# Assignment 2 Solutions

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## Our Approach:

Let the number of days = **x**
number of total cases = **y1**

Given that we have to fit

$$y1=c1*exp(c2*x)$$

to the data points
On taking logarithm on both sides,

$$log(y1)=log(c1)+c2*x$$

Let us take,
log(y1)=y, log(c1)=c, c2=m

Our equation becomes ,

$$y=mx+c$$

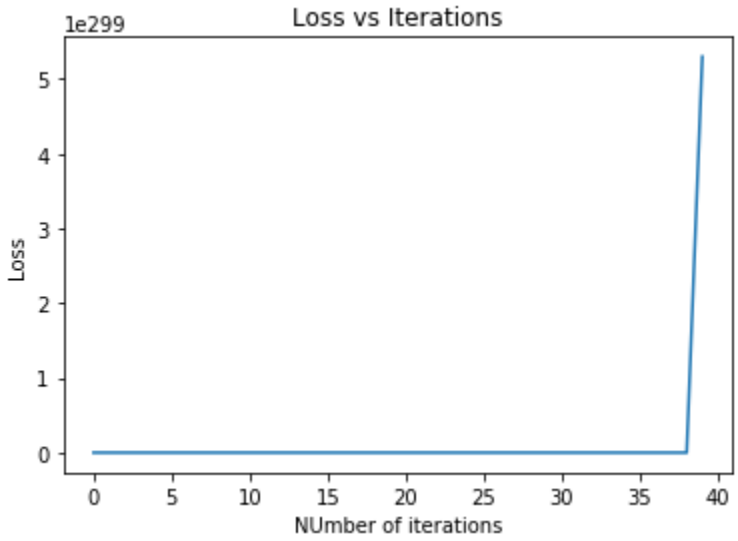
We will now apply Linear Regression to (y, x) using Gradient Descent.

## Question 1

Total number of cases on the 110th day are 288673.22 according to the Linear Regression model.
Since this value is greater than 100000 (i.e. number of beds available) so hospitals can’t handle cases on that day.

## Question 2

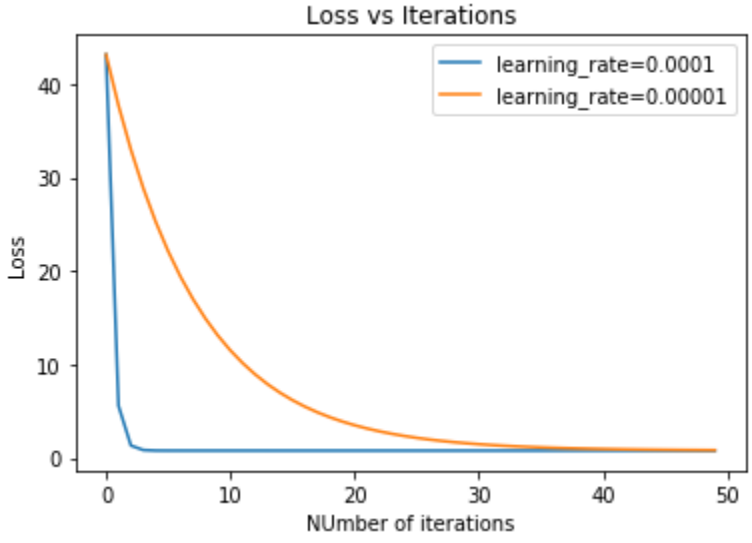
- Learning Rate = 1




We can see that when learning rate = 1, the Loss is not decreasing with iterations and hence we will not be able to find the parameters in Linear Regression.

**Justification:** When learning rate = 1 , the steps are faster hence we are skipping the optimal solution and loss diverges.

- Learning Rate = 0.00001



We can see that when learning rate = 0.00001 , Loss is decreasing hence gradient descent is converging to optimal solution but we can also observe that loss is decreasing slower than before which means it converges to optimal solution slower than when learning rate = 0.0001

**Justification:** Gradient descent is converging and we are getting optimal solution because our steps are small enough to not skip optimal solution. The reason for slow convergence is slow learning rate i.e. smaller steps than when learning rate=0.0001

## Question 3