Computing the Expected Total Amount Wagered Given a Fixed Percentage Return and Initial Bankroll

The numbers as in our example (100, 97, 94.09, 91.27, 88.53) represent a geometric series with a common ratio of 0.97, the decimal equivalent to our 97 percent return. For the general case where:

p = Decimal Equivalent of Percent Return

B = Starting Bankroll

T = Total Amount Wagered after n sessions where each successive session starts with the return from the previous session.

Then

$$T = B(1 + p + p^2 + \ldots + p^{n-1}) \qquad (1)$$

Multiplying each side by p we have

$$pT = B(p + p^2 + p^3 + \ldots + p^n) \qquad (2)$$

Subtracting (2) from (1) , we have

$$T - pT = B(1 - p^n) \qquad \text{or}$$
$$T(1 - p) = B(1 - p^n)$$

and

$$T = B(1 - p^n) / (1 - p)$$

If $p < 1$ and the number of sessions becomes very large ($n \to \infty$) , then $p^n \to 0$ and we are left with

$$T = B / (1 - p)$$

Applying this formula to our previous example (B = $ 100, p = 0.97), we find

$$T = \$100 / (1 - 0.97) = \$100 / 0.03 = \$ 3333.33$$

Given a starting bankroll of 100 credits, the table below shows how many one credit games one can expect to play *on average* before losing all the credits.

Percent Return	Expected Number of Games
100	∞
99	10,000
98	5,000
97	3,333
96	2,500
95	2,000
94	1,667
93	1,429
92	1,250
91	1,111
90	1,000
89	909
88	833
87	769
86	714
85	667
84	625
83	588
82	556
81	526
80	500