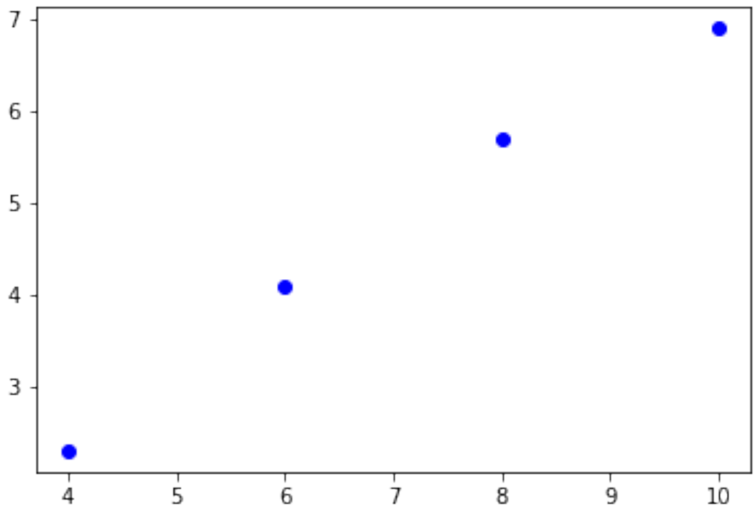
In [88]:
```
import numpy as np
from matplotlib import pyplot as plt

%matplotlib inline
```

In [89]:
```
x_data = np.array([4,6,8,10])
y_data = np.array([2.3,4.1,5.7,6.9])
plt.plot(x_data,y_data,'bo')
```

Out[89]:
```
[<matplotlib.lines.Line2D at 0x1093e1c18>]
```



In [90]:
```
n = len(x_data)
x_mean = np.sum(x_data)/n
y_mean = np.sum(y_data)/n
print(x_mean,y_mean)
```

```
7.0 4.75
```

In [91]:
```
S_xx = np.sum((x_data-x_mean)**2)
S_yy = np.sum((y_data-y_mean)**2)
S_xy = np.sum((x_data-x_mean)*(y_data-y_mean))
print(S_xx,S_yy,S_xy)
```

```
20.0 11.950000000000003 15.4
```

In [92]:
```
theta_1 = S_xy/S_xx
theta_0 = y_mean - theta_1*x_mean
print(theta_0,theta_1)
```

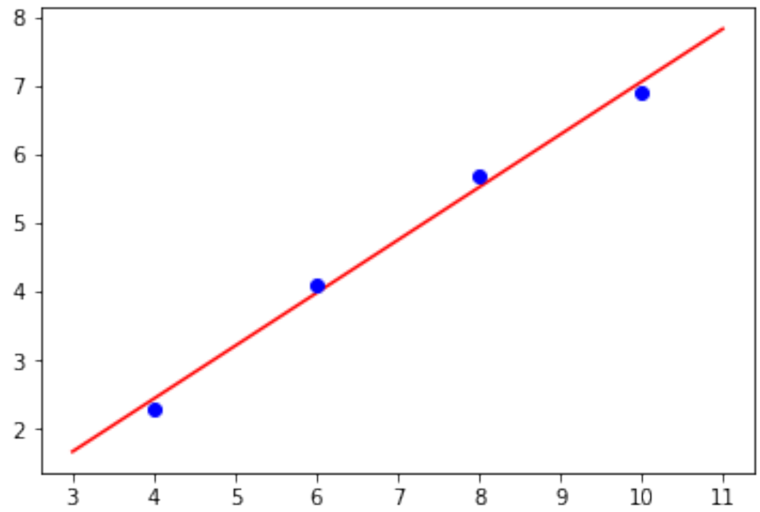
```
-0.6400000000000006 0.77
```

In [93]:
```
y = lambda x: theta_1*x+theta_0

def plot_line(y, data_points):
    x_vals = [i for i in range(int(min(data_points)-1),int(max(data
_points))+2)]
    y_vals = [y(x) for x in x_vals]
    plt.plot(x_vals,y_vals,'r')

plot_line(y,x_data)
plt.plot(x_data,y_data,'bo')
```

Out[93]: [<matplotlib.lines.Line2D at 0x1092e0a20>]



In [94]:
```
SSE = S_yy - 2*theta_1*S_xy + theta_1**2*S_xx
#print(SSE)
SSE = np.sum((y_data - y(x_data))**2)
print("SSE = ",SSE)
SST = np.sum((y_data - y_mean)**2)
print("SST = ",SST)
R_squared = 1 - SSE/SST
print("R_squared = ",R_squared)
```

```
SSE =  0.09199999999999992
SST =  11.950000000000003
R_squared =  0.9923012552301256
```

In [95]:
```
r_corr = S_xy/(np.sqrt(S_xx*S_yy))
print(r_corr,np.sqrt(R_squared))
```

```
0.9961431901238523 0.9961431901238524
```

In [96]:
```
MSE = SSE/(n-2)
print("MSE = ", MSE)
```

```
MSE =  0.04599999999999996
```

In [97]:
```
S_E = np.sqrt(MSE)
print("S_E = ", S_E)
```

```
S_E =  0.21447610589527208
```

In [98]:
```
S_theta_0 = S_E*np.sqrt(1/n+x_mean**2/(np.sum(x_data**2)-n*x_mean**
2))
print("S_theta_0 = ", S_theta_0)
```

```
S_theta_0 =  0.3524202037341218
```

In [99]:
```
S_theta_1 = S_E/np.sqrt(np.sum(x_data**2)-n*x_mean**2)
print("S_theta_1 = ", S_theta_1)
```

```
S_theta_1 =  0.04795831523312717
```

In [100]:
```
from scipy.stats import t
t_quant = t.ppf(0.975, n-2)
print("t_quant = ", t_quant)
```

```
t_quant =  4.302652729911275
```

In [101]:
```
print(theta_1-t_quant*S_theta_1,theta_1+t_quant*S_theta_1)
t.interval(0.95, n-2, loc=theta_1, scale=S_theta_1)
```

```
0.56365202404024 0.9763479759597601
```

Out[101]:
```
(0.56365202404024, 0.9763479759597601)
```

In [102]:
```
print(theta_0-t_quant*S_theta_0,theta_0+t_quant*S_theta_0)
t.interval(0.95, n-2, loc=theta_0, scale=S_theta_0)
```

```
-2.1563417516725076 0.8763417516725063
```

Out[102]:
```
(-2.1563417516725076, 0.8763417516725063)
```