Experience/Item Calculation

with mathematics and coding!

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Prerequisites

Mathematics

Basic understanding of:

1. Arithmetics:
   (a) Addition
   (b) Subtraction
   (c) Multiplication
   (d) Division
   (e) Exponentiation
2. Algebra:
   (a) Variables
   (b) Constants
3. Functions:
   (a) General syntax:
      i. Arguments
      ii. Parameters
   (b) Floor Functions
   (c) Ceiling Functions
4. Summations

Coding

1. Python(3.X+)

   or any other programming language you're comfortable with.

2. The built-in 'math' library:

```
1 import math
```

3. Basic syntactic knowledge.

1 Experience needed to reach L level

The following mathematical function, along with the code function, contains the formula to calculate the amount of experience need to reach level L. The variable M represents variable changes to experience gained by obtaining the different tiers introduced in the current league. Tiers have an incremental experience multiplier ranging from x5 to x16.

1.1 Mathematical Function

$$f(L) = \left\lfloor \frac{1}{4} \sum_{x=1}^{L-1} \left\lfloor x + 300 \cdot 2^{\frac{x}{7}} \right\rfloor \right\rfloor$$

where $\{L$ is the the targeted level

1.2 Code Function (using Python 3.X)

```
def xp_to_level(level):
    summation = 0
    for x in range(1, level - 1):
        summation += math.floor(
            x + 300 *  math.pow(2, x / 7)
        )
    return math.floor(summation * .25)
```

2 Total experience needed to reach L level given C current experience and M modifier

2.1 Mathematical Function

$$g(C,\ L,\ M) = \left\lfloor \frac{\frac{1}{4}\sum_{x=1}^{L-1}\left(\left\lfloor x+300\cdot 2^{\frac{x}{7}}\right\rfloor\right)-C}{M} \right\rfloor$$

$$\text{where} \quad \begin{cases} C & \text{is your current experience points} \\ L & \text{is the the targeted level} \\ M & \text{is a tier multiplier, which varies} \end{cases}$$

2.2 Code Function (using Python 3.X)

```
1 def xp_needed(cur_xp, tar_level, multiplier):
2     return math.floor((xp_to_level(tar_level)
        - cur_xp) / multiplier)
```

3 Actions needed to reach *g(C, L,M)* level given *U* unit experience

3.1 Mathematical Function

$$h(U,\ g(C,\ L,\ M)) = \left\lceil \frac{g(C,L,M)}{U} \right\rceil$$

where $\begin{cases} U & \text{is the experience gained per unit} \\ g(C, L, M) & \text{is the function for total experience needed to reach L level} \end{cases}$

3.2 Code Function (using Python 3.X)

```
1 def actions_needed(unit_xp, xp_needed):
2     return math.ceil(xp_needed / unit_xp)
```