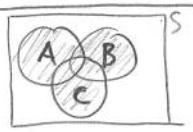
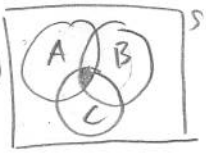
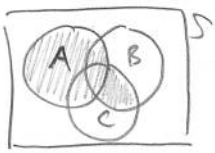
ECEn 370
Homework 1 (1)

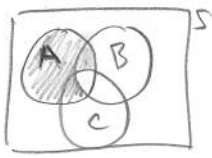
Benjamin Bergeson

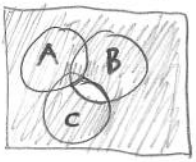
1.2.5 Problem 1

(a) 

(b) 

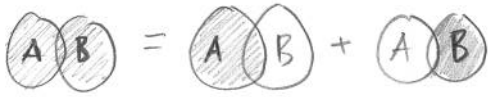
(c) 

(d) 

(e) 

1.2.5 Problem 2

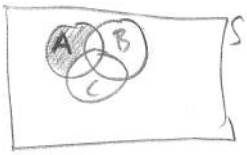
(a) 

(b) 

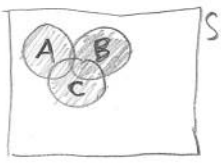
1.2.5 Problem 3

1. $\{1,2,3\}$ 2. $\{1\}\{2\}\{3\}$ 3. $\{1,2\}\{3\}$ 4. $\{1,3\}\{2\}$ 5. $\{2,3\}\{1\}$

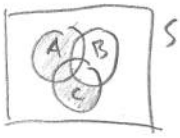
1.3.6 Problem 1

(a) 

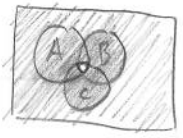
$A-B-C = A-(B \cup C)$

(b) 

$A \cup B \cup C$

(c) 

$(A \cup C) - B$

(d) 

$\overline{(A \cap B \cap C)} = \bar{A} \cup \bar{B} \cup \bar{C}$

1.3.6 Problem 2

(a) $S = \{2,3,4\cdots\}$ (b) $S = \{RB, RW, RG, BR, BW, BG, WR, WB, WG, GR, GB, GW\}$

(c) $S = [0, \frac{1}{3}]$

1.3.6 Problem 3

(a) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $\frac{5}{6} = \frac{1}{2} + \frac{2}{3} - x$ $x = \frac{1}{3}$

(b) No $A \cap B \neq 0$

(c) $C - A \cup B = C \cup A \cup B - A \cup B = 1 - \frac{5}{6} = \frac{1}{6}$

(d) $P(C \cap (A \cup B)) + P(C - (A \cup B)) = P(C)$

$\frac{5}{12} + \frac{1}{6} = \boxed{\frac{7}{12}}$

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Homework 1(2)

1.3.6 Problem 4

(a) $A = \{(1,2)(1,3)(1,4)(1,5)(1,6)(2,3)(2,4)(2,5)(2,6)(3,4)(3,5)(3,6)(4,5)(4,6)(5,6)\}$ $\frac{15}{36} = \boxed{\frac{5}{12}}$

(b) $B = \{(6,1)(6,2)(6,3)(6,4)(6,5)(6,6)(1,6)(2,6)(3,6)(4,6)(5,6)\}$ $\boxed{\frac{11}{36}}$

Schaum's 1.1

(a) $S_1 = \{TTT, TTH, THT, THH, HTT, HTH, HHT, HHH\}$

(b) $S_2 = \{0, 1, 2, 3\}$

Schaum's 1.5

(a) $S = \{(i,j) : i,j = 1,2,3,4,5,6\}$

(b) $A = \{(1,6)(2,5)(3,4)(4,3)(5,2)(6,1)\}$

(c) $B = \{(5,6)(6,5)(6,6)\}$

(d) $C = \emptyset$

Schaum's 1.37

(a) $P(A) = \frac{6}{36} = \frac{1}{6}$

(b) $P(B) = \frac{3}{36} = \frac{1}{12}$

1.3.6 Problem 5

(a) $S = [0, \infty)$

(b) $P(T \geq 0) = e^{-\frac{0}{5}} = 1$ $\lim_{t \to \infty} P(T \geq t) = e^{-\frac{\infty}{5}} = 0$

(c) $P(T \geq t_1) = e^{-\frac{t_1}{5}}$ $P(T \geq t_2) = e^{-\frac{t_2}{5}}$ $t_1 < t_2$ $\frac{t_1}{5} < \frac{t_2}{5}$ $\frac{-t_1}{5} > \frac{-t_2}{5}$

$e^{-\frac{t_1}{5}} > e^{-\frac{t_2}{5}}$

(d) $P(T \geq 3) = e^{-\frac{3}{5}} \approx 0.548812$ $1 - 0.548812 = 0.451188$

(e) $P(T \geq 2) = e^{-\frac{2}{5}} \approx 0.67032$ $P(T \geq 1) = e^{-\frac{1}{5}} \approx 0.818731$

$0.818731 - 0.67032 = 0.148411$

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Homework 1 (3)

1.5.0 Problem 18

(a) $P(T \le 1) = \frac{1}{16}(1)^2 = \boxed{\frac{1}{16}}$

(b) $P(T \le 2) = \frac{1}{16}(2)^2 = \frac{1}{16}(4) = \frac{1}{4}$ $\quad 1 - \frac{1}{4} = \boxed{\frac{3}{4}}$

(c) $P(T \le 3) = \frac{1}{16}(3)^2 = \frac{9}{16}$ $\quad P(T \le 1) = \frac{1}{16}$ $\quad \frac{9}{16} - \frac{1}{16} = \frac{8}{16} = \boxed{\frac{1}{2}}$

Schaum's 1.11

(a) $\bigcup_{i=1}^{\infty} A_i = \{v : 0 \le v \le 1\}$ $\quad \bigcap_{i=1}^{\infty} A_i = \emptyset$

(b) $\bigcup_{i=1}^{\infty} B_i = \{v : v \le \frac{1}{2}\}$ $\quad \bigcap_{i=1}^{\infty} B_i = \{v : v \le 0\}$

1.4.5 Problem 1

$P(A) = P(2 \le T \le 3) = P(T \ge 2) - P(T \ge 3) = e^{-\frac{2}{5}} - e^{-\frac{3}{5}} = 0.1215$

$P(B) = P(T \ge 2) = 0.6703$

$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)} = \frac{0.1215}{0.6703} = \boxed{0.1813}$

Schaum's 1.44

P

(a) $\frac{P(A \cap B)}{P(B)} = \frac{0}{P(B)} = 0$ $\quad$ (b) $\frac{P(A \cap B)}{P(B)} = \frac{P(A)}{P(B)}$ $\quad$ (c) $\frac{P(A \cap B)}{P(B)} = \frac{P(B)}{P(B)} = 1$

Schaum's 1.48

$A = \{(1,1)(1,2)(2,1)\}$ $\quad B = \{(1,1)(2,2)(3,3)(4,4)(5,5)(6,6)\}$ $\quad |B| = 6$

(a) $P(B) = \frac{6}{36} = \boxed{\frac{1}{6}}$ $\quad P(A) = \frac{3}{36} = \frac{1}{12}$ $\quad B \cap A = \{(1,1)\}$

(b) $P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{1/36}{1/12} = \boxed{\frac{1}{3}}$