

# A DIE IS A DIE – EXCEPT WHEN IT’S NOT

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## ON THE VARIATIONS OF DETERMINING RANDOM FACTORS

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## DISCLAIMER THINGY

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This document isn't quite ready. I haven't found the motivation to dig deeper – for example, I should leaf through the INS/MV and Feng Shui books to detail their way of tests and try to generalize and abstract more. But I think I already have shown the versatility.

If any of my dear readers would like to send in comments, feel free to contact me via the website you got this from.

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## SYNOPSIS

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This text will try to categorize the methods roleplaying game systems use to determine the success or failure of actions. I will try to examine these methods and compare them, also under the aspect of “ease of use” in common play. Also, I am going to categorize and generalize them. Looking at the complexity of the matter, I will only write about simple tests. No extended or contested tests.

In another document I will elaborate on success probabilities of these systems and their behaviour under different circumstances.

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## CONVENTIONS

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The word *Difficulty* (note casing) will in this text denote the factor the results of any dice roll is compared against. The various games sometime call it “Difficulty Class”, “Difficulty”, “Ease Factor” and many, many other names. I will stick to Difficulty, regardless what the different game designer think suited best.

On the other hand, sometimes the effort necessary to succeed a test is not determined by Difficulty alone, as sometimes the number to be achieved is not the real “difficulty” in the test. The complexity of the task at hand might be more important. I will (to our surprise) write *Complexity* in these cases.

Further, most systems differ between inborn and learned abilities. I will refer to inborn abilities as *Attributes*, even if the game calls it by another name (e.g. Characteristics). I will refer to learned abilities as *Skills*, regardless of specific systems names. Referring to any ability, features, properties and so on, I will write *Characteristic*.

While trying to be scientifically accurate, I simply have to assume a few things, including statements regarding “typical values” of Characteristics. I didn't collect statistics about said values, so I estimated them by experience and “common sense”.

In many systems certain circumstances provide modifiers to the test at hand. For example, bad lighting, bad weather, quality of tools will modify the difficulty (and sometimes Difficulty) of tests. I will call them *Circumstance Modifiers*, regardless of type. (*Dungeons & Dragons* categorizes various modifiers, including morale and terrain bonuses. Still I call them Circumstance Modifiers.)

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## INTRODUCTION

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Well, I haven't had time until now to use great format and care - think of this as a first draft.

So basically in RPG test success statistics there are, generally speaking, five classes of systems:

- Single die systems (SDS)
- Constrained pool systems (CPS)
- Open pool systems (OPS)
- No die systems (NDS)
- Other systems

The difference in these classes is the method used to determine the outcome of any actions taken (or more precise: any actions sufficiently improbable as to imply a success test of any kind).

*Single die systems* use a single die to determine a character's fate. This includes the ever-present D20 systems (e.g. *Dungeons & Dragons*, *Warcraft / WoW*), but also systems like *Fading Suns* and the new *LotR* system.

With *constrained pool systems*, a pool of dice with a fixed size rule over life and death of a character. Percentile systems belong into this category (e.g. *Rifts*), as do systems like *The Dark Eye*, as well as “strange” variations like the 3d6 system of *In Nomine / Magna Veritas* or the two die variant of *Feng Shui*.

Referring to *open pool systems* means that depending upon numerous factors the number and / or quality of dice changes. Examples for this category are all incarnations of *Shadowrun*, both *Worlds of Darkness* of White Wolf Publishing, *Exalted* and *Trinity* (yes, I seem to be rather fond of WW systems ... ;)

No die systems use other ways of determining success and failure. Cards are an often-sought method (*Engel* and *Castle Falkenstein* are examples), sometimes systems forswear all random event generators for the sake of story and follow “freeform RPG”. I won't cover that last category here at all.

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## RPG SUCCESS SYSTEMS

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### ON SINGLE DIE SYSTEMS

I have to admit that my experience with SDS is rather limited. Basically I can talk about *Fading Suns* and have been exposed to some D20. But still I would like to elaborate on success probabilities and “ease of use” in tests.

SDS can be further divided into:

- Difficulty modifying systems
- Polyfold modifying systems

I will elaborate about these variants on the basis of the two mentioned systems.

### DIFFICULTY MODIFYING SYSTEMS

When playing *Fading Suns*, success and failure are measured by the roll of a single dodecahedron (D20). The success range is bounded on both sides. The upper bound is the sum of an Attribute and a Skill; the lower bound is specified by the difficulty of the test. So *Fading*

*Suns* is a difficulty modifying system, as the Difficulty of the test directly narrows the range of numbers accepted as “successful”. (In contrast to systems who modify the die roll.)

