Reference Sheets Final Exam

Descriptive Statistics

$$\bar{x}=\frac{\sum x}{n}=\frac{x_1+x_2+x_3\ldots}{n} \qquad \mu=\frac{\sum x}{N}=\frac{x_1+x_2+x_3\ldots}{N}$$

$$\sigma=\sqrt{\frac{\sum (x-\mu)^2}{N}} \qquad s=\sqrt{\frac{\sum (x-\bar{x})^2}{n-1}} \qquad \sigma^2=\frac{\sum (x-\mu)^2}{N} \qquad s^2=\frac{\sum (x-\bar{x})^2}{n-1} \qquad \sigma=\sqrt{\sigma^2}$$

$$s=\sqrt{\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1}} \qquad s^2=\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1} \qquad sk=\frac{3(\bar{x}-median)}{s} \qquad z=\frac{x-\bar{x}}{s}$$

$$2^j \qquad i>\frac{Maximum\,Value-Minimum\,Value}{j}$$

Statistical Distributions

	% of Values Found in Intervals Around the Mean	
Interval	**Chebyshev's Theorem (any distribution)**	**Empirical Rule (Normal Distribution)**
μ±1σ, $\bar{x}$±1s	~ 0%	~ 68%
μ±2σ, $\bar{x}$±2s	~ 75%	~ 95%
μ±3σ, $\bar{x}$±3s	~ 88.89%	~ 99.7%

$$1-\frac{1}{k^2} \qquad \Delta=ks \qquad \Delta=k\sigma$$

Counting Rules

$${}_nC_r=\frac{n!}{(n-r)!\,r!} \qquad {}_nP_r=\frac{n!}{(n-r)!} \qquad Total\ Number\ of\ Arrangements=(m)(n)$$

Probability Rules

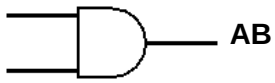
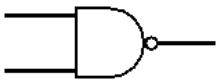
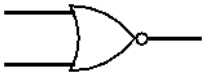
$$P(A)=\frac{Number\ of\ ways\ event\ A\ can\ occur}{Total\ number\ of\ possible\ outcomes\ (Sample\ space)}$$

$$P(A\text{ and }B)=P(A)\,P(B) \qquad P(A\text{ and }B)=P(A)\,P(B|A) \qquad P(\sim A)=1-P(A)$$

$$P(A\text{ or }B)=P(A\text{ or }B\text{ or }both)=P(A)+P(B)-P(A\text{ and }B) \qquad P(A\text{ or }B)=P(A)+P(B)$$

Discrete Probability Distribution

$$\mu=\sum[xP(x)] \qquad \sigma^2=\sum[(x-\mu)^2P(x)] \qquad \sigma=\sqrt{\sigma^2}$$

A B  AB **AND**	A B  A+B **OR**	A B  A⊕B **XOR**
A B  $\overline{AB}$ **NAND**	A B  $\overline{A+B}$ **NOR**	A B  $\overline{A \oplus B}$ **XNOR**
A  $\overline{A}$ **NOT**	A  A **Buffer**	

Postulates					
1a	$\overline{1} = 0$	1b	$\overline{0} = 1$		
2a	$0 \cdot 0 = 0$	2b	$0 + 0 = 0$	2c	$0 \oplus 0 = 0$ $\quad \overline{0 \oplus 0} = 1$
3a	$1 \cdot 1 = 1$	3b	$1 + 1 = 1$	3c	$1 \oplus 1 = 0$ $\quad \overline{1 \oplus 1} = 1$
4a	$1 \cdot 0 = 0$	4b	$1 + 0 = 1$	4c	$0 \oplus 1 = 1$ $\quad \overline{0 \oplus 1} = 0$
Basic Theorems					
5a	$A \cdot 1 = A$ $\quad \overline{A} \cdot 1 = \overline{A}$	5b	$A + 1 = 1$ $\quad \overline{A} + 1 = 1$	5c	$A \oplus 1 = \overline{A}$ $\quad \overline{A \oplus 1} = A$
6a	$A \cdot A = A$ $\quad \overline{A} \cdot \overline{A} = \overline{A}$	6b	$A + A = A$ $\quad \overline{A} + \overline{A} = \overline{A}$	6c	$A \oplus 0 = A$ $\quad \overline{A \oplus 0} = \overline{A}$
7a	$A \cdot 0 = 0$	7b	$A + 0 = A$	7c	$A \oplus A = 0$ $\quad \overline{A \oplus A} = 1$
8a	$A \cdot \overline{A} = 0$	8b	$A + \overline{A} = 1$	8c	$A \oplus \overline{A} = 1$ $\quad \overline{A \oplus \overline{A}} = 0$
9a	$\overline{\overline{A}} = A$ (double negation)	9b	(double negation) $A = \overline{\overline{A}}$	9c	$\overline{A} \oplus \overline{A} = 0$ $\quad \overline{\overline{A} \oplus \overline{A}} = 1$
Commutative Properties					
10a	$AB = BA$	10b	$A + B = B + A$	10c	$A \oplus B = B \oplus A$
Associative Properties					
11a	$A(BC) = (AB)C$	11b	$A + (B + C) = (A + B) + C$	11c	$(A \oplus B) \oplus C = A \oplus (B \oplus C) = A \oplus B \oplus C$
Distributive Properties					
12a	$A(B + C) = AB + AC$	12b	$A + BC = (A + B)(A + C)$	12c 12d	$A(B \oplus C) = AB \oplus AC$ $(A \oplus B)(A \oplus C) = \overline{A}\,B\,C + A\,\overline{B}\,\overline{C}$
De Morgan's Theorem					
13a	$\overline{A}\,\overline{B}\,\overline{C} = \overline{A + B + C}$	13b	$\overline{A} + \overline{B} + \overline{C} = \overline{ABC}$		
Absorption Theorems					
14a	$A(A + B) = A$	14b	$A + AB = A$ $A(1+B) = A$ (factoring)	14c 14d	$A \oplus (\overline{A}+B) = \overline{AB}$ $A(\overline{A} \oplus B) = AB$
15a	$A(\overline{A} + B) = AB$	15b	$A + \overline{A}B = A + B$	15c 15d	$A \oplus (\overline{A}B) = A+B$ $A \oplus (AB) = A\overline{B}$
Multiplying Out					
16a	$(A + B)(\overline{A} + C) = AC + \overline{A}B$	16b	$(A+B) \oplus (\overline{A}+C) = \overline{AC \oplus \overline{A}\,B}$		
Consensus Theorems					
17a	$AB + \overline{A}C + BC = AB + \overline{A}C$	17b	$(A+B)(\overline{A}+C)(B+C) = (A+B)(\overline{A}+C)$		
18a	$(A \oplus B)(\overline{A} \oplus C)(B \oplus C) = (A \oplus B)(\overline{A} \oplus C) = (A \oplus B)(B \oplus C) = (\overline{A} \oplus C)(B \oplus C)$				
Other					
19a	$\overline{A} \oplus \overline{B} \oplus \overline{C} = \overline{A \oplus B \oplus C}$	19b	$A \oplus B = A\overline{B} + \overline{A}B = (A+B)(\overline{A}+\overline{B})$	19c	$\overline{A \oplus B} = A\,B + \overline{A}\,\overline{B} = (\overline{A}+B)(A+\overline{B})$

