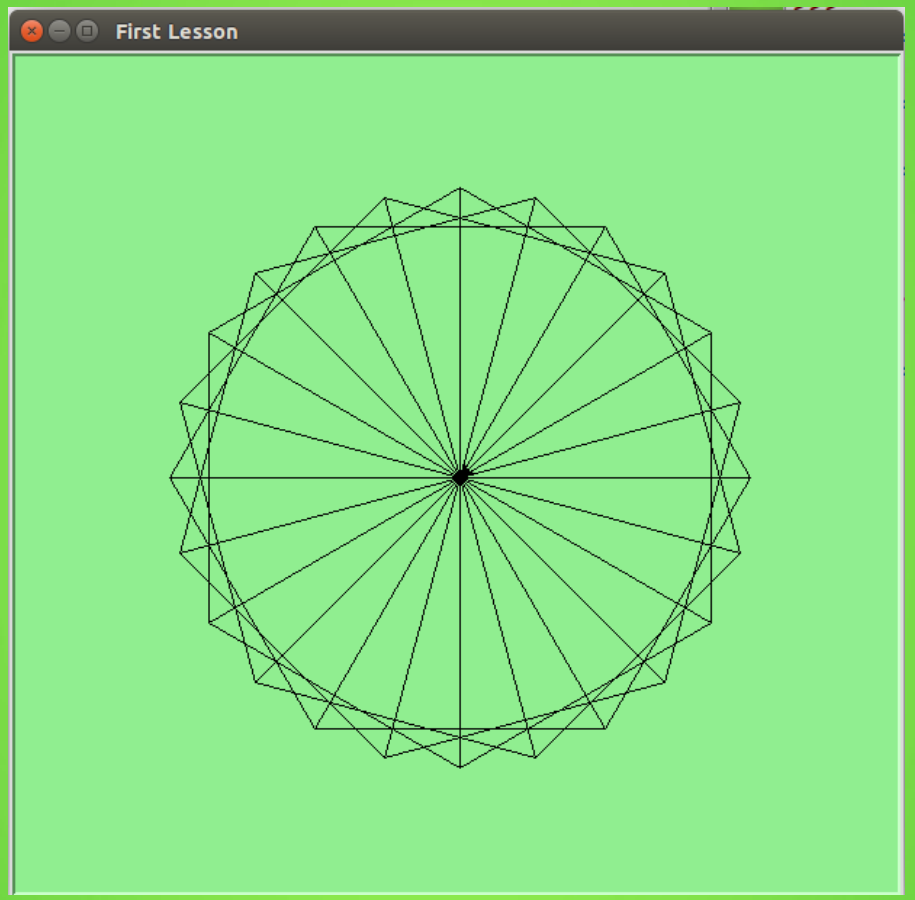
Turtle Graphics

Урок 2

Домашнее задание

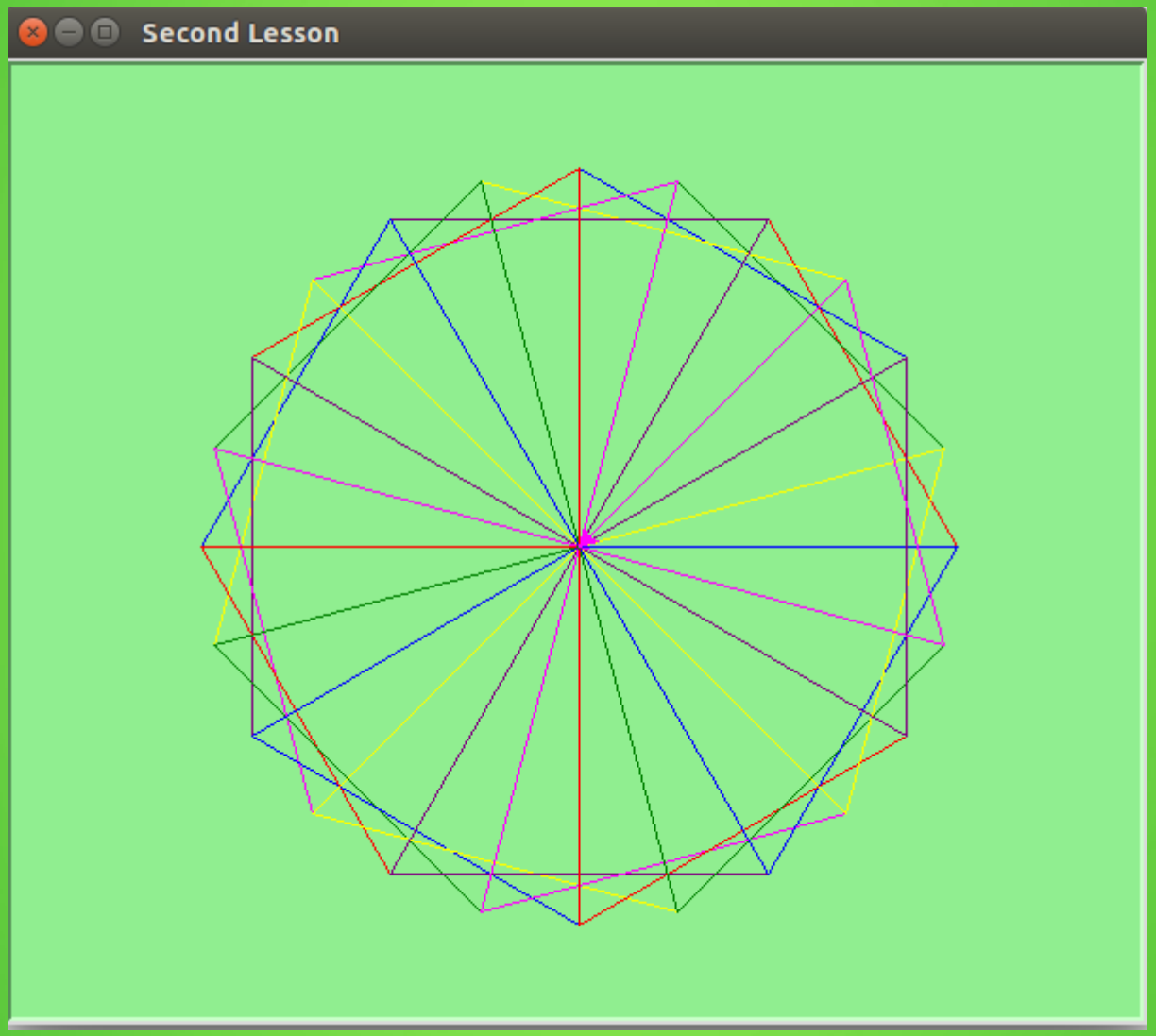


Нарисовать «цветок» из треугольников. Подсказка: Использовать цикл с изменением угла. Использовать функцию tom.seth(angle)

Домашнее задание

```
1   import turtle
2
3   window = turtle.Screen()
4   window.title('First Lesson')
5   window.bgcolor("lightgreen")  # background color
6   tom = turtle.Turtle()
7
8   for angle in range(0, 360, 15):
9       tom.seth(angle)
10      tom.forward(200)
11      tom.left(120)
12      tom.forward(200)
13      tom.left(120)
14      tom.forward(200)
15
16  window.exitonclick()  # to exit
```

