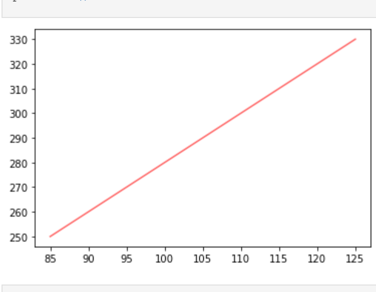
Gradient Descent

Gradient Descent is an optimization algorithm for finding a local minimum of a differentiable function. Gradient descent is simply used in machine learning to find the values of a function's parameters (coefficients) that minimize a cost function as far as possible. We start by defining the initial parameter's values and from there gradient descent uses calculus to iteratively adjust the values so they minimize the given cost-function.

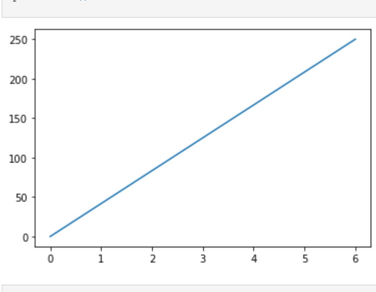
In [5]:
```
import matplotlib.pyplot as plt
```

In [27]:
```
x = np.array([85, 90, 95, 100, 105, 110, 115, 120, 125])
y = np.array([250, 260, 270, 280, 290, 300, 310, 320, 330])
plt.plot(x,y,color='red',alpha=0.6)
plt.show()
```



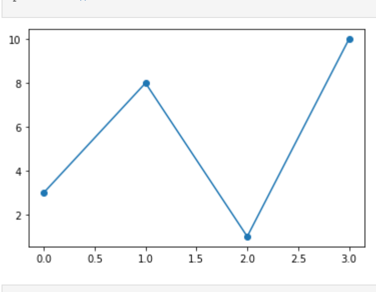
In [9]:
```
import numpy as np
xpoints = np.array([0, 6])
ypoints = np.array([0, 250])

plt.plot(xpoints, ypoints)
plt.show()
```



In [13]:
```
ypoints = np.array([3, 8, 1, 10])

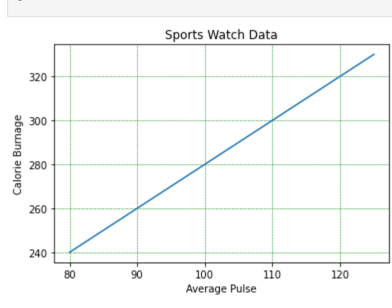
plt.plot(ypoints, marker = 'o')
plt.show()
```



In [16]:
```
x = np.array([80, 85, 90, 95, 100, 105, 110, 115, 120, 125])
y = np.array([240, 250, 260, 270, 280, 290, 300, 310, 320, 330])

plt.plot(x, y)
plt.title("Sports Watch Data")
plt.xlabel("Average Pulse")
plt.ylabel("Calorie Burnage")

plt.grid(color = 'green', linestyle = '--', linewidth = 0.5)
plt.show()
```



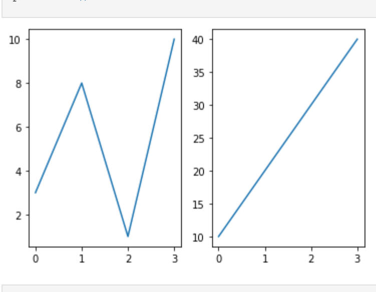
In [17]:
```
#plot 1:
x = np.array([0, 1, 2, 3])
y = np.array([3, 8, 1, 10])

plt.subplot(1, 2, 1)
plt.plot(x,y)

#plot 2:
x = np.array([0, 1, 2, 3])
y = np.array([10, 20, 30, 40])

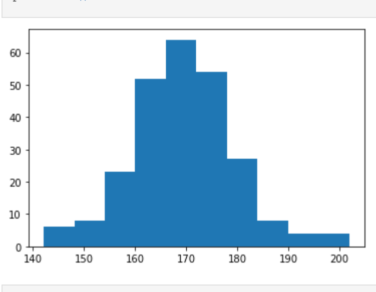
plt.subplot(1, 2, 2)
plt.plot(x,y)

plt.show()
```



In [18]:
```
#normal dist with mean 170, st.deviation 10 and sample size 250
x = np.random.normal(170, 10, 250)

plt.hist(x)
plt.show()
```



In [32]:
```
import numpy as np

def gradient_descent(x,y):
    m_curr = b_curr = 0
    iterations = 1000
    n = len(x)
    learning_rate = 0.08

    for i in range(iterations):
        y_predicted = m_curr * x + b_curr
        cost = (1/n) * sum([val**2 for val in (y-y_predicted)])
        md = - (2/n) * sum(x*(y-y_predicted))
        bd = - (2/n) * sum(y-y_predicted)
        m_curr = m_curr - learning_rate * md
        b_curr = b_curr - learning_rate * bd
        print("m{}, b {}, cost {}, iteration {}". format(m_curr,b_curr,cost,i))



x = np.array([1,2,3,4,5])
y = np.array([5,7,9,11,13])

gradient_descent(x,y)
```

```
m4.96, b 1.44, cost 89.0, iteration 0
m0.49919999999999983, b 0.26879999999999993, cost 71.10560000000002, iteration 1
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