**Solutions of Chapter 6**

6.1 . For this problem we have to take N pills from Nth bottle to identify which bottle is heavy.

If we take 1 pill from bottle 1 and 2 pills from bottle 2 and so on. Total expected sum of all these pills would be 210(1+2+3+…..20). However if there is an increase in the sum of the pills then the difference between the expected value and given value would be give the bottle which weighs more than the expected.

Bott\_num = (actual\_weight – expected\_weight)/weight of each pill

Ex : if actual\_weight = 211 then

bott\_num = (211-210)/.1 = 10

6.2

6.3: Since the corner two squares are cut off there are only 62 squares. Now we have 31 dominos to cover these 62 squares. Each domino can cover 2 square, so Ideally 31 dominos should easily cover 62 squares.

Each domino will take up one white and one black square. So 31 dominos will take up 31 black and 31 white squares however there are 32 whites and 30 blacks. So it is not possible to cover entire board with 31 dominos

6.4: The ants will collide if any of the three move towards each other.

P(clockwise) = (1/2)^3

P(counterclockwise) = (1/2)^3

P(samedirection) = (1/2)^3 + (1/2)^3 = (1/4)

P(collision) = 1-p(samedirection) = ¾

6.5:

|  |  |  |
| --- | --- | --- |
| 5 Quart | 3 Quart | Do |
| 5 | 0 | Fill 5-quart jug |
| 2 | 3 | Move 3 quarts to 3-quart jug |
| 2 | 0 | Empty 3 quart jug |
| 0 | 2 | Move contents from 5 to 3 quart jug |
| 5 | 2 | Fill the 5-quart jug |
| 4 | 3 | Fill the 3quart jug |
| 4 |  | 5-quart jug is left with 4 quarts |

6.6:

If you consider the case of just one blue –eyed person on the person. The person leave on the first night because he sees around the he couldn’t find any with blue eyes so he knows that he is the one so leaves.

In case there are 2 blue eyed. They will look at each other and think if I don’t have blue eyes then he is the only guy with blue eyes so he will leave tonight. But when neither of them leave the first night then they realize they are 2 and both of them leave on same night.

The same pattern extends N number of blue eyed people on the island. It will take N nights for the blue-eyed men to leave and they will all leave same night.

6.7

Since the odds of having Boy or Girl is equal which is 50%. So half of the population should be Girls and other half should be Boys giving an even gender ratio.

Therefore, The gender ratio is 50% boys and 50% girls.

Double nfamilies(int n){

Int boys = 0;

Int girls = 0;

for(int i =0; i< n; i++){

int[] genders = oneFamily();

girls = girls + genders[0];

boys = boys+genders[1];

}

return girls / (boys+girls)

}

oneFamily(){

Random rnd = new Random();

Int b = 0;

Int g =0;

While(g==0){

If(rnd.nextInt(1)==0)

g++;

Else b++;

}

Int[] gen = {g,b};

Return gen;

}

6.8

int eggDrop(int n, int k)

{

    // If there are no floors, then no trials needed. OR if there is

    // one floor, one trial needed.

    if (k == 1 || k == 0)

        return k;

    // We need k trials for one egg and k floors

    if (n == 1)

        return k;

    int min = INT\_MAX, x, res;

    // Consider all droppings from 1st floor to kth floor and

    // return the minimum of these values plus 1.

    for (x = 1; x <= k; x++)

    {

        res = max(eggDrop(n-1, x-1), eggDrop(n, k-x));

        if (res < min)

            min = res;

    }

    return min + 1;

}

6.9

The door i is toggled for every factor i including itself and 1. A door is left open if the number of factors is odd. If the factor is odd and i is a perfect square then i has odd number of factors. There are 10 perfect squares within 100. Therefore there are 10 lockers open at the end of the process.

6.10

There are 1000 bottles of soda and 10 test strips. For each strip take 100 bottles, Strip 1 gets bottles from 1-100 , strip 2 gets bottles from 101-200 so on.

After seven days, check the test strips of results. Repeat this process for rest of bottles. On the positive test strip select the associated bottles and keep it aside