

TITLE: Drawing a square in Scratch and in Python
LEARNING SCENARIO

School:	Duration (minutes):	90
Teacher:	Students age:	12

Essential Idea:
How to draw a square in Scratch and in Python?
Topics:

- Pupils plan, anticipate, monitor, create and adjust programs.

Aims:

- Pupils design and create a working game or program for a specific purpose.

Outcomes:

- Pupils plan, anticipate, monitor, create and adjust programs.

Work forms:

- individual work
- work in pairs
- group work

Methods:

- presentation
- discussion
- interactive exercise

ARTICULATION

Course of action (duration, minutes)

INTRODUCTION

Teacher explains and starts discussion with pupils:

What is a square?

How do we draw a square with a pencil and paper?

How do we draw a square on a computer?

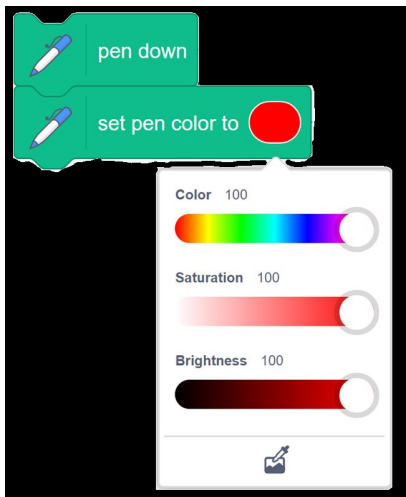
How should a square drawing program work?

MAIN PART

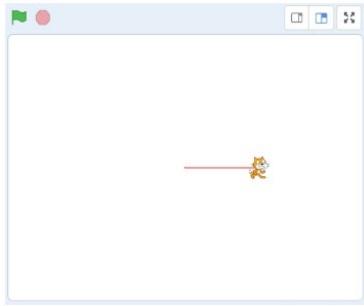
Drawing a square in Scratch, instructions:

Using the Pen category blocks from Scratch extensions, you learn to draw squares.

1. Open a new project.
2. Display the Pen block category from Scratch extensions.
3. Enable the sprite to draw.
4. Set the pen color to red.

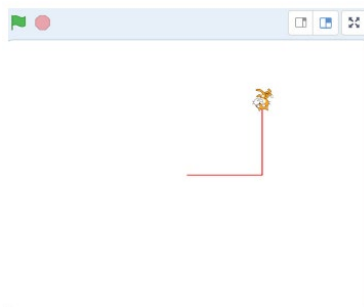


5. The sprite moves 100 steps. The sprite draws the first side as shown in the figure.
6. The sprite rotates to the left by 90°.



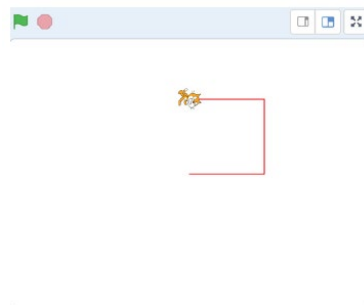
7. The sprite moves 100 steps. The sprite draws the first side as shown in the figure.

8. The sprite rotates to the left by 90°.



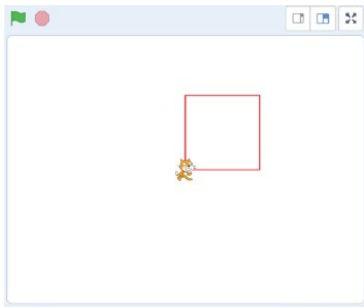
9. The sprite moves 100 steps. The sprite draws the first side as shown in the figure.

10. The sprite rotates to the left by 90°.

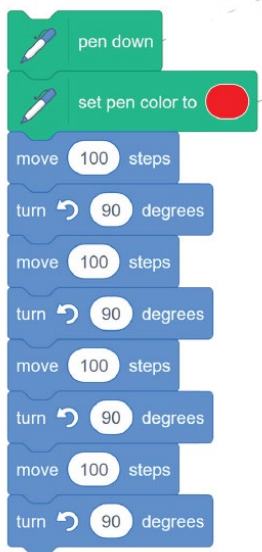


11. The sprite moves 100 steps. The sprite draws the first side as shown in the figure.

12. The sprite rotates to the left by 90°.



Script looks:



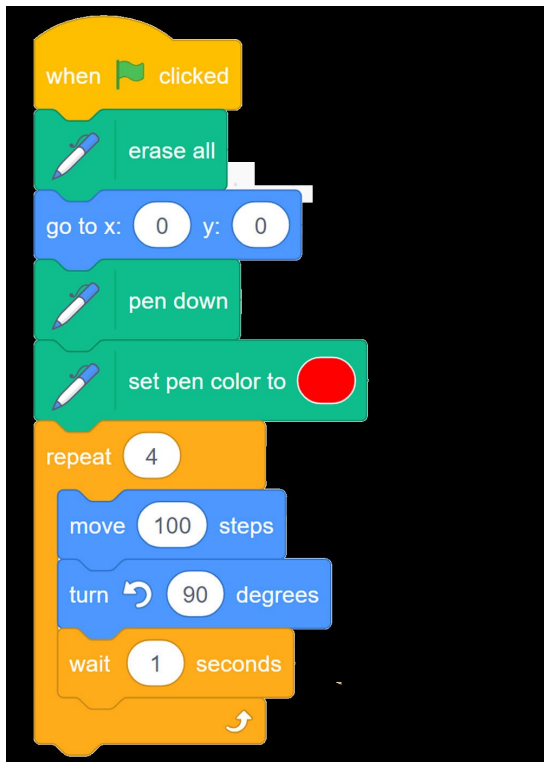
We can improve program:

We can use repetitive blocks.

