

Entropy Exercises.

5.

$$\text{Shannon Entropy} = - \sum_{i=1}^N p_i \log_2(p_i)$$

$N=2$ as outcome is either T or F.

p_1 and $p_2 = \frac{1}{2}$, as 6/12

Watts are True, 6/12 are False

$$= - \sum_{i=1}^2 \frac{1}{2} \log_2\left(\frac{1}{2}\right)$$

$$= -2 \left(\frac{1}{2}\right) \log_2\left(\frac{1}{2}\right) = \cancel{-2} - (-1)$$

as 1.

Friday = T

6. $X_4, X_5, X_9, X_{10}, X_{12}$

Wait: T, F, F, F, T

$$p_1 = 2/5 \quad p_2 = 3/5 \quad > - \sum_{i=1}^2 p_i (\log_2(p_i))$$

$$\text{Friday} = \boxed{0.971}$$

2:1

4:2

4:3

$$p_1 = 4/7 \quad p_2 = 3/7 \quad = - \left(\frac{4}{7} \log_2 \left(\frac{4}{7} \right) + \frac{3}{7} \log_2 \left(\frac{3}{7} \right) \right)$$

$$\text{Not Friday} = \boxed{0.985}$$

7. ~~2/12, 5/12~~

$$\frac{7}{12} \cdot 0.985 + \frac{5}{12} (0.971) = \boxed{0.979}$$

$$1 - 0.979 = \boxed{0.021} \text{ decrease}$$

8. When $es + > 60$, wait always = F.

Entropy of 0: $es + > 60$

type = French: 6:6, entropy of 1.

Entropy of 1: type = French

Alt, every value has entropy of 1,
6:6