

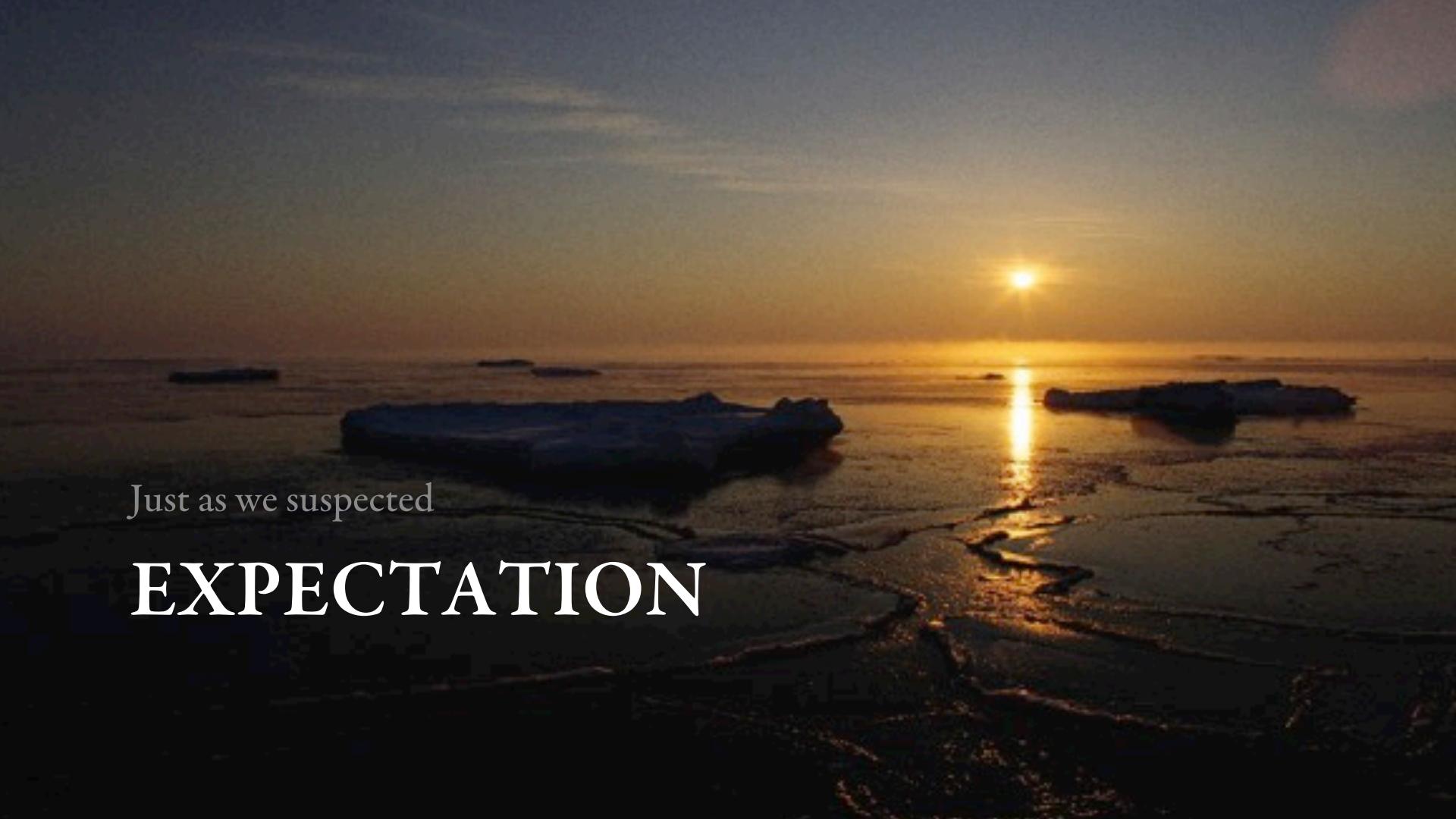


ASQ CRE Prep course

Lesson II. A. 2. c.

Basic Probability Concepts

Expectation

A wide-angle photograph of a sunset over a calm body of water. The sky is a gradient from dark blue at the top to a bright orange and yellow near the horizon. The sun is a small, bright yellow dot in the center-right. On the dark, silhouetted shore in the foreground, several people are standing in small groups, their figures dark against the bright water. The water reflects the sky's colors, creating a bright path of light on the right side.

Just as we suspected

EXPECTATION

Expected Value

- The expected value is like a weighted average
- The mean is the expected value of a random variable

$$\mu = E[x] = \int xf(x)dx$$

$$\mu = E[x] = \sum p_i x_i$$

Variance and Notes

$$Var(x) = E[(x - \mu)^2] = \sigma^2$$

X is a random variable and c is a constant, then

$$E[c] = c$$

$$Var[c] = 0$$

$$E[x] = \mu$$

$$Var[x] = \sigma^2$$

$$E[cx] = cE[x] = c\mu$$

$$Var[cx] = c^2Var[x] = c^2\sigma^2$$

Robustness

- **Some statistical procedures still work well enough even if the underlying assumptions are not totally true**

$$Var[s^2] = \frac{2\sigma^4}{n-1} \left(1 + \frac{n-1}{2n} \left(\frac{\mu^4}{\sigma^4} - 3 \right) \right)$$

$$E[s^2] = \sum \frac{s_i^2}{n} = \sigma^2$$

$$Var[s^2] = \frac{2\sigma^4}{n-1}$$

normal

Not normal

Do you see any
similarity between
histograms and PDFs?



ASQ CRE Prep course

Lesson II. A. 3. a.

Probability Distributions

The Four Functions