Exercise Sheet 1

Exercise 1 - Wallis formula

Compute the decimals of Pi using the Wallis formula:

$$\pi = 2 \prod_{i=1}^{\infty} \frac{4i^2}{4i^2 - 1}$$

Exercise 2 - Fibonacci sequence

Write a function that displays the n first terms of the Fibonacci sequence, defined by:

$$\begin{cases} U_0 = 0 \\ U_1 = 1 \\ U_{n+2} = U_{n+1} + U_n \end{cases}$$

Exercise 3 - Quicksort

Implement the quicksort algorithm, as defined by wikipedia

```
function quicksort(array)
    var list less, greater
    if length(array) < 2
        return array
    select and remove a pivot value pivot from array
    for each x in array
        if x < pivot + 1 then append x to less
        else append x to greater
    return concatenate(quicksort(less), pivot, quicksort(greater))
```

Exercise 4 - Turtle graphics

This exercise uses the turtle module, which allows you to create images using turtle graphics. See the documentation for more details:

- https://docs.python.org/3.3/library/turtle.html?highlight=turtle

For example, here is how you would draw a square using turtle:

```
def square(t, length):
    for i in range(4):
        t.fd(length)
        t.lt(90)

square(bob, 100)
```

a) Make a copy of square and change the name to polygon. Add another parameter named n and modify the body so it draws an n-sided regular polygon. Hint: The exterior angles of an n-sided regular polygon are 360/n degrees.

b) Write a function called circle that takes a turtle, t, and radius, r, as parameters and that draws an approximate circle by calling polygon with an appropriate length and number of sides. Test your function with a range of values of r.

c) Make a more general version of circle called arc that takes an additional parameter angle, which determines what fraction of a circle to draw. angle is in units of degrees, so when angle=360, arc should draw a complete circle.
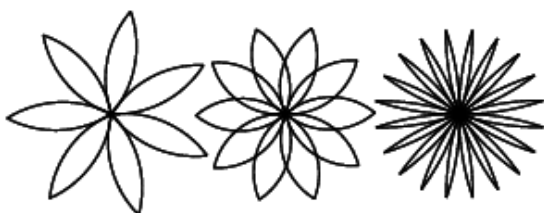
d) Write an appropriately general set of functions that can draw flowers as above.