeat command to quickly repeat command sequences. These are two important programming skills which they will hopefully be able to build on in lower KS2 when they are taught how to program a similar on-screen robot to draw more complex shapes in LOGO (you can read my blog posts on those lessons by [clicking here](#)).