Разноцветный цветок



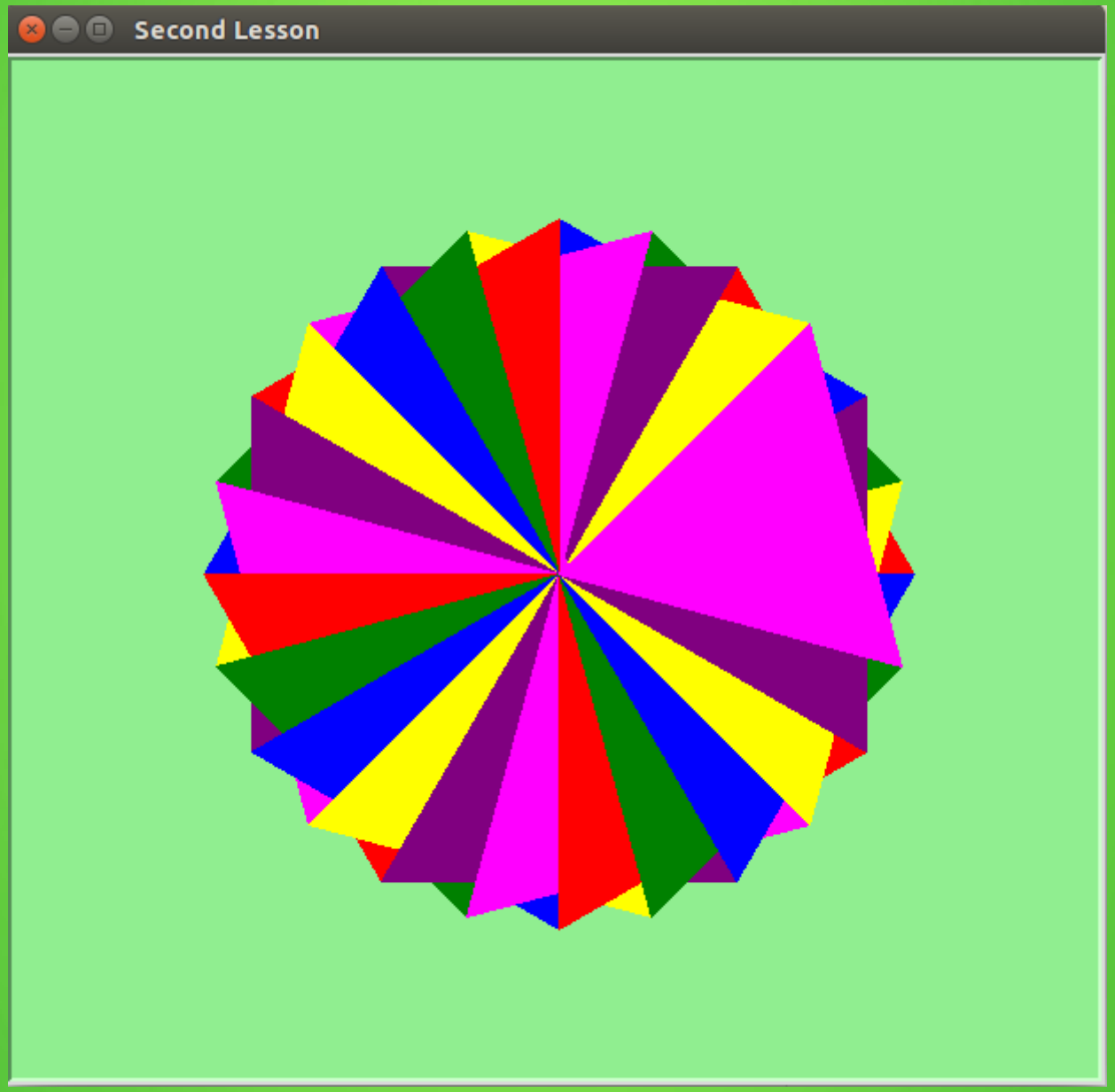
Разноцветный цветок

```
1  import turtle
2
3  window = turtle.Screen()
4  window.title('Second Lesson')
5  window.bgcolor("lightgreen")  # background color
6  tom = turtle.Turtle()
7
8  colors = ['red', 'green', 'blue', 'yellow', 'purple', 'magenta']
9  i = 0 # number of steps
10
11 for angle in range(0, 360, 15):
12     tom.color(colors[i%6]) # 0, 1, 2, 3, 4, 5, 0, 1, 2, 3 ...
13     tom.seth(angle)
14     tom.forward(200)
15     tom.left(120)
16     tom.forward(200)
17     tom.left(120)
18     tom.forward(200)
19     i+=1
20
21 window.exitonclick()  # to exit
```

