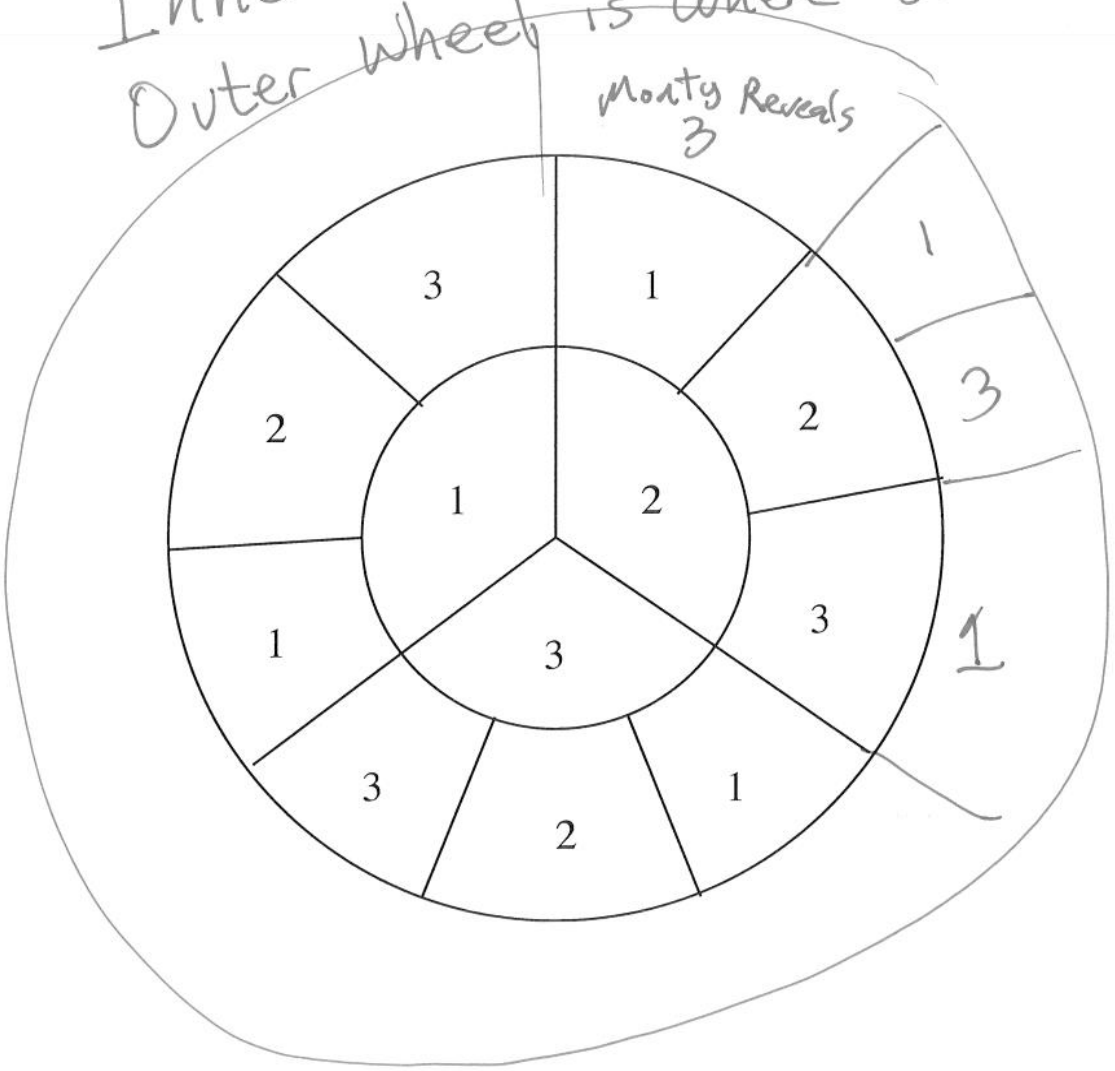
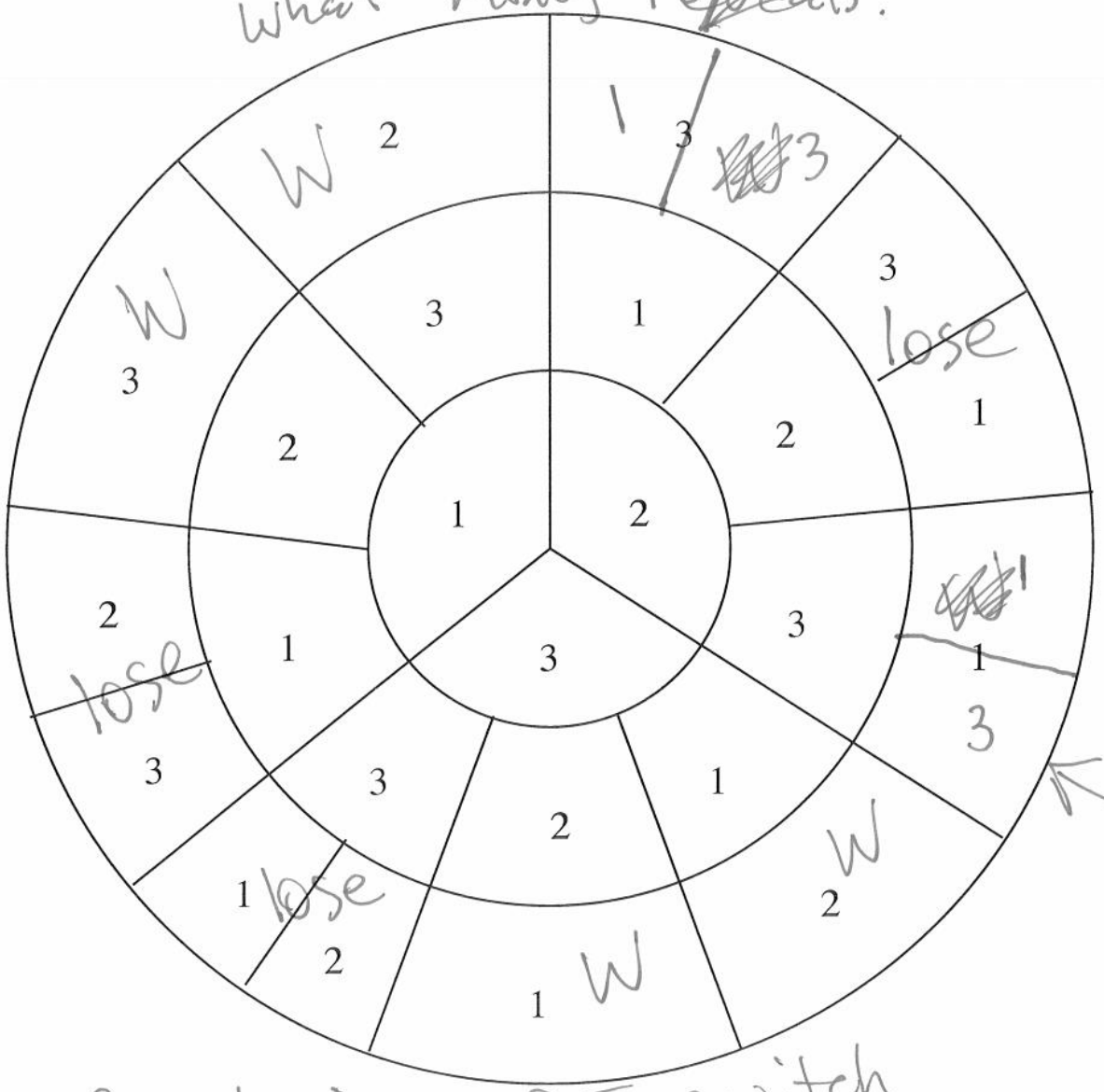
Inner wheel is players pick
Outer wheel is where the car is.



