Chain System The Formula With Changeable Commission

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ABSTRACT
In this paper I describe the formula which is useful to determine the profit or loss in chain business having variable commission. I also describe a formula which is helpful to calculate the profit for a participant according to number of members made participants by him in his chain.

Keyword- To evaluate total profit or loss, commission

INTRODUCTION
I had published a article named Chain System The Formula recently in International Journal of Mathematics Trends And Technology in this paper we can find profit chain business system but in which the commission remains stable at all the stages.
I had also published a article named Complex Chain System The Formula recently in International Journal of Science And Research in this paper we can find profit of chain business in which not every participant necessarily make other members participant but the commission remains stable.
But now in this paper I describe a formula we can find profit of chain business in which every participant makes his own members in his chain and they get commission can be changed at different stages. This also helps to find that a company is gaining or losing something with the chain business.
The members which participate in chain they can find their profit easily.

Procedure of commission change used in formula-
I will like to clear it with a example that is- Suppose if a person completes a task and gets 10% commission of starting price and then if second task is also completed by him then he will get 20% commission and 30% for next task and so on.
The formulae are-
Formula which find the chain’s stages through a number of members those participate in the chain system
Total member = \((G^n - 1)/(G - 1)\)

“G” shows the type of group mean number of members which is to be participated by a member this his chain, that is a member can make only “G” number of members the participant.

“n” number of stage.

Formula for total profit =

\[
\left(\frac{G^n - 1}{G - 1}\right)P \cdot \frac{1}{(G-1)^2} \left( \frac{G(G^n-1)}{(G-1)} - Gn \right) - \frac{n(n-1)}{2(G-1)} \]

“P” shows the starting price mean the starting investment by each member.

“C” showing starting commission mean the first profit gained a member after completing his first task.

Formula for evaluating the commission =

\[
\left(\frac{n(n-1)}{2}\right)C
\]

Methodology

If every member has put "G" member and every "G" member has to put "G" member toward then:-

Total member = \(\left(\frac{G^n - 1}{G - 1}\right)\)

Total profit = \(\left(\frac{G^n - 1}{G - 1}\right)P \cdot \frac{1}{(G-1)^2} \left( \frac{G(G^n-1)}{(G-1)} - Gn \right) - \frac{n(n-1)}{2(G-1)} \)

Where "P" is starting Price

"C" is commission

"n" is no. of Stages

For example:- If every member has put 2-2 member for his chain, starting price is 1000 Rs., Starting commission is 100 Rs., Total member is 31, then find out the profit?

Ans:-

\(\_\_\_\_\_\_S_1\)

\(\_\_\_\_\_\_S_2\)

\(\_\_\_\_\_\_S_3\)

\(\_\_\_\_\_\_S_4\)

\(\_\_\_\_\_\_S_5\)
Profit of S1 = 1000 Rs
Profit of S2 = 2(1000) - 100 = 1900 Rs
Profit of S3 = 4(1000) - 2(100) - 200 = 3600 Rs
Profit of S4 = 8(1000) - 400 - 400 - 300 = 6900 Rs
Profit of S5 = 16(1000) - 800 - 800 - 400 = 13400 Rs

Total Profit = 26800 Rs.

By his methodology:

Total member = 31

We know Total member = \( \frac{G^n - 1}{G - 1} \)

Since G = 2; then \( \frac{2^n - 1}{2 - 1} = 31 \)

\( 2^n = 32 \)

n = 5

We know total profit = \( P \left[ \frac{1}{(G-1)^2} \left( \frac{G(G^n - 1)}{G - 1} - Gn \right) - \frac{n(n-1)}{2(G-1)} \right] C \)

Since G = 2; P = 1000; n = 5; C = 100;

Total profit = \( \left( \frac{2^5 - 1}{2 - 1} \right) (1000) - \left[ \frac{1}{(2-1)^2} \left( \frac{2(2^5 - 1)}{2 - 1} - (2)(5) \right) - \frac{5(5-1)}{2(2-1)} \right] (100) \)

= 31000 - \( \frac{1}{1} \left( \frac{62 - 10}{2} \right) \) 100

= 31000 - \( \left[ 31 \right] 100 \)

= 31000 - 4200

= 26800 Rs. Ans………..

