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Chapter 02 - Sets

1. Identify the sets:
The integers greater than –5 and less than 1.

a. {-5, -4, -3, -2, -1, 0}
b. {-4, -3, -2, -1, 0}
c. {-4, -3, -2, -1, 0, 1}
d. {-5, -4, -3, -2, -1, 0, 1}

ANSWER: b

2. Identify the sets:
The even natural numbers that are less than 12.

a. {0, 2, 4, 6, 8, 10}
b. {2, 4, 6, 8, 10}
c. {2, 4, 6, 8, 10, 12}
d. {0, 2, 4, 6, 8, 10, 12}

ANSWER: b

3. Use the roster method to write the set of the odd natural numbers less than 11.
ANSWER: {1, 3, 5, 7, 9}

4. Use set-builder notation to write the set:
Even integers less than 54

a. $\{x | x < 54, x \in \text{even integers}\}$
b. $\{x | x < 54, x \in \text{integers}\}$
c. $\{x | x > 54, x \in \text{even integers}\}$
d. $\{x | x > 54, x \in \text{negative integers}\}$

ANSWER: a

5. Use the roster method to write the set of integers x that satisfy $4x - 2 = 14$.

a. $\{2, 4, 6\}$
b. $\{4, -2, 14\}$
c. $\{4, -2\}$
d. $\{4\}$
e. $\emptyset$

ANSWER: d

6. Indicate whether the following sets are equal.

$A = \{x, j, a, w\}, D = \{x, a, b, y\}$

a. $A \neq D$
b. $A = D$

ANSWER: a

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7. Write a description of the set $\{6, 7, 8, 9\}$.

a. The set of all integers between 5 and 10.
b. The set of all integers between 6 and 9.
c. The set of all real numbers between 5 and 10.
d. The set of all real numbers between 6 and 9.
e. The set of all rational numbers between 6 and 9.

ANSWER: a

8. Use $\in$ or $\notin$ to indicate whether the given object is an element of the given set.

6 $\{1, 2, 3, 4, 5, 6\}$

a. $6 \in \{1, 2, 3, 4, 5, 6\}$
b. $6 \notin \{1, 2, 3, 4, 5, 6\}$

ANSWER: a

9. Suppose $A = \{-1, 0, 4\}$. Find a set B such that A is equivalent to B.

a. $B = \emptyset$
b. $B = \{x \in R | -1 \leq x \leq 4\}$
c. $B = \{x \in Q | -1 \leq x \leq 4\}$
d. $B = \{-1, 4\}$
e. $B = \{\pi, \mu, \varepsilon\}$

ANSWER: e

10. Find a set B that is well-defined such that $10 \in B$ and $-5 \in B$.

a. $B = \{x \in I | x \leq 11\}$
b. B is the set containing the first 10 positive real numbers
c. $B = \{x | 9 \leq x \leq 11\}$
d. B is the set containing the first 10 positive real numbers and the first 5 negative real numbers
e. $B = \{x \in R | |x| \leq -5\}$

ANSWER: a

11. Use $\in$ or $\notin$ to indicate whether the given object is an element of the given set.

6 $\emptyset$

a. $6 \in \emptyset$
b. $6 \notin \emptyset$

ANSWER: b

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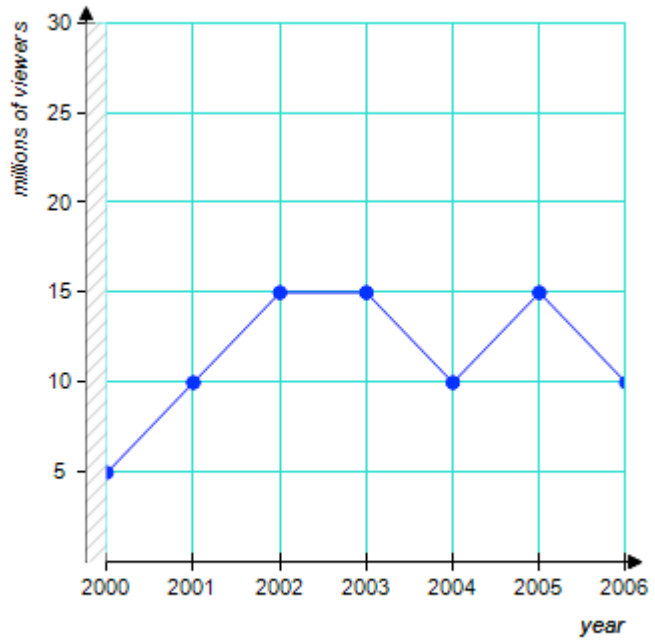
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12. Use set-builder notation to write the set:
Positive integers less than 8

a. $\{x | x < 8, x \in \text{positive integers}\}$
b. $\{x | x > 8, x \in \text{positive integers}\}$
c. $\{x | x > 8, x \in \text{negative integers}\}$
d. $\{x | x < 8, x \in \text{negative integers}\}$

ANSWER: a

13. Use the graph below, which shows the average number of weekly viewers of a 30-minute television program (in millions of viewers) from 2000 to 2006.



List the set of years such that the average number of weekly viewers was at least 10 million and more than the previous year.

a. {2002, 2003, 2005}
b. {1001, 2002, 2005}
c. {2001, 2004, 2006}
d. null set
e. {2004}

ANSWER: b

14. The following table shows the total student enrollment at a certain university for the years 2001 through 2005.

Year	Enrollment

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2001	5536
2002	5617
2003	5796
2004	5768
2005	5730

Use the information in the table and the roster method to represent the following set:
$\{x | x \text{ is a year in which the enrollment was greater than } 5633 \text{ and less than } 5807\}$

a. {2003, 2004, 2005}
b. {2002, 2003, 2004, 2005}
c. {2002, 2003, 2004}
d. {2004, 2005}
e. {2001, 2002, 2004, 2005}

ANSWER: a

15. Find the cardinality of the set $\{22, 44, 88, 176\}$.

a. 330
b. 176
c. 22
d. 4
e. 44

ANSWER: d

16. Find the cardinality of the set $\{2, 7, 12, 17, 22, \ldots, 142\}$.

a. 55
b. 29
c. 30
d. 6
e. 202

ANSWER: b

17. Determine whether sets *A* and *B* are equal but not equivalent, equivalent but not equal, both equal and equivalent, or neither equal nor equivalent.

A is the set of all integers larger than –9 but smaller than –6
B is the set of all whole numbers larger than 7.55 but smaller than 9.55

a. neither equal nor equivalent
b. equivalent but not equal
c. both equal and equivalent
d. equal but not equivalent

ANSWER: b

18. Determine whether sets *A* and *B* are equal but not equivalent, equivalent but not equal, both equal and equivalent, or

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neither equal nor equivalent.

$A = \{18, 36, 72, 144\}$
$B = \{24, 48, 96, 192\}$

a. equivalent but not equal
b. both equal and equivalent
c. equal but not equivalent
d. neither equal nor equivalent

ANSWER: a

19. Provide an example of a set that is not well defined.

a. The set of numbers larger than that are perfect squares.
b. The set of real numbers that are both rational and irrational.
c. $\{x \in R | x \text{ is a large number}\}$
d. $\{x \in R | x^4 \geq 0\}$
e. $\{2, 2\sqrt{7}, 2+2\sqrt{7}, 2+3\sqrt{7}, \ldots, 2+35\sqrt{7}\}$

ANSWER: c

20. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $T = \{1, 3, 7\}$. Find T'.

a. $T' = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
b. $T' = \{1, 3, 7\}$
c. $T' = \{2, 4, 5, 6, 8, 9, 10\}$
d. $T' = \{1, 1, 2, 3, 3, 4, 5, 6, 7, 7, 8, 9, 10\}$

ANSWER: c

21. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. and $S = \{x | x > 4 \text{ and } x \in \text{even integers}\}$. Find S'.

a. $S' = \{1, 2, 3, 4, 5, 7, 9\}$
b. $S' = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
c. $S' = \{\emptyset\}$
d. $S' = \{4\}$