Цвета на выбор

000000	000033	000066	000099	0000CC	0000FF
003300	003333	003366	003399	0033CC	0033FF
006600	006633	006666	006699	0066CC	0066FF
009900	009933	009966	009999	0099CC	0099FF
00CC00	00CC33	00CC66	00CC99	00CCCC	00CCFF
00FF00	00FF33	00FF66	00FF99	00FFCC	00FFFF
330000	330033	330066	330099	3300CC	3300FF
333300	333333	333366	333399	3333CC	3333FF
336600	336633	336666	336699	3366CC	3366FF
339900	339933	339966	339999	3399CC	3399FF
33CC00	33CC33	33CC66	33CC99	33CCCC	33CCFF
33FF00	33FF33	33FF66	33FF99	33FFCC	33FFFF
660000	660033	660066	660099	6600CC	6600FF
663300	663333	663366	663399	6633CC	6633FF
666600	666633	666666	666699	6666CC	6666FF
669900	669933	669966	669999	6699CC	6699FF
66CC00	66CC33	66CC66	66CC99	66CCCC	66CCFF
66FF00	66FF33	66FF66	66FF99	66FFCC	66FFFF
990000	990033	990066	990099	9900CC	9900FF
993300	993333	993366	993399	9933CC	9933FF
996600	996633	996666	996699	9966CC	9966FF
999900	999933	999966	999999	9999CC	9999FF
99CC00	99CC33	99CC66	99CC99	99CCCC	99CCFF
99FF00	99FF33	99FF66	99FF99	99FFCC	99FFFF
CC0000	CC0033	CC0066	CC0099	CC00CC	CC00FF
CC3300	CC3333	CC3366	CC3399	CC33CC	CC33FF
CC6600	CC6633	CC6666	CC6699	CC66CC	CC66FF
CC9900	CC9933	CC9966	CC9999	CC99CC	CC99FF
CCCC00	CCCC33	CCCC66	CCCC99	CCCCCC	CCCCFF
CCFF00	CCFF33	CCFF66	CCFF99	CCFFCC	CCFFFF
FF0000	FF0033	FF0066	FF0099	FF00CC	FF00FF
FF3300	FF3333	FF3366	FF3399	FF33CC	FF33FF
FF6600	FF6633	FF6666	FF6699	FF66CC	FF66FF
FF9900	FF9933	FF9966	FF9999	FF99CC	FF99FF
FFCC00	FFCC33	FFCC66	FFCC99	FFCCCC	FFCCFF
FFFF00	FFFF33	FFFF66	FFFF99	FFFFCC	FFFFFF

