



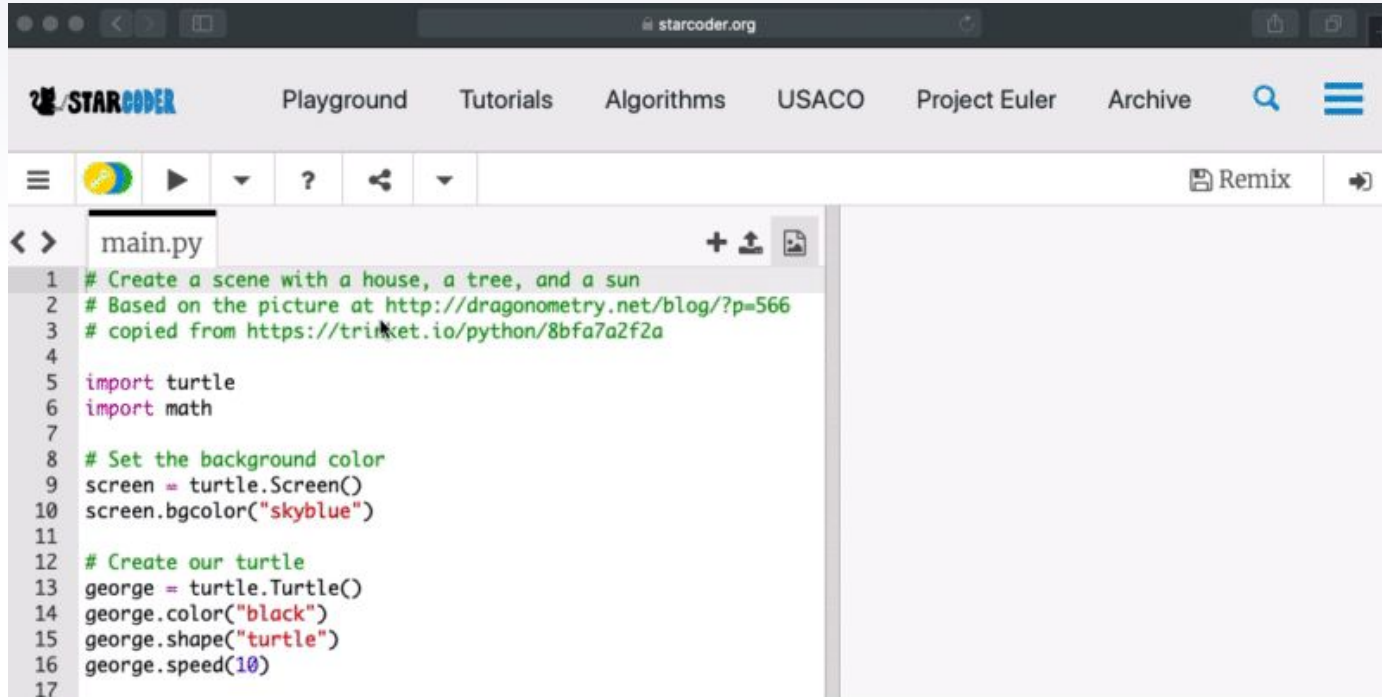
# Welcome to Lesson 4: Turtle

# ► What is Turtle?

- ▶ Turtle - Python feature that allows you to draw things
- ▶ Using a turtle



# Cool Example!



The screenshot shows the StarCoder playground interface. The browser address bar displays 'starcoder.org'. The navigation bar includes links for 'Playground', 'Tutorials', 'Algorithms', 'USACO', 'Project Euler', and 'Archive', along with a search icon and a menu icon. Below the navigation bar is a toolbar with icons for file management and execution. The main editor area shows a file named 'main.py' with the following Python code:

```
1 # Create a scene with a house, a tree, and a sun
2 # Based on the picture at http://dragonometry.net/blog/?p=566
3 # copied from https://trinket.io/python/8bfa7a2f2a
4
5 import turtle
6 import math
7
8 # Set the background color
9 screen = turtle.Screen()
10 screen.bgcolor("skyblue")
11
12 # Create our turtle
13 george = turtle.Turtle()
14 george.color("black")
15 george.shape("turtle")
16 george.speed(10)
17
```

