Solution 3

Employ your id to calculate a specific number that will be used in the question as follows *('14990013' will be used here as an example to show you how the number is calculated):*

- multiply your id with '54321'

  $14950103 * 54321 \longrightarrow 812104545063$

- remove all the zeros and ones from the resulting number

  $8121045450 63 \longrightarrow 82454563$

- cut out the last 2 digits and assign them to the letters A, B, respectively.

  $6 \longrightarrow A, \quad 3 \longrightarrow B$

1. How many integer solutions are there for the equation $x_1 + x_2 + x_3 = A + B$ $x_1, x_2, x_3 \geq 0$?

Solution

$x_1 + x_2 + x_3 = 9$ *where* $x_1, x_2, x_3 \geq 0$

apply combination with repetition formula

$n = 3$ *and* $r = 9$, $\binom{n+r-1}{r} = \binom{11}{9} = 55$

2. Suppose half of the people in a community has a particular disease and there is a fairly accurate diagnostic test for it. A% of the time this test gives a negative result for the people having this disease, and B% of the time this test gives a positive result for the people not having this disease. What is the probability that a person, who had a positive result from the test, has the disease?

Solution

E : person has the disease ($\bar{E}$: person does not have the disease)

F : test gives a positive result ($\bar{F}$: test gives a negative result)

$$p(E|F) = \frac{p(F|E)p(E)}{p(F|E)p(E)+p(F|\bar{E})p(\bar{E})} = ?$$

$p(E) = 0.5, p(\bar{E}) = 0.5$, *thus* $\quad p(E|F) = \frac{p(F|E)p(E)}{p(F|E)p(E)+p(F|\bar{E})p(\bar{E})} = \frac{p(F|E)}{p(F|E)+p(F|\bar{E})}$

$p(F|\bar{E}) = 0.03$ *and* $p(\bar{F}\,|E) = 0.06$, *then* $p(F\,|E) = 0.94$

Thus, $p(E|F) = \frac{0.94}{0.94+0.03} = 0.969$