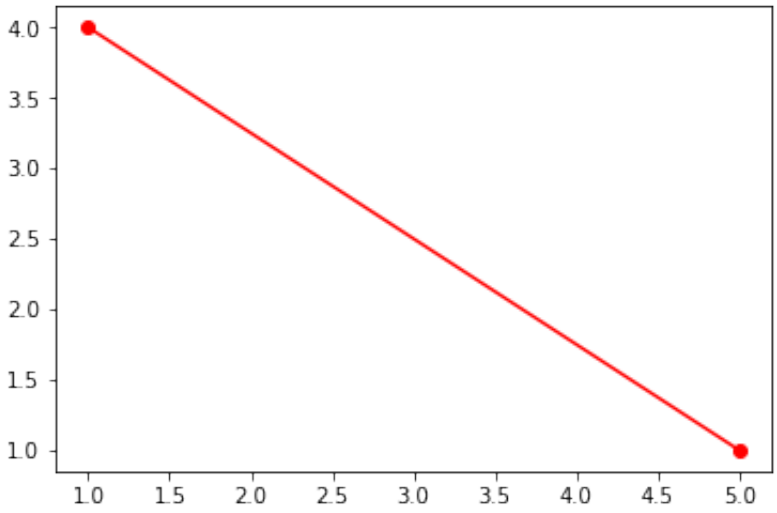
计算样本之间的距离

1、欧拉距离
2、曼哈顿距离
3、明可夫斯基距离

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
```

In [2]:
```
X = np.array([[5, 1],     # a
              [1, 4]])    # b
plt.plot(X[0], X[1], 'r-o')
plt.show()
```

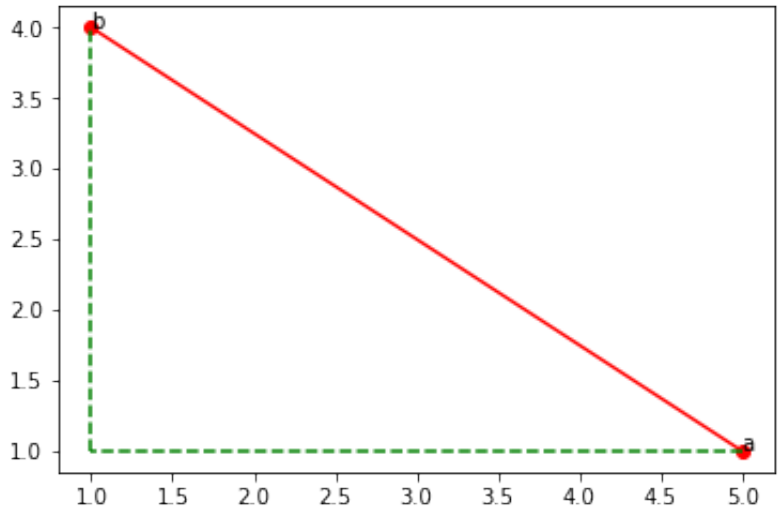


In [3]:
```
plt.plot(X[0], X[1], 'r-o')

plt.annotate('a', xy=X[0])
plt.annotate('b', xy=X[1])

plt.plot([5, 1], [1, 1], 'g--')
plt.plot([1, 1], [1, 4], 'g--')

plt.show()
```



欧拉距离

In [4]:
```
((5-1)**2 + (1-4)**2)**(1/2)
```

Out[4]: 5.0

In [5]:
```
X
```

Out[5]:
```
array([[5, 1],
       [1, 4]])
```

用 numpy 求欧拉距离

In [6]:
```
np.sum((X[0] - X[1])**2)**(1/2)
```

Out[6]: 5.0

曼哈顿距离

In [7]:
```
def distance(a, b, p=2):
    return np.sum(np.abs(a - b) ** p) ** (1/p)
```

In [8]:
```
distance(X[0], X[1], 1)
```

Out[8]: 7.0

In [9]:
```
distance(X[0], X[1])
```

Out[9]: 5.0

明可夫斯基距离

In [10]:
```
distance(X[0], X[1], 3)
```

Out[10]: 4.497941445275415

In [11]:
```
Y = np.array([[5, 1, 11, 6],     # a
              [1, 4, 43, 99]])      # b
```

In [12]:
```
distance(Y[0], Y[1])
```

Out[12]: 98.47842403288143

In [13]:
```
distance(Y[0], Y[1], 1)
```

Out[13]: 132.0

In [14]:
```
distance(Y[0], Y[1], 3)
```

Out[14]: 94.24952566326392