On the Throwing of Gnomes, and the Maximization of Said Throws

u/aedificatori

1 Background

Recently, Brewmaster Meg of the Dungeons and Dragons Meme group on Facebook brought to my attention the work of one u/patxipierce from Reddit, detailing a set of mechanics for throwing gnomes. There being a gnome in my current campaign's party, my instinctive reaction was to share this with them and immediately start plotting how to best (ab)use this new action.

The core of u/patxipierce's mechanic is simple and elegant. Based on a character's strength, they may throw a gnome some distance, based on the table shown here, which assumes the character is strong enough to throw an average weight, unencumbered, willing gnome in the first place (information directly from u/patxipierce's document, found at `http://homebrewery.naturalcrit.com/share/rkbNJW8xkM`).

Table 1: Unmodified distance d a gnome can be thrown based on strength stat s.

Strength Stat	4, 5, 6, 7	8, 9, 10	11, 12	13, 14	15	16, 17	18	19, 20
Distance (ft.)	5	10	15	20	25	30	40	45

There a few modifiers that augment the listed distances, those including whether the gnome is being thrown one-handed (divide distance by 2), whether the throw has a running start (+5 throwing feet for every 10 ft of speed used), and how large the thrower is (multiply distance by 2 for a large creature throwing, 4 for a huge creature throwing, etc.).

Now, I don't know about you, but I am instantly wondering *just how far* I can throw our party's gnome. They wondered precisely the same, and immediately wondered about midair turns. The rest of this document follows from that question, summarized here: "If we take an action to pick up and throw a gnome, what is the maximum distance we can throw that gnome?"

2 First Steps

The easiest augmentation to take advantage of, for any character, is movement leading up to the throw. On a given turn, a character has a certain base speed b. This speed can be increased during our bonus action in a variety of ways, most notably Step of the Wind and Cunning Action. Recall that since the throwing of the gnome requires our action, any speed increases must be performed through a bonus action. Let us refer to any bonus action speed increase by a multiplier m attached to the base speed b. This formulation yields the following equation for gnome throw distance, based on the running start modifier, using the notation $d(s)$ to refer to the information found in Table 1. The total distance thrown will be referred to as D.

$$D = d(s) + 5 \cdot (mb) \bmod 10 \tag{1}$$

As an example, consider a Medium creature with $s = 10$ and $b = 30$ ft. Such a creature would be able to throw a gnome $D = 25$ ft.

3 A Bit of Magic

In the case of our party's gnome, who is a wizard, we can introduce some magical influence to our throw. Namely, our Wizard has Feather Fall, which reduces one's falling speed. Another candidate for slowing one's fall is the Levitate spell, but the mechanics surrounding this spell are more complex (and negate some of the interest in throwing distance in the first place). As such, Levitate will be considered to fall outside the purview of this brief report.

In the case of a standard throw, approximately half the time spent in the air – and therefore half of the time spent moving horizontally – will be spent falling. We can represent the total distance thrown in these terms as shown, taking p_r as the proportion of the base throw spent rising and p_f as the proportion of the base throw spent falling.

$$D = \Big(p_r + p_f\Big)\Big(d(s) + 5 \cdot (mb) \bmod 10\Big) \tag{2}$$

Without any modification, $p_r = p_f = 1/2$, which recovers Equation 1. If we consider as an example the effect of Feather Fall, however, which reduces falling speed to 60 ft per turn, down from the 500 ft per turn as normal (ref: Xanathar's Guide, page 77), we obtain a multiplier for p_f equal to $500/60 = 8.33$. Thus, a Feather Fall-augmented throw takes the following characteristics, with $p_f = 8.33/2$. Note that Feather Fall may be cast as a reaction and may be cast by the gnome being thrown, and as such does not interfere with any action or bonus action of the thrower.

$$D = 4.7 \cdot \Big(d(s) + 5 \cdot (mb) \bmod 10\Big) \tag{3}$$

To make this easier to remember and use in-game, let us simplify this and say that using Feather Fall multiplies the throw distance by a factor of 5 (for the persnickety, the extra 0.3 can be explained away by optimizations made to the throw – a base throw will likely be made at an angle of 45 degrees from horizontal, but with feather fall, one could throw at a slightly lower angle to achieve a slightly further distance given the lower speed when falling).

