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Question 7:

3.1.1.A
Answer:
True. 27 is multiple of 3, so 27 is an element of A.

3.1.1.B
Answer:
False. The square root of 27 is not an integer, so 27 is not a perfect square, therefore not an element of B.

3.1.1.C
Answer:
True. The square root of 100 is 10 an integer, so 100 is a perfect square, therefore an element of B.

3.1.1.D
Answer:
False. 3 is an element of E but not an element of C, so E ⊈ C. 4, 5, and 10 are elements of C but not elements of E, so C ⊈ E.

3.1.1.E
Answer:
True. every element of E is an integer multiple of 3, so every element of E is an element of A, therefore E ⊆ A. (f) A ⊂ E

3.1.1.F
Answer:
False. For example, 12 is an element of A but not an element of E, so A is not a subset of E.

3.1.1.G
Answer:
False. The symbol should be ⊆, not , as is used to indicate that an element is in a set. ∈ ∈

3.1.2.A
Answer:
F. 15 A ∈ , but 15 is not a subset of A since 15 is an element of A

3.1.2.B
Answer:
True. {15} ⊆ A and there is an element of A (for example, 27) that is not an element of {15}, so {15} is proper set of A.

3.1.2.C
Answer:
True. ∅ ≠ A and ∅ ⊆ A, so ∅ n is a proper subset of A

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3.1.2.D
Answer:
True. since every set is a subset of itself, the statement is true

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3.1.2.E
Answer:
False. ∅ is an empty set which cannot be an element of B

3.1.5.B
Answer:
{ x Z: x = 3n, n Z ∈ ∈ ⁺}; the set is infinite

3.1.5.D
Answer:
{ x Z: x is an integer multiple of 10 and 0 ≤ x ≤1000 }; the cardinality is 101 ∈

3.2.1.A
Answer:
True. 2 is an element of X

3.2.1.B
Answer:
True. Since 2 is an element of X, {2} is a subset of X.

3.2.1.C
Answer:
False. {2} is not an element of X.

3.2.1.D
Answer:
False. 3 is not an element of X.

3.2.1.E
Answer:
True. {1, 2} is an element of X.

3.2.1.F
Answer:
True. 1 and 2 are both elements of X, so {1, 2} is subset of X

3.2.1.G
Answer:
True. 2 and 4 are both element of X, so {2, 4} is a subset of X.

3.2.1.H
Answer:
False. {2, 4} is not an element of X.

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3.2.1.I
Answer:
False. 3 is not an element of X, so {2, 3} is not a subset of X.

3.2.1.J
Answer:
False. {2, 3} is not an element of X.

3.2.1.K
Answer:
False. X contains 6 elements.

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Question 8:
3.2.4.D.
Answer:
P(A) = {∅, {1}, {2}, {3}, {1,2}, {1,3}, {2,3}, {1,2,3}}
Therefore, X = **{{2}, {1,2}, {2,3}, {1,2,3}}**

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Question 9:
3.3.1.C
Answer:

A = {-3, 0, 1, 4, 17}
C = {x ∈ Z: x is odd}

A ∩ C = {-3, 1, 17}

3.3.1.D
Answer:

A = {-3, 0, 1, 4, 17}
B = {-12, -5, 1, 4, 6}
C = {x ∈ Z: x is odd}
B ∩ C = {-5, 1}

A (B ∩ C) = {-5, -3, 0, 1, 4, 17} ∪

3.3.1.E
Answer:

A = {-3, 0, 1, 4, 17}
B ∩ C = {-5, 1}

A ∩ B ∩ C = {1}

3.3.3.A
Answer:
When i = 2, i^2 = 4, A = {1, 2, 4}

When i = 3, i^2 = 9, A = {1, 3, 9}

When i = 4, i^2 = 16, A = {1, 4, 16}

When i = 5, i^2 = 25, A = {1, 5, 25}

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3.3.3.B
Answer:

When $i = 2$, $i^2 = 4$, $A = \{1, 2, 4\}$

When $i = 3$, $i^2 = 9$, $A = \{1, 3, 9\}$

When $i = 4$, $i^2 = 16$, $A = \{1, 4, 16\}$

When $i = 5$, $i^2 = 25$, $A = \{1, 5, 25\}$

Therefore, the union of all 5 sets is **$\{1, 2, 3, 4, 5, 9, 16, 25\}$**

3.3.3.E
Answer:

$B_1 = \{x \in R, -1 \le x \le 1\}$

$B_2 = \{x \in R, -1/2 \le x \le 1/2\}$

$B_3 = \{x \in R, -1/3 \le x \le 1/3\}$

.
.
.

$B_{100} = \{x \in R, -1/100 \le x \le 1/100\}$

So, the range of values common to all 100 sets is $[-1/100, 1/100]$

Therefore, the intersection of all 100 sets is **$\{x \in R, -1/100 \le x \le 1/100\}$**

3.3.3.F
Answer:

$B_1 = \{x \in R, -1 \le x \le 1\}$

$B_2 = \{x \in R, -1/2 \le x \le 1/2\}$

$B_3 = \{x \in R, -1/3 \le x \le 1/3\}$

.
.
.

