Homework 3

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Problem 1: logic with numpy

(a)

In [1]:
```
import numpy as np
```

In [2]:
```
def square_max (x):
    if not np.iterable(x):
        return x**2

    y = None
    for i in x:
        if y is None or i > y:
            y = i
    return y**2
```

In [4]:
```
print(square_max(5))
print(square_max([1,2,3,4,5,6,7,8,9,10]))
print(square_max(np.array([1,114,2,4,2])))
```

```
25
100
12996
```

(b)

In [5]:
```
def shape(a, b, c):
    a = np.asarray(a)
    b = np.asarray(b)
    c = np.asarray(c)

    d = a + b
    e = np.logical_and(d > c, d < 2*(c**2))
    return np.where(e, d, -c)
```

In [6]:
```
A1 = np.array([1, 2, 3, 4])
B1 = np.array([1, 1, 1, 1])
C1 = np.array([1, 2, 2, 10])

print(shape(A1, B1, C1))
```

```
[ -1   3   4 -10]
```

In [7]:
```
A2 = np.array([[0, 2],
               [5, 1]])
B2 = np.array([[3, 1],
               [1, 4]])
C2 = np.array([[2, 1],
```

```
                [2, 2]])

print(shape(A2, B2, C2))
```

```
[[ 3 -1]
 [ 6  5]]
```

Problem 2: Random Numbers

(a)

In [ ]:

In [13]:
```
def coin(p):
    r = np.random.rand()
    if r < p:
        return 'Head'
    return 'Tail'
```

In [9]:
```
print(coin(0.5))
print(coin(0.7))
```

```
Tail
Head
```

In [12]:
```
for i in range (10):
    print(coin(0.5))
```

```
Tail
Tail
Head
Tail
Tail
Head
Head
Head
Tail
Tail
```

(b)

In [16]:
```
def coin_array(p, n):
    r = np.empty(n)
    for i in range(n):
        if coin(p) == 'Head':
            r[i] = 1
        else:
            r[i] = -1
    return r
```

In [17]:
```
print(coin_array(0.5, 10))
print(coin_array(0.7, 10))
```

```
[-1.  1.  1. -1.  1.  1. -1.  1.  1. -1.]
[ 1. -1. -1.  1. -1.  1. -1.  1.  1.  1.]
```

(c)

In [23]:
```
def game(p):
    m = 50
    flip = 0

    while m > 0 and m < 150:
        if coin(p) == 'Head':
            m += 1
        else:
            m -= 1
        flip += 1

    return flip
```

In [25]:
```
for i in range (10):
    print(game(0.45))
```

```
308
496
278
372
592
674
294
722
502
682
```

In [26]:
```
for i in range (10):
    print(game(0.5))
```

```
5712
10168
3858
13234
1098
1052
1760
3842
7662
5242
```

In [ ]: