

Solutions (Set Operations)

①

a) $\{ \} = \emptyset$

b) $\{ x \mid x \text{ is a letter of the English alphabet} \}$,
in other words the whole English alphabet.

c) $\{ a, e, i, o, u \} = A$

② a) $\{0, 4\}$

b) $\{1, 2, 3, 6\}$

c) $\{0, 1, 2, 3, 4, 5, 6\}$

d) $\{(1, 0), (1, 4), (1, 5),$
 $(2, 0), (2, 4), (2, 5),$
 $(3, 0), (3, 4), (3, 5),$
 $(5, 0), (5, 4), (5, 5),$
 $(6, 0), (6, 4), (6, 5)\}$

e) $\{(0, 1), (0, 2), (0, 3), (0, 5), (0, 6),$
 $(4, 1), (4, 2), (4, 3), (4, 5), (4, 6),$
 $(5, 1), (5, 2), (5, 3), (5, 5), (5, 6)\}$

f) $\{(5, 5)\}$

③ a) $\{a, c, d\}$

b) $\{e, g, h\}$

c) $\{\emptyset, \{e\}, \{g\}, \{h\}, \{e, g\}, \{e, h\}, \{g, h\}, \{e, g, h\}\}$

d) $\{\emptyset, \{a\}, \{c\}, \{d\}, \{a, c\}, \{a, d\}, \{c, d\}, \{a, c, d\}\}$

④

a) Call $A \cap B = D$

Then $D = \{0, 2, 4, 6\}$

Now

$$D \cap C = \{4, 6\}$$

$$\therefore A \cap B \cap C = \{4, 6\}$$

b) Call $A \cup B = D$

Then $D = \{0, 1, 2, 3, 4, 5, 6, 8, 10\}$

$D \cup C = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$\therefore A \cup B \cup C = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

c) Call $A \cap B = D$

$D = \{0, 2, 4, 6\}$

$D \cup C = \{0, 2, 4, 5, 6, 7, 8, 9, 10\}$

$\therefore (A \cap B) \cup C = \{0, 2, 4, 5, 6, 7, 8, 9, 10\}$

⑤ a) Call $(A \cap B) = D$

$D = \{b, e, g\}$

Call $(B \cap C) = E$

$E = \{b\}$

$D - E = \{e, g\}$

$\therefore (A \cap B) - (B \cap C) = \{e, g\}$

b) Call $A \cap B = D$

$$D = \{b, e, g\}$$

$$D \cap C = \{b\}$$

$$\therefore A \cap B \cap C = \{b\}$$

c) Call $A \cup B = D$

$$D = \{a, b, c, d, e, f, g, h\}$$

Call $A \cap C = E$

$$E = \{a, b, h\}$$

$$D - E = \{c, d, e, f, g\}$$

$$\therefore (A \cup B) - (A \cap C) = \{c, d, e, f, g\}$$