

Probability and Statistics

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Textbooks

❑ **Probability & Statistics for Engineers & Scientists**, Ninth Edition, Ronald E. Walpole, Raymond H. Myer

❑ **Elementary Statistics: Picturing the World**, 6th Edition, Ron Larson and Betsy Farber

❑ **Elementary Statistics**, 13th Edition, Mario F. Triola

Reference books

- ❑ **Probability Demystified**, Allan G. Bluman
- ❑ **Schaum's Outline of Probability and Statistics**
- ❑ **MATLAB Primer**, Seventh Edition
- ❑ **MATLAB Demystified** by McMahan, David

References

Readings for these lecture notes:

❑ **Schaum's Outline of Probability, Second Edition (Schaum's Outlines)**

by Seymour Lipschutz, Marc Lipson

❑ **Probability & Statistics for Engineers & Scientists**, Ninth Edition, Ronald E. Walpole, Raymond H. Myer

These notes contain material from the above resources.

Finite Stochastic Processes And Tree Diagrams

- ❑ A (finite) sequence of experiments in which each experiment has a finite number of outcomes with given probabilities is called a **(finite) stochastic process**.
- ❑ A convenient way of describing such a process and computing the probability of any event is by a **tree diagram**.

Example:

We are given three boxes as follows:

Box 1 has **10** light bulbs of which **4** are defective.

Box 2 has **6** light bulbs of which **1** is defective.

Box 3 has **8** light bulbs of which **3** are defective.

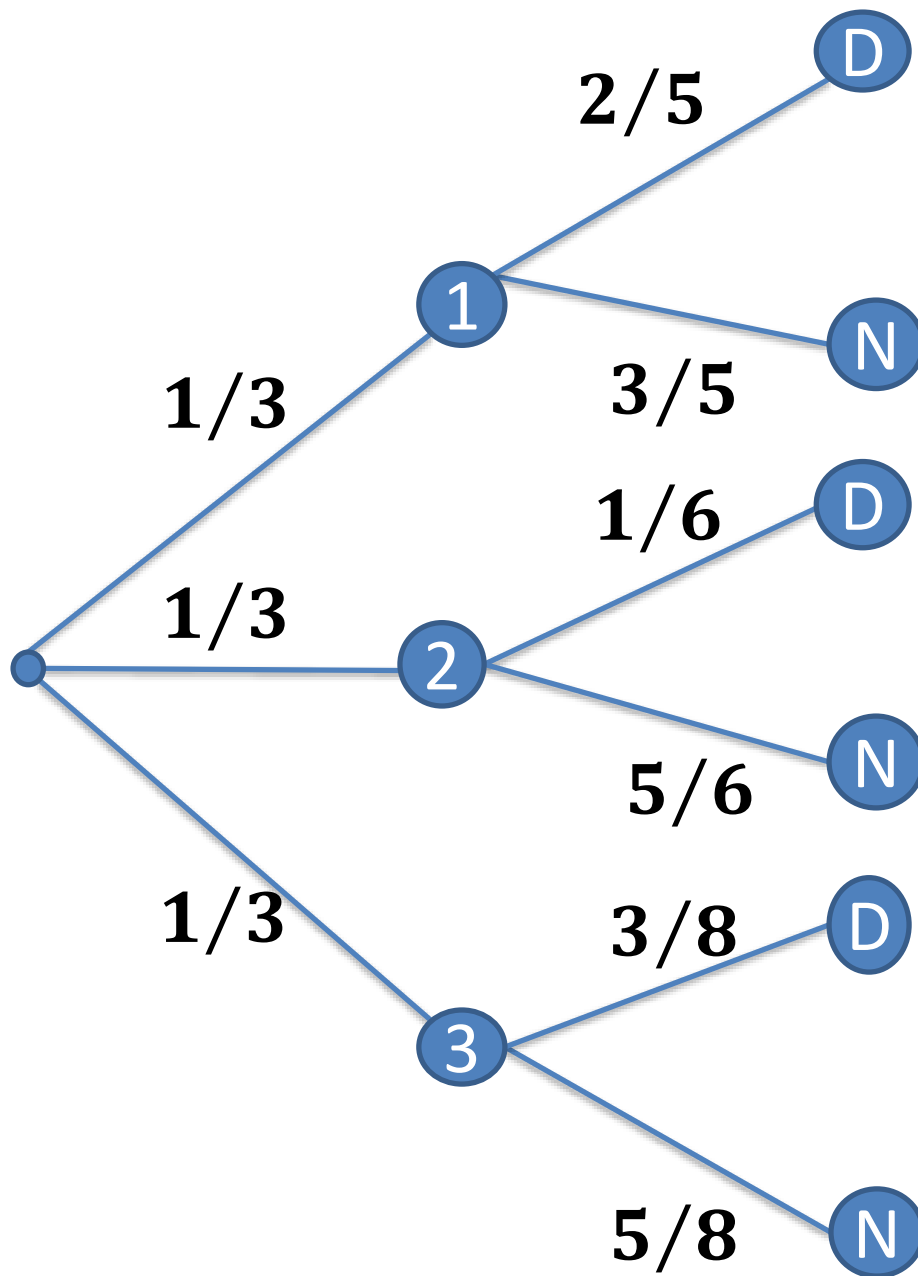
We select a box at random and then draw a bulb at random. What is the probability **p** that the **bulb** is **defective**?