# ▶ Importing and Creation

- ▶ Getting all the turtle commands

```
import turtle
```

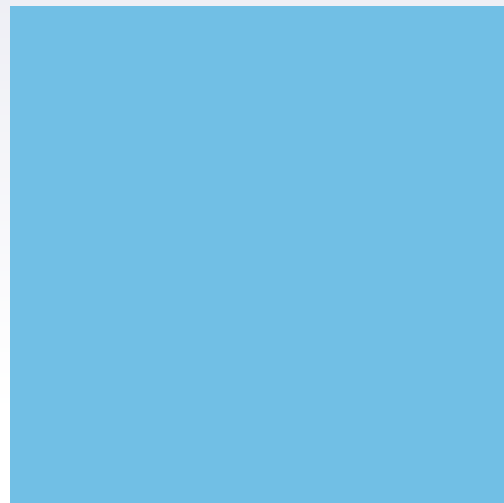
- ▶ Create a turtle

```
name = turtle.Turtle()
```



# ▶ Screen

- ▶ Setting up the screen  
`screen = turtle.Screen()`
- ▶ `screen.bgcolor("skyblue")`



# Settings of Cursor Turtle

- ▶ `name.pensize(thickness)`

- ▶ `name.speed(number)`

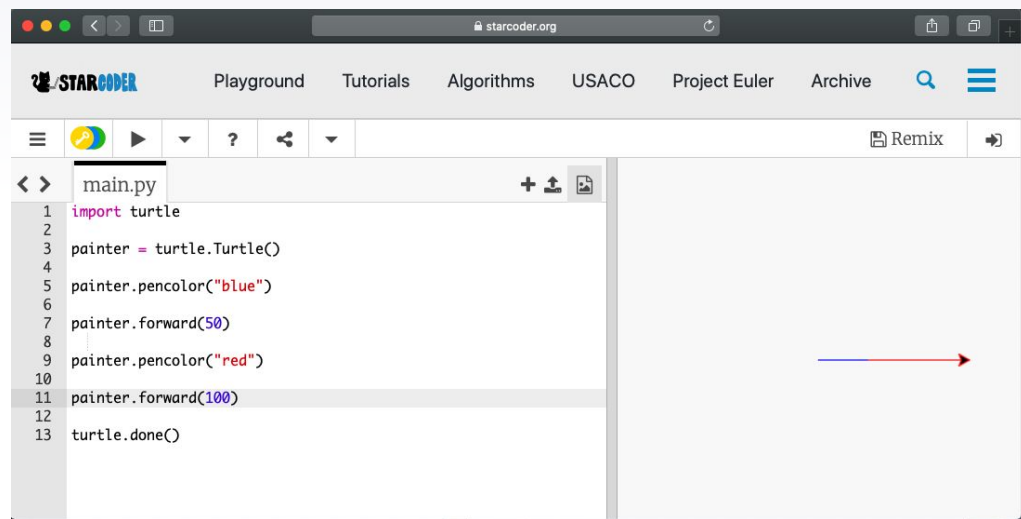
0 is max speed!

- ▶ `name.shape("turtle")`



# ▶ Changing Colors

▶ `painter.pencolor("blue")`



The screenshot shows the StarCoder Playground web interface. The browser address bar displays 'starcoder.org'. The navigation bar includes links for 'Playground', 'Tutorials', 'Algorithms', 'USACO', 'Project Euler', and 'Archive'. Below the navigation bar, there is a toolbar with icons for file management and execution. The main area is split into two panels. The left panel, titled 'main.py', contains the following Python code:

```
1 import turtle
2
3 painter = turtle.Turtle()
4
5 painter.pencolor("blue")
6
7 painter.forward(50)
8
9 painter.pencolor("red")
10
11 painter.forward(100)
12
13 turtle.done()
```

The right panel shows the execution result, which is a horizontal line. The first 50 units of the line are blue, and the next 100 units are red, ending with an arrowhead. This visualizes the effect of the `pencolor` method in the code.

Red colors				
IndianRed	CD	5C	5D	205 92 92
LightCoral	F0	80	80	240 128 128
Salmon	FA	80	72	250 128 114
DarkSalmon	B9	36	7A	233 150 122
LightSalmon	FF	A0	7A	255 160 122
Crimson	DC	14	3C	220 20 60
Red	FF	00	00	255 0 0
FireBrick	B2	22	22	178 34 34
DarkRed	8B	00	00	139 0 0

#### Pink colors

Pink	FF	CD	CD	255 192 203
LightPink	FF	B6	C1	255 182 193
HotPink	FF	69	8A	255 105 180
DeepPink	FF	14	33	255 20 147
MediumVioletRed	C7	15	85	199 21 133
PaleVioletRed	DB	70	93	219 112 147

