



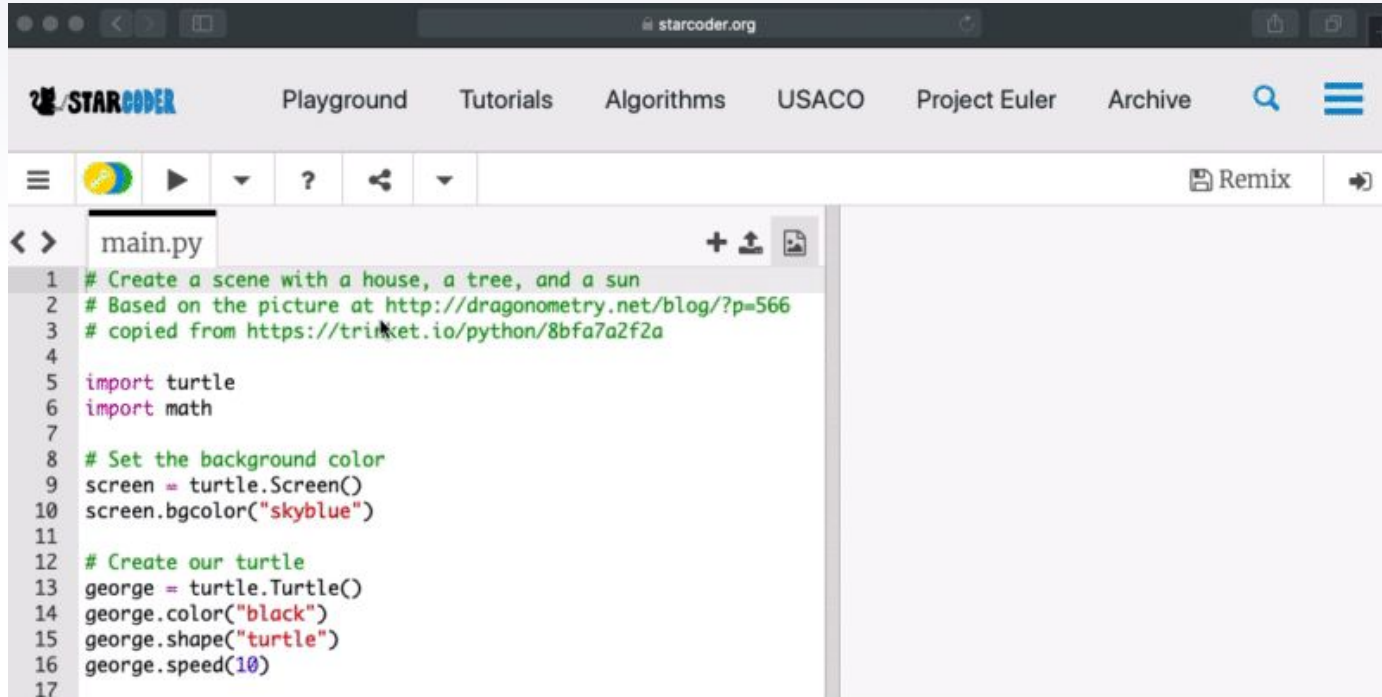
# Welcome to Lesson 4: Turtle

# ► 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 menu includes "STARCODER", "Playground", "Tutorials", "Algorithms", "USACO", "Project Euler", and "Archive". A search icon and a hamburger menu are also present. Below the navigation is a toolbar with icons for file operations and a "Remix" button. The code editor 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)`