ANSWER: a

22. Assume that $A = \{1, 3, 5, 8, 9\}$ and that U is the universal set of natural numbers less than 11. Find A'.

a. {1, 3, 5, 8, 9}
b. {2, 4, 6, 7, 10}
c. {2, 4, 6, 7, 10, 11}
d. {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
e. {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}

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ANSWER: b

23. If $A = \{a, b, c, d\}$ and $B = \{d, c, a, b\}$, is A a subset of B?

a. Yes
b. No

ANSWER: a

24. Is $A \subseteq B$ if $A = \{7, 8, 9, 16\}$ and $B = \{7, 8, 9, 17, 18, 21\}$?

a. Yes
b. No

ANSWER: b

25. Tell whether each of the following statements is true or false.

a. {Irrational} ⊂ {Integers}
b. {Naturals} ⊂ {Real}

ANSWER: a. False
b. True

26. Find a subset of the set $\{18, 20, 22, 24, \ldots, 3700\}$.

a. The set of even whole numbers.
b. {3697, 3698, 3699, 3700}
c. {18, 22, 26, 30, ..., 3700}
d. {–18, –16, –14, ..., 14, 16, 18}
e. The set of positive real numbers between 18 and 3700.

ANSWER: c

27. ***Job growth*** The number of jobs in 2000, the number projected in 2025, and the projected annual growth rate for jobs in some cities are shown in the table below. Consider the following sets.

A = set of cities with at least 2,000,000 jobs in 2000 or in 2025
B = set of cities with at least 1,500,000 jobs in 2000
C = set of cities with projected annual growth rate of at least 2.5%

Cities	Jobs in 2000 (thousands)	Projected Jobs in 2025 (thousands)	Annual Rates of Increase (%)
O (Orlando)	1539	1923	0.89
M (Myrtle Beach)	133	256	2.65
A (Atlanta)	2715	4893	2.38
P (Phoenix)	1953	3723	2.61
D (Denver)	233	524	3.29

Which of the following statements is true?

a. A is a subset of B.

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b. B is a subset of A.
c. C is a subset of A.
d. A is a subset of C.
e. B is a subset of C.

ANSWER: a

28. Let $U = \{2, 5, 7, 12, 13, 16\}$ and $A = \{2, 5, 12, 16\}$. If $B = \{5, 16\}$, determine the relationship between sets A and B.

a. A is a subset of B.
b. B is the complement of A.
c. B is an element of A.
d. B is not a subset of A.
e. B is a subset of A.

ANSWER: e

29. Given the sets $A = \{5, 6, 7\}$, $B = \{0, 1, 2, 3, \ldots\}$, and $C = \{4, 5, 6\}$, tell which of the following statements are true and which are false.

a. $A \subset C$ b. $8 \in B$ c. $C \subset A$ d. $C \subset B$

a. a. False b. True c. False d. True
b. a. False b. False c. False d. False
c. a. True b. True c. True d. True
d. a. True b. False c. True d. False

ANSWER: a

30. Use $\subseteq$ notation to indicate which of the sets E and F is a subset of the other.

$E = \{b, d, c, z\}, F = \{c, 1, d, z, 6, b\}$

a. $F \subseteq E$
b. $E \subseteq F$
c. $E \supseteq F$
d. $F \subseteq E$ and $E \supseteq F$
e. $F \subseteq E$ and $E \subseteq F$

ANSWER: b

31. Use $\subseteq$ notation to indicate which set is a subset of the other.

$A = \{3, 5, 7, 11, 13\}$, $\varnothing$

a. $\varnothing \subseteq A$
b. $A \subseteq \varnothing$
c. $\varnothing \supseteq A$
d. $A \subseteq \varnothing$ and $\varnothing \supseteq A$

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e. $A \subseteq \emptyset$ and $\emptyset \subseteq A$

