

AP Test Review- Probability

I. Probability

A. Likelihood of an outcome in the long term

B. $0 \leq P(A) \leq 1$

C. Vocabulary

a) Trial

b) Outcome

c) Sample Space, S

d) Event

D. **Law of Large Numbers**

E. Simulation

a) ask a question

b) describe your chance process and what you will record after each process

c) perform many simulations of your chance process

d) answer your question based on results of simulation

F. Mutually Exclusive (Disjoint) Events

a) no common outcomes

G. Independent Events

a) one event happening has no influence on the probability of the next.

When $P(A)$ is close to 0, it is unlikely to occur, when close to 1, it is very likely. $P(A) = .5$ means it is equally likely to occur as not to occur.

Law of Large Numbers states that the relative frequency of many trials of independent events gets closer to the true probability as the number of trials increases.

Disjoint: $P(A \text{ and } B) = 0$

Independent:

$P(A|B) = P(A)$ & $P(B|A) = P(B)$

II. Probability Rules (* = on formula sheet)

A. $P(A) = \frac{\text{\# of outcomes corresponding to event } A}{\text{\# of outcomes in the sample space}}$

B. $P(A^c) = 1 - P(A)$

C. Addition Rule for Mutually Exclusive Events: $P(A \cup B) = P(A) + P(B)$

D. General Addition Rule*: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

E. Multiplication Rule for Independent Events: $P(A \cap B) = P(A) \cdot P(B)$

F. Conditional Probability*: $P(A|B) = \frac{P(A \cap B)}{P(B)}$

G. General Multiplication Rule: $P(A \cap B) = P(A) \cdot P(B|A)$

III. Diagrams for Probability

A. Addition Rule

- a) Venn Diagram
- b) Two – Way Table

B. Multiplication Rule

- a) Tree Diagram

All these diagrams display the sample space of a chance process, and will often have the corresponding probabilities.

Tips and Common Mistakes:

- Do not confuse the definition of mutually exclusive (disjoint) with independence.
- Even the most simple calculations need work shown (i.e. probabilities). **Answers without work will receive little or no credit!!**
- Other forms of A^c are: A' , $\sim A$, or \bar{A}
- \cup = union (or), \cap = intersection (and)
- Remember a 4 step process when performing a simulation
- Watch out for scientific notation when giving probabilities. I.e., $2.3844832E-8$ is $.000000023$
- When concluding simulations, never use the word prove or causes. Like with significance tests and association, use "there is (or is not) convincing evidence"
- Be careful when writing complements, the notation is $P(A^c)$, there is no such thing as $P(A)^c$