Instructions

Before you begin, take out a pen and paper. Put a title of Lab 5 on it and the date. Answer the questions below and make any notes or questions, comments or thoughts on your page.

Today's lab is a little different to the previous labs. Start by inputting the centipede program and running it. Rather than copy and pasting it, type it in and comment it as you go with comments about what you think it does or questions about particular aspects of it. Try to answer the questions in Q2 and Q3 about the code. When you have tried this on your own, talk to other people in the lab and see if they agree. Run the program to help work out what happens and what particular lines might be doing.

Q4 and Q5 are a little less prescriptive in terms of how to write the code than in previous labs – but you can take it that it makes sense to use functions, loops and if statements to create the solutions. Aim to finish the these exercises in your own time before the next lab. Good luck!

Listing 1: centipede.py

```python
# centipede.py

from turtle import *

def centipede(length, step, life):
    penup()
    theta = 0
    dtheta = 1
    for i in range(life):
        forward(step)
        left(theta)
        theta += dtheta
        stamp()
        if i > length:
            clearstamps(1)
        if theta > 10 or theta < -10:
            dtheta = -dtheta
        if ycor() > 350:
            left(30)

def main():
    setworldcoordinates(-400, -400, 400, 400)
    centipede(14, 10, 200)
    exitonclick()

main()
```

Exercises

1. (*2 points*) Input the `centipede.py` program. Can you work out what each line does? Add comments to help explain it.

2. (*3 points*) Describe the effect of changing each of these quantities in Listing 1:

  (i) length

 (ii) step

(iii) life

(iv) dtheta

 (v) The 350 in line 18

(vi) The 10 and -10 in line 16

3. (*3 points*) Use Listing 1 to answer these questions:

  1. Describe the effect of removing the if statement (and its body) at line 14. Explain the result. Hint: an easy way to do this is to put comment symbols at the beginning of those two lines, thereby changing the code into comments. This is called commenting out a section of code.

  2. Describe the effect of removing the if statement (and its body) at line 16. Explain the result.

  3. Describe the effect of removing the if statement (and its body) at line 18. Explain the result.

	from Celsius	to Celsius
Fahrenheit	$°F =° C \times \frac{9}{5} + 32$	$°C = (°F - 32) \times \frac{5}{9}$
Kelvin	$K = °C + 273.15$	$°C = K - 273.15$
Rankine	$°R = (°C + 273.15) \times \frac{9}{5}$	$°C = (°R - 491.67) \times \frac{5}{9}$

Table 1: Temperature Conversion (from/to °Celcius)

4. (*5 points*) Table 1 shows the temperature conversion formulae to and from Celsius. Write a program `temperatureconvert.py` to print a table of temperatures ranging from -30 °C to 60 °C in 10 °C increments and displays the corresponding temperatures in Kelvin, Fahrenheit and Rankine.

5. (*2 points*) Expand your program `temperatureconvert.py` allow the user to input a temperature in °C and return a conversion to °F as well as a descriptive text e.g. (-30 to -20 Arctic, -19 to -10 Baltic, -9 to +2 Freezing, +3 to 10 Chilly, 11 to 20 Not Bad, 20+ Great Summer in Ireland.)