ANSWER: a

32. Given $A = \{30\}$ and $B = \{10, 20, 30, 40, 50\}$, which of the following statements is true?

a. $A \in B$
b. $35 \in B$
c. $10 \subset A$
d. $B \subset A$

ANSWER: a

33. Find all the subsets of the set $\{e\}$.

a. $\emptyset, \{e\}$
b. $\{e, b\}$
c. $\{e\}$
d. e

ANSWER: a

34. How many subsets of three elements are contained in the set $\{a, b, c, d, e, f, g, h\}$?

a. 70
b. 8
c. 56
d. 28

ANSWER: c

35. Find the number of subsets of the set $\{17, 22, 27, 32, 37, 42\}$.

ANSWER: 64

36. Find the number of subsets of the given set.

$\{x | x \text{ is an even counting number between 7 and 11}\}$

a. 2
b. 1
c. 4
d. 6

ANSWER: c

37. Find the number of subsets of the set of all vowels in the alphabet.

a. 128
b. 5
c. 32

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d. 25

ANSWER: c

38. An Italian food restaurant claims that with the choices of toppings that they offer on their pizzas, you can order about 128 different types of pizza. How many toppings do they offer?

a. 128
b. 7
c. 9
d. 8
e. 11

ANSWER: b

39. Find $A \cup B$, the union of sets A and B.

$A = \{d, e, g, o, u\}$ and $B = \{a, b, c, d\}$

a. $A \cup B = \{e, g, o, u\}$
b. $A \cup B = \{a, b, c, d\}$
c. $A \cup B = \{a, b, c, d, e, g, o, u\}$
d. $A \cup B = \{a, c, d, e, g, o, u\}$
e. $A \cup B = \{a, c, d, e, u\}$

ANSWER: c

40. Find $A \cap B$, the intersection of sets A and B.

$A = \{2, 3, 4, 5, 6\}$ and
$B = \{4, 6, 8, 10, 12\}$

a. $A \cap B = \{4, 5, 7, 9, 11\}$
b. $A \cap B = \{3, 5\}$
c. $A \cap B = \{4, 6, 8, 10, 12\}$
d. $A \cap B = \{2, 3, 4, 5, 6\}$
e. $A \cap B = \{4, 6\}$

ANSWER: e

41. Find $A \cap B$ if $A = \{b, d, f, g\}$ and $B = \{a, c, d, f, h\}$

ANSWER: $\{d, f\}$

42. Assume that

$A = \{2, 3, 4, 7\}$
$B = \{5, 3, 4\}$

and that U is the universal set of natural numbers less than 11. Find $A \cap B'$.

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a. $A \cap B' = \{2, 3, 4, 7\}$
b. $A \cap B' = \{2, 3, 5, 6\}$
c. $A \cap B' = \{2, 7\}$
d. $A \cap B' = \{1, 2, 6, 7, 8, 9, 10\}$
e. $A \cap B' = \{5, 3, 4, 9\}$

ANSWER: c

43. Assume that

$A = \{1, 2, 3, 5, 8, 7\}$
$B = \{1, 2, 5, 7, 8\}$

and that U is the universal set of natural numbers less than 11. Find $A' \cap B'$.

a. $A' \cap B' = \{2, 4, 9, 10\}$
b. $A' \cap B' = \{1, 3, 5, 7\}$
c. $A' \cap B' = \{3, 6, 7\}$
d. $A' \cap B' = \{4, 6, 9, 10\}$
e. $A' \cap B' = \{1, 5, 7, 8\}$

ANSWER: d

44. Assume that

$A = \{2, 3, 4, 7\}$
$B = \{5, 3, 4\}$

and that U is the universal set of natural numbers less than 11. Find $(A \cap B)'$.

a. $(A \cap B)' = \{1, 2, 5, 6, 7, 8, 9, 10\}$
b. $(A \cap B)' = \{1, 4, 7, 9, 10\}$
c. $(A \cap B)' = \{3, 5, 7, 9\}$
d. $(A \cap B)' = \{2, 5, 6, 7, 9\}$
e. $(A \cap B)' = \{2, 4, 6, 7, 9\}$

ANSWER: a

45. Assume that

$A = \{1, 2, 3, 5, 8, 7\}$
$B = \{5, 3, 4\}$
$C = \{5, 7, 3\}$

and that U is the universal set of natural numbers less than 11. Find $A \cap (B \cup C)$.