Solution:

Here we perform a sequence of two experiments:

(i) select one of the three boxes;

(ii) select a bulb which is either defective (***D***) or nondefective (***N***).

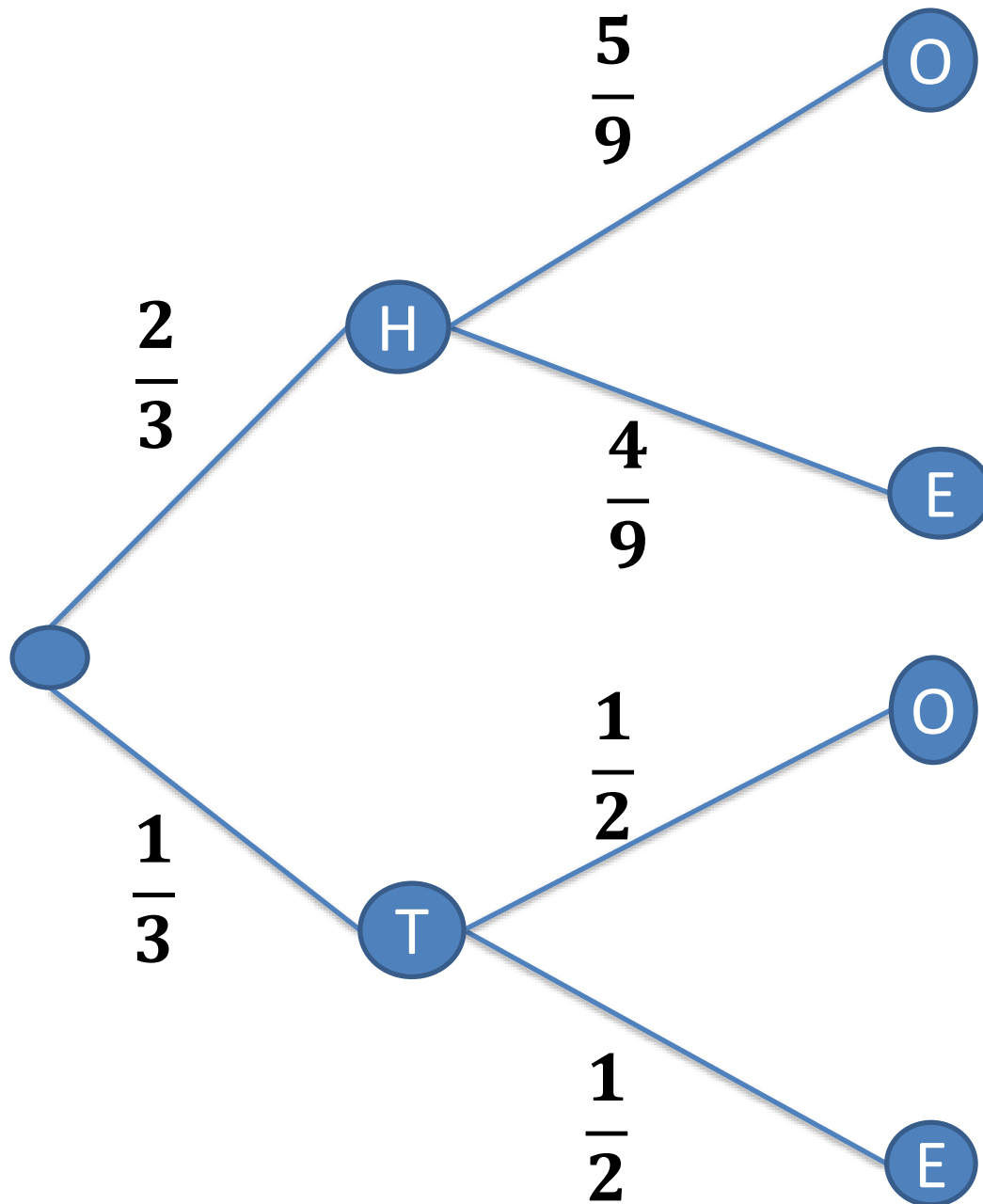


Thus by the multiplication theorem,

$$\mathbf{p} = \left(\frac{1}{3}\right)\left(\frac{2}{5}\right) + \left(\frac{1}{3}\right)\left(\frac{1}{6}\right) + \left(\frac{1}{3}\right)\left(\frac{5}{8}\right) = \frac{\mathbf{113}}{\mathbf{360}}$$

Example : A coin, weighted so that $P(H) = \frac{2}{3}$ and $P(T) = \frac{1}{3}$, is tossed. If **heads** appears, then a number is selected at random from the numbers **1 through 9**; if **tails** appears, then a number is selected at random from the numbers **1 through 6**.

Find the probability p that an **even number** is selected.



Probability of even using 1 through 9:

$$P(E) = \frac{4}{9}$$

Probability of even using 1 through 6:

$$P(E) = \frac{3}{6} = \frac{1}{2}$$

$$\mathbf{p} = \left(\frac{2}{3}\right)\left(\frac{4}{9}\right) + \left(\frac{1}{3}\right)\left(\frac{1}{2}\right) = \frac{\mathbf{25}}{\mathbf{54}}$$