

[Last week](#) I wrote that if you play a Noxious Fumes card, every opponent monster with h health points or less will be dead in $\sqrt{2h}$ turns.¹

What about the upgraded Noxious Fumes+? Well amazingly, if you play a Noxious Fumes+, then the monster dies in \sqrt{h} turns or less.

In fact, if

- the monster can't heal,
- the monster experiences no poison damage on the turn that the Noxious Fumes+ is played,
- it experiences 3 poison damage on the turn after Noxious Fumes+ is played, 5 poison damage on the next turn, 7 on the next, and so on for

$$t = \text{floor}(\sqrt{h}) \quad \text{turns, and}$$

- the monster experiences only poison damage,

then the monster will be die *exactly* t turns after the Noxious Fumes+ is played.

Notation: $\text{floor}(x)$ is the largest whole number less than or equal to x . It is x rounded down. For example

$$\text{floor}(3) = 3, \text{ floor}(4.8) = 4, \text{ and } \text{floor}(\pi) = 3.$$

Example 1

Suppose there is a minion that has 8 hit points when the Noxious Fumes+ is played. Suppose that the minion is not healed, it has no poison on the turn that the Noxious Fumes+ is played, and you do not take any other offensive actions against that minion (nor do you play any area of effect cards). Then, that minion will die in exactly

$$t = \text{floor}(\sqrt{8}) = \text{floor}(2.8284) = 2$$

turns.

One turn after the Noxious Fumes+ is played, it experiences 3 points poison damage, and the following turn it dies with 5 additional points poison damage.

¹If the monster can't heal or avoid poison damage, and it experiences 2 poison damage on the next turn after an ordinary Noxious Fumes is played, 3 poison damage on the next turn, 4 on the next, and so on, then it will be dead within $\sqrt{2h}$ turns after the Noxious Fumes is played. With [a few more calculations](#), you can get better, 100% accurate, but more complicated formula for the number of turns to death if all the damage comes from the Noxious Fumes card.

Example 2

Suppose there is a monster that has 25 hit points when the Noxious Fumes+ is played. Suppose that the monster is not healed, it has no poison on the turn that the Noxious Fumes+ is played, and you do not take any other offensive actions against that monster (nor do you play any area of effect cards). Then, that monster will die in exactly

$$t = \text{floor}(\sqrt{25}) = \text{floor}(5) = 5$$

turns.

The total poison damage over the next 4 turns is $3+5+7+9 = 24$. On the fifth turn after the Noxious Fumes+ is played, it experiences 11 additional poison damage and dies.