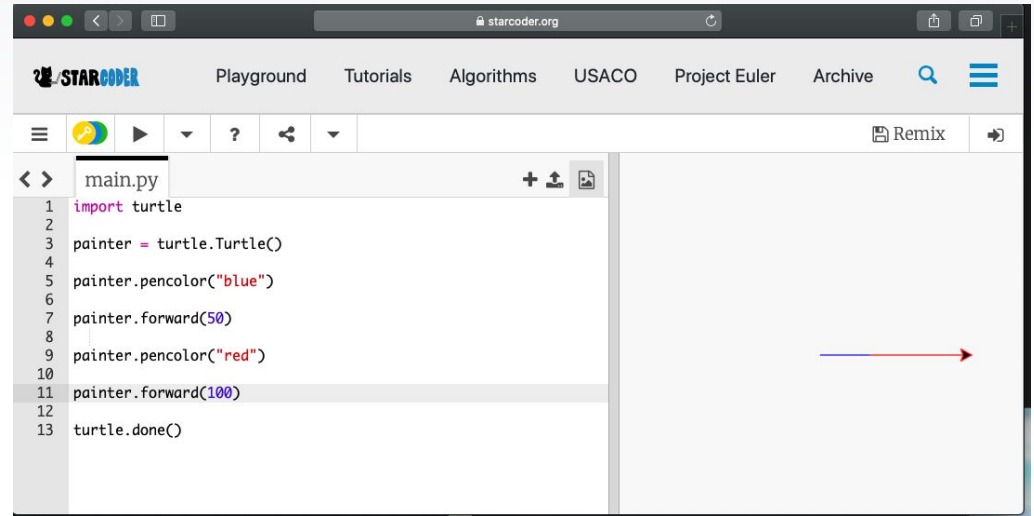
- ▶ `name.shape("turtle")`

0 is max speed!



# ▶ Changing Colors

▶ `painter.pencolor("blue")`



The screenshot shows a web browser window with the URL `starcoder.org`. The page features a navigation bar with links for "Playground", "Tutorials", "Algorithms", "USACO", "Project Euler", and "Archive". Below the navigation bar is a toolbar with icons for file operations and a "Remix" button. The main area is split into two panes. The left pane, 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 pane displays the output of the code: a horizontal line starting with a blue segment of length 50, followed by a red segment of length 100, ending in an arrowhead pointing to the right.

Red colors			
IndianRed	CD 5C 5E	205 92 92	
LightCoral	F0 80 80	240 128 128	
Salmon	FA 80 72	250 128 114	
DarkSalmon	B9 96 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 C0 CB	255 192 203	
LightPink	FF B6 C1	255 182 193	
HotPink	FF 69 B4	255 105 180	
DeepPink	FF 14 93	255 20 147	
MediumVioletRed	C7 15 85	199 21 133	
PaleVioletRed	DE 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 A5 00	255 165 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	FFFACD	255 250 205	
LightGoldenrodYellow	FAFAD2	250 250 210	
PapayaWhip	FFE4C4	255 239 213	
Moccasin	FFE4B5	255 228 181	
PeachPuff	FFDAB9	255 218 185	
PaleGoldenrod	EEE8AA	238 232 170	
Khaki	F0E68C	240 230 140	
DarkKhaki	BD B7 6B	189 183 107	

Purple colors			
Lavender	E6E6FA	230 230 250	
Thistle	D8BFD8	216 191 216	
Plum	DDA0DD	221 160 221	
Violet	EE82EE	238 130 238	
Orchid	DA70D6	218 112 214	
Fuchsia	FF 00 FF	255 0 255	
Magenta	FF 00 FF	255 0 255	
MediumOrchid	BA55D3	186 85 211	
BlueViolet	8A2BE2	138 43 226	
DarkViolet	8A008A	140 0 211	
DarkOrchid	9932CC	153 50 204	
DarkMagenta	8B008B	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	7C FC 00	127 255 0	
LawnGreen	7C FC 00	124 252 0	
Lime	90 EE 90	0 255 0	
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 BB 67	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	89 107 47	
MediumAquamarine	66 CD AA	102 205 170	
DarkSeaGreen	8F BC 8F	143 188 143	
LightSeaGreen	20 B2 AA	32 178 176	
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 EEEF	175 238 238	
Aquamarine	7FFFD4	127 255 212	
Turquoise	40 E0 D0	64 224 208	
MediumTurquoise	48 D1 CC	72 209 204	
DarkTurquoise	00 CED1	0 206 209	
CadetBlue	5F 9E 90	95 158 160	
SteelBlue	46 82 B4	70 130 180	
LightSteelBlue	80 C4 DE	176 196 222	
PowderBlue	B0 E0 E6	176 224 230	
LightBlue	ADD8E6	173 216 230	
SkyBlue	87 CE EB	135 206 235	
LightSkyBlue	87 CE FA	135 206 250	
DeepSkyBlue	00 BFFF	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	30 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	FFF8DC	255 248 220	
BlanchedAlmond	FFF5DC	255 235 205	
Bisque	FFE4C4	255 228 196	
NavajoWhite	FFDEAD	255 222 173	
Wheat	F5DEB3	245 222 179	
BurlyWood	DEB887	222 184 135	
Tan	D2B48C	210 180 140	
RosyBrown	BC8F8F	188 143 143	
SandyBrown	F4A460	244 164 96	
Goldenrod	DAA520	218 165 32	
DarkGoldenrod	DDA066	184 134 11	
Peru	CD853F	205 133 63	
Chocolate	D2691E	210 105 30	
SaddleBrown	8B4513	139 69 19	
Sienna	A0522D	160 82 45	
Brown	A52A2A	165 42 42	
Maroon	800000	128 0 0	