Other mechanics may be used to extend throw distance, using this same analytical setup, but for now I will restrict my analysis to Feather Fall given its relative simplicity.

4 A Bit of Geometry

Care must be taken on different types of terrain, namely hills, to throw your gnome the furthest distance. This especially comes into play when you have characters that can run up walls, such as higher-level Monks.

When a creature throws a gnome, the gnome will travel out of the creatures hands with a speed v, which is componentized into its horizontal and vertical parts $v_h = v\cos\theta$ and $v_v = v\sin\theta$. On horizontal ground, this means our gnome is thrown at a 45 degree angle from the ground to achieve maximum distance.

If running up a 45 degree slope, however, the thrower may devote all their strength to horizontal velocity relative to their own movement, thus making v_h relative to their own movement equal to v. This extrapolates to any other angle of slope, and in this way, if the thrower is running up a slope of angle θ, the thrown distance can be multiplied by $1/\cos\theta$.

Extending Equation 2 with this information yields the following formulation, assuming running up a slope of angle θ. A selection of common slopes is provided below in Table 2, which describes a rounded multiplier shown in this equation as $M(\theta)$.

$$D = M(\theta)\Big(p_r + p_f\Big)\Big(d(s) + 5 \cdot (mb) \bmod 10\Big) \tag{4}$$

There are other geometric considerations to make when throwing your gnome, such as when throwing your gnome off a cliff, but such calculations are left as an exercise to the reader.

Table 2: Multipliers based on angle of the slope being run up θ. Note that the bold elements on the right of the table have been calculated with $\cos(\pi/2 - \theta)$, since past a certain point the slope requires the thrower to thrown downwards at an increasing angle to achieve the same distance.

Angle (deg)	0	5	10	15	30	45	**60**	**75**	**80**	**85**	**90**
$\cos\theta$	1.00	0.99	0.98	0.97	0.87	0.71	**0.87**	**0.97**	**0.98**	**0.99**	**1.00**
$1/\cos\theta$	1.00	1.01	1.02	1.04	1.15	1.41	**1.15**	**1.04**	**1.02**	**1.01**	**1.00**
Rounded Multiplier	1	1	1	1	1.2	1.4	**1.2**	**1**	**1**	**1**	**1**

5 A Case Study

Since these calculations were developed primarily for my own campaign, I will conclude with a case study based on my own character and my party's gnome wizard. My character is a 5th-level Tabaxi Monk, which gives me access to Feline Agility and Step of the Wind. Our DM ruled that I could use Dexterity for this throw in place of Strength, so my relevant stat is 18. My gnome friend is a 5th-level Wizard, with access to the spells Feather Fall and Enlarge/Reduce.

Let us step through the completed throw distance equation, replicated here.

$$D = M(\theta)\Big(p_r + p_f\Big)\Big(d(s) + 5 \cdot (mb) \bmod 10\Big)$$

For simplicity, let us assume flat, open ground, making $M(\theta) = 1$. My gnome friend will use Feather Fall as a reaction upon being thrown, setting $p_r + p_f \approx 5$. Given my Dexterity stat of 18, we also have $d(s = 18) = 40$ ft. My base speed is 40 ft, which I can double first with Step of the Wind by using a ki point as a bonus action, and then double again using Feline Agility (which is simply invoked upon starting movement). This yields $m = 4$, so $mb = 160$ ft.

Plugging this all in, we get:

$$D = 1 \cdot 5 \cdot (40 \text{ ft } + 5 \cdot 160 \bmod 10) = 5 \cdot (40 + 80) = 600 \text{ ft} \tag{5}$$

As such, we can throw our gnome about 600 ft, or about a tenth of a mile. [1]

[1] This report is meant as a grave abuse of the D&D 5e physics system, and was primarily written for self-serving amusement. Some elements may be wrong or vaguely bent out of shape, and I take no responsibility for damage sustained by thrown gnomes.