Заполнение цветом

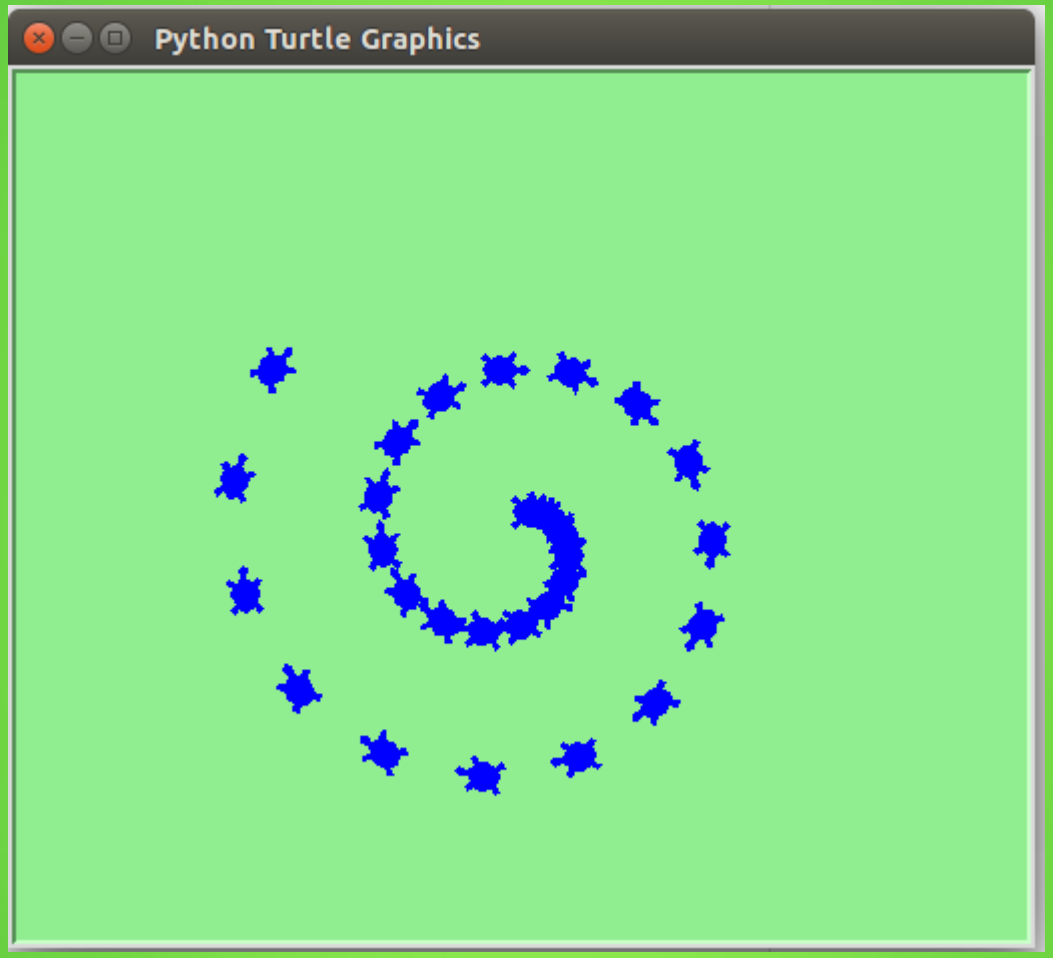


Заполнение цветом

```
1   import turtle
2
3   window = turtle.Screen()
4   window.title('Second Lesson')
5   window.bgcolor("lightgreen")  # background color
6   tom = turtle.Turtle()
7
8   colors = ['red', 'green', 'blue', 'yellow', 'purple', 'magenta']
9   i = 0 # number of steps
10
11  for angle in range(0, 360, 15):
12      tom.begin_fill()
13      tom.color(colors[i%6]) # 0, 1, 2, 3, 4, 5, 0, 1, 2, 3 ...
14      tom.seth(angle)
15      tom.forward(200)
16      tom.left(120)
17      tom.forward(200)
18      tom.left(120)
19      tom.forward(200)
20      i += 1
21      tom.end_fill()
22
23  window.exitonclick()  # to exit
```

begin_fill() → end_fill()