White colors			
White	FFFFFF	255 255 255	
Snow	FFFAFA	255 250 250	
Honeydew	FFF0F0	240 255 240	
MintCream	F0FFF0	245 255 250	
Azure	F0FFFF	240 255 255	
AliceBlue	F0F8FF	240 248 255	
GhostWhite	F8F8FF	248 248 255	
WhiteSmoke	F5F5F5	245 245 245	
Seashell	FFF5EE	255 245 238	
Beige	F5F5DC	245 245 220	
OldLace	FDF5E6	253 245 230	
FloralWhite	FFFAF0	255 250 240	
Ivory	FFFFF0	255 255 240	
AntiqueWhite	FAEBD7	250 235 215	
Linen	FAFAD2	250 240 230	
LavenderBlush	FFF0F5	255 240 245	
MistyRose	FFC0CB	255 228 225	

Gray colors			
Gainsboro	DCDCDC	220 220 220	
LightGray	D3D3D3	211 211 211	
Silver	CCC0C0	192 192 192	
DarkGray	A9A9A9	169 169 169	
Gray	808080	128 128 128	
DimGray	696969	105 105 105	
LightSlateGray	778899	119 136 153	
SlateGray	707070	112 128 144	
Black	000000	0 0 0	



# Drawing a Line

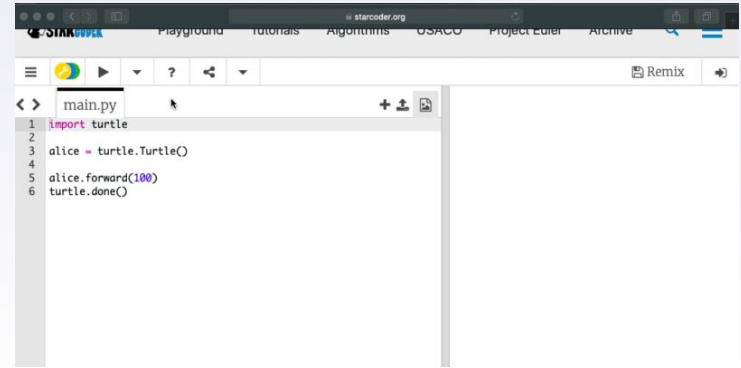
- ▶ Moving the turtle

name.forward(amount of pixels)

- ▶ Turning the turtle

name.right(degrees)

name.left(degrees)



The screenshot shows a web browser window with the URL 'starcoder.org'. The page title is 'STARCODER Playground'. The main content area displays a code editor with the following Python code in a file named 'main.py':

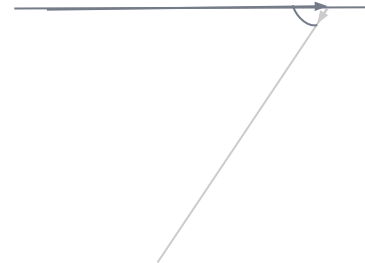
```
1 import turtle
2
3 alice = turtle.Turtle()
4
5 alice.forward(100)
6 turtle.done()
```

The code editor has a 'Remix' button in the top right corner.

← All you need!

