Week 2 - Neural Network Basics

1. What does a neuron compute?

   Ans: A neuron computes a linear function ($z = Wx + b$) followed by an activation function The output of a neuron is $a = g(Wx + b)$ where g is the non-linear activation function

2. Which of these is the logistic loss?

   Ans: $\mathbb{L}^{(i)}$ = -$(y^{(i)}log\hat{y}^{(i)} + (1 - y^{(i)})log(1 - \hat{y}^{(i)}))$

3. Suppose img is a (32,32,3) array, representing a 32x32 image with 3 color channels red, green and blue. How do you reshape this into a column vector?

   Ans: `x = img.reshape((32 * 32 * 3, 1))`

4. Consider the two following random arrays a and b. What will be the shape of c?

   ```
   a = np.random.randn(2, 3) # a.shape = (2, 3)
   b = np.random.randn(2, 1) # b.shape = (2, 1)
   c = a + b
   ```

   Ans: `c.shape = (2, 3)` as b (column vector) is copied 3X so that it can be summed to each column of a. Therefore, `c.shape = (2, 3)`.

5. Consider the two following random arrays a and b. What will be the shape of c?

   ```
   a = np.random.randn(4, 3) # a.shape = (4, 3)
   b = np.random.randn(3, 2) # b.shape = (3, 2)
   c = a * b
   ```

   Ans: "*" operator indicates element-wise multiplication. Element-wise multiplication requires same dimensions. It's going to be an error.

6. Suppose you have n_x input features per example. Recall that, $X = [x^{(1)}x^{(2)} \ldots x^{(m)}]$. What is the dimension of X?

   Ans: (n_x, m)

7. Recall that `np.dot(a,b)` performs a matrix multiplication on a and b, whereas `a*b` performs an element-wise multiplication. Consider the two following random arrays a and b. What is the shape of c?

   ```
   a = np.random.randn(12288, 150) # a.shape = (12288, 150)
   b = np.random.randn(150, 45) # b.shape = (150, 45)
   c = np.dot(a, b)
   ```

   Ans: `c.shape = (12288, 45)`

8. Consider the following code snippet. How do you vectorize this?

   ```
   # a.shape = (3,4)
   # b.shape = (4,1)
   for i in range(3):
     for j in range(4):
       c[i][j] = a[i][j] + b[j]
   ```
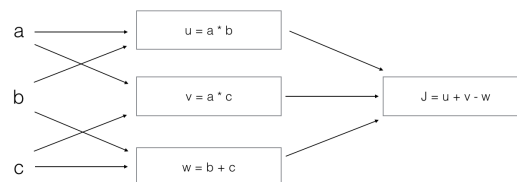
   Ans: `c = a + b.T`

9. Consider the following code. What will be c?

   ```
   a = np.random.randn(3, 3)
   b = np.random.randn(3, 1)
   c = a * b
   ```

   Ans: `c.shape = (3, 3)`. This operation will invoke broadcasting.

10. Consider the following computation graph. What is the result?

   Ans: $(a - 1) * (b + c)$