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a. $A \cap (B \cup C) = \{2, 5, 6\}$

b. $A \cap (B \cup C) = \{3, 5, 7\}$

c. $A \cap (B \cup C) = \{3, 7\}$

d. $A \cap (B \cup C) = \{2, 7, 8\}$

e. $A \cap (B \cup C) = \{3, 5, 7, 9\}$

ANSWER: b

46. Find the intersection of the following sets.

$\{8, 10, 12, 14, 28\} \cap \{1, 2, 3, 8, 11\}$

a. $\{8\}$

b. $\emptyset$

c. $\{1, 2, 3, 8, 10, 11, 12, 14, 28\}$

d. none of these

ANSWER: a

47. If $A = \{13, 12, 14, 6\}$, $B = \{9, 3, 6, 18\}$, and $C = \{13, 3, 14, 6\}$ find $(A \cup C) \cap B$.

a. $\{3, 6\}$

b. $\{13, 12, 14, 6\}$

c. $\{12\}$

d. $\{9, 18\}$

ANSWER: a

48. Assume that

$A = \{1, 2, 3, 5, 8, 7\}$
$B = \{5, 3, 4\}$
$C = \{2, 3, 5, 6\}$

and that U is the universal set of natural numbers less than 11. Find $A \cap (B' \cup C')$.

a. $A \cap (B' \cup C') = \{2, 3, 4, 8\}$

b. $A \cap (B' \cup C') = \{3, 5, 7\}$

c. $A \cap (B' \cup C') = \{1, 2, 7, 8\}$

d. $A \cap (B' \cup C') = \{3, 7\}$

e. $A \cap (B' \cup C') = \{1, 4, 7, 8\}$

ANSWER: c

49. Let $U = \{1, 5, 8, 11, 13, 18, 19, 22\}$, $A = \{1, 5, 11, 18\}$, $B = \{8, 13\}$, and $C = \{11, 18, 22\}$. Find $(A \cup B') \cup (C \cup A')$.

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a. $\{8, 13\}$
b. $\{11, 18, 22\}$
c. $\{1, 5, 11, 18\}$
d. $\{1, 5, 8, 11, 13, 18, 19, 22\}$
e. $\emptyset$

ANSWER: d

50. ***Job growth*** The number of jobs in 2000, the number projected in 2025, and the projected annual growth rate for jobs in some cities are shown in the table below. Consider the following sets.

A = set of cities with at least 2,000,000 jobs in 2000 or in 2025
B = set of cities with at least 1,500,000 jobs in 2000
C = set of cities with projected annual growth rate of at least 2.5%

Cities	Jobs in 2000 (thousands)	Projected Jobs in 2025 (thousands)	Annual Rates of Increase (%)
O (Orlando)	1582	1923	0.78
M (Myrtle Beach)	133	256	2.65
A (Atlanta)	2715	4893	2.38
P (Phoenix)	1953	4182	3.09
B (Boulder)	233	420	2.38

Choose the correct verbal description of $A \cap C$.

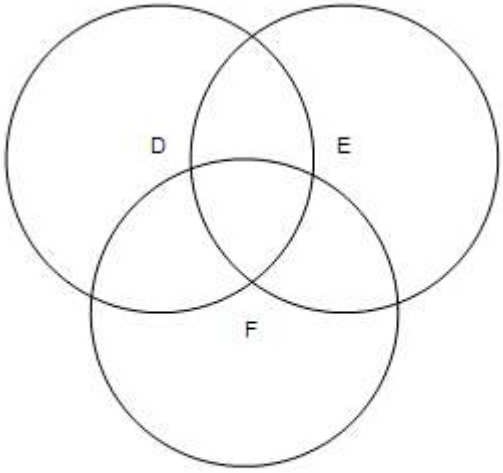
a. The set of cities with at least 2,000,000 jobs in 2000 or 2025 and projected annual growth rates of at least 2.5%.
b. The set of cities with at least 1,500,000 jobs in 2000 or projected annual growth rates of at least 2.5%.
c. The set of cities with at least 2,000,000 jobs in 2000 and projected annual growth rates of at least 2.5%.
d. The set of cities with at least 2,000,000 jobs in 2000 or 2025 and projected annual growth rates of less than 2.5%.
e. The set of cities with at least 2,000,000 jobs in 2000 or 2025 or projected annual growth rates of at least 2.5%.