$B_{100} = \{x \in R, -1/100 \le x \le 1/100\}$

So, the union of all 100 sets is **$\{x \in R, -1 \le x \le 1\}$**

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3.3.4.B
Answer:

A = {a, b} and B = {b, c}
A ∪ B = {a, b, c}

P(A ∪ B) = { ∅, {a}, {b}, {c}, {a, b}, {a, c}, {b, c}, {a ,b, c}}

3.3.4.D
Answer:

P(A) = {∅, {a}, {b}, {a, b}}
P(B) = {∅, {b}, {c}, {b, c}}

P(A) ∪ P(B) = **{{∅, {a}, {b}, {c}, {a, b}, {b, c}}**

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<u>Question 10:</u>
3.5.1.B.
Answer:
(foam, tall, non-fat)

3.5.1.C.
Answer:

C={non-fat, whole}
B={foam, no-foam}

	non-fat	**whole**
foam	(foam, non-fat)	(foam,whole)
No foam	(no foam, non-fat)	(no foam, whole)

B × C = {(foam, non-fat), (foam, whole), (no-foam, non-fat), (no-foam, whole)}

3.5.3.B.
Answer:
True. Z^2 = {(a, b): a, b Z}. Z ∈ ⊆ R, so for every a, b Z, a, b R, therefore Z ∈ ∈ ^{2} ⊆ R^2

3.5.3.C.
Answer:
True. The elements in Z^2 are pairs. The elements in Z^3 are triples. Therefore, the two sets have no elements in common.

3.5.3.E
Answer:
True. let any (a, c) A ∈ × C, then a A and c C. Since A ∈ ∈ ⊆ B, every a is an element of B, therefore a B and c C, ∈ ∈ therefore (a, c) B × C. Since (a, c) is an arbitrary element of A ∈ × C, ∀ (a, c) A ∈ × C => ∀ (a, c) B ∈ × C, therefore A × C ⊆ B × C

3.5.6.D.
Answer:

$\{0\}^2 = \{00\}$, $\{1\}^2 = \{11\}$
$\{0\} \cup \{0\}^2 = \{0, 00\}$, $\{1\} \cup \{1\}^2 = \{1, 11\}$

{xy: where x ∈ $\{0\} \cup \{0\}^2$ and y ∈ $\{1\} \cup \{1\}^2$} = **{01, 011, 001, 0011}**

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3.5.6.E.

Answer:

$\{a\}^2 = \{aa\}$
{a} {a} $\cup^2$ = {a, aa}

{xy: x {aa, ab} and y {a} {a} ∈ ∈ ∪ ^{2}} = **{aaa, aaaa, aba, abaa}**

3.5.7.C

Answer:

A × B = {(a, b), (a, c)}
A × C = {(a, a), (a, b), (a, d)}

(A × B) ∪ (A × C) = {(a, a), (a, b), (a, c), (a, d)}

3.5.7.F

Answer:

A × B = {(a, b), (a, c)}

P(A × B) = {∅, {(a, b)}, {(a, c)}, {(a, b), (a, c)}

3.5.7.G

Answer:

P(A) = {∅, {a}}
P(B) = {∅, {b}, {c}, {b, c}}

P(A) × P(B) = {∅, {b}, {c}, {b, c}, {a}, ({a}, {b}), ({a}, {c}), ({a}, {b, c})}

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Question 11:

3.6.2.B

Answer:

(B A) ∩ ∪ (B' **∪ A) = A**	
(B ∩ B' **) A ∪**	**Distributive laws**
∅ ∪ **A**	**Complement laws**
A	**Identity laws**

3.6.2.C

Answer:

A ∩ B'	
A' ∪ B'	**De Morgan's Law**
A' ∪ **B**	**Double Complement Law**

3.6.3.B

Answer:

If A = {a, b} and B = {b, c}, then B ∩ A = {b}, so A - (B ∩ A) = {a}, which is not equal to A.

3.6.3.D

Answer:

If A = {a, b} and B = {b, c}, then B - A = {c}, so (B - A) U A = {a, b, c}, which is not equal to A.

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3.6.4.B
Answer:

$A \cap (B - A)$	
$A \cap (B \cap A')$	**Set subtraction law**
$A \cap (A' \cap B)$	**Commutative laws**
$(A \cap A') \cap B$	**Associative laws**
$\varnothing \cap B$	**Complement laws**
$\varnothing$	**Domination laws**

3.6.4.C
Answer:

$A \cup (B - A)$	
$A \cup (B \cap A')$	**Set subtraction law**
$(A \cup B) \cap (A \cup A')$	**Distributive laws**
$(A \cup B) \cap U$	**Domination laws**
$A \cup B$	**Identity laws**