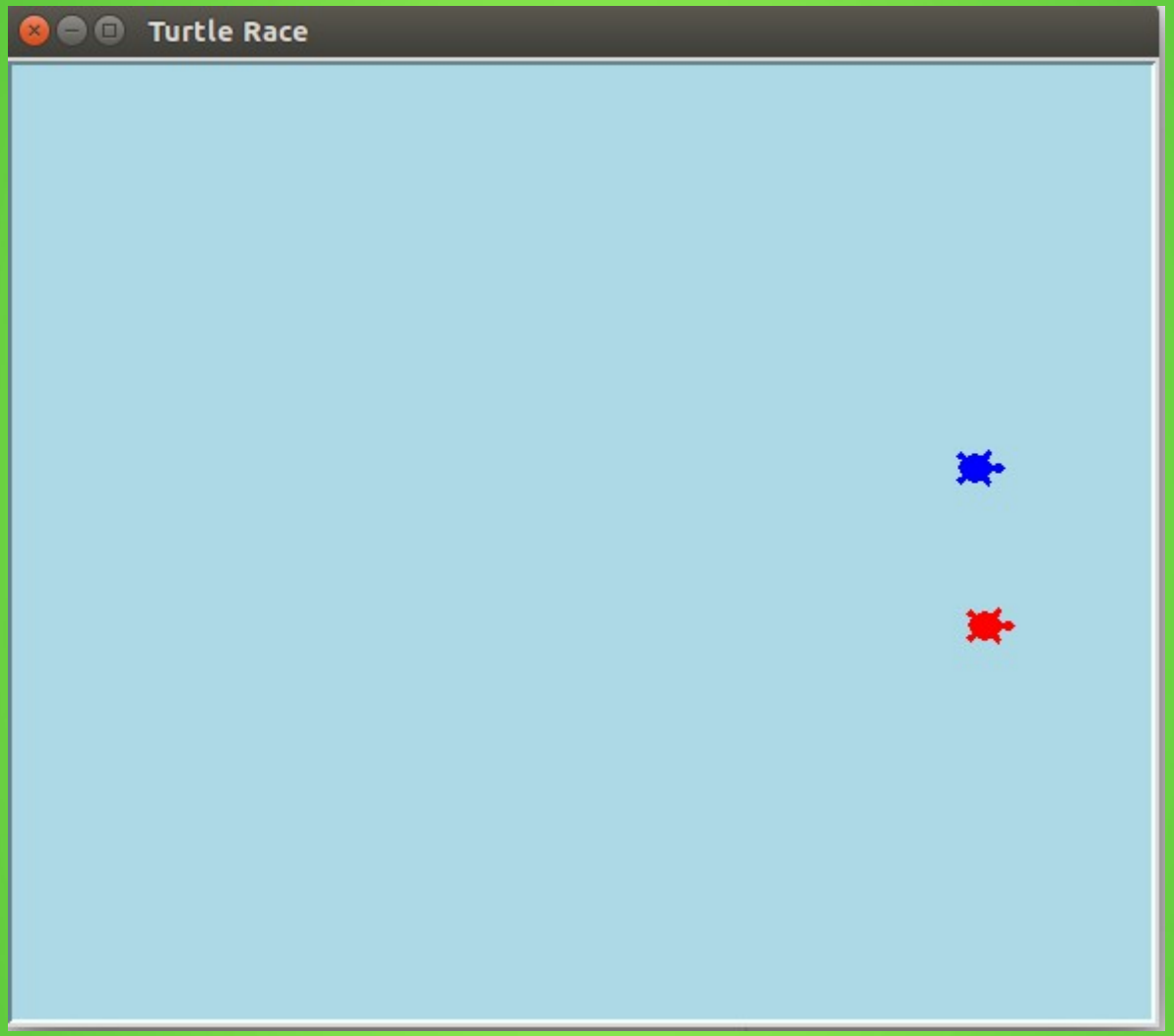
Отпечаток черепахи



Отпечаток черепахи

```
1  import turtle
2  wn = turtle.Screen()
3  wn.bgcolor("lightgreen")
4  tess = turtle.Turtle()
5  tess.color("blue")
6  tess.shape("turtle")
7
8  print(range(5, 60, 2))
9  tess.up()                        # this is new
10 for size in range(5, 60, 2):     # start with size = 5 and grow by 2
11     tess.stamp()                 # leave an impression on the canvas
12     tess.forward(size)           # move tess along
13     tess.right(24)               # and turn her
14
15 wn.exitonclick()
```

Черепашьи гонки



Черепашьи гонки

```
1  import turtle                # 1.  import the modules
2  import random
3  wn = turtle.Screen()         # 2.  Create a screen
4  wn.bgcolor('lightblue')
5  wn.title('Turtle Race')
6
7  lance = turtle.Turtle()      # 3.  Create two turtles
8  andy = turtle.Turtle()
9  lance.color('red')
10 andy.color('blue')
11 lance.shape('turtle')
12 andy.shape('turtle')
13
14 andy.up()                    # 4.  Move the turtles to their starting point
15 lance.up()
16 andy.goto(-300, 40)
17 lance.goto(-300, -40)
18
19 for i in range(100):
20     x = random.randrange(1,10)
21     andy.fd(x)
22     x = random.randrange(1,10)
23     lance.fd(x)
24
25
26 wn.exitonclick()
27
```