#### Orange colors

LightSalmon	FF	A0	7A	255 160 122
Coral	FF	7F	50	255 127 80
Tomato	FF	63	47	255 99 71
OrangeRed	FF	45	00	255 69 0
DarkOrange	FF	8C	00	255 140 0
Orange	FF	A8	00	255 168 0

#### Yellow colors

Gold	FF	D7	00	255 215 0
Yellow	FF	FF	00	255 255 0
LightYellow	FF	FF	E0	255 255 224
LemonChiffon	FF	FA	CD	255 250 205
LightGoldenrodYellow	FA	FA	D2	250 250 210
PapayaWhip	FF	EP	5D	255 239 213
Moccasin	FF	E4	B5	255 228 181
PeachPuff	FF	DA	B9	255 218 185
PaleGoldenrod	EE	E8	AA	238 232 170
Khaki	F0	E6	8C	240 230 140
DarkKhaki	BD	B7	6B	189 183 107

#### Purple colors

Lavender	E6	E6	FA	230 230 250
Thistle	D8	BF	D8	216 191 216
Plum	DD	A0	D0	221 160 221
Violet	EE	82	EE	238 130 238
Orchid	DA	70	D6	218 112 214
Fuchsia	FF	00	FF	255 0 255
Magenta	FF	00	FF	255 0 255
MediumOrchid	BA	55	D3	186 85 211
BlueViolet	8A	2B	E2	138 43 226
DarkViolet	94	00	00	148 0 211
DarkOrchid	99	32	CC	153 50 204
DarkMagenta	8B	00	8B	139 0 139
Purple	80	00	80	128 0 128
Indigo	4B	00	82	75 0 130
SlateBlue	6A	5A	CD	106 90 205
DarkSlateBlue	48	3D	8B	72 61 139
MediumSlateBlue	7B	68	EE	123 104 238

#### Green colors

GreenYellow	AD	FF	2F	173 255 47
Chartreuse	7F	FF	00	127 255 0
LawnGreen	7C	FC	00	124 252 0
Lime	90	EE	00	144 238 144
LimeGreen	32	CD	32	50 205 50
PaleGreen	98	FB	98	152 251 152
LightGreen	90	EE	90	144 238 144
MediumSpringGreen	00	FA	9A	0 250 154
SpringGreen	00	FF	7F	0 255 127
MediumSeaGreen	3C	B3	71	60 179 113
SeaGreen	2E	EE	87	46 139 87
ForestGreen	22	8B	22	34 139 34
Green	00	80	00	0 128 0
DarkGreen	00	64	00	0 100 0
YellowGreen	9A	CD	32	154 205 50
OliveDrab	6B	8E	23	107 142 35
Olive	80	80	00	128 128 0

DarkOliveGreen	55	6B	2F	85 107 47
MediumAquamarine	66	CD	AA	102 205 170
DarkSeaGreen	8F	BC	8F	143 188 143
LightSeaGreen	20	B2	AA	32 178 170
DarkCyan	00	8B	8B	0 139 139
Teal	00	80	80	0 128 128

#### Blue/Cyan colors

Aqua	00	FF	FF	0 255 255
Cyan	00	FF	FF	0 255 255
LightCyan	E0	FF	FF	224 255 255
PaleTurquoise	AF	EE	EE	175 238 238
Aquamarine	7F	FF	D4	127 255 212
Turquoise	40	E0	D0	64 224 208
MediumTurquoise	48	D1	CC	72 209 204
DarkTurquoise	00	CE	D1	0 206 209
CadetBlue	5F	9E	A9	95 158 160
SteelBlue	46	82	84	70 130 180
LightSteelBlue	80	C4	DE	176 196 222
PowderBlue	B0	E0	EB	176 224 230
LightBlue	AD	D8	E6	173 216 230
SkyBlue	87	CE	EB	135 206 235
LightSkyBlue	87	CE	FA	135 206 250
DeepSkyBlue	00	BF	FF	0 191 255
DodgerBlue	1E	90	FF	30 144 255
CornflowerBlue	64	95	ED	100 149 237
MediumSlateBlue	7B	68	EE	123 104 238
RoyalBlue	41	69	E1	65 105 225
MediumBlue	00	00	CD	0 0 205
DarkBlue	00	00	8B	0 0 139
Navy	00	00	80	0 0 128
MidnightBlue	19	19	70	25 25 112