# ▶ Geometry Review

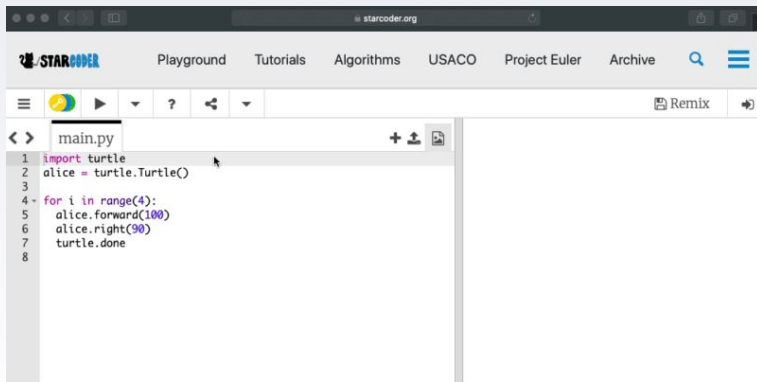
- ▶ Angles in a shape
  - ▶ Square
  - ▶ Equilateral Triangle
  - ▶ Hexagon
  - ▶  $180(\text{sides} - 2)$
  
- ▶ Turtle turns:  $180 - \text{angle}$



# Squares

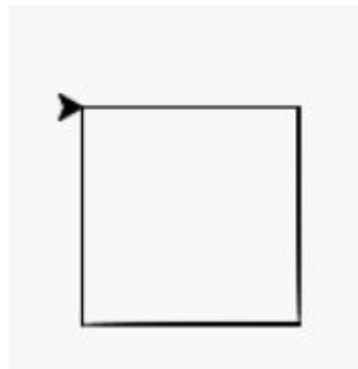
```
import turtle  
alice = turtle.Turtle()
```

```
for i in range(4):  
    alice.forward(100)  
    alice.right(90)  
turtle.done
```



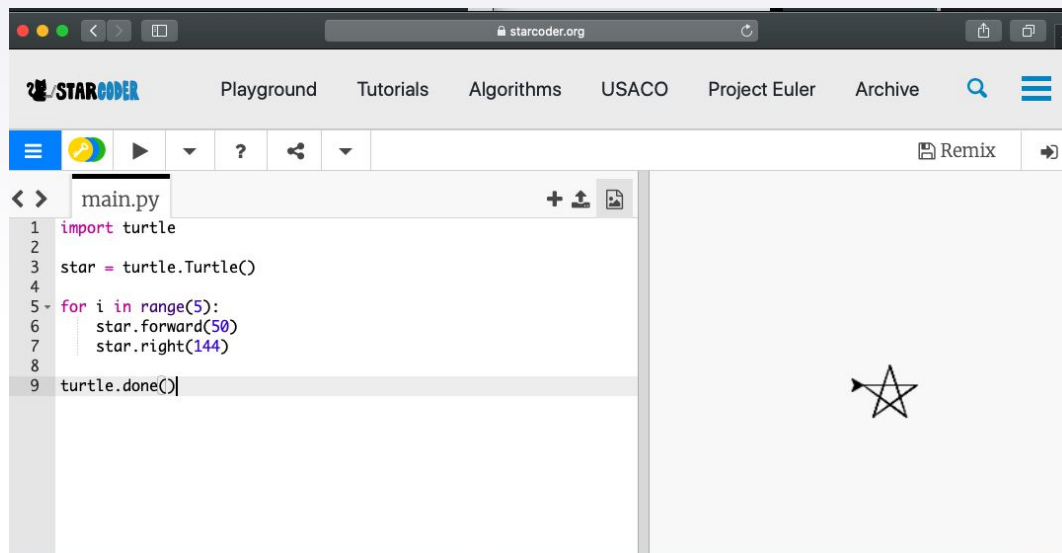
The screenshot shows the StarCoder playground interface. The code editor contains the following Python code:

```
main.py  
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()
```



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

```
1 import turtle
2
3 star = turtle.Turtle()
4
5 for i in range(5):
6     star.forward(50)
7     star.right(144)
8
9 turtle.done()
```

The execution result on the right shows a black star shape on a white background.