ANSWER: a

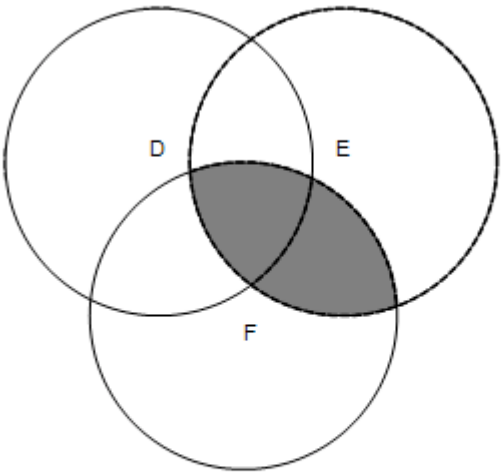
51. The circles contain the members of sets D, E, and F, as indicated. Designate the area that shows $E \cap F$.

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ANSWER:

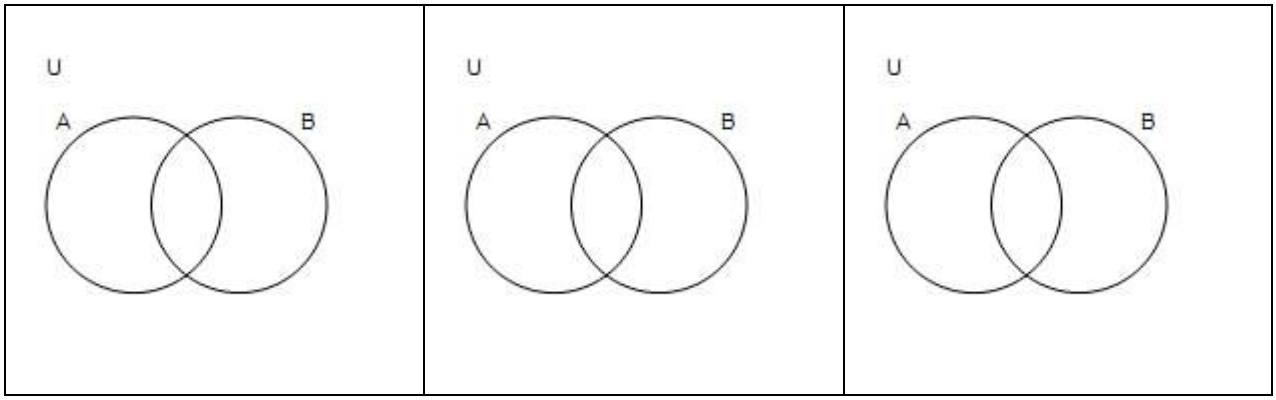


52. Use Venn diagrams to determine which (if any) of the following expressions are equal for all sets A and B.

$A' \cap B$, $A' \cup A$, $A' \cup B'$

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a. $A' \cap B$, $A' \cup A$

b. $A' \cap B$, $A' \cup B'$

c. none are equal,

d. all are equal

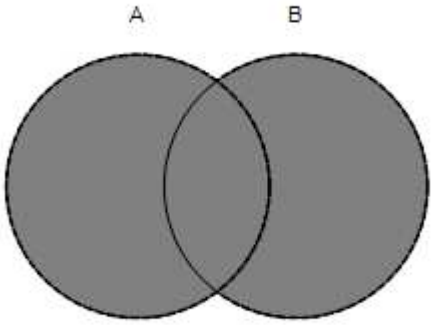
e. $A' \cup A$, $A' \cup B'$

ANSWER: c

53. Draw two Venn diagrams to determine whether the following expressions are equal for all sets A and B.

$A \cup (A' \cap B)$ and $A \cup B$

ANSWER:



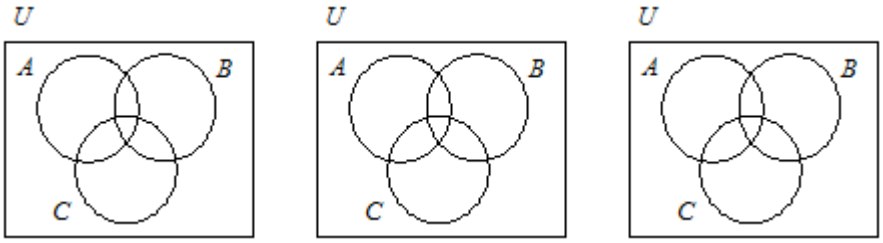
equal

54. Use Venn diagrams to determine which (if any) of the following expressions are equal for all sets A, B and C.

$A' \cup (C \cup B)$, $A' \cup (C' \cap B)$, $(A \cup C') \cap B$

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a. $A' \cup (C \cup B)$, $A' \cup (C' \cap B)$

b. $A' \cup (C \cup B)$, $(A \cup C') \cap B$

c. none are equale

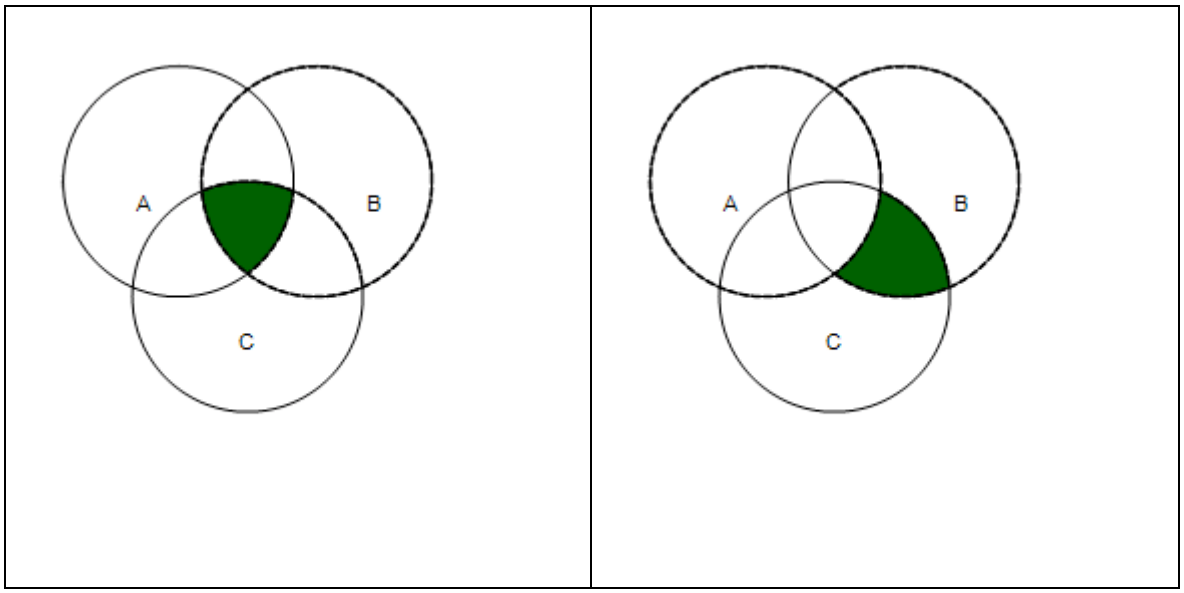
d. all are equale

e. $A' \cup (C' \cap B)$, $(A \cup C') \cap B$

ANSWER: c

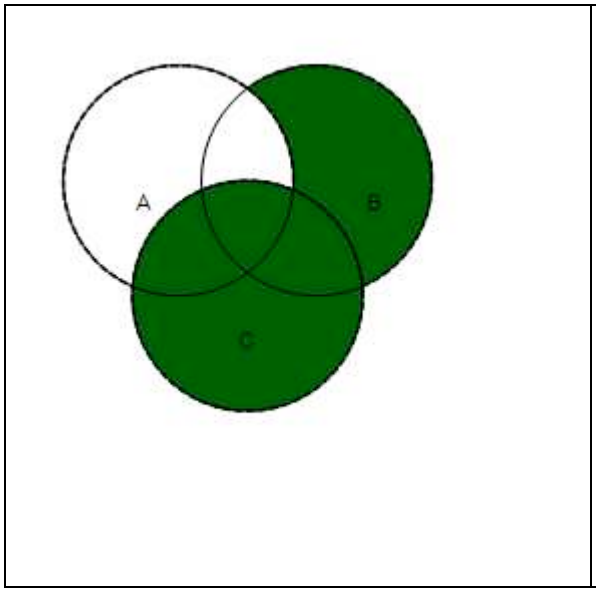
55. Which Venn diagrams represent $(A' \cap B) \cup C \neq (A' \cup C) \cap (A' \cap B)$?