The project should start when you click the green flag. In the beginning, everything is deleted from the stage.

The sprite should always start drawing from the same point. Set the sprite to the starting point of (0,0). To see clearly what's happening, we need to add the wait ___ secs block after turning to the left.

Solution:



EXERCISE 1

Change the script block so that each page in the square has a different color.

EXERCISE 2

Change the script block so that it draws a square with the side length of 65, then with the side length of 50 and finally, a square with the side length of 120.

Drawing a square in Python, instructions:

Python, as well as some other programming languages such as Logo, makes it possible to draw using turtle graphics.

The basic idea of turtle graphics is to draw using commands which make an object like a turtle or an arrow move across the screen.

Python module that makes it possible to use turtle graphics is called turtle, and it's activated by calling the command `>>> from turtle import*` in order to use all of its functions.

The window for drawing will be shown by calling any graphical command through an interactive user interface.

We will mostly start by showing the pen for drawing with the command `st()`, and then we will name the window with the command `title()`.

Basic commands for moving the pen

Graphic commands in Python are made from words in the English language and they can be written in a shortened form.

Most of the commands already contain a numerical value which will be written inside brackets.

By using the commands for movement the pen can be:

- moved on a plane for a specific numerical value (in dots or pixels).
- rotated by a given amount of degrees (towards the left or the right).

The pen is always moved from its initial position on the screen, when it's moved it leaves a trace and so we get lines.

Basic commands for drawing are shown in the table below.

Command	Shortened form	Description
<code>forward(a)</code>	<code>fd(a)</code>	Moves the pen by a steps forward
<code>backward(a)</code>	<code>bk(a)</code>	Moves the pen by a steps backward
<code>right(angle)</code>	<code>rt(angle)</code>	Rotates the pen for an amount of degrees to the right
<code>left(angle)</code>	<code>lt(angle)</code>	Rotates the pen for an amount of degrees to the left
<code>penup()</code>	<code>pu()</code>	The pen raises and stops leaving a trace (line)
<code>pendown()</code>	<code>pd()</code>	The pen lowers and continues to leave a trace (line)
<code>undo()</code>		Reverses the command before it, can be used multiple times
<code>showturtle()</code>	<code>st()</code>	The pen becomes visible on the graphical interface
<code>hideturtle()</code>	<code>ht()</code>	The pen becomes invisible on the graphical interface
<code>home()</code>		Puts the pen in the starting position
<code>reset()</code>		Puts the pen in the starting position and erases everything
<code>clear()</code>		Erases everything, but the pen doesn't move

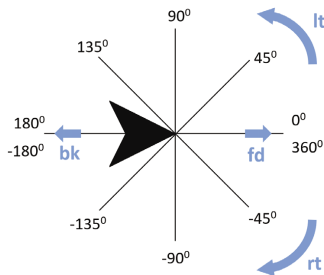
After typing the command in the interface and confirming it by typing Enter, the command is executed in the window. How do we draw something? Let's take a look at a simple example of using the command `fd()` and the command `lt()`.

command `fd(100)`

command `lt(90)`

While turning left or right, the turtle is not moved forward or backward.

The ways in which we can rotate it are shown in the image.



Sometimes during drawing we need the turtle to not leave a trace. In those cases the turtle needs to be raised using the command `pu()`. After raising the turtle, in order to draw again we need to lower it by using the command `pd()`.

The commands can be written in a single line using the spacing marker `;`. By writing the code like this we're making it clearer and easier to read.

```
>>> from turtle import*
>>> title('Crtanje')
>>> fd(200);lt(90)
>>> fd(180);lt(90)
>>> fd(160);lt(90)
>>> fd(140);lt(90)
>>> fd(120);lt(90)
>>> fd(100);lt(90)
>>> fd(80);lt(90)
>>> fd(60);lt(90)
>>> fd(40);lt(90)
```

Drawing a square

While drawing geometrical shapes like a rectangle or a square, the pen is making a full 360° turn. It also always needs to end where it has started. A square is a geometrical shape in which all the sides are equal, as well as all of the angles. Because all of the angles are 90°, the rotations of our turtle will be the same. Drawing a square is best started by having the turtle point forward.

```
Python 3.6.2 Shell
File Edit Shell Debug Options Window Help
Python 3.6.2 (v3.6.2:5f
Type "copyright", "cred:
>>> from turtle import*
>>> fd(100);lt(90)
>>> fd(100);lt(90)
>>> fd(100);lt(90)
>>> fd(100);lt(90)
>>>
```

CONCLUSION

Pupils and teacher discuss and evaluate the presented solutions.

Methods

presentation
discussion
work on the text
graphic work
interactive exercise /simulation on the computer

Work forms

individual work
work in pairs
group work
frontal work

Material:

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Literature**PERSONAL OBSERVATIONS, COMMENTS AND NOTES**