#### Brown colors

Cornsilk	FF	F8	DC	255 248 220
BlanchedAlmond	FF	EB	CD	255 235 205
Bisque	FF	E4	C4	255 228 196
NavajoWhite	FF	DE	AD	255 222 173
Wheat	F5	DE	B3	245 222 179
BurlyWood	DE	B8	87	222 184 135
Tan	D2	B4	8C	210 180 140
RosyBrown	BC	8F	8F	188 143 143
SandyBrown	F4	A4	60	244 164 96
Goldenrod	DA	A5	20	218 165 32
DarkGoldenrod	B8	86	0B	184 134 11
Peru	CD	85	3F	205 133 63
Chocolate	D2	69	1E	210 105 30
SaddleBrown	8B	45	13	139 69 19
Sienna	A0	52	2D	160 82 45
Brown	A5	2A	2A	165 42 42
Maroon	80	00	00	128 0 0

#### White colors

White	FF	FF	FF	255 255 255
Snow	FF	FA	FA	255 250 250
Honeydew	F0	FF	F0	240 255 240
MintCream	F5	FF	FA	245 255 250
Azure	F0	FF	FF	240 255 255
AliceBlue	F0	F8	FF	240 248 255
GhostWhite	F8	F8	FF	248 248 255
WhiteSmoke	F5	F5	F5	245 245 245
Seashell	FF	F5	EE	255 245 238
Beige	F5	F5	DC	245 245 220
OldLace	FD	F5	E6	253 245 230
FloralWhite	FF	FA	F0	255 250 240
Ivory	FF	FF	F0	255 255 240
AntiqueWhite	FA	EB	D7	250 235 215
Linen	FA	F0	E6	250 240 230
LavenderBlush	FF	F0	F5	255 240 245
MistyRose	FF	E4	E1	255 228 225

#### Gray colors

Gainsboro	DC	DC	DC	220 220 220
LightGray	D3	D3	D3	211 211 211
Silver	CO	CO	CO	192 192 192
DarkGray	A9	A9	A9	169 169 169
Gray	80	80	80	128 128 128
DimGray	69	69	69	105 105 105
LightSlateGray	77	88	99	119 136 153
SlateGray	70	80	90	112 128 144
Black	00	00	00	0 0 0



# ▶ Drawing a Line

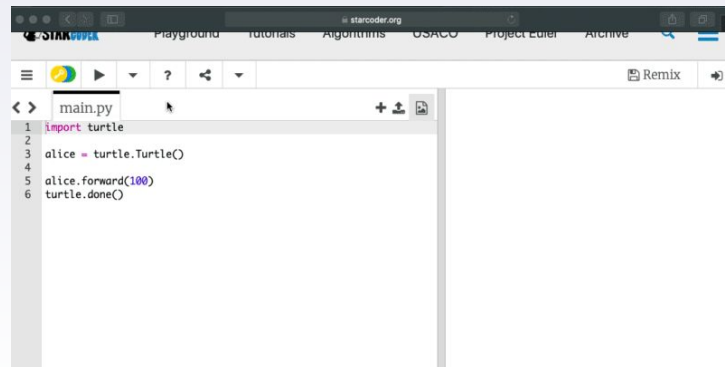
- ▶ Moving the turtle

name.forward(amount of pixels)

- ▶ Turning the turtle

name.right(degrees)

name.left(degrees)



The screenshot shows the StarCoder playground interface. The code editor on the left contains a Python script named 'main.py' with the following code:

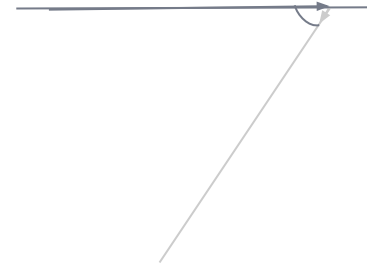
```
1 import turtle
2
3 alice = turtle.Turtle()
4
5 alice.forward(100)
6 turtle.done()
```

The right side of the interface shows a blank canvas where the turtle's movement would be visualized. The top navigation bar includes links for Playground, Tutorials, Algorithms, USACO, Project Editor, and Archive.

← All you need!