Функции в Python

```
Python 3.4.3+ (default, Oct 14 2015, 16:03:50)
[GCC 5.2.1 20151010] on linux
Type "copyright", "credits" or "license()" for more information.
>>> def func():
        print('Hello, world!')


>>> func()
Hello, world!
>>> func
<function func at 0x7fd31dabd488>
>>> def abcplus(a, b, c):
        return a + b + c

>>> abcplus(1, 2, 3)
6
>>> def abcnew(a, b=10, c=20):
        print('a=', a, 'b=', b, 'c=', c)
        return a+b+c

>>> abcnew(1)
a= 1 b= 10 c= 20
31
>>> z = abcnew(1, 2)
a= 1 b= 2 c= 20
>>> z
23
>>> x = abcnew(3, c=30)
a= 3 b= 10 c= 30
>>> x
43
>>>
```

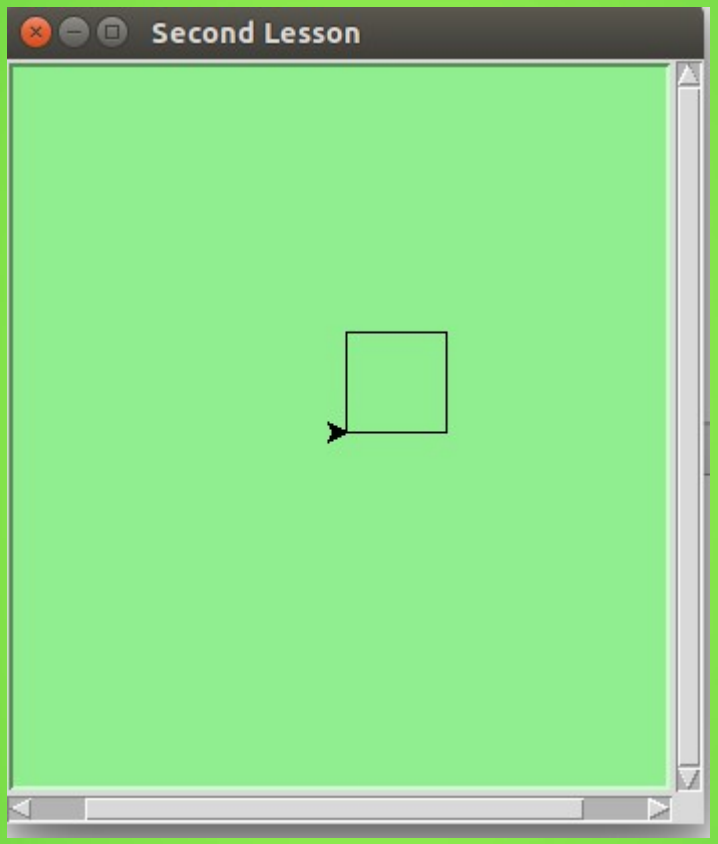
Функции: локальные и глобальные переменные

```
Python 3.4.3+ (default, Oct 14 2015, 16:03:50)
[GCC 5.2.1 20151010] on linux
Type "copyright", "credits" or "license()" for more information.
>>> x = 42
>>> x
42
>>> def func():
        x = 30
        print(x)


>>> func()
30
>>> x
42
>>> def funcGlob():
        global x
        x = 30
        print(x)


>>> x
42
>>> funcGlob()
30
>>> x
30
>>>
```

