Question
Create a basic Perceptron from scratch using plain python code.

Hint - create a class Perceptron, add functionalities to perform a weighted sum with of inputs (consider random weights), and activation function.

In [1]:

```
import numpy as np
from sklearn.metrics import mean_squared_error
```

In [2]:

```
x = np.arange(1, 51)
y = np.arange(10, 501, 10)
```

In [3]:

```
x
```

Out[3]:

```
array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
       18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34,
       35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50])
```

In [4]:

```
y
```

Out[4]:

```
array([ 10,  20,  30,  40,  50,  60,  70,  80,  90, 100, 110, 120, 130,
       140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260,
       270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390,
       400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500])
```

In [12]:

```
def gradient_descent(x,y):
    weight=0.5 #here i change the value of weight
    bias=0.1
    lr=0.05
    n=len(x)
    itr=50

    for i in range(itr):
        # forward propogation
        y_hat = x * weight + bias
        mse = mean_squared_error(y, y_hat)

        #backward propogation
        dw = -(2/n) * sum(x * (y-y_hat))
        db = -(2/n) * sum(y-y_hat)

        weight = weight - (lr * dw)
        bias = bias - (lr * db)
        print(f"Itr ={i}, W={weight}, B={bias}, MSE={mse}")
```

In [13]:

```
gradient_descent(x,y)
```

```
Itr =0, W=815.82, B=24.31499999999999, MSE=77431.185
Itr =1, W=-68425.83025, B=-2032.9575000000004, MSE=558463291.8529251
Itr =2, W=5811974.238337501, B=172681.7053875, MSE=4027852483802.1963
Itr =3, W=-493585493.97167516, B=-14665095.27291189, MSE=2.905042438585653
6e+16
Itr =4, W=41918126014.942566, B=1245444449.3821514, MSE=2.0952285625955402
e+20
Itr =5, W=-3559928874855.302, B=-105770321308.15959, MSE=1.511159586244624
6e+24
Itr =6, W=302329679351666.6, B=8982625341729.174, MSE=1.0899065313762855e+
28
Itr =7, W=-2.5675578987609464e+16, B=-762856319539168.2, MSE=7.86082593757
5001e+31
Itr =8, W=2.1805181607134892e+18, B=6.478615573081891e+16, MSE=5.669530610
374726e+35
Itr =9, W=-1.8518217063365316e+20, B=-5.50201376966166e+18, MSE=4.08908397
12311486e+39
Itr =10, W=1.572673731337811e+22, B=4.6726272272311996e+20, MSE=2.94920494
70872105e+43
Itr =11, W=-1.3356051809830768e+24, B=-3.968264369866337e+22, MSE=2.127080
265682321e+47
Itr =12, W=1.1342729034784563e+26, B=3.370078832178048e+24, MSE=1.53413226
20266787e+51
Itr =13, W=-9.632899287036759e+27, B=-2.8620651943804617e+26, MSE=1.106475
3104820523e+55
Itr =14, W=8.18081331129636e+29, B=2.4306307314449495e+28, MSE=7.980326357
839576e+58
Itr =15, W=-6.947618203000146e+31, B=-2.0642317177975676e+30, MSE=5.755718
918832762e+62
Itr =16, W=5.900317836126007e+33, B=1.7530645563048592e+32, MSE=4.15124630
0856526e+66
Itr =17, W=-5.0108899985714955e+35, B=-1.4888034672053881e+34, MSE=2.99403
88148540353e+70
Itr =18, W=4.255536612629288e+37, B=1.2643777184308832e+36, MSE=2.15941617
89443725e+74
Itr =19, W=-3.614046978997949e+39, B=-1.0737824367545907e+38, MSE=1.557454
168847857e+78
Itr =20, W=3.0692570068934835e+41, B=9.119179377136859e+39, MSE=1.12329596