Both Attributes and Skills range from zero through ten, with Attributes running the whole gamut (except zero), skills usually being between three and eight. Commonly used attributes for success tests tend to have higher values than one or two. That means typical upper bounds range from 9 to 16, since the “character defining” characteristics tend to have values of 6 or greater and characteristics with moderate importance are around 4 (three to five).

The tests difficulty, the lower bound, is 1 for simple tests, but can be as high as 10 for demanding tasks.

So the success range runs from theoretically [1, 19] (a 20 is always a failure, where 1 is always successful) to no range at all if the task complexity is larger than the combined Attribute-Skill value.

#### POLYFOLD MODIFYING SYSTEMS

*Dungeons & Dragons* on the other hand uses the same die (a D20, to our great surprise), but works differently. The Difficulty is determined by the complexity of the task at hand, usually being between ten and 30. The die roll is modified by various factors: First and foremost it is increased by the Skill being tested. All Skills are linked to a specific Attribute which contribute a value between including -5 and +5. Additionally, there are various Circumstance Modifiers which can adjust the test value by at least  $\pm 10$ . (I used caution in estimating this number. In my experience, there are tools which give more than +8 to a certain test. There are enhancement bonuses on weapons up until +5. There are various feats and magic. Morale bonuses. I am not sure if there is a reasonable bound to the Circumstance Modifiers, albeit I have the impression they usually are positive in value.)

Therefore, the die roll will be modified by values between -4 and about 40. (Skills between 1 and 20 [I think], Attributes between -5 and +5, Circumstance modifiers estimated between -5 and +20 [+10 Tool, +5 Morale, +5 What Do I Know Bonus].)

Hence I label D20 as “polyfold modifying system”, since the test is made more difficult by modifying the Difficulty and is made more easy by modifying the die roll. (And both modifications usually are positive, except certain circumstances – as negative Attribute modifiers.) So determining the numbers actually to roll in order to be successful in the test is rather complex.

With no knowledge about any factor I can say:

$$\text{Success iff } \text{Attribute} + \text{Skill} + \text{Die Roll} + \text{Circumstance Modifier} \geq \text{Difficulty}$$

So extensively speaking about success probability in general is impossible for me. Using simple math though, this equation can be modified:

$$\text{Success iff } \text{Die Roll} \geq \text{Difficulty} - (\text{Attribute} + \text{Skill} + \text{Circumstance Modifier})$$

This does not really remove degrees of freedom, but since I have establishes bounds for mentioned DF, I can say, that

$$\text{Success iff Die Roll} \geq [5, 35] - ([-5, 5] + [1, 20] + [-5, 20]) = [-40, 34]$$

and will call the value calculated via this method the *integrated Difficulty*. Though the notation is not really correct, I would like to keep it. With that I mean, that the modified Difficulties lie between -40 and 34. Of course, this does not mean that every test is successful – these are merely the highest and lowest possible integrated Difficulty. The actual bounds of this value vary from test to test, of course. But if given the necessary information besides the roll, calculating success probability is trivially easy – Just without being able to estimate Circumstance Modifiers, estimating success probability is difficult. So for inexperienced players, this might be complicated and result in hour-long shuffling through books. ;)

### **ON CONSTRAINED POOL SYSTEMS**

I have established two-and-a-half classes of CPSs:

- Percentile rolls
- 3d20 TDE
- 3d6 INS/MV

#### PERCENTILE ROLLS

Calculating success probabilities for percentile systems is rather easy. If one accepts that rolling two d10 can be understood as rolling one d100. ( $P(\text{Rolling a certain percentile value}) = P(\text{Rolling floor}(\text{value} / 10)) * P(\text{Rolling}(\text{value} \% 10)) = 1/10 * 1/10 = 1\%$  – in short.)

So, a success test in a percentile system is any variation of the following:

- Die roll + Characteristic + Circumstance Modifier compared to Difficulty
- Die roll + Difficulty + Circumstance Modifier compared to Characteristic
- Die roll compared to Characteristic + Difficulty + Circumstance Modifier
- ...

Of course these variants are basically the same. I think this system is rather obvious, so I don't feel the need to elaborate further.

Besides that, assuming 2d10 as 1d100 this could be accepted as a SDS.