# ▶ Geometry Review

- ▶ Angles in a shape
  - ▶ Square
  - ▶ Equilateral Triangle
  - ▶ Hexagon
  - ▶  $180(\text{sides} - 2)$
- ▶ Turtle turns:  $180 - \text{angle}$



# Squares

```
import turtle
```

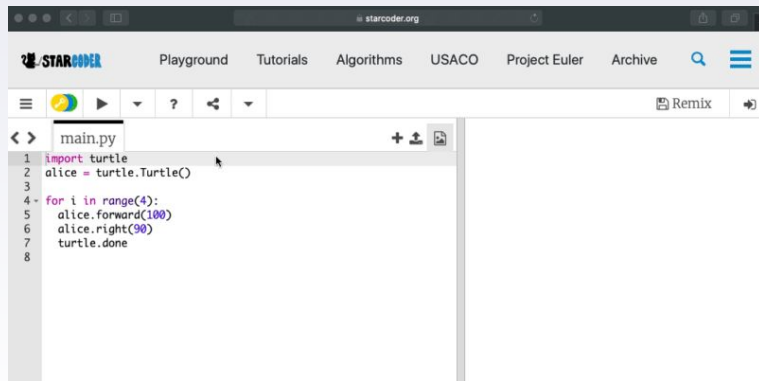
```
alice = turtle.Turtle()
```

```
for i in range(4):
```

```
    alice.forward(100)
```

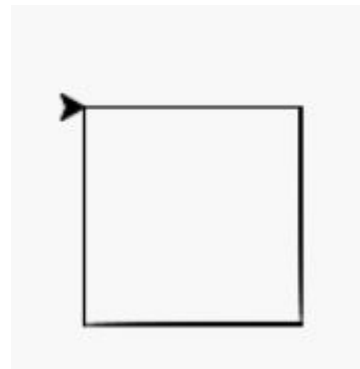
```
    alice.right(90)
```

```
turtle.done
```



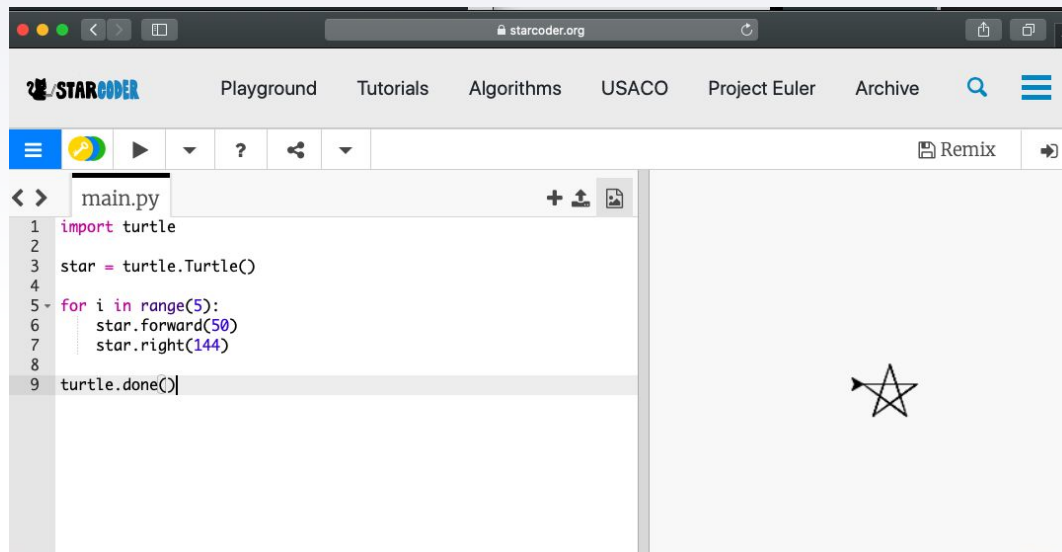
The screenshot shows the StarCoder playground interface. The code editor displays a Python script named 'main.py' with the following content:

```
1 import turtle
2 alice = turtle.Turtle()
3
4 for i in range(4):
5     alice.forward(100)
6     alice.right(90)
7 turtle.done
8
```