# All Main Shapes

```
import turtle
```

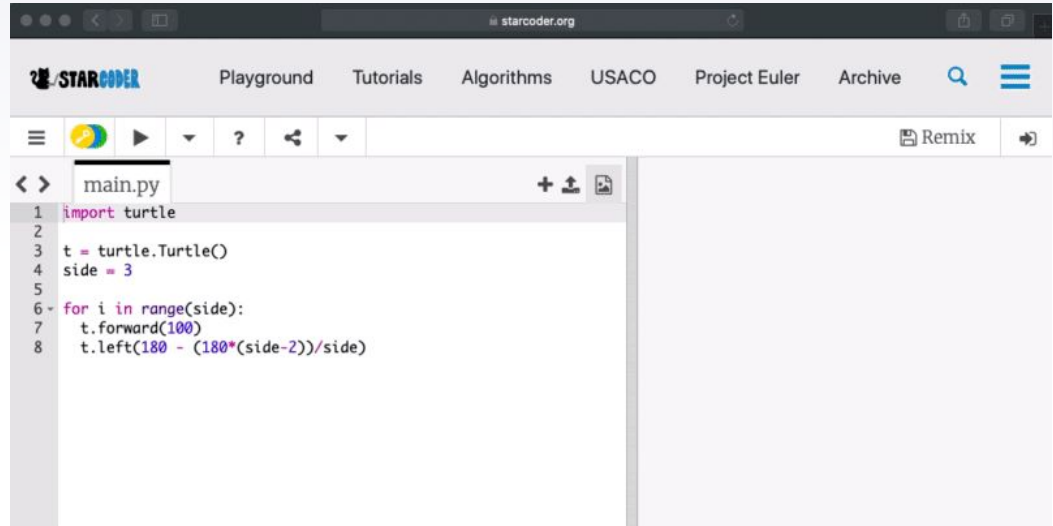
```
t = turtle.Turtle()
```

```
side = [insert side #]
```

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

```
    t.forward(100)
```

```
    t.left(180 - (180*(side-2))/side)
```

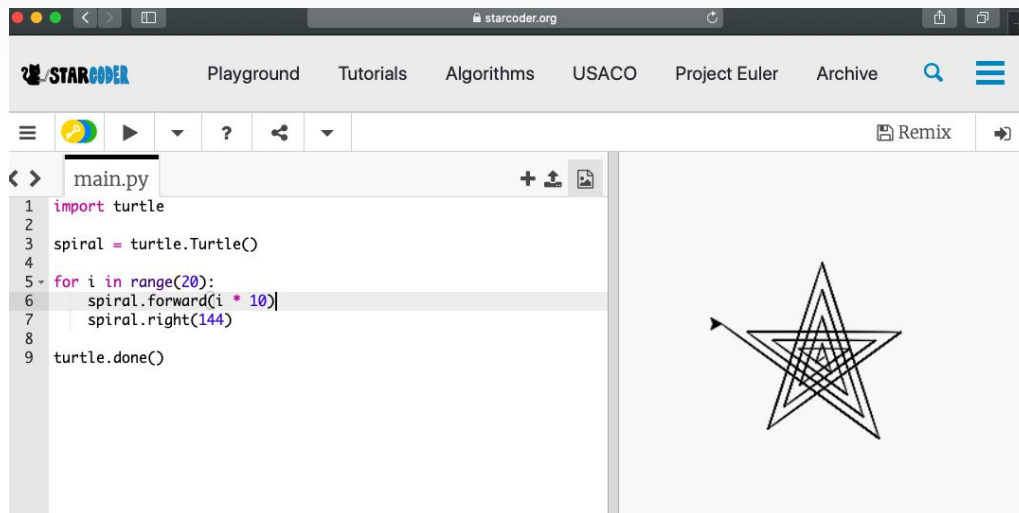


The screenshot shows a web browser window with the URL starcoder.org. The page has a navigation bar with links for Playground, Tutorials, Algorithms, USACO, Project Euler, and Archive. Below the navigation bar is a toolbar with icons for running, help, and sharing. The main area is a code editor with a file named main.py. The code in the editor is:

```
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()
```



