Section 1

MANE 3332.04

Subsection 1

Lecture 6, February 12

Agenda

- Complete Chapter 2 lecture
- **New: Two Events Quiz (assigned 2/12/2025, due 2/17/205)**
- Attendance

Handouts

- Lecture 6 Slides
- Lecture 5 Marked Slides

Multiplication Rules

- This rule provides another method for calculating $P(A \cap B)$

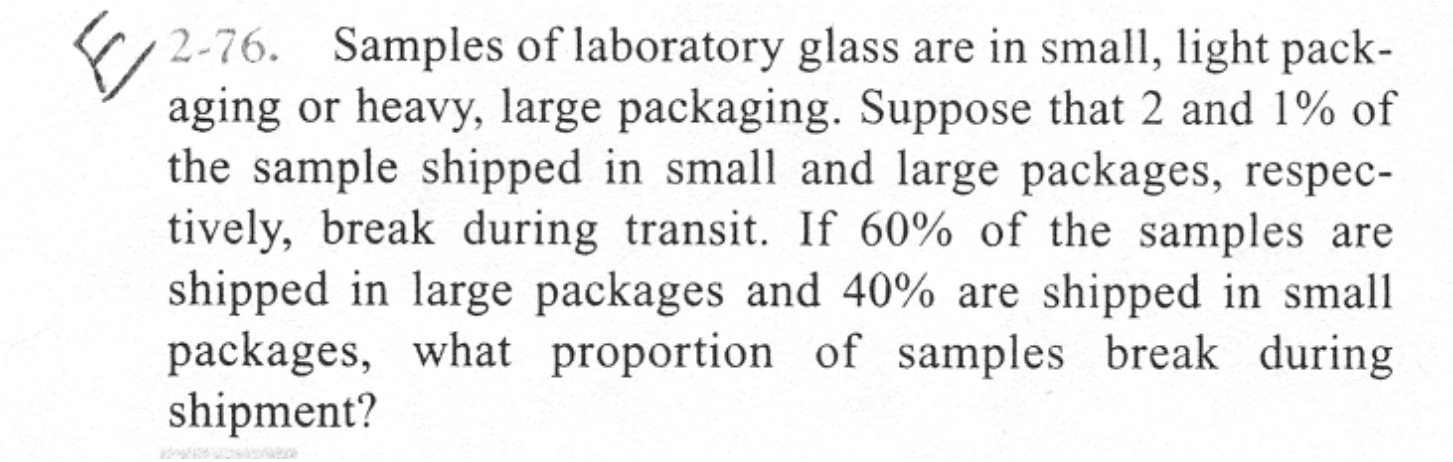
$$P(A \cap B) = \quad P(A|B)P(B) = P(B|A)P(A)$$

- This leads to the total probability rule

$$\begin{aligned} P(B) = & \quad P(B \cap A) + P(B \cap A') \\ = & \quad P(B|A)P(A) + P(B|A')P(A') \end{aligned}$$

- Consider problems from 3rd edition (next slide) and 2-129

Example Problem 2-76



2-76. Samples of laboratory glass are in small, light packaging or heavy, large packaging. Suppose that 2 and 1% of the sample shipped in small and large packages, respectively, break during transit. If 60% of the samples are shipped in large packages and 40% are shipped in small packages, what proportion of samples break during shipment?

Figure 1: problem 2-76

Independent Events

- Two events are independent if any one of the following is true:
  1. $P(A|B) = P(A)$
  2. $P(B|A) = P(B)$
  3. $P(A \cap B) = P(A)P(B)$
- Consider problem 2-146

Reliability Analysis

- Reliability is the application of statistics and probability to determine the probability that a system will be working properly
- Components can be arranged in series. All components must work for the system to work.

$$P(\text{system works}) = P(A \text{ works})P(B \text{ works})$$

- Components can be arranged in parallel. As long as one component works, the system works.

$$P(\text{system works}) = 1 - (1 - P(A \text{ works})) \times 1 - P(B \text{ works}))$$

- Consider problem 2-157