MATH 1324 – FINITE MATHEMATICS
SECTION 4.3 RULES OF PROBABILITY

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$\frac{n(A \cup B)}{n(S)} = \frac{n(A)}{n(S)} + \frac{n(B)}{n(S)} - \frac{n(A \cap B)}{n(S)}$

- Properties of the Probability Function

1. $0 \le P(E) \le 1$ for any event E
2. $P(S) = 1$ and $P(\varnothing) = 0$
3. Addition Rule (Union Rule): $P(E \cup F) = P(E) + P(F) - P(E \cap F)$
4. Rule of Complements: $P(E^c) = 1 - P(E)$ $\quad P(E) + P(E^c) = 1$

Ex: A pair of dice is cast and the number that appears uppermost is observed. What is the probability that

(a) the sum is at least 3?

$P(\text{sum} \ge 3) = 1 - P(\text{sum} < 3) = 1 - \frac{1}{36} = \frac{35}{36}$

(b) one die is a 4?

$P(\text{one die} = 4) = \frac{11}{36}$

(c) the first die is a 5?

$P(\text{1st die} = 5) = \frac{6}{36}$

$S = \{$

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36
41	42	43	44	45	46
51	52	53	54	55	56
61	62	63	64	65	66

$\}$

$\frac{26}{32}$

Ex: An experiment consists of selecting a card at random from a standard 52 card deck. What is the probability that a king or a diamond is drawn?

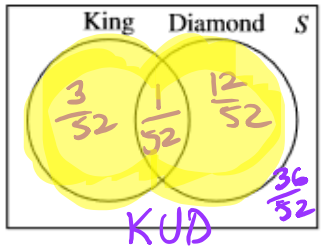
$P(K \cup D) = P(K) + P(D) - P(K \cap D)$

$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

$= \frac{16}{52}$

$P(K \cup D) = \frac{3}{52} + \frac{1}{52} + \frac{12}{52}$

$= \frac{16}{52}$



$K \cup D$

Ex: Let E and F be two events of an experiment with sample space S. Suppose $P(E) = 0.6, P(F) = 0.4$, and $P(E \cap F) = 0.2$. Compute

(a) $P(E \cup F) = P(E) + P(F) - P(E \cap F)$

$= .6 + .4 - .2 = .8$

OR $\text{I}, \text{II}, \text{III}$

$.4 + .2 + .2 = .8$

E^c: Regions III & IV

F: Regions II & III

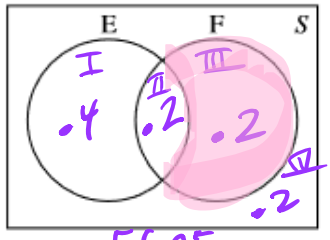
(b) $P(E^c) = 1 - P(E)$

$= 1 - .6 = .4$

OR III, IV

$.2 + .2 = .4$

(c) $P(E^c \cap F) = .2$



$E^c \cap F$

Ex: Among 500 freshmen pursuing a business degree at a university, 320 are enrolled in an economics course, 225 are enrolled in a mathematics course, and 140 are enrolled in both an economics and a math course. What is the probability that a freshman selected at random from this group is enrolled in

(a) an economics or a math course?

$P(E \cup M) = \frac{180}{500} + \frac{140}{500} + \frac{85}{500} = \frac{405}{500}$

(b) exactly one of these courses?

$P(\text{exactly one}) = \frac{180}{500} + \frac{85}{500} = \frac{265}{500}$

(c) neither of these courses?

$P(\text{neither}) = \frac{95}{500}$