Outer wheel represents what Monty reveals.

Game over



Conclusion: If I switch then win 2/3 of the time

Basic Requirements

1. The more probable the event the smaller the uncertainty

   $h(x)$ should be a decreasing function

2. The uncertainty about the simultaneous occurrence of two independent events is equal to the sum of the individual uncertainties

   $$h(xy) = h(x) + h(y)$$

3. Small changes in the probability should correspond to small changes in the uncertainty

   $h(x)$ should be a continuous function

4. Recording the outcome of a 50/50 situation requires one binary register.

   $$h(1/2) = 1 \text{ (bit)}$$

Therefore $h(x) = \log_2 1/x$

$h(x \cdot y) = \log_2(1/xy) = \log_2(1/x) + \log_2(1/y)$
$= h(x) + h(y)$

$= \log_e 1/x \,/\, \log_e(2)$

$h'(x) = \frac{1}{1/x} \cdot \left(-\frac{1}{x^2}\right) / \log_e(2)$

Information Theory Definitions

Definition: The Entropy of a random variable X

$$H(X) = \sum_a P[X = a] \; log_2 \left(\frac{1}{P[X = a]} \right)$$

measures the uncertainty for random variable X.

Definition: The entropy of two random variables X and Y.

$$H(X, Y) = \sum_{a,b} P[X = a \;\&\; Y = b] \; log_2 \left(\frac{1}{P[X = a \;\&\; Y = b]} \right)$$