

# Matthew Trautmann

## Sprint 2

$$1. p(\text{she's a witch} | \text{no letter}) = \frac{p(\text{she's a witch}) \times p(\text{no letter} | \text{witch})}{p(\text{no letter})}$$

$$p(\text{no letter}) = p(\text{no letter} | \text{witch}) \times p(\text{witch}) + p(\text{no letter} | \text{nowitch}) \times p(\text{nowitch})$$

$$(.03) \times (.75) + (.99) \times (.25) = .27$$

$$p(\text{no letter}) = .27$$

$$p(\text{she's a witch} | \text{no letter}) = \frac{(.75) \times (.03)}{.27} = \boxed{.083}$$

$$2. E[X] = 1 + 30/29 + 30/28 + \dots + 30/2 + 30/1$$

$$\sum_{n=0}^{29} \frac{30}{30-n} \approx 119.84$$

$$3. p(\text{evil} | \text{slitherin}) = \frac{p(\text{slitherin} | \text{evil}) \times p(\text{evil})}{p(\text{slitherin})}$$

$$p(\text{slitherin} | \text{evil}) = 1$$

$$p(\text{evil}) = .1$$

$$p(\text{slitherin}) = (p(\text{slitherin} | \text{evil}) \times p(\text{evil})) + (p(\text{slitherin} | \text{not evil}) \times p(\text{not evil}))$$

$$((1) \times .1) + (.2) \times (.9)$$

$$p(\text{slitherin}) = .28$$

$$p(\text{evil} | \text{slitherin}) = \frac{(1) \times (.1)}{.28} = \boxed{.357}$$