Chapter 5: Probability

Section 5.6: Putting it together: Which technique do I use?

Sum: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ → mutually exclusive?

Mult Rule: $P(A \text{ and } B) = P(A) \cdot P(B|A)$ → indep.?

## WHICH PROBABILITY RULE DOE I USE?

This section will help you learn when to use a particular rule. To aid you, consider the flowchart given below. While not all situations can be handled directly with the formulas provided, they can be combined and expanded to many more situations.

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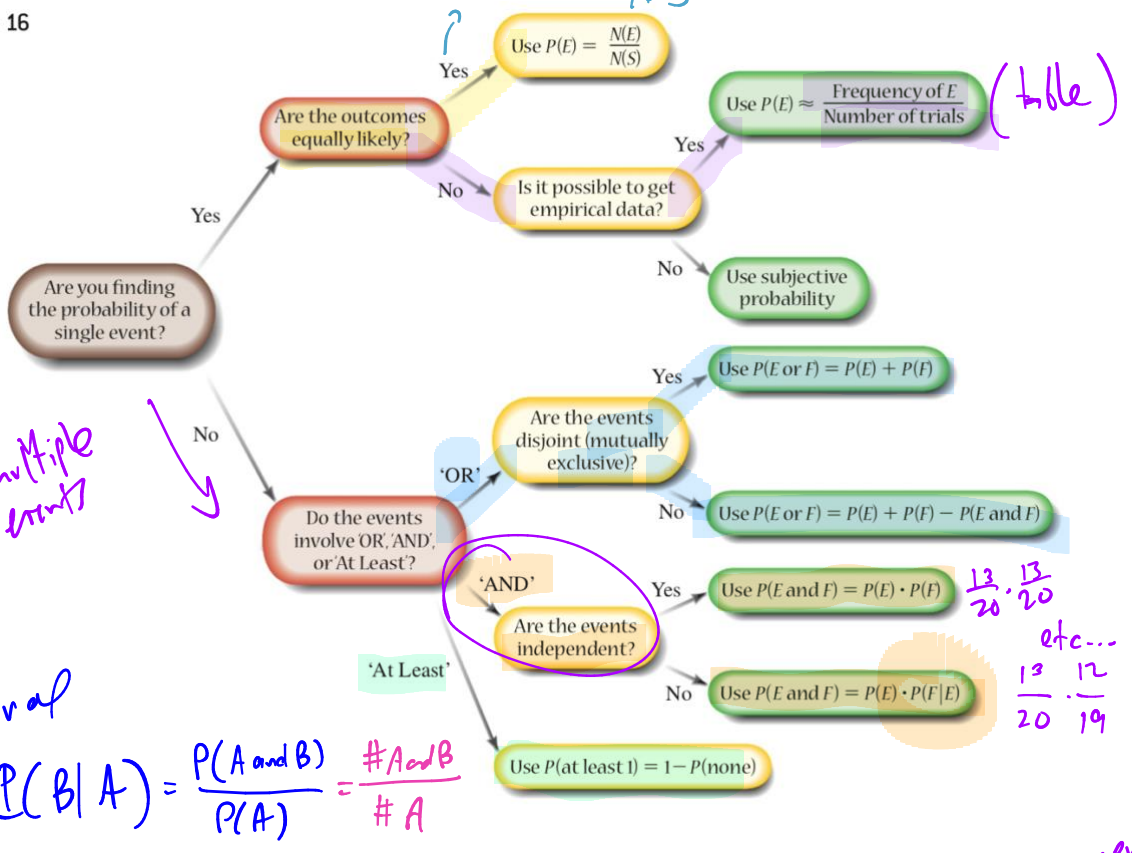


classical prob. #E/#S

table

multiple events

Conditional Prob $P(B|A) = \frac{P(A \text{ and } B)}{P(A)} = \frac{\#A \text{ and } B}{\#A}$

$\frac{13}{20} \cdot \frac{13}{20}$ etc... $\frac{13}{20} \cdot \frac{12}{19}$

## RECOMMENDED PROBLEMS: 5, 6, 8, 9, 13, 14, 15, 17, 18, 21

**21. *Titanic* Survivors** The following data represent the survival data for the ill-fated *Titanic* voyage by gender. The males are adult males and the females are adult females.

| | M Male | F Female | C Child | Total |
|---|---|---|---|---|
| S Survived | 338 | 316 | 57 | 711 |
| D Died | 1352 | 109 | 52 | 1513 |
| Total | 1690 | 425 | 109 | 2224 |

Suppose a passenger is selected at random.

(a) What is the probability that the passenger survived?

(b) What is the probability that the passenger was female?

(c) What is the probability that the passenger was female or a child?

(d) What is the probability that the passenger was female and survived? $P(F \text{ and } S) = 316/2224$ (one passenger)

(e) What is the probability that the passenger was female or survived?

(f) If a female passenger is selected at random, what is the probability that she survived? $P(S|F) = \frac{\#S \text{ and } F}{\#F} = \frac{316}{425}$

(g) If a child passenger is selected at random, what is the probability that the child survived?

(h) If a male passenger is selected at random, what is the probability that he survived?

(i) Do you think the adage "women and children first" was adhered to on the *Titanic*?

(j) Suppose two females are randomly selected. What is the probability both survived?

(k) Suppose three children are randomly selected. What is the probability all three survived?

(l) Suppose three children are randomly selected. What is the probability at least one survived?

a) $P(S) = \frac{711}{2224}$ b) $P(F) = \frac{425}{2224}$ c) $P(F \text{ or } C) = P(F) + P(C) = \frac{425 + 109}{2224}$

(1c) $P(\text{all 3 } S \mid C) = P(S^{1st} \text{ and } S^{2nd} \text{ and } S^{3rd} \mid C)$

$= P(S|C) * P(S|C) * P(S|C)$

independent?

logical: no

5% rule: $109/2224 = 0.049 \leq 5\%$ yes

independent

$= P(S|C)^3$

$= \left(\frac{\#S\&C}{\#C}\right)^3 = \left(\frac{57}{109}\right)^3 = \boxed{0.143}$

dependent

$= \frac{57}{109} * \frac{56}{108} * \frac{55}{107}$

$= \boxed{0.139}$