Homework 6 problem 5

In [4]:

```
import random
import matplotlib.pyplot as plt
import numpy as np
```

In [5]:

```
def randomized_selection_counter(l, r, k, count):
    p = random.randint(l,r)
    pivot = s[p]
    s[p], s[r] = s[r], s[p]
    i = l
    for j in range(l, r):
        if s[j] < pivot:
            s[i], s[j] = s[j], s[i]
            i += 1
    s[i], s[r] = s[r], s[i]
    count += r - l
    if i == k :
        assert pivot == sorted(s)[k]
        return count
    if i < k :
        return randomized_selection_counter(i+1, r, k, count)
    if i > k :
        return randomized_selection_counter(l, i-1, k, count)
```

In [6]:

```
count_ls = list()
c_ls = list()
for i in range(1000,10001,1000):
    n = i
    itersum = 0
    for j in range(1000):
        s = random.sample(range(0, n*2), n)
        count = randomized_selection_counter(0, n-1, n//2, 0)
        itersum += count
    count_ls.append(itersum/(1000))
    c_ls.append(itersum/(1000 * n))
    print("n= %i, count= %.2f, c= %.2f" %(n, itersum/(1000), itersum/(1000 * n)))
```

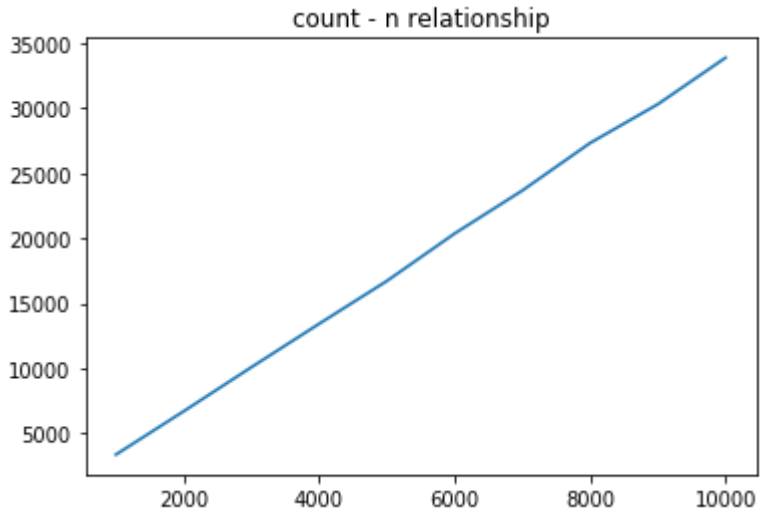
```
n= 1000, count= 3354.06, c= 3.35
n= 2000, count= 6687.47, c= 3.34
n= 3000, count= 10080.17, c= 3.36
n= 4000, count= 13422.33, c= 3.36
n= 5000, count= 16715.75, c= 3.34
n= 6000, count= 20365.75, c= 3.39
n= 7000, count= 23676.22, c= 3.38
n= 8000, count= 27332.68, c= 3.42
n= 9000, count= 30317.65, c= 3.37
n= 10000, count= 33898.33, c= 3.39
```

In [7]:

```
plt.title("count - n relationship")
plt.plot(np.array(range(1000,10001,1000)), np.array(count_ls), label='linear')
```

Out[7]:

```
[<matplotlib.lines.Line2D at 0x1a18a3fea48>]
```

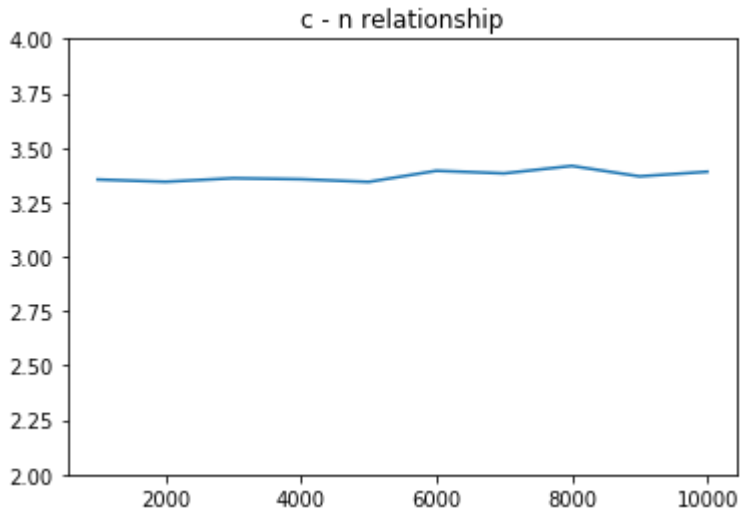


In [8]:

```
plt.title("c - n relationship")
plt.ylim(2, 4)
plt.plot(np.array(range(1000,10001,1000)), np.array(c_ls), label='linear')
```

Out[8]:

```
[<matplotlib.lines.Line2D at 0x1a18a841048>]
```



In [13]:

```
np.mean(c_ls)
```

Out[13]:

```
3.370823556468254
```

The result of c is around 3.4