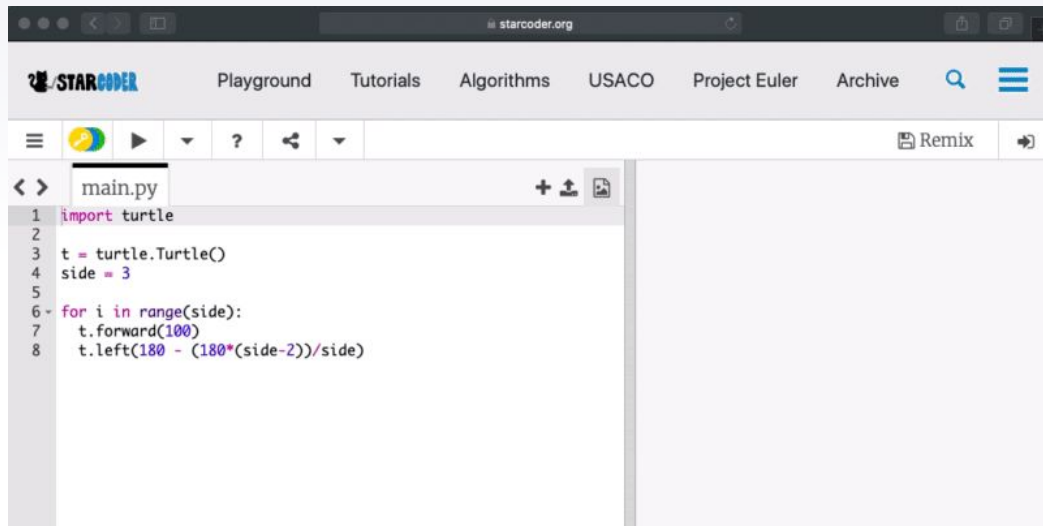
# Stars

```
import turtle  
star = turtle.Turtle()  
for i in range(5):  
    star.forward(50)  
    star.right(144)  
turtle.done()
```



# ► All Main Shapes

```
import turtle  
  
t = turtle.Turtle()  
  
side = [insert side #]  
  
for i in range(side):  
    t.forward(100)  
    t.left(180 - (180*(side-2))/side)
```

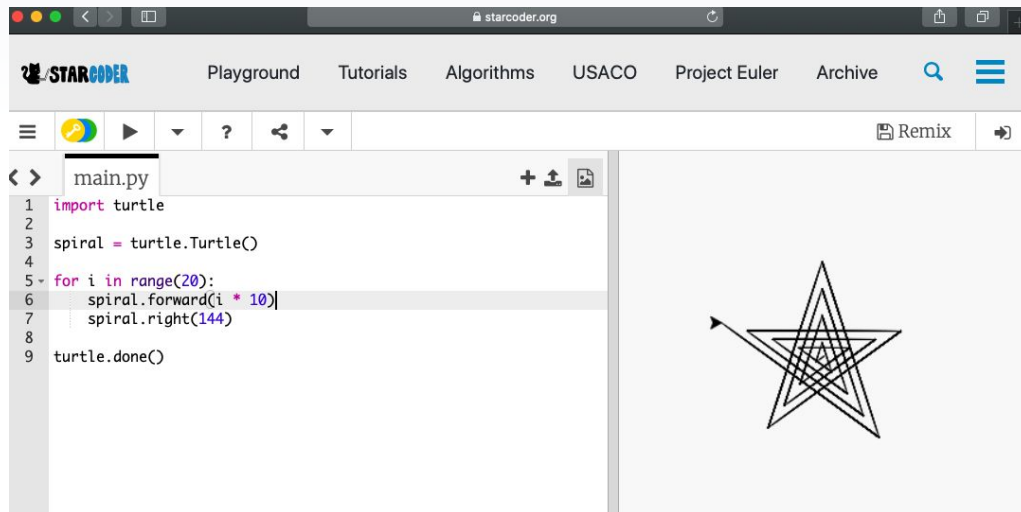


The screenshot shows the StarCoder playground interface. The browser address bar displays 'starcoder.org'. The navigation bar includes links for 'Playground', 'Tutorials', 'Algorithms', 'USACO', 'Project Euler', and 'Archive'. Below the navigation bar is a toolbar with icons for file management and execution. The main code editor displays a file named 'main.py' with the following Python code:

```
1 import turtle  
2  
3 t = turtle.Turtle()  
4 side = 3  
5  
6 for i in range(side):  
7     t.forward(100)  
8     t.left(180 - (180*(side-2))/side)
```

# ► Incrementing Values

```
import turtle
spiral = turtle.Turtle()
for i in range(20):
    spiral.forward(i * 10)
    spiral.right(144)
turtle.done()
```



