Schuam Ch. 3 Exercises

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1 Ch.1 Supplementary

- 1.41
  - $A = \{3, 1\}$
  - $B = \{2, 1\}$
  - $C = \{1, 2\}$
  - $D = \{1, 3\}$
  - $A = G$
  - $A = H$
  - $B = E = F = C$
- 1.42
  - $A = \{a, e, i, o, u\}$
  - $B = \{l, i, t, e\}$
  - $C = \{a, b, c, d, e\}$
  - $D = \{l, i, t, e\}$
  - $B = D$
- 1.43
  - (a) C, E
  - (b) E, D
  - (c) B, D, A
  - (d) *none*
- 1.44
  - (a) $\emptyset \subseteq A$
  - (b) $D \subseteq E$
  - (c) $A \nsubseteq B$
  - (d) $D \nsubseteq A$
  - (e) $B \subseteq C$
  - (f) $D \subseteq C$
  - (g) $C \nsubseteq D$
  - (h) $B \nsubseteq D$
- 1.45

- (a) $A \cap B = \{2, 5\}, A \cap C = \{1, 5\}$
- (b) $A \cup B = \{1, 2, 5, 6, 7\}, A \cup C = \{1, 2, 3, 5, 6, 7, 9\}$
- (c) $\bar{A} = \{3, 4, 7, 8, 9\}, \bar{C} = \{2, 4, 6, 8\}$

- 1.46
  - (a) $A \setminus B = \{1, 6\}$, $A \setminus C = \{2, 6\}$
  - (b) $A \oplus B = \{1, 7\}, A \oplus C = \{2, 3, 7, 9\}$

- 1.47
  - (a) $A \cup C = \{1, 2, 3, 4, 5, 6, 7, 9\}, (A \cup C) \setminus B = \{1, 3, 6, 9\}$
  - (b) $A \cup B = \{1, 2, 5, 6, 7\}$
  - $(A \cup B)^c = \{3, 4, 8, 9\}$

- 1.48
  - (a) $A \cup B = \{a, b, c, d, e, f, g\}$
  - (b) $C \cap D = \{e, g, h\}$
  - (c) $B \cap C = \{b, g\}$
  - (d) $A \cap D = \{d, e\}$
  - (e) $C \cap D = \{b, c\}$
  - (f) $D \cap A = \{f, g, h\}$
  - (g) $A \oplus B = \{c, e, f, g\}$
  - (h) $A \oplus C = \{a, d, g, h\}$

- 1.49
  - (a) $B \cup D = \{a, b, d, e, f, g, h\}, A \cap (B \cup D) = \{a, b, d, e\}$
  - (b) $C \cup D = \{b, c, d, e, f, g, h\}, B \setminus (C \cup D) = \{a\}$
  - (c) $A \cup D = \{a, b, c, ...h\}, (A \cup D) \setminus C = \{a, d, f\}$
  - (d) $B \cap C \cap D = \{g\}$
  - (e) $C \setminus A = \{g, h\}, (C \setminus A) \setminus D = \{emptyset\}$
  - (f) $A \oplus D = \{a, b, c, f, g, h\}, (A \oplus D) \setminus B = \{c, h\}$
  - (g) $A \cap D = \{d, e\}, B \cup C = \{a, b, ...h\}, (A \cap D) \setminus (B \cup C) = \{\emptyset\}$
  - (h) $A \setminus C = \{a, d\}, B \cap D = \{a, b, d, e, f, g, h\}, (A \setminus C) \cap (B \cap D) = \{a, d\}$
  - $= \{\}$

- 1.50

1.50

A and B are disjoint if $A \cap B = \emptyset$

$A \setminus B = \{x : x \in A, x \notin B\}$

$A \cap B = \{x : x \in A \text{ and } x \in B\}$

$B \setminus A = \{x : x \in B, x \notin A\}$

$(A \setminus B) \cup (A \cap B) \cup (B \setminus A) = \emptyset$

There are no sets A, B, in which $x \in A$ and $x \in B$ and $x \notin A, x \notin B$

