Today in MA40189:

- consider an experiment with possible outcomes $\theta \in \Theta$
  - chose some decision $d \in \mathcal{D}$ where the consequences depend upon θ
  - loss function $L(\theta, d)$ measures consequence of decision d if θ occurs
  - want to minimise loss: if $L(\theta, d_1) < L(\theta, d_2)$ we prefer d_1 to d_2
- focus upon statistical decision theory: consider d as being a method of inference for θ
- statistical decision problem: $[\Theta, \mathcal{D}, \pi(\theta), L(\theta, d)]$
  - solve $[\Theta, \mathcal{D}, f(\theta), L(\theta, d)]$ for immediate decision
  - solve $[\Theta, \mathcal{D}, f(\theta \mid x), L(\theta, d)]$ for decision having observed the sample x
- Bayes risk $\rho^*(\pi)$ minimises expected loss

$$\rho(\pi, d) \;=\; \int_\theta L(\theta, d)\pi(\theta)\, d\theta$$

- Bayes rule d^* decision which achieves Bayes risk
- example of quadratic loss: Bayes rule is the mean, Bayes risk is the variance