Функция квадрата



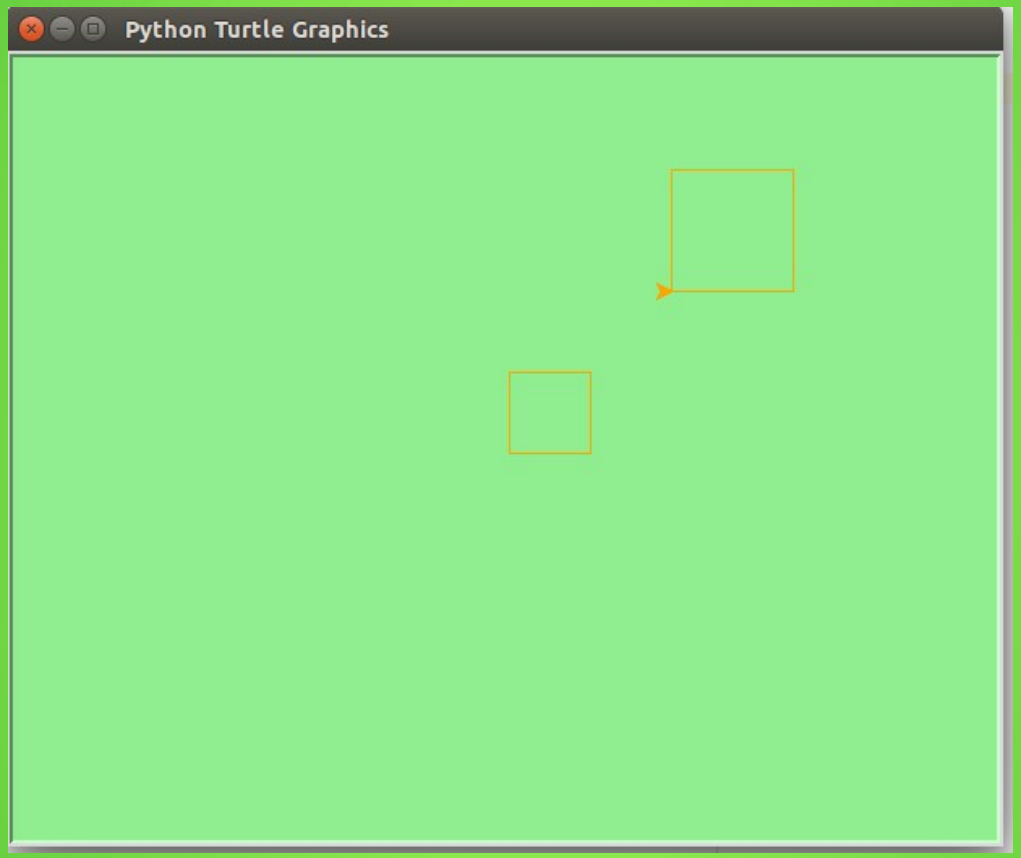
Функция квадрата

```
1  import turtle
2
3  def drawSquare(t, sz):
4      """Make turtle t draw a square of with side sz."""
5
6      for i in range(4):
7          t.forward(sz)
8          t.left(90)
9
10
11 wn = turtle.Screen()              # Set up the window and its attributes
12 wn.bgcolor("lightgreen")
13 wn.title('Second Lesson')
14
15 alex = turtle.Turtle()            # create alex
16 drawSquare(alex, 50)              # Call the function to draw the square passing the actual turtle and the actual side size
17
18 wn.exitonclick()
19
```

Параметры по умолчанию

```
1  import turtle
2
3
4  def drawSquare(t, sz=50, color='orange'):
5      """Make turtle t draw a square of with side sz."""
6
7      for i in range(4):
8          t.forward(sz)
9          t.left(90)
10
11
12 wn = turtle.Screen()  # Set up the window and its attributes
13 wn.bgcolor("lightgreen")
14 wn.title('Second Lesson')
15
16 alex = turtle.Turtle()  # create alex
17 drawSquare(alex)  # Call the function to draw the square passing the actual turtle and the actual side size
18
19 wn.exitonclick()
20
```

Много квадратов



Много квадратов

```
1   import turtle
2
3   def drawSquare(t, sz=50, sqcolor='orange'):
4       """Make turtle t draw a square of with side sz."""
5
6       t.color(sqcolor)
7
8       for i in range(4):
9           t.forward(sz)
10          t.left(90)
11
12
13  wn = turtle.Screen()          # Set up the window and its attributes
14  wn.bgcolor("lightgreen")
15
16  alex = turtle.Turtle()        # create alex
17  drawSquare(alex)            # Call the function to draw the square
18
19  alex.penup()
20  alex.goto(100,100)
21  alex.pendown()
22
23  drawSquare(alex,75)           # Draw another square
24
25  wn.exitonclick()
```

Домашнее задание

(1) Написать функцию, которая рисует треугольник. В ней должны быть параметры: размер стороны, цвет, толщина линии.

(2) Написать программу, которая запрашивает у пользователя количество треугольников, цвет, толщину линии. Потом открывает окно «черепахи» и рисует указанное количество треугольников.