#### 3D20 TDE

The system *The Dark Eye* (I'm only speaking of the third version of it) uses a kind of “rolling a pool of three d20” method if solving tests. Each (relevant) success test is applied to a Skill, that means Attributes are never tested alone (well, as rarely as to be irrelevant for this document). A success test in TDE means a test of three Attributes (not necessarily mutually different ones). Succeeding an Attribute test requires a roll of a d20 lower than the Attribute (it would be helpful to note by how much the roll beats or fails the Difficulty), so the probability of succeeding an Skill test is basically the multiplication of the probability of succeeding the Attribute tests. Since all Attributes are known, success probabilities can be calculated beforehand. Sounds simple? It is. Except ...

There are modifiers to this. The Skill is one modifier, Circumstance Modifiers are the other. These modifiers are added up and the sum of the amounts the attribute tests must be equal or greater than the calculated modifier. (Add Skill to CircMod, gives test mod. Throw dice. If one of the three Att tests fails, the Skill test fails. Else, sum up the differences between Att test and Att. Add test mod. Positive? You just succeeded.)

## ON OPEN POOL SYSTEMS

Again, here are subclasses:

- Target number modifying systems
- Pool modifying systems
- Hit threshold systems

### TARGET NUMBER MODIFYING SYSTEMS

To have a test to succeed in a TNMS, you assemble a pool of dice through various means and roll them. Each die that comes up equal or greater to a target number (Difficulty) counts as success. If there is at least one success in the rolls, the whole test succeeds. If there is no success, the test fails. Since that nomenclature can be confusing, I will call the event that a single die comes up a number at least equal to the Difficulty a “hit”. If there is at least one hit, I will call the test a success. So, tests might be made with Attribute + Skill combinations or single Characteristics contributing the dice pool. The Difficulty of the test depends on the Complexity of the task and any Circumstance Modifiers. Rising in (Characteristic) rank eases these tests as additional dies obviously make it easier to achieve at least one hit.

Usually systems award more hits with better successes (jumping farther, running faster, coding faster or more robust, gaining more insight, ...), so even though one hit is enough to basically succeed a test, players are often interested in more than one hit for various reasons.

Examples for this category are Shadowrun up to the third version and the old World of Darkness.

### POOL MODIFYING SYSTEMS

The philosophy in pool modifying systems is a little different. These systems have a fixed Difficulty for each hit (usually around half of the highest possible number, like 4 on a d6 or 7 on a d10) and the Complexity of a task and the Circumstance Modifiers do not adjust it but rather the dice pool size. For example, good tools might provide a +2 bonus on the dice pool, bad weather or a serious wound might subtract a penalty of 4 dice.

So in a test, the Characteristic(s) determine the initial dice pool at my disposal. This size is then adjusted to compensate for Complexity and Circumstance. When having the final dice pool size I roll as many dice and compare all of them to the fixed Difficulty and count hits. (As above, one is enough as Complexity adjusts dice pool, but more successes often yield better results.)

The new World of Darkness is an example for this subclass.

### HIT THRESHOLD SYSTEMS

Another variant of OPS are systems that do not modify Difficulty of pool size, but the number of hits required to count as successful test. So the number of dice per Characteristic(s) is always fixed, as well as the Difficulty; so the only “real” unknown is the Complexity, or the number of hits required to succeed.

A hit threshold example would be Trinity.

## ON NO DIE SYSTEMS

As said above, *no die systems* use other ways of determining success and failure. The only method from the tip of my mind would be to use cards, which both *Engel* and *Castle Falkenstein* use. Talking about success probabilities or something similar is entirely impossible with Engel, since this system does use a kind of free storytelling, where drawn cards indicate the nature of the outcome of the action, although not necessarily a success or a failure. The cards used in this game

have a positive and a negative interpretation, but they are merely suggestions to be incorporated into the collective story.

Castle Falkenstein, on the other hand, does indeed measure success and failure by cards.

#### **ON OTHER SYSTEMS**

This class would be for systems that use completely different systems that even won't fit into *no die systems* – although I can't think of one. Still, for completeness sake I include this class.

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#### **CONCLUSION**

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There are many, many different ways to determine success and failure – and I suppose there will be many more ways in the future. Until I started to write this short text, I have not thought much about this matter and I was surprised, how many different systems of determining random factors I know from the tip of my head. A little more thorough research will surely show more existing ways. Gamers are creative almost by definition, as it seems.