84720659e+82
Itr =21, W=-2.6065899610902907e+43, B=-7.744532753184152e+41, MSE=8.101643
425687586e+85
Itr =22, W=2.2136664378371734e+45, B=6.577103606001584e+43, MSE=5.84321746
3538789e+89
Itr =23, W=-1.8799731339243724e+47, B=-5.5856554840307775e+45, MSE=4.21435
3623358453e+93
Itr =24, W=1.5965815462832577e+49, B=4.743660592150873e+47, MSE=3.03955424
79020102e+97
Itr =25, W=-1.3559090754723424e+51, B=-4.0285899976929496e+49, MSE=2.19224
366335367e+101
Itr =26, W=1.1515161409876944e+53, B=3.4213108324752366e+51, MSE=1.5811306
157248275e+105
Itr =27, W=-9.7793387989034e+54, B=-2.9055743620263432e+53, MSE=1.14037233
44137482e+109
Itr =28, W=8.305178185492704e+56, B=2.46758122446213e+55, MSE=8.2248047578
28979e+112
Itr =29, W=-7.05323602251294e+58, B=-2.0956122062804802e+57, MSE=5.9320461
```

```
62728327e+116
Itr =30, W=5.990014576228245e+60, B=1.7797146758842754e+59, MSE=4.27842030
4536009e+120
Itr =31, W=-5.087065640353171e+62, B=-1.5114362848552444e+61, MSE=3.085761
6073990596e+124
Itr =32, W=4.3202293583660465e+64, B=1.2835988117263616e+63, MSE=2.2255701
917838283e+128
Itr =33, W=-3.668987787543493e+66, B=-1.0901060970778045e+65, MSE=1.605166
9923820354e+132
Itr =34, W=3.1159159082782033e+68, B=9.257809309498904e+66, MSE=1.15770829
55840804e+136
Itr =35, W=-2.6462153895479776e+70, B=-7.862265282323929e+68, MSE=8.349838
390803414e+139
Itr =36, W=2.247318635678452e+72, B=6.677088855806427e+70, MSE=6.022225237
434259e+143
Itr =37, W=-1.9085525200313977e+74, B=-5.670568721277796e+72, MSE=4.343460
9285773896e+147
Itr =38, W=1.6208528082705666e+76, B=4.815773807588565e+74, MSE=3.13267141
2023769e+151
Itr =39, W=-1.376521630138511e+78, B=-4.089832696821648e+76, MSE=2.2594033
507112125e+155
Itr =40, W=1.1690215105102162e+80, B=3.473321662581807e+78, MSE=1.62956877
04786076e+159
Itr =41, W=-9.928004486918772e+81, B=-2.949744956837816e+80, MSE=1.1753077
983544936e+163
Itr =42, W=8.431433656790515e+83, B=2.5050934395527464e+82, MSE=8.47677278
7362529e+166
Itr =43, W=-7.160459446057612e+85, B=-2.1274697415256066e+84, MSE=6.113775
216089983e+170
Itr =44, W=6.081074887820775e+87, B=1.8067699310709604e+86, MSE=4.40949030
1379898e+174
Itr =45, W=-5.164399305640159e+89, B=-1.5344131670146593e+88, MSE=3.180294
340359865e+178
Itr =46, W=4.3859055644115624e+91, B=1.3031121044351085e+90, MSE=2.2937508
41941947e+182
Itr =47, W=-3.7247638072695213e+93, B=-1.1066779099850323e+92, MSE=1.65434
15048539343e+186
Itr =48, W=3.16328411913865e+95, B=9.398546696638627e+93, MSE=1.1931748490
89232e+190
Itr =49, W=-2.6864432044967874e+97, B=-7.981787583533813e+95, MSE=8.605636
84294924e+193
```

In [14]:

```
y_hat = x * 5.53 + 2.81
```

In [15]:

```
y_hat
```

Out[15]:

```
array([  8.34,  13.87,  19.4 ,  24.93,  30.46,  35.99,  41.52,  47.05,
        52.58,  58.11,  63.64,  69.17,  74.7 ,  80.23,  85.76,  91.29,
        96.82, 102.35, 107.88, 113.41, 118.94, 124.47, 130.  , 135.53,
       141.06, 146.59, 152.12, 157.65, 163.18, 168.71, 174.24, 179.77,
       185.3 , 190.83, 196.36, 201.89, 207.42, 212.95, 218.48, 224.01,
       229.54, 235.07, 240.6 , 246.13, 251.66, 257.19, 262.72, 268.25,
       273.78, 279.31])
```

In [ ]: