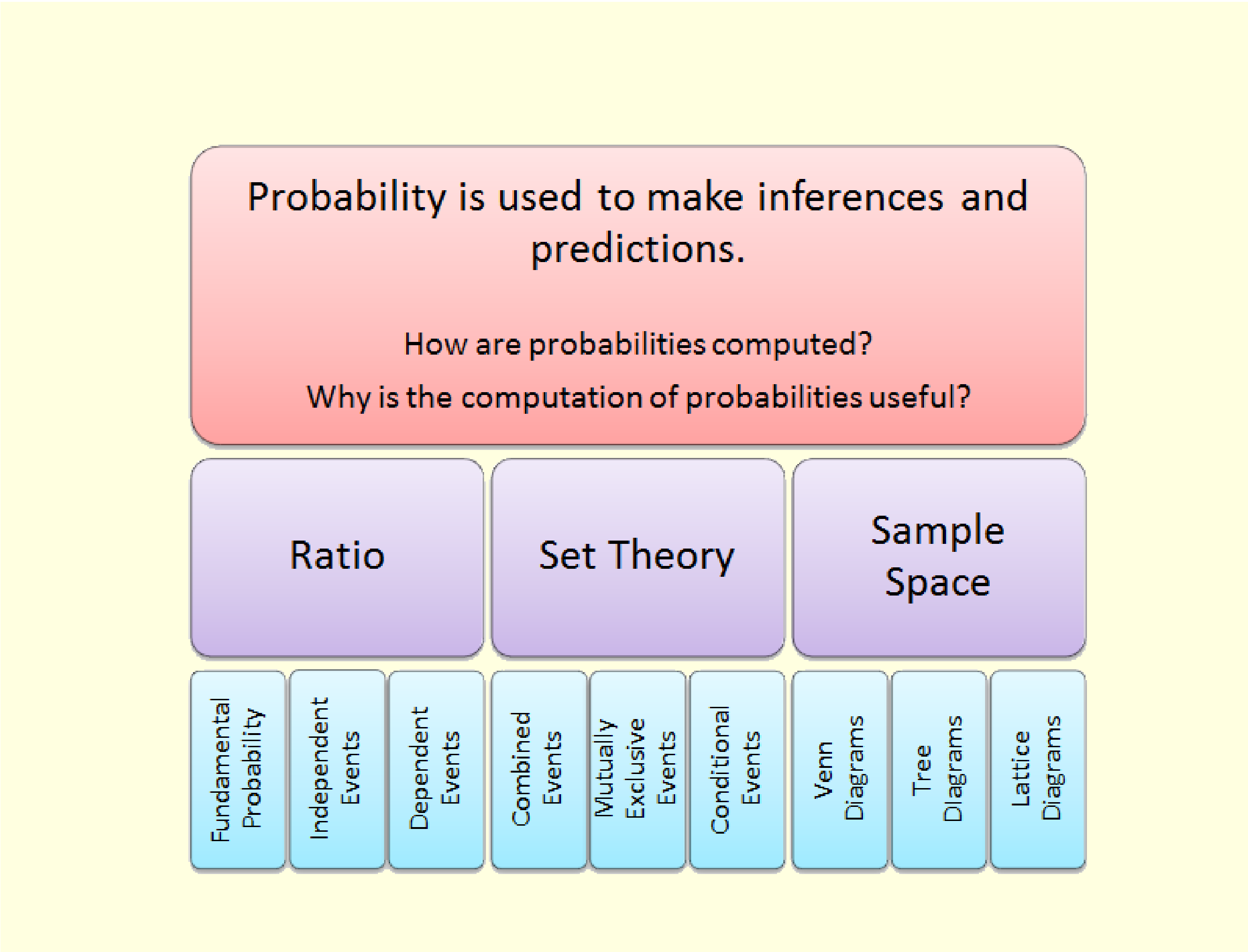
P.2 Independent and Dependent Events


Probability is used to make inferences and predictions.
How are probabilities computed?
Why is the computation of probabilities useful?
Ratio
Set Theory
Sample Space
Fundamental Probability
Independent Events
Dependent Events
Combined Events
Mutually Exclusive Events
Conditional Events
Venn Diagrams
Tree Diagrams
Lattice Diagrams

Find the probability of getting a sum of 5 on the first toss of two dice and a sum of 3 on the second toss.

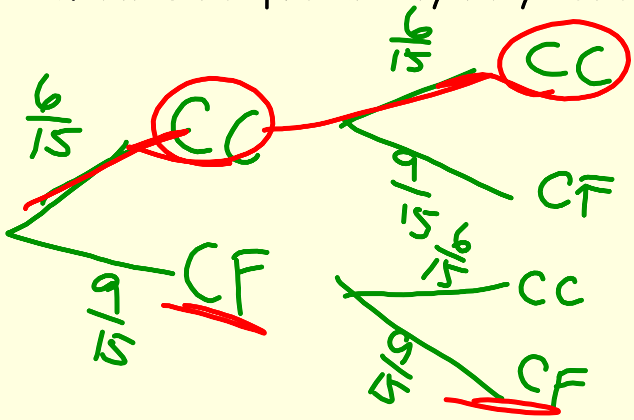
$$P(\text{sum } 5) = \frac{4}{36}$$

$$P(\text{sum } 3) = \frac{2}{36}$$

$$P(5 \cap 3) = \frac{4}{36} \cdot \frac{2}{36} = \frac{1}{162}$$

A shelf contains 9 boxes of Corn Flakes and 6 boxes of Captain Crunch. Ahmed chooses one box at random, then puts it back. A second person does the same thing.

What is the probability they both chose Captain Crunch?



$$P(CC \cap CC) = \frac{6}{15} \cdot \frac{6}{15} = \frac{36}{225}$$

What is the probability they both chose the same cereal?

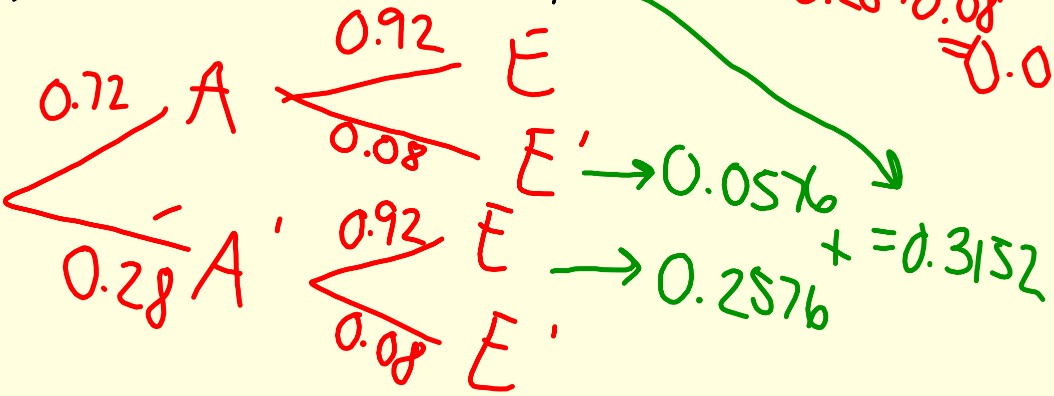
$$P(CC \cap CC \cup CF \cap CF)$$

$$= \frac{36}{225} + \frac{9}{15} \cdot \frac{9}{15}$$

$$= \frac{117}{225} = \frac{13}{25}$$

Andrew is 55, and the probability that he will be alive in 10 years is 0.72. Ellen is 35, and the probability that she will be alive in 10 years is 0.92.

What is the probability that
a) they will both be alive in 10 years; $P(A \cap E) = 0.72 \cdot 0.92 = 0.6624$
b) neither will be alive in 10 years; $P(A' \cap E') = 0.28 \cdot 0.08 = 0.0224$
c) one of them will be alive in 10 years.



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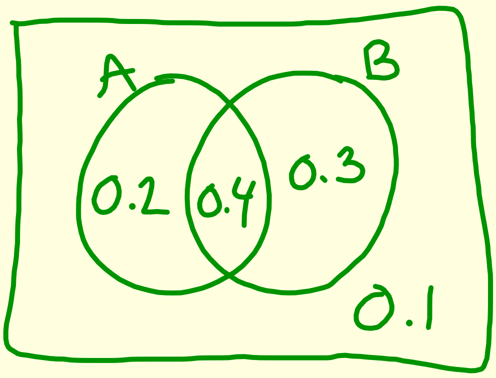


$$P(A \cap B) = P(A) \cdot P(B)$$

$$0.4 \stackrel{?}{=} 0.6(0.7)$$

No!

