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GAME BALANCE

WEEK 1

Deterministic games:

Games that do not have random elements (Checkers and Chess)

Non - Deterministic games:

Games that do have random elements (Ms. Pacman and poker)

Solvability:

- **Trivial solvability:**
  - game where the human mind can completely solve the game in real-time.

- **Theoretical complete solvability:**
  - games which in theory are completely solvable, but it is not realistically solvable by the human mind (Chess).

- ***Solving non-deterministic games:***
  - they are “not solvable”, but a set of actions increase our probability of winning.

- ***Solving intransitive games:***
  - (intransitive game example: rock, paper and scissors)
  - solvability ratio → 1:1:1
  - Change odds of winning by tweaking for instance score lost and won per movement.

- ***Perfect information:***
    - Each player knows about the game state.
    - In non-perfect information games, there are different layers of information that can be obtained for instance with rival’s deck vision cards.

Symmetry:

- ***Symmetric games:*** Those games where players start from the same position and have the same rules.
- Perfect symmetry does not mean the game is fully balanced. Maybe the objects or some strategies are better than others.

The Metagame:

It means the game surrounding the game. The actions the players do between games, which affect their chances to win in the next game.

- When you identify an imbalance, before slapping a fix on it, ask yourself *why* this imbalance is really happening, *what* is actually causing it… and then, *what* is causing that, and *what* is causing *that*, and so on as deep as you can go.

GAME BALANCE MADE EASY, FOR LAZY PEOPLE:

- to balance fast, create playtesting mechanics like auction to choose between A and B and have statistics.
- cooperate to kill the leader mechanic in a multiplayer game.

With these two balancing ways, when removing them we can find imbalances.

WEEK 2 (numeric relationships)

Identity and Linear relationships:

- Identity relationship is when for instance we add +1 to one value, then we should add +1 to another related value.
- Linear relationship example: healing spell always costs 5 MP and heals exactly 50 HP, then there is a 1-to-10 linear relationship between MP and HP.

Exponential and Triangular relationships:

Things that look like OP, when overused, change the value of it.

- *exponential relationship*: when you add to one value, multiply the other one. An example is doubling: for each +1 you give to one value, *double* the other one. This gives you a relationship where buying 1, 2, 3, 4 or 5 of something costs 1, 2, 4, 8 or 16, respectively. As you can see, the numbers get really big, really fast when you do this. (ex. this blocks bulk buying of an OP item)
- Another exp relat. is the double or nothing term.

- *Triangular relationship:* 1, 3, 6, 10, 15, 21, 28, …
    - They follow the pattern of 1, 2 (3-1), 3 (6-3), 4…
    - If at one point our mathematical formula breaks (take the example of -1 cost per +1 product bought) add limits such as only being able to buy 3 or 4 items.

- *Other numeric relationships:* We can come up with num relat. within our own game framework.

Relationships within systems:

NES Dragon Warrior sets HP as the main loss condition of the game. Attack, MP and Defense are all related to this HP. (common technique of making a single resource the central core of all others).
Another system in Dragon Warrior is the XP. You get XP mainly by killing monsters. Counteraction → leveling up progressively demands more XP.
Another feedback loop: defeating monsters earns Gold, which the player uses to increase their stats, which lets them defeat even more monsters.
Player arrives in a new city → he expects new store equipment to be balanced with his HP-to-cost ratio.

MARIO: **Coins:** there is a 100-to-1 relationship between Coins and Lives, since collecting 100 coins awards an extra life. There is a 1-to-200 relationship between Coins and Score, since collecting a coin gives 200 points.
…
The central resource is SCORE (makes sense being an arcade game).

Interactions between relationships:

"However, these relationships chain together, since XP gives you Levels and Levels give you Upgrade Points. Since XP is the actual resource the player is earning, it is the XP-to-Points ratio we care about, and the two triangular relationships actually *cancel* with each other to form a linear relationship of 1000 XP to 1 Upgrade Point. While the awarding of these upgrade points is staggered based on levels, on average you are earning them at a ***constant XP rate.***" (increase rate of XP gain)

This leveling system also has negative feedback loop:

- **Over-leveling**
- **Under-leveling**

How Relationships Interact:

- *Two linear relationships that combine:* multiply them together. If you can turn 1 of Resource A into 2 Resource B, and 1 Resource B into 5 Resource C, then there is a 1-to-10 conversion between A and C (2×5).

- *Linear relationship combines with an increasing (triangular or exponential) relationship:* the increasing relationship just gets multiplied by a bigger number, but the **nature of the curve stays the same.**

- *Linear relationship counteracts an increasing relationship:* if the linear conversion is large, it may dominate early on, but eventually the increasing relationship will outpace it. Exactly where the two curves meet and the game shifts from one to the other depends on the exact numbers, and tweaking these can provide an interesting strategic shift for the players.

- *Two increasing relationships combine:* you end up with an increasing relationship that's even faster than either of the two individually.

- *Two increasing relationships counteract one another:* depends on the exact relationships. In general, an exponential relationship will dominate a triangular one (how fast this happens depends on the exact numbers used). Two identical relationships (such as two pure triangulars) will cancel out to form a linear or identity relationship.