Homework 2: FISH 553 Advanced R

Open a new script in R and put the following information at the top using comments:

```
# Name: First Last
# Homework 2
```

Complete the tasks below and be sure to label each question with comments as before. When your script is complete, save it as LastName_Homework2.R, then clear your workspace (Workspace/Clear all) and run through your script again to make sure you don't have any 'object not found' errors. Then go to the course website on Canvas to submit your R script.

Important note: this homework is intended to be practice for using for-loops. It is indeed faster and more elegant to use vectorized code, but please use for-loops when solving the problems.

Question 1: (60 points)

In this week's homework we will write functions that are required in a basic fisheries model.

Question 1a. (20 points) Write a function $length.weight()$ that takes a vector of fish lengths and converts them to a vector of weights in kg using the following equation:

$$W_i = aL_i^b$$

where a and b are parameters, L_i is the length of fish number *i* in cm, and W_i is the weight of fish number *i* in g.

Add a line of code that calculates the weights of fish of lengths c(20, 25, 30, 35, 40) cm using the parameters for orange roughy, *Hoplostethus atlanticus*: a=0.0631 and b=2.81.

Question 1b. (20 points) Write a function $age.length()$ that takes a vector of fish ages and converts them to a vector of lengths in cm, using the Von Bertalanffy growth equation:

$$L_i = L_\infty(1 - \exp[-K(t_i - t_0)])$$

where L_∞ is the asymptotic maximum length in cm, K is the growth rate, and t_0 shifts the curve left and right (biologically, it is the age at zero length). The ages are t_i and the lengths are L_i.

Add a line of code that calculates the lengths of orange roughy of ages c(5, 10, 20, 50, 100) using orange roughy parameters: L_∞ = 40 cm, K = 0.04, t_0 = -2.7 yr.

Question 1c. (20 points) Write a function `total.weight()` that takes a vector of numbers at age, and a vector of weight at age and calculates the total weight by multiplying weight at age by numbers at age, and then summing the result up over all ages. The equation is:

$$W = \sum_a N_a W_a$$

where N_a is the number at age a, and W_a is the weight at age a.

Add a line of code that calculates the summed total weight in g of fish of ages 1 to 7, where there are: c(1000,800,700,500,450,300,100) numbers of fish at ages 1 to 7, and they weigh c(100, 400, 650, 800, 900, 960, 1000) g at ages 1 to 7.

Question 2: (40 points)

Putting it together. Write a function `weight.from.age()` that takes the following sets of parameters:
1) ages of fish (1,2,3,4,5,6,7,8,9,10)
2) a vector of the numbers of fish at each age (100, 90, 81, 70, 65, 60, 30, 20, 10, 5)
3) length weight parameters (a=0.0631, b=2.81)
4) age-length parameters (L_∞ = 40 cm, K = 0.04, t_0 = -2.7 yr)

Inside the function, calculate the length at age, the weight at age, and then the total weight of all the fish in the population using the functions you created in Question 1.

Add a line of code that calculates the total weight of fish in the population given the parameter values listed above.