Lesson 7 – While Loops

1. **while loops**
2. A while loop is illustrated as follows:

while(xpos > 20):

xdir = 1

A while loop has the following structure:

while <condition(s)>:

<statements>

1. **An Example**

A typical (but simplified) use of a while loop is given below:

answer = input()

while answer == "yes":

print("continuing game")

answer = input()

print("end of game")

1. **Programming Projects**
2. A ball is dropped from a height of 100. It bounces to 2/3 of its previous height on each bounce. How many bounces does it take until its height is less than 10?
3. Careless land management causes 1% of the topsoil to erode each year. 9 cm of topsoil is too shallow to grow crops on a large scale. If there is 30 cm of topsoil now, how long will it be before the depth is eroded to less than 9 cm?
4. Animals and food supply – Suppose there are 10 animals in a lab and enough food for 1000 animals. If the number of animals doubles every day and each day enough food for 4000 animals is added, determine how many days will pass before the number of animals exceeds the food supply. Surprisingly enough, this will not take many days.
5. Tickets to Drake concert are selling out quick! For every thousand people there are one thousand tickets. If the maximum capacity of BC Place is 50,000 and tickets go on sale started yesterday. On the first day alone, 1000 tickets were sold. Each day ticket sales increases by 5% . How many days will it take before the show sells out?
6. You’re waiting outside a popular restaurant downtown. The restaurant is open from 11-3pm. When the doors open at 11am everybody who was waiting outside gets seated immediately and as it starts to fill up fewer and fewer people are waiting in line. The initial length of the line is 50 meters and gets shorter by 4/5 of its original length every 5 mins. How long does it take until its length is less than 2 meters?
7. Find the product of the digits of a number. For example, 1853 = 1 \* 8 \* 5 \* 3 = 120
8. Poison Penny. X pennies are laid out (you can use either an applet or application) where X > 3. Two players alternatively taking 1 or 2 pennies. Whoever takes the last penny loses. There can be two players or one player versus the computer (you will need to think up a simple AI for the computer – so no random numbers!!)
9. Digital root – the digital root of a number is defined by repeatedly finding the sum of the digits until you get a single digit number.

For example, 285 = 2+8+5 giving 15, 1 + 5 gives 6 which is the digital root.

You may need to use nested loops to solve this – ask if you are not sure what a nested loop is.

1. Triangular numbers - In order to know if a number is triangular or not, it's helpful to know the formula for triangular numbers:

n (n+1)

T = ---------

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Given a number to test, I'd do it this way, using 66 as an example:

66 = n(n+1)/2

132 = n(n+1)

Since n and (n+1) are numbers relatively close together, taking the integer portion of the square root of 132 should give me the value of “n”. The square root of 132 is 11.xxxxx, so taking 11 gives us 11(11 + 1)/2 = 11(12)/2 = 11(6) = 66 which shows that 66 is a triangular number.

Another example (just to show that the above works), using 100 gives:

100 = n(n+1)/2

200 = n(n+1)

Where the square root of 200 is 14.xxxx. But 14(15)/2 = 105, which does not equal 100 so 100 is not triangular.

1. Find all perfect numbers up to 500, (which are 6, 28, 496). You may need to use nested loops to solve this