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- 1.60
  - (a) $|A \cup B| = |A| + |B| - |A \cap B| = 17$
  - (b) $|A^c| = |U| - |A| = 8$
  - (c) $|B^c| = 11$
  - (d) $|A \setminus B| = |A| - |A \cap B| = 8$
  - (e) $|\emptyset| = 0$
- 1.61

1.60

a. $|A \cup B| = |A| + |B| - |A \cap B| = 17$

b. $|A^c| = |U| - |A| = 8$

c. $|B^c| = 11$

d. $|A \setminus B| = |A| - |A \cap B| = 8$

e. $|\emptyset| = 0$

- 1.62

1.62 $|U| = 120, |M| = 40, |E| = 50$

$M \cap E = 15$

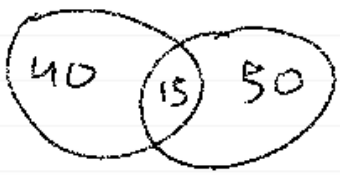
a. $|M^c| = 120 - 40 = 80$

b. $|M \cup E| = |M| + |E| - |M \cap E|$
$= 40 + 50 - 15 = 75$

c. $|M \setminus E| = |M| - |M \cap E|$
$= 40 - 15 = 25$

d. $|E \setminus M| = |E| - |M \cap E|$
$= 50 - 15 = 35$

e.



$40 + 50 = 90$ ~~90~~ 60

f. $|M^c \cap E^c| = |U| - |M \cup E|$
$= 120 - 75$
~~45~~

- 1.63
- 1.64
- 1.65
- 1.66
- 1.67

- 1.68

2 Ch.3 Supplementary

- 3.35
  - (a) $C^2 = \{(H,H),(H,T),(T,H),(T,T)\}$
  - (b) $C^3 = \{(H,H,H),(H,H,T),(H,T,H),(H,T,T),(T,T,T),(T,T,H),(T,H,T),(T,H,H),\}$
- 3.36
  - (a) $x = 3, y = -2$
  - (b) $x = 2, y = 3$
- 3.37
  - $|AxB| = |A| \bullet |B|$
  - (a) $15, 15, 9, 25$
  - (b) $45, 27, 125$
- 3.38
- 3.39
- 3.40
- 3.41
  - (a) $E = \{1,3,4\}, F = \{3\}$
  - (b) $G = \{a,b\}, H = \emptyset$
  - (c) domain $= \{1,3,4\}$ range $= \{a,b,d\}$
  - (d) $\{(a,1),(b,1),(b3),(d,3),(b,4)$
- 3.42
  - (a) $R \cap S = \{2,b\}$
  - (b) $R \cup S = \{(1,a),(1,b),(2.b),(3,a),(2,b),(3,b)\}$
  - (c) $R^c = \{(1,b),(2,a)\}$
  - (d) $R \circ S =$ not defined
- 3.43
- 3.44
- 3.45

3.45

a.