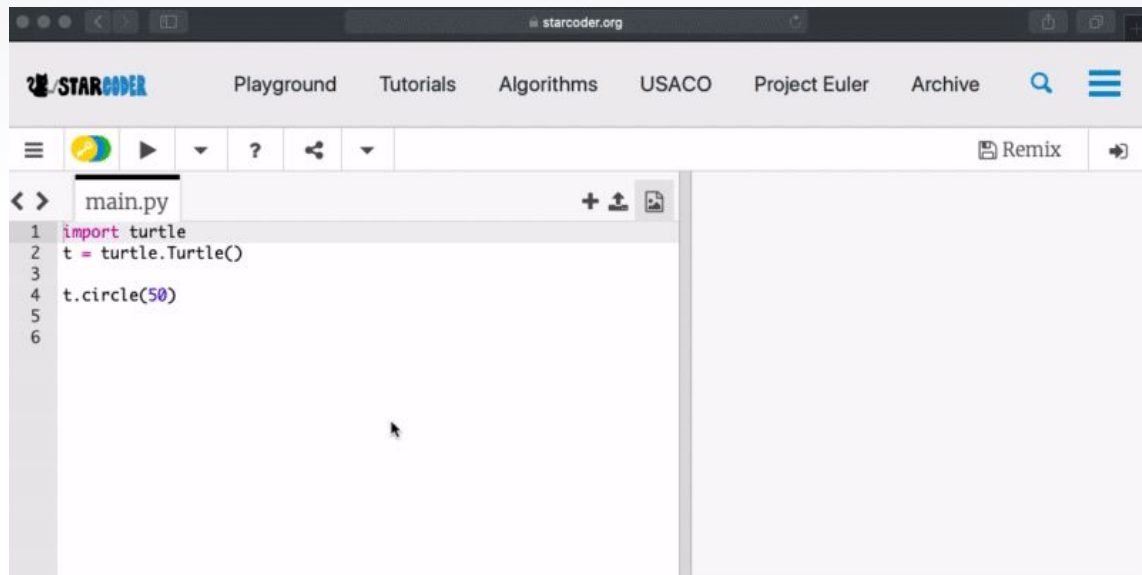
The screenshot shows a web browser window with the URL `starcoder.org`. The page features a navigation bar with links for "Playground", "Tutorials", "Algorithms", "USACO", "Project Euler", and "Archive". Below the navigation bar, there is a toolbar with icons for running, undo, redo, and search. The main content area is split into two panes. The left pane, titled "main.py", 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 right pane displays the output of the code, which is a complex geometric pattern consisting of multiple overlapping, concentric pentagrams. The pattern is drawn in black lines on a white background. The browser window also shows a "Remix" button and a search icon.

# Circles

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



```
starcoder.org  
STARCODER Playground Tutorials Algorithms USACO Project Euler Archive  
Remix  
main.py  
1 import turtle  
2 t = turtle.Turtle()  
3  
4 t.circle(50)  
5  
6
```

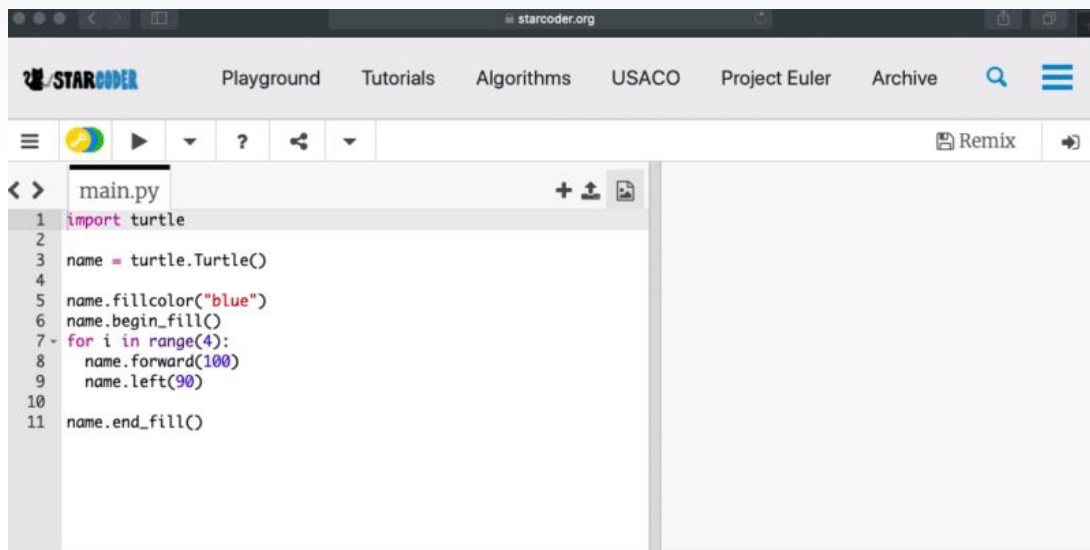
# ▶ Multiple Shapes

- ▶ 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 menu includes "Playground", "Tutorials", "Algorithms", "USACO", "Project Euler", and "Archive". The code editor shows a file named "main.py" with the following Python code:

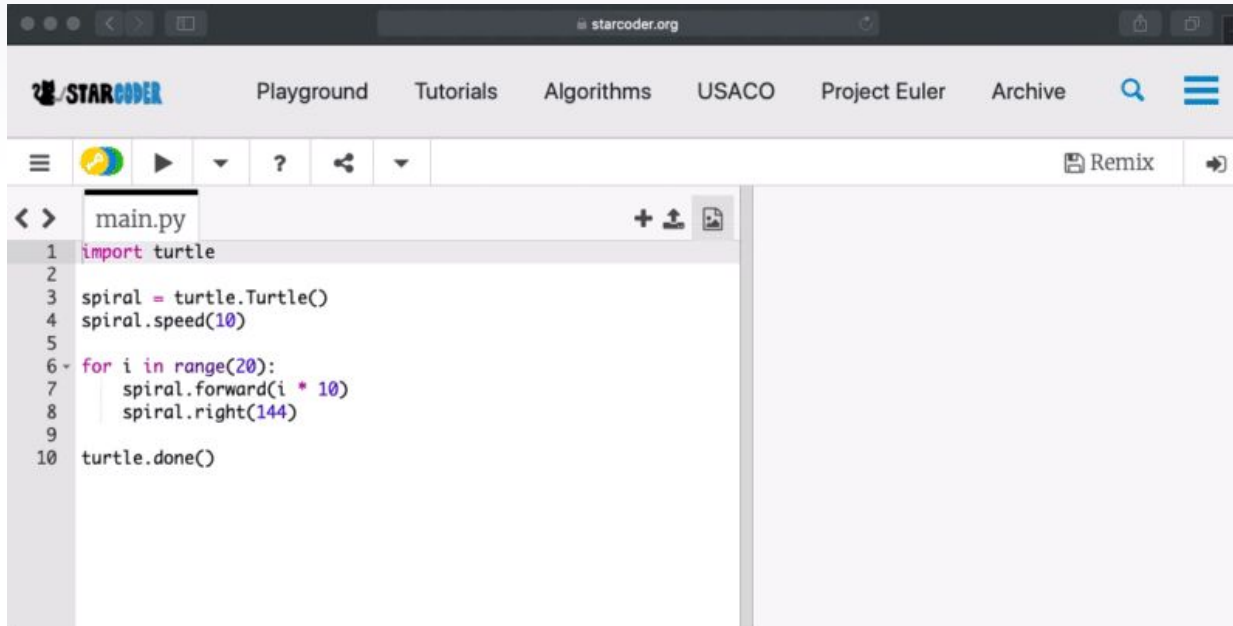
```
1 import turtle
2
3 name = turtle.Turtle()
4
5 name.fillcolor("blue")
6 name.begin_fill()
7 for i in range(4):
8     name.forward(100)
9     name.left(90)
10
11 name.end_fill()
```



# Examples and Problems!

Type Your Answers in the Chat

# Example: Spiral



The screenshot shows a web browser window with the URL `starcoder.org`. The page features a navigation bar with links for `STARCODER`, `Playground`, `Tutorials`, `Algorithms`, `USACO`, `Project Euler`, and `Archive`. Below the navigation bar is a toolbar with icons for file operations and a `Remix` button. The main area displays a code editor with a file named `main.py`. The code in the editor is as follows:

```
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?



# Final Google Form

<https://forms.gle/bv6Xzy3odibXiJBG7>



# Turtle Program Sharing

[https://docs.google.com/document/d/1\\_0dO7kH\\_8XwWP2s73h6i5ChyBHtjITOI85x-MkVM5IE/edit?usp=sharing](https://docs.google.com/document/d/1_0dO7kH_8XwWP2s73h6i5ChyBHtjITOI85x-MkVM5IE/edit?usp=sharing)