

BIS 420 PROGRAMMING FOR DATA SCIENCE

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CHAPTER 4 EXERCISE 4.3
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Write an appropriately general set of functions that can draw shapes as in Figure 4.2.

Solution: [http:// thinkpython. com/ code/ pie. py](http://thinkpython.com/code/pie.py) .

```
from __future__ import print_function, division
```

```
import math
```

```
import turtle
```

```
def draw_pie(t, n, r):
```

```
    polypie(t, n, r)
```

```
    t.pu()
```

```
    t.fd(r*2 + 10)
```

```
    t.pd()
```

```
def polypie(t, n, r):
```

```
    angle = 360.0 / n
```

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

```
        isosceles(t, r, angle/2)
```

```
        t.lt(angle)
```

```
def isosceles(t, r, angle):  
    y = r * math.sin(angle * math.pi / 180)  
  
    t.rt(angle)  
    t.fd(r)  
    t.lt(90+angle)  
    t.fd(2*y)  
    t.lt(90+angle)  
    t.fd(r)  
    t.lt(180-angle)
```

```
bob = turtle.Turtle()
```

```
bob.pu()  
bob.bk(130)  
bob.pd()
```

```
size = 40  
draw_pie(bob, 5, size)  
draw_pie(bob, 6, size)  
draw_pie(bob, 7, size)  
draw_pie(bob, 8, size)
```

```
bob.hideturtle()  
turtle.mainloop()
```

```

1  from __future__ import print_function, division
2
3  import math
4  import turtle
5
6
7  def draw_pie(t, n, r):
8      polypie(t, n, r)
9      t.pu()
10     t.fd(r*2 + 10)
11     t.pd()
12
13
14  def polypie(t, n, r):
15     angle = 360.0 / n
16     for i in range(n):
17         isosceles(t, r, angle/2)
18         t.lt(angle)
19
20
21  def isosceles(t, r, angle):
22     y = r * math.sin(angle * math.pi / 180)
23
24     t.rt(angle)
25     t.fd(r)
26     t.lt(90+angle)
27     t.fd(2*y)
28     t.lt(90+angle)
29     t.fd(r)
30     t.lt(180-angle)
31
32
33  bob = turtle.Turtle()
34
35  bob.pu()
36  bob.bk(130)
37  bob.pd()
38
39  size = 40
40  draw_pie(bob, 5, size)
41  draw_pie(bob, 6, size)
42  draw_pie(bob, 7, size)
43  draw_pie(bob, 8, size)
44
45  bob.hideturtle()
46  turtle.mainloop()

```