Metric Symbol	Metric Prefix	Power of Ten with Respect to Base	CNS Conversion
E	**1 Exa_BaseUnit =**	10^{18} BaseUnit	
P	**1 Peta_BaseUnit =**	10^{15} BaseUnit	0 0000
T	**1 Tera_BaseUnit =**	10^{12} BaseUnit	1 0001
G	**1 Giga_BaseUnit =**	10^{9} BaseUnit	2 0010
M	**1 Mega_BaseUnit =**	10^{6} BaseUnit	3 0011
k	**1 kilo_BaseUnit =**	10^{3} BaseUnit	4 0100
h	**1 hecto_BaseUnit =**	10^{2} BaseUnit	5 0101
dk/da	**1 deca_BaseUnit =**	10^{1} BaseUnit	6 0110
	Base Unit (m, s, L, Hz, F, g, J, Pa, A, V, Ω...)	$10^{0} = 1$	7 0111
d	**1 deci_BaseUnit =**	10^{-1} BaseUnit	8 1000
c	**1 centi_BaseUnit =**	10^{-2} BaseUnit	9 1001
m	**1 milli_BaseUnit =**	10^{-3} BaseUnit	10 A 1010
µ	**1 micro_BaseUnit =**	10^{-6} BaseUnit	11 B 1011
n	**1 nano_BaseUnit =**	10^{-9} BaseUnit	12 C 1100
p	**1 pico_BaseUnit =**	10^{-12} BaseUnit	13 D 1101
f	**1 femto_BaseUnit =**	10^{-15} BaseUnit	14 E 1110
a	**1 atto_BaseUnit =**	10^{-18} BaseUnit	15 F 1111

Time
60 min = 1 h
60 s = 1 min
24 h = 1 day
365 day = 1 yr

Angles
π rad = 180°
1° = 60 min (60‘)
1‘ = 60 s (60”)

Temperature
°C = 5/9 (°F - 32)
K = °C + 273
°F = (9/5)°C+32
R = °F + 460

Imperial Conversion Units

Length
12 in = 1 ft
3 ft = 1 yd
5280 ft = 1 mi
1760 yd = 1 mi
1852 m = 1 nmi

Weight
16 oz = 1 lb
2000 lb = 1 ton

Capacity
3 tsp = 1 tbsp
1 fl. oz. = 2 tbsp
16 tbsp = 1 cup
2 cups = 1 US pt
2 US pt = 1 US qt
4 US qt = 1 US gal
1 cup = 8 fl. oz.

Metric – Imperial Conversion Units

Length
1 in = 2.54 cm
1 m = 39.37 in
1 mi = 1.609 km

Weight
1 lb = 453.6 g
1 kg = 2.205 lb
1 oz = 28.35 g

Capacity
1 US gal = 3.79 L
1 tsp = 4.93 mL
1 US pt = 0.473 L

Heat - Energy - Power Units
1 cal = 4.186 J
1 BTU = 1055 J
1 hp = 745.7 W

Area
1 hectare = 10000 m^2
1 acre = 4840 yd^2
1 hectare = 2.47 acres