

Question 7

Solve the following questions from the Discrete Math Zybook:

Exercise 3.1.1, a - g

- a) true
- b) false
- c) true
- d) false
- e) true
- f) false
- g) false

Exercise 3.1.2, a - e

- a) false
- b) true
- c) true
- d) true
- e) false

Exercise 3.1.5, b, d

- b) $\{x \in \mathbb{Z}^+ : x \text{ is an integer multiple of } 3\}$, the set is infinite
- d) $\{x \in \mathbb{N} : x \text{ is an integer multiple of } 10 \text{ and } x \leq 1000\}$, the cardinality is 101

Exercise 3.2.1, a - k

a) true

b) true

c) false

d) false

e) true

f) true

g) true

h) false

i) false

j) false

k) false

Question 8

Solve the following questions from the Discrete Math Zybook:

Exercise 3.2.4, b

b) $X = \{\{2\}, \{1, 2\}, \{2, 3\}, \{1, 2, 3\}\}$

Question 9

Solve the following questions from the Discrete Math Zybook:

Exercise 3.3.1, c - e

c) $\{-3, 1, 17\}$

d) $\{-5, -3, 0, 1, 4, 17\}$

e) $\{1\}$

Exercise 3.3.3, a, b, e, f

a) $\{1\}$

b) $\{1, 2, 3, 4, 5, 9, 16, 25\}$

e) $\{x \in \mathbb{R} : (-1 / 100) \leq x \leq (1 / 100)\}$

f) $\{x \in \mathbb{R} : -1 \leq x \leq 1\}$

Exercise 3.3.4, b, d

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

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

Question 10

Solve the following questions from the Discrete Math Zybook:

Exercise 3.5.1, b, c

b) (foam, tall, non-fat)

c) $B \times C = \{(\text{foam}, \text{non-fat}), (\text{foam}, \text{whole}), (\text{no-foam}, \text{non-fat}), (\text{no-foam}, \text{whole})\}$

Exercise 3.5.3, b, c, e

b) True, the elements of both \mathbb{Z}^2 and \mathbb{R}^2 are pairs, and all integers are real numbers.

c) True, since the elements in \mathbb{Z}^2 are pairs and \mathbb{Z}^3 are triples, there are no elements that intersect between the two sets and thus the intersection is the empty set.

e) True

Exercise 3.5.6, d, e

d) {01, 001, 011, 0011}

e) {aaa, aba, aaaa, abaa}

Exercise 3.5.7, c, f, g

c) {aa, ab, ac, ad}

f) $\{\emptyset, \{ab\}, \{ac\}, \{ab, ac\}\}$

g) $\{(\emptyset, \emptyset), (\emptyset, \{b\}), (\emptyset, \{c\}), (\emptyset, \{b, c\}), (\{a\}, \emptyset), (\{a\}, \{b\}), (\{a\}, \{c\}), (\{a\}, \{b, c\})\}$

Question 11

Solve the following questions from the Discrete Math Zybook:

Exercise 3.6.2, b, c

b)	$(B \cup A) \cap (\overline{B} \cup A)$	Given
	$A \cup (\overline{B} \cap B)$	Distributive Law, 1
	$A \cup \emptyset$	Complement Law, 2
	A	Identity Law, 3
c)	$\overline{A \cap \overline{B}}$	Given
	$\overline{\overline{A} \cup B}$	De Morgan's Law, 1
	$\overline{\overline{A}} \cap \overline{B}$	Double Complement Law, 2

Exercise 3.6.3, b, d

b) If $A = \{1, 2\}$ and $B = \{1, 3\}$:

$$\begin{aligned} A - (B \cap A) \\ &= A - \{1\} \\ &= \{2\} \neq A \end{aligned}$$

d) If $A = \{1, 2\}$ and $B = \{1, 3\}$:

$$\begin{aligned} (B - A) \cup A \\ &= \{3\} \cup A \\ &= \{1, 2, 3\} \neq A \end{aligned}$$

Exercise 3.6.4, b, c

b)	$A \cap (B - A)$	Given
	$A \cap (B \cap \overline{A})$	Set Subtraction Law, 1
	$(A \cap \overline{A}) \cap B$	Associative Law, 2
	$\emptyset \cap B$	Complement Law, 3
	\emptyset	Domination Law, 4

c)	$A \cup (B - A)$	Given
	$A \cup (B \cap \bar{A})$	Set Subtraction Law, 1
	$(A \cup B) \cap (A \cup \bar{A})$	Distributive Law, 2
	$(A \cup B) \cap (U)$	Complement Law, 3
	$A \cup B$	Identity Law, 4