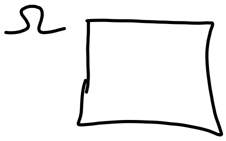
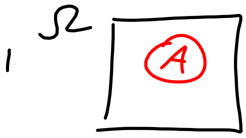
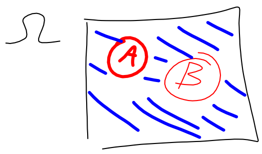


$$\sigma(\Omega) = \{\emptyset, \Omega\}$$

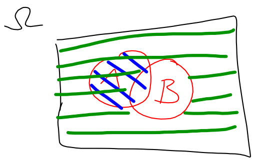


$$\sigma(A) = \{\emptyset, \Omega, A, A^c\}$$

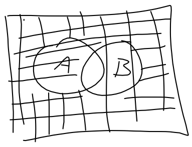


$$\sigma(B) = \{\emptyset, \Omega, B, B^c\}$$

$$\sigma(A,B) = \{\emptyset, \Omega, A, B, A^c, B^c, A\cup B, (A\cup B)^c\}$$



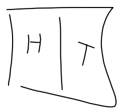
$$\sigma(A,B) = \{\emptyset, \Omega, A, B, A^c, B^c, A\cup B, (A\cup B)^c, A\cup B^c, (A\cup B^c)^c, B\cup A^c, (B\cup A^c)^c, A^c\cup B^c, (A^c\cup B^c)^c, (A^c\cup B^c)^c \cup (A\cup B)^c, \left((A^c\cup B^c)^c \cup (A\cup B)^c\right)^c\}$$



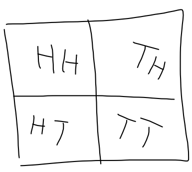
\# elements in sigma-algebra $= 2^{\#\text{distinct regions}}$

$\omega_i = \{H, T\}$ $\quad \omega = \{\omega_i\}$

$$\sigma(\omega_1) = \{\emptyset, H, T, \Omega\}$$

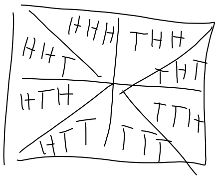


$$\sigma(\omega_1\omega_2) = \{\emptyset, \Omega, HH, HT, TH, TT, HH^c, HT^c, TH^c, TT^c, HH\cup TT, (HH\cup TT)^c, HH\cup HT, (HH\cup HT)^c, HH\cup TH, (HH\cup TH)^c\}$$



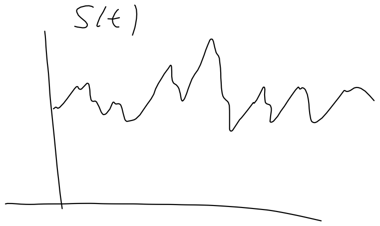
$\sigma(\omega_1\omega_2\omega_3)$

256 elements

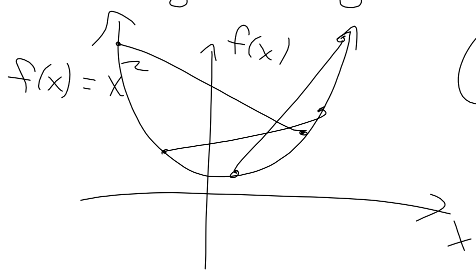


$$X(\omega_i) = \begin{cases} 1 & \omega_i = H \\ -1 & \omega_i = T \end{cases}$$

$$M(n) = \sum_{i=1}^{n} X(\omega_i) \qquad M(0) = 0$$



$$E\left[(X - E[X])^2\right] = E\left[X^2 - 2XE[X] + E[X]^2\right]$$
$$= E[X^2] - 2E[XE[X]] + E[E[X]^2]$$
$$= E[x^2] - 2E[x]E[X] + E[X]^2$$
$$= E[X^2] - E[X]^2$$



$$(E[X])^2 \leq E[X^2]$$
$$E[X^2] - E[X]^2 \geq 0$$

$$Var(\alpha X + \beta Y) = E\left[(\alpha X + \beta Y)^2\right] - E[\alpha X + \beta Y]^2$$
$$= E\left[\alpha^2 X^2 + 2\alpha\beta XY + \beta^2 Y^2\right] - (\alpha E[X] + \beta E[Y])^2$$
$$= \alpha^2 E[X^2] + 2\alpha\beta E[XY] + \beta^2 E[Y^2] - \alpha^2 E[X]^2 - 2\alpha\beta E[X]E[Y] - \beta^2 E[Y]^2$$
$$= \alpha^2 Var(X) + 2\alpha\beta Cov(X, Y) + \beta^2 Var(Y)$$

$$\underline{Q(n)} = \sum_{i=2}^{n+2} X_i \qquad \sigma_{J1}(n)$$

$$\in X_{n+1}, X_{n+2}$$
$$\omega_{n+1}, \omega_{n+2}$$