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GAT211

Project 1

Mathematical Analysis

There are a wealth of different opportunities for me to do mathematical analyses on my system/game over the course of its development, but that would take up as many pages as either one of the other two major documents for this project. So, for this section, I will focus on analyzing the numbers of the game in its final iteration. I will stick mostly to the combat section of the game, as that was the assignment, even though there are a few mildly interesting things to say about the two coin-based sections of the game (though not as interesting as it used to be when the coins could be carried over to the different sections). I’ll start with a look at the maximum and minimum damages, as well as expected values of damage, players can inflict with and without the use of the material bonuses.

Minimum and Maximum Damages without Material Aid

Base Damage = 2 hp

Base Attack Success Rate = 50%

Min. Damage with lowest Attack Success = 2 \* 0.5 = **1 hp per round**

With added D4 die Expected Value = 1 + 2.5 = **3.5 hp per round**

With added D6 die Expected = 3.5 + 1 = **4.5 hp per round**

Base Attack Success Rate = 70%

Min. Damage with middle Attack Success = 2 \* 0.7 = **1.4 hp per round**

With added D4 die Expected Value = 1.4 + 2.5 = **3.9 hp per round**

With added D6 die Expected = 3.5 + 1.4 = **4.9 hp per round**

Base Attack Success Rate = 90%

Min. Damage with highest Attack Success = 2 \* 0.9 = **1.8 hp per round**

With added D4 die Expected Value = 1.8 + 2.5 = **4.3 hp per round**

With added D6 die Expected = 3.5 + 1.8 = **5.3 hp per round**

Minimum and Maximum Damages with Material Aid

Using Yellow (1 Round of 7 hp Damage)

Min. Dmg = 1 + 7 = **8 hp**

Max. Dmg = 5.3 + 7 = **12.3 hp**

Mean Dmg = 20.3 / 2 = **10.15 hp**

Using Red (Base Damage x2 multiplier for 3 rounds)

Min. Dmg = 1 \* 2 = **2 hp for 3 rounds**

Max. Dmg = 5.3 \* 2 = **10.6 hp for 3 rounds**

Mean Dmg = 2 + 10.6 / 2 = **6.3 hp for 3 rounds or 18.9 hp total damage**

Using Green (A DoT adding 4 hp dmg for 3 rounds)

Min. Dmg = 1 + 4 = **5 hp for 3 rounds**

Max. Dmg = 5.3 + 4 = **9.3 hp for 3 rounds**

Mean Dmg = 14.3 / 2 = **7.15 hp for 3 rounds or 21.45 total damage**

The fighters the player’s build have a base HP of 20. They can add on to that using bonuses of 4hp, 8hp, or 12hp. Taking the worst case scenario, however, only one case of the mean damages *with* material aid gets quite up to the base. Now we’ll take a look at the average amount of rounds the game will last using minimum and maximum damages along with the base hp.

Minimum Damages

20 hp / 1 dmg per round = **20 rounds**

20 hp / 1.4 dmg per round = **~ 14 rounds**

20 hp / 1.8 dmg per round = **~ 11 rounds**

Maximum Damages

20 hp / 4.5 dmg per round = **4.45 rounds**

20 hp / 4.9 dmg per round = **~ 4 rounds**

20 hp / 5.3 dmg per round = **3.78 rounds**

So, even with maximum damage (though without the changing bonuses given by the materials), the game will go at least over 3 rounds. As an edge case, I still think this probably fine, given the relative simplicity of the system and the rareness of getting max. damage the entire game.