not independent $0.4 \neq 0.42$

5) $P(A) = \frac{2}{3}$

$P(A \cap B) = \frac{1}{6}$

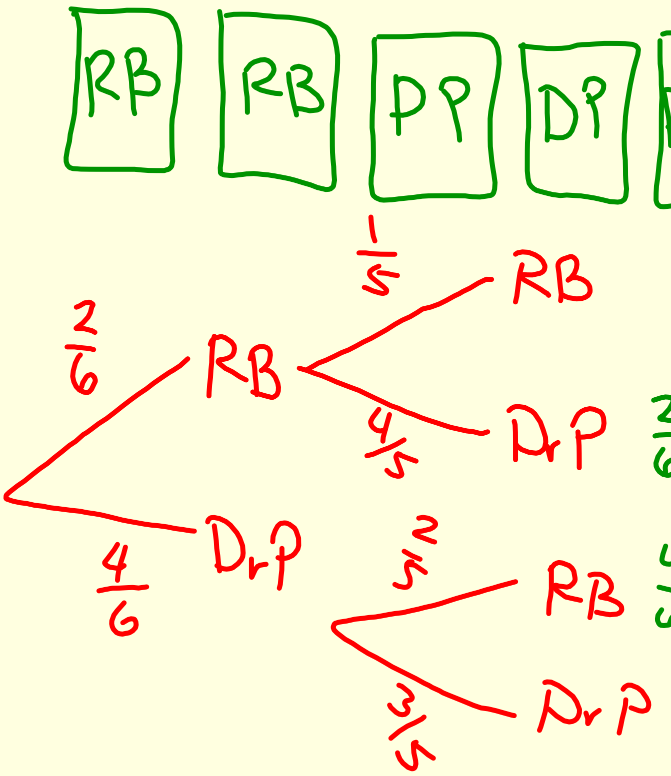
$P(A \cap B) = P(A) \cdot P(B)$

$\left(\frac{3}{2}\right)\frac{1}{6} = \frac{\cancel{2}}{\cancel{3}} \times \left(\frac{\cancel{3}}{\cancel{2}}\right)$

$\boxed{P(B) = \frac{1}{4}}$

$\frac{3}{12} = x$

There are 2 cans of root beer and 4 cans of Dr. Pepper on the counter. Nada drinks two of them at random. What is the probability that she drank one can of each?



$\frac{2}{6}\cdot\frac{4}{5}=\frac{8}{30}$

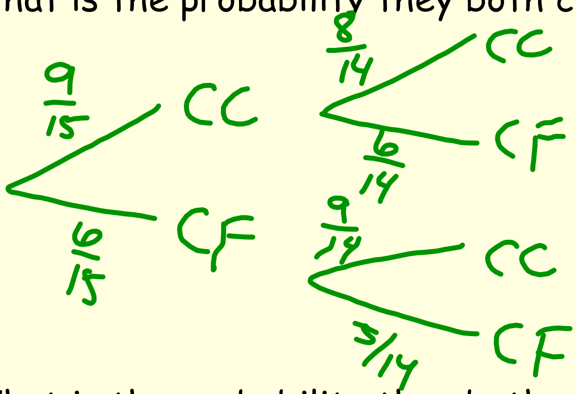
$+$

$\frac{4}{6}\cdot\frac{2}{5}=\frac{8}{30}$

$=\frac{16}{30}$

A shelf contains 9 boxes of Corn Flakes and 6 boxes of Captain Crunch. Ahmed chooses one box at random, but does not put it back. A second person does the same thing.

What is the probability they both chose Captain Crunch?

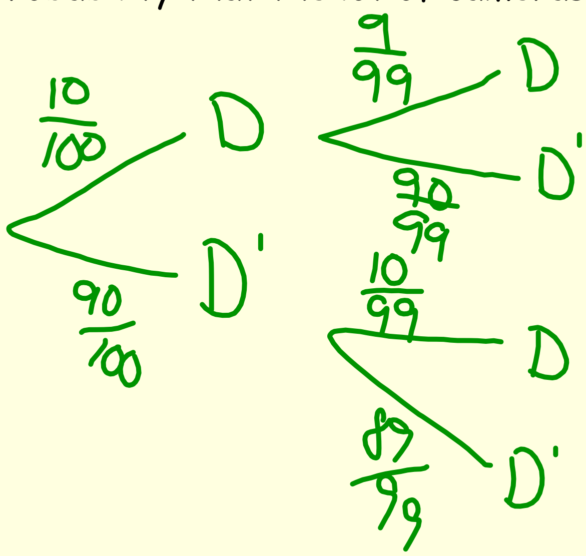


$$P(CC \cap CC) = \frac{12}{35}$$

What is the probability they both chose the same cereal?

$$\frac{12}{35} + \frac{6}{15}\left(\frac{5}{14}\right) = \frac{17}{35}$$

A quality-control procedure for testing Ready-Flash disposable cameras consists of choosing two cameras at random from each lot of 100 without replacement. If both cameras are defective, the entire lot is rejected. Typically, 10 cameras of the 100 are defective. Find the probability that the lot of cameras will NOT be rejected.



$P(\text{rejected}) =$

$P(D \cap D) = \frac{1}{110}$

$P(\text{not rejected}) =$

$1 - \frac{1}{110} = \frac{109}{110}$