For example:- If every member has put 3-3 member for his chain Starting price is 800, Starting commission is 150; total member is 40. then find out the total profit?
Ans:

\[ \text{Profit of } S_1 = 800 \text{ Rs} \]
\[ \text{Profit of } S_2 = 3(800) - 150 = 2250 \text{ Rs} \]
\[ \text{Profit of } S_3 = 9(800) - 3(150) - 2(150) = 6450 \text{ Rs} \]
\[ \text{Profit of } S_4 = 27(800) - 9(150) - 3(300) - 450 = 18900 \text{ Rs} \]

Total Profit = 28400 Rs.

By this Methodology:

Total member = 40

We know total member = \( \frac{G^n - 1}{G - 1} \)

Since \( G = 3 \), then \( \frac{3^n - 1}{3 - 1} = 40 \)

\( 3^n = 81 \)

\( n = 4 \)

We know total profit = \( \left( \frac{G^n - 1}{G - 1} \right) P \left[ \frac{1}{(G - 1)^2} \left( \frac{G(G^n - 1)}{(G - 1)} - Gn \right) - \frac{n(n - 1)}{2(G - 1)} \right] C \)

Since \( G = 3; n=4; P = 800; C=150; \)

Now total profit = \( \left( \frac{3^4 - 1}{3 - 1} \right)(800) - \left[ \frac{1}{(3 - 1)^2} \left( \frac{3(3^4 - 1)}{(3 - 1)} - (3)(4) \right) - \frac{4(4 - 1)}{2(3 - 1)} \right] (150) \)

\[ = (40)(800) - \left[ \frac{1}{4} \left( 3(40) - 12 \right) - \frac{4(3)}{2(2)} \right] (150) \]
\[ = 32000 - \left[ \frac{1}{4} (120 - 12) - 3 \right] (150) \]
= 32000 - [27 – 3](150)
= 32000 – 3600
= 28,400 Rs. Ans…………

For example:- If every member has put 4-4 member for his chain Starting price is 500, Starting commission is 100; total member is 21. then find out the total profit?

Ans:-

Profit of S1 = 500 Rs
Profit of S2 = 4(500) -100 = 1900 Rs
Profit of S3 = 16(500)-4(100)-200= 7400 Rs

Total Profit = 9800

By this methodology:-

Total member = 21

We know total member = \[ \frac{G^n-1}{G-1} \]

Since G = 4, then \[ \frac{4^n-1}{4-1} = 21 \]

\[ 4^n = 64 \]

n = 3

We know that total profit = \[ \left( \frac{G^n-1}{G-1} \right)P - \left[ \frac{1}{(G-1)^2} \left( \frac{G(G^n-1)}{(G-1)} - Gn \right) - \frac{n(n-1)}{2(G-1)} \right]C \]

Since G = 4; n = 3; P = 500; C = 100;
Now total profit = \( \left( \frac{4^3 - 1}{4 - 1} \right) \times P \times \left[ \frac{1}{(4 - 1)^2} \left( \frac{4(4^3 - 1)}{(4 - 1)} - (3)(4) \right) - \frac{3(3 - 1)}{2(4 - 1)} \right] \) 

= \( (21)(500) \times \left[ \frac{1}{9}(4(21) - 12) - \frac{3(2)}{2(3)} \right] \)

= 10500 - \( \left[ \frac{1}{9}(84 - 12) - 1 \right] \)

= 10500 - 700

= 9800

For example:- If every member has put 3-3 member for his chain Starting price is 1000, Starting commission is 200; total member is 15. then find out the total profit?

Ans:-

\[ \text{Profit of S1} = 1000 \text{ Rs} \]
\[ \text{Profit of S2} = 3(1000) - 100 = 2900 \text{ Rs} \]
\[ \text{Profit of S3} = 9(1000) - 3(100) - 200 = 8500 \text{ Rs} \]
\[ \text{Profit of S4 is} = 2(1000) = 2000 \text{ Rs} \]

Total Profit = 14400 Rs.

By this methodology:

Total member = 15

We know total member = \( \frac{G^n - 1}{G - 1} \)

Since \( G = 3 \), then \( \frac{3^n - 1}{3 - 1} = 15 \)

\( 3^n = 31 \)

If this does not express in power of "3" then a smaller number is chosen which can be expressed in power of "3" completely like 27:
$3^n = 27$  
$n = 3$  
"R" is equal to difference between them  
$R = 31 - 27 = 4$  
$\Rightarrow R = 4$  

We know that total profit $= \left(\frac{G^n - 1}{G - 1}\right) P \left[\frac{1}{(G - 1)^2}\left(\frac{G(G^n - 1)}{(G - 1)} - Gn\right) - \frac{n(n-1)}{2(G-1)}\right] C$

Since $G = 3; n = 3; P = 1000; C = 100$;