	1	2	3	4
1	0	0	1	1
2	0	0	0	0
3	0	1	1	1
4	0	0	0	0

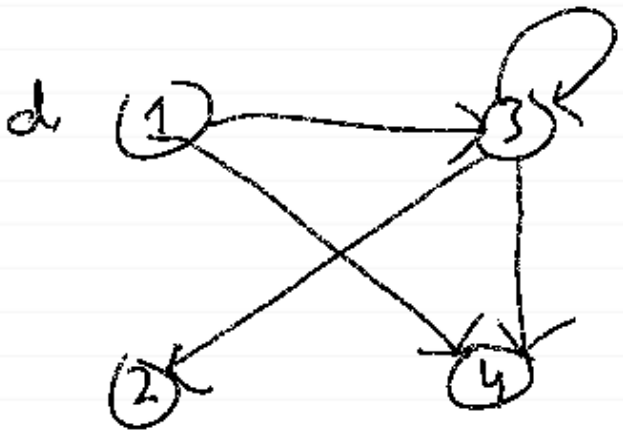
b. domain = {1,3}

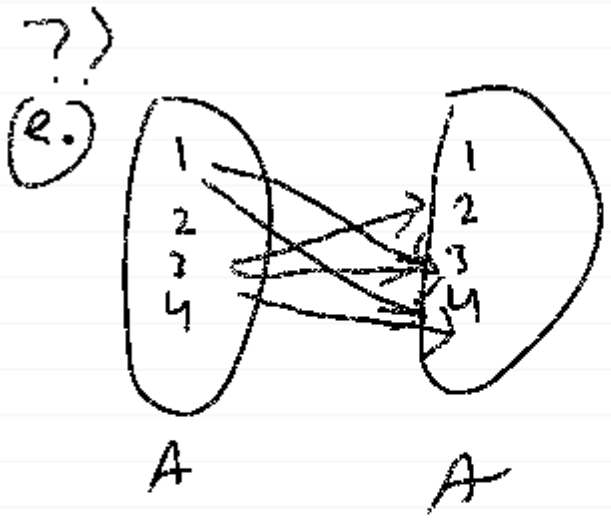
range = {2,3,4}

c.

$R^{-1} = \{(3,1),(4,1),(2,3),(3,3),(4,3)\}$

d.





e. $B \circ R = \{(3,2),(3,3),(3,4),(1,2),(1,3),(1,4)\}$

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– (c) $R^{-}1 = (3,1),(4,1),(2,3),(3,3),(4,3)/$

- 3.46

3.46

a $E = \{1, 2, 5\}$

$F = \{3\}$

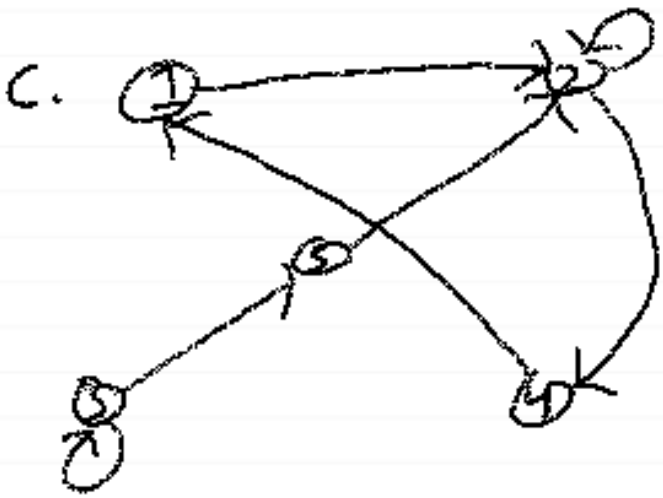
$G = \{2, 4\}$

$H = \{3, 5\}$

b

	1	2	3	4	5
1	0	1	0	0	0
2	0	1	0	1	0
3	0	0	1	0	1
4	1	0	0	0	0
5	0	1	0	0	0

c.



d) $S \circ S = \{(1,2), (1,4), (2,2), (2,4), (3,1), (3,3), (3,5), (3,2), (4,2), (5,2), (5,4)\}$

- 3.47
  -

3.47

a. $E = \{b, c\}$

$F = \{a, b, d, e\}$

$G = \emptyset$

$H = \{a, b, f\}$

b. $\text{domain} = \{a, b, c, d, e\}$

$\text{range} = \{a, b, c, f\}$

c. $B \cdot A = \{(a,b), (a,c), (b,b), (b,c), (d,b), (d,c), (e,b), (e,c)\}$

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3 Questions

- (Schaunmp p.69) " No other element of A is connected to an element of C" ???
- (Schaum p.68) How to read $R \circ S$?
- (Klir p. 10) Meaning of vertical bar symbol in middle of equation ?
- (Klir p. 10) Proper way to read notation for cartesian products with n factors?

4 Pain points

- Venn diagrams and counting principles
- Proofs
- Relation composition fundamentals (get very confused at first trying to relate a set to itsself)