BIS 420 PROGRAMMING FOR DATA SCIENCE

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CHAPTER 4 EXERCISE 4.2
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Write an appropriately general set of functions that can draw flowers as in Figure 4.1.

Solution: http: // thinkpython. com/ code/ flower. py , also requires http:// thinkpython. com/ code/ polygon. py .

```
import math
import turtle


def polyline(t, n, length, angle):
    for i in range(n):
        t.fd(length)
        t.lt(angle)


def arc(t, r, angle):
    arc_length = 2 * math.pi * r * abs(angle) / 360
    n = int(arc_length / 4) + 3
    step_length = arc_length / n
    step_angle = float(angle) / n
    t.lt(step_angle / 2)
    polyline(t, n, step_length, step_angle)
    t.rt(step_angle / 2)


def petal(t, r, angle):
```

```
    for i in range(2):
        arc(t, r, angle)
        t.lt(180 - angle)

def flower(t, n, r, angle):
    for i in range(n):
        petal(t, r, angle)
        t.lt(360.0 / n)

def move(t, length):
    t.pu()
    t.fd(length)
    t.pd()

if __name__ == '__main__':
    bob = turtle.Turtle()

    move(bob, -100)
    flower(bob, 7, 60.0, 60.0)

    move(bob, 100)
    flower(bob, 10, 40.0, 80.0)

    move(bob, 100)
    flower(bob, 20, 140.0, 20.0)

    bob.hideturtle()
```

turtle.mainloop()

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        petal(t, r, angle)
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