

High Luck
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Warhammer 40k Unit Efficiency Calculator

The Problem to Solve

The problem we are attempting to solve relates to the mechanics of a table-top wargame known as *Warhammer 40,000* or simply *40k*. The game uses model soldiers, tanks, aircraft and terrain to construct the 'battlefield' in which players command their forces and seek victory. To facilitate gameplay the system is based on the use of six-sided dice which creates a game based upon random probability and statistical outcomes. Amongst the community for this game is a concept known as "Mathhammer" in which the players who have a knowledge of statistics calculate the various expected average outcomes of attacks made by one unit against another.

Our aim is to create a simple calculator that takes into account the units various stats, any bonuses or determinants and the enemies stats that can negate any damage done. The process for making these attacks is dependent on a pool of six-sided dice that are rolled to generate successful hits, then the number of successes is used to generate how many of those hits effectively wound the target and then finally those wounds are attempted to be resisted by the units saving stats.

With all the information input into the calculator by the user and the calculation run the output would be the statistical average damage dealt for that particular set of dice rolls. This information is valuable as playing the averages is how games of chance are won, and this being a diced based game at the end of the day is a game of chance.

As you can see the process is a simple series of dice rolls. However the best players know how to use their units well, and what their capabilities are. Many new players and even some veteran ones stumble with being able to truly understand a unit's effectiveness. To do so they need to know the statistical average damage output that can be expected from that unit on a variety of targets. This information can help them in many ways:

- Knowing the best role for their units.
- Understanding the threat posed by the opponents units to their own.
- Model kits are expensive for the game, knowing the capabilities of them before spending the money would be wise.
- Gaining a better understanding of the various effects of the bonuses and determinants placed on their own and foes units.

This calculator would be a simple tool able to be used by new and veteran players to better enjoy the hobby. We aim to include functionality that defines the key terms such as 'Ballistic Skill' and 'Feel No Pain Save' to help the new players grasp the concepts better as well. 40k is a

fun hobby enjoyed worldwide, with a thriving community and even international tournament play. Our aim is to give that vast player base a tool that can improve on an already beloved game.

Who would the customers be?

The customers would be the 40k playerbase, who also would be the end users of this product. For a unifying name we can say "40k Playerbase". The player base would want the calculator to be simple to use and account for all modifiers that can affect the dice rolled in the process of making an attack.

While the user base cannot be specifically determined due to the nature of its "table-top" format, a popular forum dedicated to the game called Dakka has over 100K registered users that actively play the game. YouTube is a popular site to find guides and dedicated Warhammer players with hundreds of thousands of subscribers and equally as many views.

We are working with Shieldwall Gaming Club to develop the application. The club has a large player base, active tournament leagues and weekly casual games of 40k. The club is a good representation of how many players participate in and play the game.

Who are the end users?

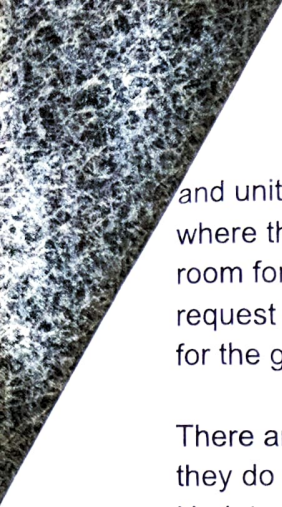
The "40k Player Base" would be the end users. The pool of end users is large, as this is a game enjoyed by players of every description except young children. The average player of the game is a man in their mid to late twenties, working an entry level job and simply looking to enjoy a bit of escapism in a game with friends or indulge a competitive itch. Most players use a phone based application to draft 'lists' or rosters of units made using the game's rules they know how to use, and often play with a smart phone at hand.

Constraints imposed by consumers

- Calculations need to be accurate (little to no margin of error to be accurate).
- Rule and stat changes impact the process of performing calculations so this needs to be accounted for.
- The calculator is VERY specific so even minute changes must be accounted for. Changes within the overall rule-book of Warhammer 40k impact the calculator as values and statistics might change.
- The calculator needs to be efficient/simple to allow for fast calculations in order to be usable in tournaments (time-limits exist).

Assumptions/risks

With a table-top game like Warhammer 40K and with the sheer amount of units that exist within the game currently, the calculator serves to simplify the calculations when dealing damage. Many assumptions must be made as inputting every unit into the calculator would cause the app size to be too large and slow for an app whose purpose is to be fast and efficient. It is assumed that a player owns the core rulebook and a separate rule book that includes the player's faction



and units within the faction. It is also assumed that the player isn't following an older edition where there are differences in the rules and stats that the app will not be designed for. There is room for expansion to these older editions provided the initial calculator is received well and the request made for that expansion. Our calculator is also meant to be a tool and is not a dictionary for the game itself.

There are a few risks to consider but nothing of serious concern. While editions have changed, they do not change frequently enough that there could be an overlap with development. Updates to the game do release and will more than likely have little to no impact on this core algorithm to gameplay but that chance is always there.

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System Functionality

What will the system do?

The system takes the input of the user which includes information on the various units stats, any bonuses or determinants and the enemies stats that can negate any damage done and calculate the statistical average damage output for one unit versus another.

When will the system do it?

Upon completion of user input and completion of the calculation.

Are there several modes of operation?

No, not at this time. There is the potential to expand the system to allow for multiple game types, which would constitute different modes of operation.

Data

For input and output, what should be the format of the data?

All data will be input and output in integer form.

Must any data be retained for any period of time?

The data must be retained while the application is opened until a new calculation is needed by the user.

Are there any design constraints?

Calculations will need to be accurate and rounded appropriately. The application must work consistently and reliably without an internet connection.

Interfaces

Is input coming from any other systems?

No, all input is native to the application and/or is input by the user.

Is output going to any other systems?

No, all output will not be going to any other system.

Performance

Are there constraints on execution speed, response time, or throughput?

Since tournament play is time limited, the calculations need to be fast enough to not delay gameplay. Any delays must be from user error only.

End Users

Who will use the system?

The Warhammer 40K player base during casual games and competitions.

Will there be several types of users?

No, the only users of this application will be players of the game. It needs to be noted however that there are players that follow different rulesets so different versions of the calculator will need to be created to account for this sub-playerbase.

What will be the skill level of each user?

The skill level will vary, but the user must be familiar with the basic Warhammer 40k rules (and whichever ruleset they decide to follow).

Usability and Human Factor

What kind of prerequisite knowledge or training will the user need to have?

The user will need to have basic knowledge of the Warhammer 40k rules.

How easy should it be for a user to understand and use the system?

The system should be intuitive for any user of the system, and will be able to be used without any outside instruction.

Reliability & Availability

Should the system detect and isolate faults?

Yes, the system should detect faults and return errors to the users.

What is the needed uptime of the system?

Since the system does not require an internet connection, uptime is not an issue.

Will the application require internet access?

The application will only require internet access for initial download and future updates.

Maintainability

When and in what ways might the system be changed in the future?

Rule updates happen periodically, and the system must be changed quickly to keep up with these changes. Also, there are several older versions of the game that a small percentage of the user base might want added in the future.

How easy should it be to add features to the system?

Features will be easy to add, and require a small update on the user end. This is the only time an internet connection will be required, and should automatically update.

How easy should it be to port (migrate) the system from one platform to another?

The technology and program will be easy to port from Android to Apple. The issue will be getting the app approved for the Apple app store, which is notoriously difficult.