Now some part of total profit $= \left(\frac{3^3 - 1}{3 - 1}\right) (1000) - \left[\frac{1}{(3 - 1)^2}\left(\frac{3(3^3 - 1)}{(3 - 1)} - (3)(3)\right) - \frac{3(3 - 1)}{2(3 - 1)}\right] (100)$

$= 13000 - \left[\frac{1}{4}(39 - 9) - \frac{3}{2}\right](100)$

$= 13000 - \left[\frac{15}{2} - \frac{3}{2}\right](100)$

$= 12400 \text{ Rs} \quad \cdots \text{(1)}$

Now find out $I = \frac{R}{G - 1}$

Now we arises three cases:-

Case 1:- If $I < G$ then (IP) add in (1)

Case 2:- If $I = G$ then (IP-C) add in (1)

Case 1:- If $I > G$ then find out $\frac{I}{G} = X$. __

and arises two cases more

Case 1:- If $X < G$ then add (IP-XC) in (1)

Case 2:- If $X \geq G$ then find out $\frac{X}{G} = Y$. __

Then add (IP-XC-2YC) in (1)

Now $I = \frac{R}{G - 1} = \frac{4}{3 - 1} = 2$

Since $2 < 3$

$I < G$

Then add $2(1000)$ in (1) \text{ \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad (By \text{ Case:1})}$

Total profit $= 12400 + 2000 = 14400 \text{ Rs}$
For example: If every member has put 3-3 members for his chain, starting Price is 700 Rs. , Starting commission is 50, total member is 16 then find out the total profit?

_________S1

_________S2

_________S3

_________S4

Profit of S1 is = 700 Rs
Profit of S2 is = 2100-50 = 2050 Rs
Profit of S3 is = 6300-150-100 = 6050 Rs
Profit of S4 is = 2100-50 = 2050 Rs
Total profit = 10850 Rs
By this methodology:-
Total member = 16
We know total member = \( \left( \frac{G^n - 1}{G - 1} \right) \)
Since G = 3, then \( \left( \frac{3^n - 1}{3 - 1} \right) = 15 \)

\(3^n = 33\)
\(R = 6\)
\(3^n = 27\)
\(n = 3\)

We know that some part of profit = \(\left( \frac{G^n - 1}{G - 1} \right)P \left[ \frac{1}{(G - 1)^2} \left( \frac{G^n - 1}{G - 1} - Gn \right) - \frac{n(n - 1)}{2(G - 1)} \right]C\)
Since G = 3; n = 3; P = 700; C = 50;
Now some part of total profit = \(\left( \frac{3^3 - 1}{3 - 1} \right)(700) - \left[ \frac{1}{(3 - 1)^2} \left( \frac{3^{3^2} - 1}{3 - 1} - (3)(3) \right) - \frac{3(3 - 1)}{2(3 - 1)} \right] (50)\)
= (13) (700) - \(\left[ \frac{1}{4}(39 - 9) - \frac{3}{2} \right](50)\)
= 9100 - \(\left[ \frac{15}{2} - \frac{3}{2} \right](50)\)
= 9100 - 300 = 8800 Rs ___________________(1)

Now \( I = \frac{R}{G - 1} = \frac{6}{2} = 3 \)

\[ I = 3 \quad \text{Since} \ I = G \]

Then \( [3(700) - 50] \) add in (1) _____________________ (By Case: 2)

Total profit = 8800 + 2050 = 10850 Rs

For example:- If every member has put 4-4 members for his chain, starting price is 500 Rs, Starting commission is 50, total member is 33 then find out the total profit?

Profit of S1 is = 500 Rs
Profit of S2 is = 2000 - 50 = 1950 Rs
Profit of S3 is = 8000 - 200 - 100 = 7700 Rs
Profit of S4 is = 6000 - 150 = 5850 Rs

Total profit = 16000 Rs

By this methodology:-

Total member = 33

We know total member = \( \left( \frac{G^n - 1}{G - 1} \right) \)

Since \( G = 4 \), then \( \left( \frac{4^n - 1}{4 - 1} = 33 \right) \)

\( 4^n = 100 \)

R = 36

\( 4^n = 64 \)

n = 3
We know that total profit = \[ \left( \frac{G^n - 1}{G - 1} \right)P - \left[ \frac{1}{(G-1)^2} \left( \frac{G(G^n - 1)}{(G-1)} - Gn \right) - \frac{n(n-1)}{2(G-1)} \right]C \]

Since \( G = 4; n = 3; P = 500; C = 50; \)