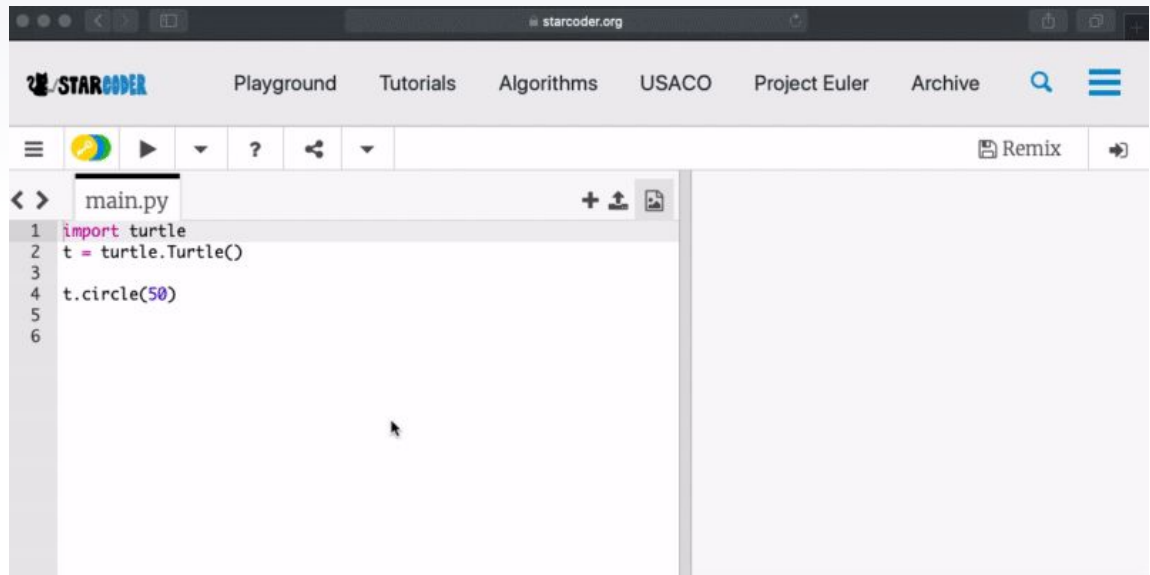
The screenshot shows the StarCoder playground interface. The code editor on the left contains the following Python code:

```
1 import turtle
2
3 spiral = turtle.Turtle()
4
5 for i in range(20):
6     spiral.forward(i * 10)
7     spiral.right(144)
8
9 turtle.done()
```

The output window on the right displays a complex geometric pattern, which is a spiral star. The star is composed of multiple overlapping five-pointed stars, each slightly larger than the last, creating a dense, intricate design. The points of the stars are sharp and well-defined.

