Profit and loss analogy:

Specific case:

When the selling price of both the articles bought are same and profit & loss percentage respectively of articles 1 and 2 are same.

Let the selling price of both the articles be Y.

Let the cost price of articles 1 and 2 be x_1 and x_2 respectively.

Let the common profit and loss percentage of articles 1 and 2 respectively be 'a'.

Now, profit is given by,

$a = ((Y-x_1)/x_1)*100$…… (1)

Loss is given by,

$a = ((x_2-Y)/x_2)*100$…….. (2)

Equating (1) and (2), we get

$x_2*(Y-x_1) = x_1*(x_2-Y)$

$Y= (2*x_1*x_2)/(x_1+x_2)$…….. (3)

Now let us compute overall profit or loss percentage in the transaction.

Assuming it to be a profit,

Overall profit percentage is then given by,

$P = (((2*Y) - (x_1+x_2))/(x_1+x_2))*100$.

Substituting the value of Y from equation (3), we get,

$P = (((4x_1x_2) - (x_1+x_2)^2)/(x_1+x_2)^2)*100$……. (4)

As $4*x_1*x_2$ is always less than $(x_1+x_2)^2$ for any 2 numbers, the overall transaction in this case is always loss. Hence we will get a negative sign for the net result of equation (4).

Hence equation (4) can be rewritten as ,

Overall loss percentage $L= (((x_1+x_2)^2- (4*x_1*x_2))/(x_1+x_2)^2)$…….(4(a))

From equation (1),

$a*x_1= (Y-x_1)*100$

Simplifying, we get,

$Y = (x_1*(a+100))/100$…….. (5)

From equation (2),

$a*x_2 = (x_2-Y)*100$

Simplifying, we get,

$Y = (x_2*(100 –a))/100$…… (6)

Equating (5) and (6) we get,

$a = (100*(x_2-x_1))/(x_1+x_2)$…….. (7)

Example 1: When the cost price of articles 1 and 2 are Rs 100 and Rs 900 respectively and if they have same selling price and same loss and profit % for their respective transactions,

1. What is their common Selling Price?
2. What is their overall loss%?
3. What is their common individual loss /gain %?

Solution:

1. Common selling price $Y= (2*100*900)/(1000)$…(From equation (3))
   = Rs 180.
2. Overall loss percentage $L = (((1000)^2- (4*100*900))/1000^2)*100$ (From equation (4(a)))
   = 64.
3. Common individual loss/gain percentage $a = (100(900-100))/1000$ (From equation (7))
   = 80.