

# Probability

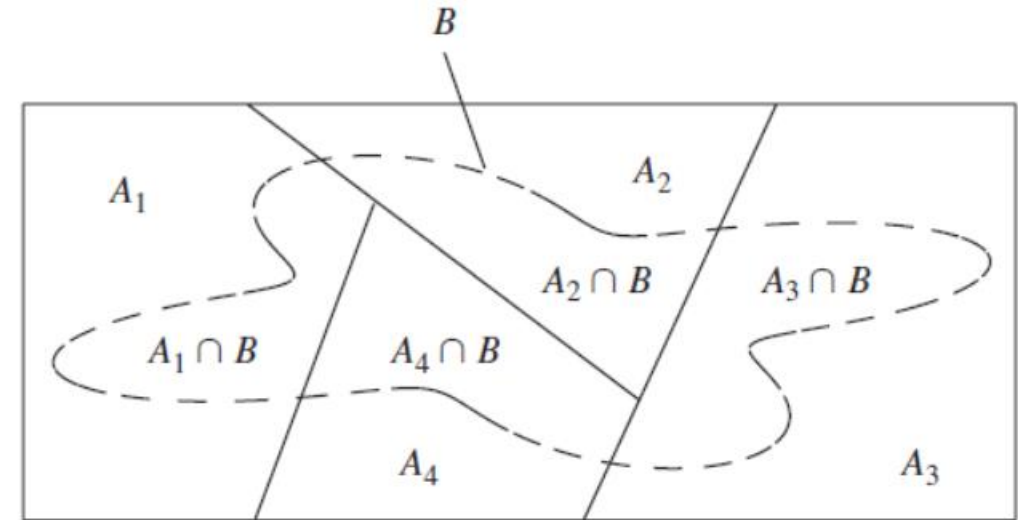
## Law of Total Probability | Conditional Probability

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<https://youtube.com/drmelhosseini>

# | Intro...

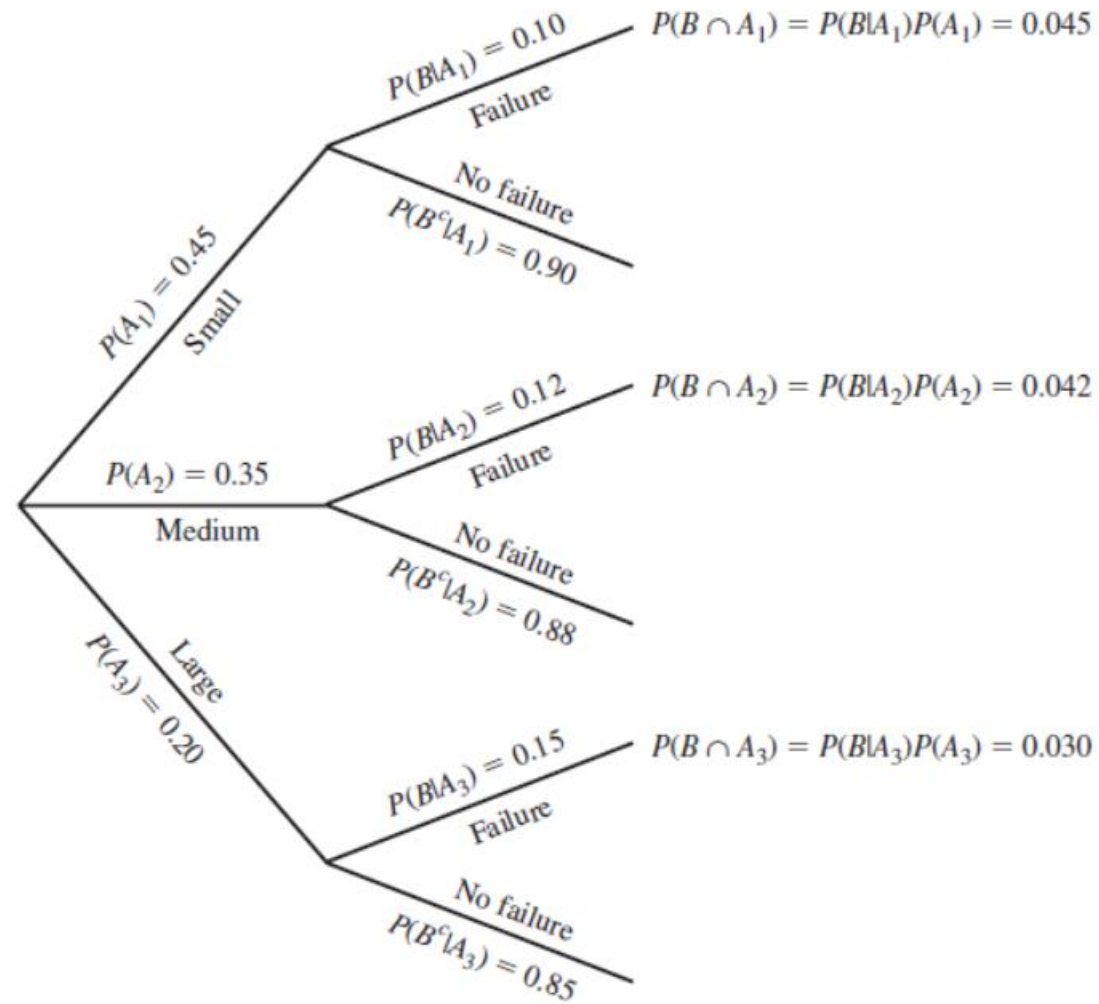
- Assume a sample space contains the events  $A_1$ ,  $A_2$ ,  $A_3$ , and  $A_4$ . These events are **mutually exclusive**, since **no two overlap**.
- They are also **exhaustive**, which means that **their union covers the whole sample space**.
- Each outcome in the sample space belongs to one and only one of the events  $A_1$ ,  $A_2$ ,  $A_3$ ,  $A_4$



## | Example

- Customers who **purchase a certain make of car** can order an **engine** in any of **three sizes**. Of all cars sold, **45%** have the **smallest engine**, **35%** have the **medium-sized** one, and **20%** have the **largest**. Of cars with the **smallest engine**, **10% fail an emissions test** within two years of purchase, while **12%** of those with the **medium size** and **15%** of those with the **largest engine fail**.
- **What is the probability that a randomly chosen car will fail an emissions test within two years?**

# | Example



# | References

- Statistics for Engineers and Scientists, Fourth Edition, William Navidi  
Colorado School of Mines
- Khan Academy