# Circles

```
import turtle  
t = turtle.Turtle()  
  
t.circle(50)
```



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```
1 import turtle  
2 t = turtle.Turtle()  
3  
4 t.circle(50)  
5  
6
```

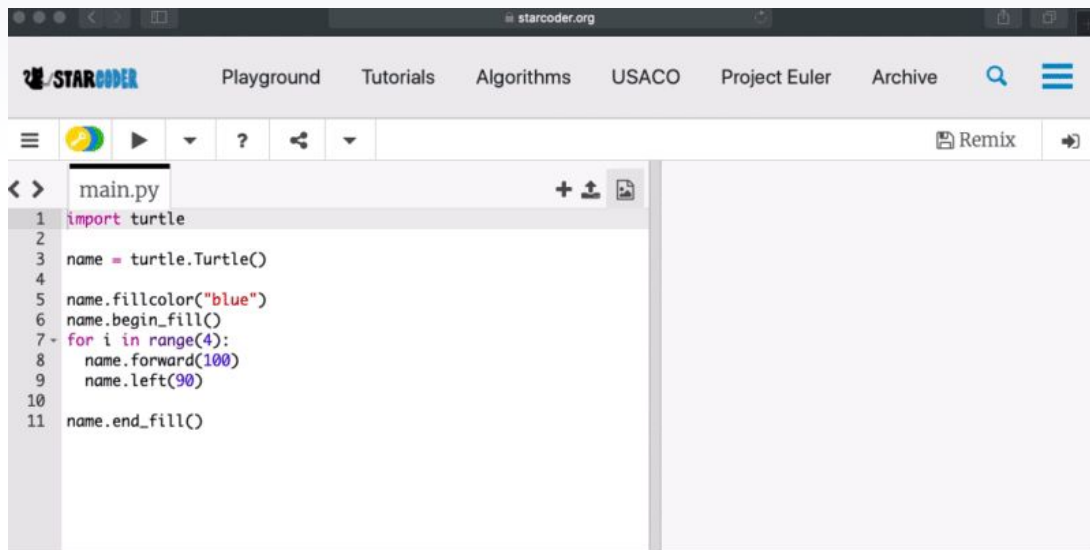
# ► Multiple Shapes

- ▶ Pen up  
name.up()
- ▶ Pen down  
up.down()



# Filling in Shapes

- ▶ Set color  
`name.fillcolor("blue")`
- ▶ Start fill  
`name.start_fill()`
- ▶ Draw shape
- ▶ End fill  
`name.end_fill()`



The screenshot shows the StarCoder playground interface. The browser address bar displays 'starcoder.org'. The navigation bar includes links for 'Playground', 'Tutorials', 'Algorithms', 'USACO', 'Project Euler', and 'Archive', along with a search icon and a menu icon. Below the navigation bar is a toolbar with icons for file operations and execution. The main area is divided into a code editor on the left and a canvas on the right. The code editor shows a file named 'main.py' with the following Python code:

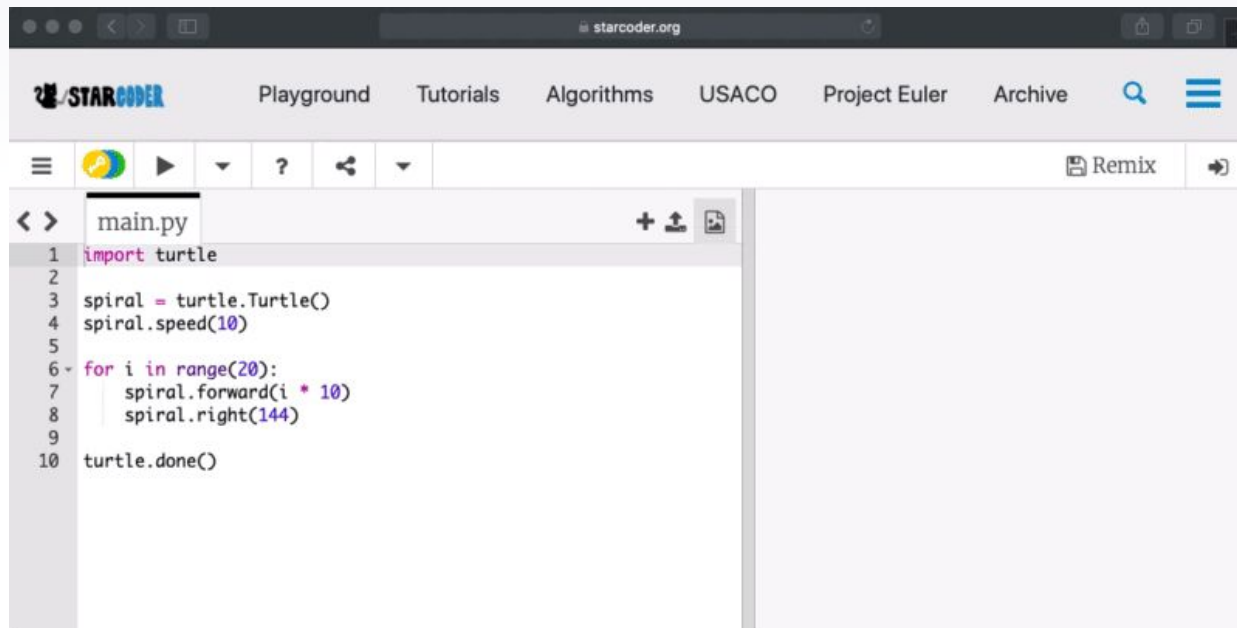
```
1 import turtle
2
3 name = turtle.Turtle()
4
5 name.fillcolor("blue")
6 name.begin_fill()
7 for i in range(4):
8     name.forward(100)
9     name.left(90)
10
11 name.end_fill()
```



# Examples and Problems!

Type Your Answers in the Chat

# Example: Spiral



The screenshot shows the StarCoder playground interface. The browser address bar displays 'starcoder.org'. The navigation bar includes links for 'Playground', 'Tutorials', 'Algorithms', 'USACO', 'Project Euler', and 'Archive', along with a search icon and a menu icon. Below the navigation bar is a toolbar with icons for undo, redo, run, and other functions. The main editor area shows a file named 'main.py' with the following Python code:

```
1 import turtle
2
3 spiral = turtle.Turtle()
4 spiral.speed(10)
5
6 for i in range(20):
7     spiral.forward(i * 10)
8     spiral.right(144)
9
10 turtle.done()
```



`name.circle(40)`

What does the 40 mean?



`name.forward(100)`

What unit is the 100 in?