WIA2003 Prob&Stats (W1-W4) Cheat Sheet

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Probability and its notations

Deterministic processes	outcome can be predicted exactly in advance
Random processes	outcome is not known exactly (can desc the probability distribution of possible outcomes)
Probability of event A	0<=P(A)<=1
Probability of whole sample space	P(S)=1, P(A)+P(B)+P(C) = 1
Event A will almost definitely not occur	P(A)=0
Only small chance that event A will occur	P(A)=0.1
50-50 chance that event A will occur	P(A)=0.5
Strong chance that event A will occur	P(A)=0.9
Event A will almost definitely occur	P(A)=1
Probability successful outcome (S)	P(S) = r/n ; r: num of successful outcomes, n: total num of equally likely outcomes
Permutations	Order is taken into account
Combinations	Order is not important
Permutation with repetition	n^r
Permutation without repetition	n!/(n-r)!

Probability and its notations (cont)

Probability events A and B both occur	P(A∩B)
Events A and B are mutually exclusive or disjoint cannot occur at the same time	P{A|B}=0, P{A∩B}=0
Probability events A or B occur	P(A∪B)
Conditional probability (event A occurs, given that event B has occured)	P(A|B)
Independent (event A does not change the probability of event B)	P{A|B} = P(A)
Complement (event that not occuring)	P(A')
Rule of subtraction (event A will occur)	P(A) = 1 - P(A')
Rule of multiplication (probability of the intersection of two events)	P(A∩B) = P(A) x P(B|A)
Rule of addition (either event occurs, not mutually exclusive)	P(A∪B) = P(A) + P(B) - P(A∩B)
	P(A∪B) = P(A) + P(B) - (P(A) x P(B|A))
Random variable	determined by a chance event, outcome of a random experiment, measurable real-valued
Discrete random variable	range of X is finite ot countably infinite (values X can take on, not the size of the values)

Probability and its notations (cont)

Continuous random variable	range of X is uncountably infinite (that makes a physical measurement)

Bayes' Theorem

Mutually exclusive/disjoint (if both events cannot occur together)	P(A∪B) = P(A)+P(B)
Collectively exhaustive (if at least one of the events must occur)	A∪B = S
Events A and B are independent	P(A∩B) = P(A) x P(B)
Events A and B are not independent	P(A∩B) = P(A) x P(B|A)
Conditional probability of A given B	P(A|B) = P(A,B) / P(B)
If A and B are statistically independent	P(A|B) = (P(A) x P(B)) / P(B) = P(A)
if A and B are statistically dependent	P(A|B) != P(A)
Multiplication rule for conditional probabilities	P(A∩B) = P(B) x P(A|B) or P(A∩B) = P(A) x P(B|A)
Bayes Theorem	P(A|B) = (P(B|A) x P(A)) / P(B)
	P(S|F) = (P(F|S) x P(S)) / (P(F|S) x P(S)) + (P(F|S') x P(S'))
Prior probability	**originally** obtained **before** any additional information is obtained
Posterior probability	has been **revised** by using additional information that is **later** obtained

Combination with repetition	(r+n-1)!/r!(n-1)!
Combination without repetition	n!/(n-r)!
	n: number of things to choose from ; r: them are chosen