Maximum Probability

Problem Description: Given an urn consisting of 8 balls: 4 red, 2 blue and 2 green. We have to calculate the probability of drawing out n number of balls from the urn, out of which exactly x balls should be red.

Solution Description:
The problem can be broken into two pieces:

a. Number of ways to draw n balls from the urn of total 8 balls.
b. Number of ways to draw x red balls from a total of 4 red balls.

Probability =
(number of ways to draw x red balls)*(number of ways to draw (n-x) non red balls)

(number of ways to draw n balls)

a. **Number of ways to draw n balls:**
   Since n number of balls are drawn together, the order doesn't matter. So, to select n balls from a total of 8 balls, we shall use combination.
   Number of ways= $^{8}C_{n}$.
b. **Number of ways to select x red balls out of 4**
   Again, the order is not important, hence we will use combinations.
   Number of ways to draw x red balls= $^{4}C_{x}$
   For the remaining n-x balls out of 4 non red balls:
   Number of ways for non red balls= $^{4}C_{n-x}$

Probability= Favourable outcome/ total number of outcomes
= $^{4}C_{x} * {}^{4}C_{n-x} / {}^{8}C_{n}$

Pseudo-Code:
Method: probability:
Input: Two integers n and x

```
favourable_outcome= ncr(4,x)*ncr(4,n-x)
total_outcomes= ncr(8,n)
answer= (favourable_outcome/total_outcomes)*100
return ans
```

Method: ncr
Input: Two integers n and r
Initialize nfact, rfact,nrfact with 1

```
for i from 1 to n
        nfact=nfact*i;
for i from 1 to r
        rfact=rfact*i;
for i from 1 to n-r
        nrfact=nrfact*i
ans= nfact/(rfact*nrfact)
return (integer) (ans*100)
```

For example:

n=3 and x=1

Total number of ways to draw 3 balls= ${}^{8}C_{3}$=56

Desired outcome= ${}^{4}C_{1}$ * ${}^{4}C_{2}$ = 4*6=24

(number of ways to draw 1 red ball and 2 non red balls)

Probability=24/56=0.428

Answer=(4/56)*100=42.8

Integer value of 42.8 = 42 (**ans)**