Now some part of total profit = \[ \left( \frac{4^3 - 1}{4 - 1} \right)(500) - \left[ \frac{1}{(4-1)^2} \left( \frac{4(4^3 - 1)}{(4-1)} - (3)(4) \right) - \frac{3(3-1)}{2(4-1)} \right] \]

= 10500 - \left[ \frac{1}{9}(4(21) - 12) - \frac{3(2)}{2(3)} \right] (50)

= 10500 - \left[ \frac{1}{9}(84 - 12) - 1 \right] (50)

= 10500 - 350

= 10150 Rs  \hspace{1cm} \text{(1)}

Now \( I = \frac{R}{G-1} = \frac{36}{4-1} = 12 \)

\( 12 > 3 \) \hspace{1cm} \text{Since I > G}

Then we find out \( \frac{I}{G} = ? \)

\( \frac{I}{G} = \frac{12}{4} = 3 \)

Since \( 3 < 4 \)

Then add \( IP - 3C \) in (1) \hspace{1cm} \text{(By Case: 3.1)}

Mean \( (12)(500) - 3(50) \)

= 6000 - 150

= 5850 Rs

Add in (1)

Total profit = 10150 + 5850 = 16000 Rs

For example:- If every member has put 4-4 members for his chain, starting price is 1000 Rs. , Starting commission is 150 Rs., total member is 35 then find out the total profit?
Profit of S1 is = 1000 Rs
Profit of S2 is = 4(1000)-150 = 3850 Rs
Profit of S3 is = 16(1000)-4(150)-300 = 15100 Rs
Profit of S4 is = 14(1000)-3(150) = 13550 Rs
Total profit = 33500 Rs

By this methodology:

Total member = 35

We know total member = \[
\begin{pmatrix}
G^n - 1 \\
G - 1
\end{pmatrix}
\]

Since G = 4, then \[
\begin{pmatrix}
4^n - 1 \\
4 - 1
\end{pmatrix} = 35
\]

4^n = 106
R = 42
4^n = 64
n = 3

We know that total profit = \[
\begin{pmatrix}
P - \frac{1}{(G-1)^2} \left( G(G^n - 1) - Gn \right) - \frac{n(n-1)}{2(G-1)} C
\end{pmatrix}
\]

Since G = 4; n = 3; P = 500; C = 50;

Now some part of total profit = \[
\begin{pmatrix}
\left( \frac{4}{4-1} \right)(1000) - \left[ \frac{1}{(4-1)^2} \left( \frac{4(4^3 - 1)}{4-1} - (3)(4) \right) - (4)(3) \right](150)
\end{pmatrix}
\]

= 21000 - \[
\frac{1}{9} (84 - 12 - 1)(150)
\]

= 21000 - \[
8 - 1)(150)
\]

= 21000 - 1050

= 19950 Rs

___________________(1)

Now \[
I = \frac{R}{G-1} = \frac{42}{4-1} = 14
\]

14 > 4 \hspace{1cm} \text{Since I > G}

Now \[
I = \frac{14}{G} = \frac{14}{4} = 3.5
\]

Since 3 < 4

X < G

Then add in (1) (IP-XC) \________________( By Case:3.1 )
Mean 14000-3(150)
= 14000-450
= 13550 Rs
Add in (1)
Total profit = 33500 Rs

For example:- If every member has put 4-4 members for his chain, starting price is 800 Rs. , Starting commission is 100, total member is 37 then find out the total profit?

\[
\text{Profit of S}1 = 800 \text{ Rs}
\]
\[
\text{Profit of S}2 = 4(800)-100 = 3100 \text{ Rs}
\]
\[
\text{Profit of S}3 = 16(800)-4(100)-200 = 112200 \text{ Rs}
\]
\[
\text{Profit of S}4 = 16(800)-4(100)-200 = 12200 \text{ Rs}
\]
Total profit = 28300 Rs
By this methodology:-
Total member = 33
We know total member = \( \frac{G^n - 1}{G-1} \)
Since \( G = 4 \), then \( \frac{4^n - 1}{4-1} = 33 \)
\( 4^n = 112 \)
\( R = 48 \)
\( 4^n = 64 \)
\( n = 3 \)
We know that total profit = \[\left(\frac{G^n - 1}{G - 1}\right)P - \left[\frac{1}{(G-1)^2}\left(\frac{G(G^n - 1)}{(G-1)^2} - Gn\right) - \frac{n(n-1)}{2(G-1)}\right]C\]

Since \(G = 4\); \(n = 3\); \(P = 800\); \(C = 100\);

