

A Potpourri of Potter Problems

[Questions 1, 2, and 3 were found on Youtube from “mrpenguinbobman”]

1. Harry and Malfoy are having a grudge match to decide who is the better wizard. Harry uses an Expelliarmus charm and knocks Malfoy's wand straight up into the air at an initial velocity of 16 ft/sec. What would the maximum height the wand would reach if its initial position is 4 feet and acceleration due to gravity is -32 ft/sec^2 ?



2. The rate at which wizards pass through the wall into Platform $9\frac{3}{4}$, measured in wizards per minute, is modeled by the function $F(t) = 24 + 2\sin\left(\frac{t}{2}\right)$ for the times the platform is open, $0 \leq t \leq 30$ in minutes.

To the nearest whole number, how many wizards enter the platform in the 30 minute period?



3. Voldemort and his Death Eaters are harming wizards and Muggles at a rate given by the function $y = Ce^{kt}$ where y is measured in people/year. The harm rate doubles every 5 years and the rate at the time Voldemort came back to power was 3 people/year. How many people will Voldemort have harmed by Harry's first year at Hogwart's , assuming he came back to power on the day of Harry's birth? [Harry is 11 when he enters his first year at Hogwart's.]



4. It seems like it rains a lot at Hogwarts. The rainfall rate in cm per hour was measured during a 10-hour storm. Use the trapezoid rule to estimate the total amount of rain during the storm.

Time [hours]	0	1	3	4	5	6	7	8	10
Rate in cm/hour	0	0.5	1	0.2	1.5	2	0.3	1	1