Now some part of total profit =

\[\left(\frac{4^3 - 1}{4 - 1}\right)(500) - \left[\frac{1}{(4-1)^2}\left(\frac{4(4^3 - 1)}{(4-1)^2} - (3)(4)\right) - \frac{3(3-1)}{2(4-1)}\right](100)\]

\[= 16800 - \left[\frac{1}{9}(4(21) - 12) - \frac{3(2)}{2(3)}\right](50)\]

\[= 16800 - \left[\frac{1}{9}(84 - 12) - 1\right](50)\]

\[= 16800 - 700\]

\[= 16100 \quad \text{(1)}\]

Now \(I = \frac{R}{G-1} = \frac{48}{4-1} = 16\)

\(16 > 4 \quad \text{Since } I > G\)

Now \(\frac{I}{G} = \frac{16}{4} = 4\)

\(X = 4\)

Since \(4 > 3\)

So \(X > G\)

Then \(\frac{X}{G} = \frac{4}{4} = 1\)

So \(Y = 1\)

Then add \(IP - XC - 2YC\) in (1) \(\text{(By Case:3.2)}\)

Mean \((16)(800) - 4(100) - (2)(100)\)

\[= 12800 - 600\]

\[= 12200 \text{ Rs}\]

Add in (1)

Total profit = \(16100 + 12200 = 16000\)

\[= 28300 \text{ Rs}\]

For example:- If every member has put 4-4 members for his chain, starting price is 1000 Rs., starting commission is 100, total member is 41 than find out the total profit?
Profit of S1 is = 1000 Rs
Profit of S2 is = 4(1000)-100 = 3900 Rs
Profit of S3 is = 16(1000)-4(100)-200 = 15400 Rs
Profit of S4 is = 20000-400-200-100 = 19300 Rs

Total profit = 39600 Rs.

By this methodology:-

Total member = 35

We know total member = $\left(\frac{G^n - 1}{G - 1}\right)

Since G = 4, then $\left(\frac{4^n - 1}{4 - 1}\right) = 41$

$4^n = 124$

R = 60

$4^n = 64$

n = 3

We know that total profit = $\left(\frac{G^n - 1}{G - 1}\right)P - \left[\frac{1}{(G-1)^2}\left(\frac{G(G^n - 1)}{(G-1)} - Gn\right) - \frac{n(n-1)}{2(G-1)}\right]C$

Since G = 4; n = 3; P = 500; C = 50;

Now some part of total profit = $\left(\frac{4^3 - 1}{4 - 1}\right)(1000) - \left[\frac{1}{(4-1)^2}\left(\frac{4(4^3 - 1)}{(4-1)} - (3)(4)\right) - (4)(3)\right](100)$

= 21000 - $\left[\frac{1}{9}(84 - 12) - 1\right](100)$
\[= 21000 - [8 - 1](100)\]
\[= 21000 - 700\]
\[= 20300 \text{ Rs} \quad \text{(1)}\]

Now \( I = \frac{R}{G - 1} = \frac{60}{4 - 1} = 20 \)

14 > 4 \quad \text{Since } I > G

Now \( \frac{I}{G} = \frac{20}{4} = 5 \)

\( X = 5 \)

5 > 4

\( X > G \)

\[\text{Then } \frac{X}{G} = \frac{5}{4} = 1.25\]

Then \( Y = 1 \)

Then add in (1) \((IP - XC - 2YC) \quad \text{(By Case:3.2)}\)

Mean \(20000 - 500 - 200\)

\[= 19300 \text{ add in (1)}\]

Total profit = 39600 Rs

For calculating commission :
\[\left\lceil \frac{n(n - 1)}{2} \right\rceil C\]

For example: If a member has a task of making 2 participants and he have now a total of 31 participants in his chain, if he gains commission of RS100 on completing first task then find out the total commission = ?

Sol.

Ts

Since total member is 31

We know total member = \(\frac{G^n - 1}{G - 1}\)

Since \(G = 2\); then \(\frac{2^n - 1}{2 - 1} = 31\)
\( 2^n = 32 \)
\( n = 5 \)

We know total commission = \( \left[ \frac{n(n-1)}{2} \right] C \)

\[ = \left[ \frac{5(5-1)}{2} \right] (100) \]

\[ = (10)(100) \]

\[ = 1000 \text{ Rs.} \]

**CONCLUSION**

With this formula we can very easily find the profit or loss earned by a company with varying commission. It is very useful to Multiple National Marketing Companies which do this type of business and this type of companies can find easily their profit or loss.

**REFERENCE**

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