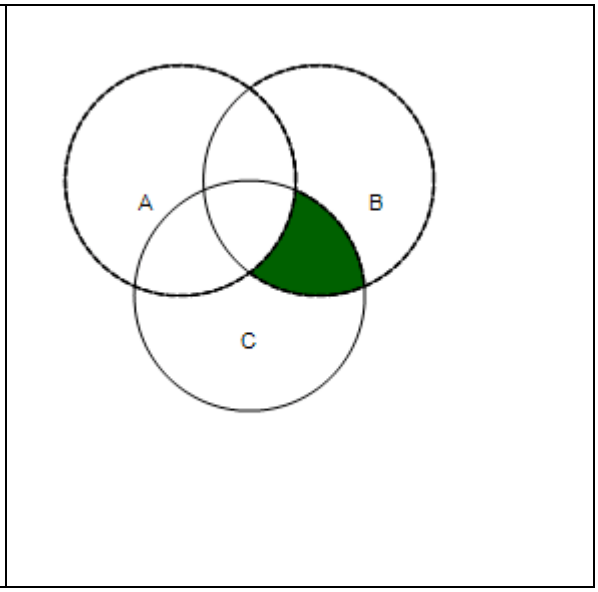
a.



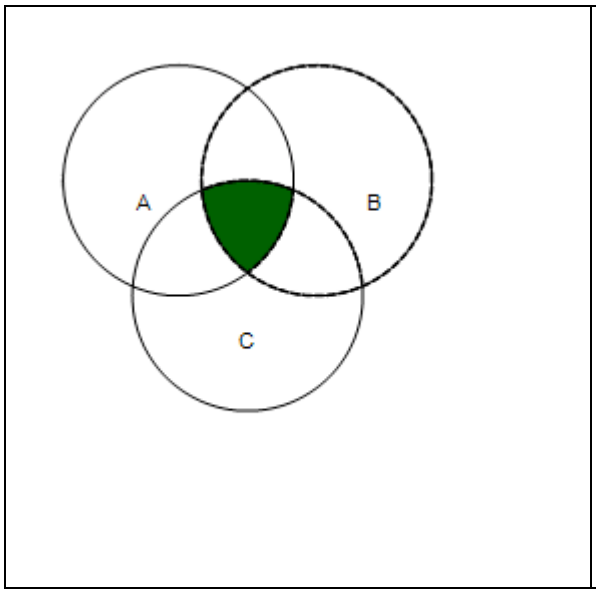
b.

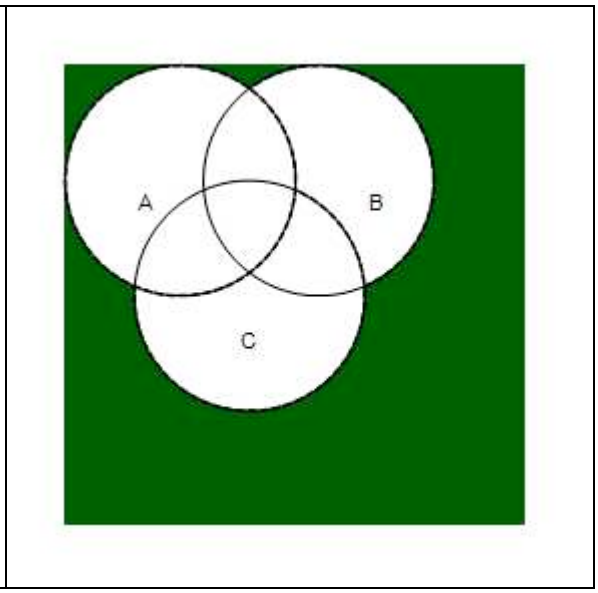
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c.

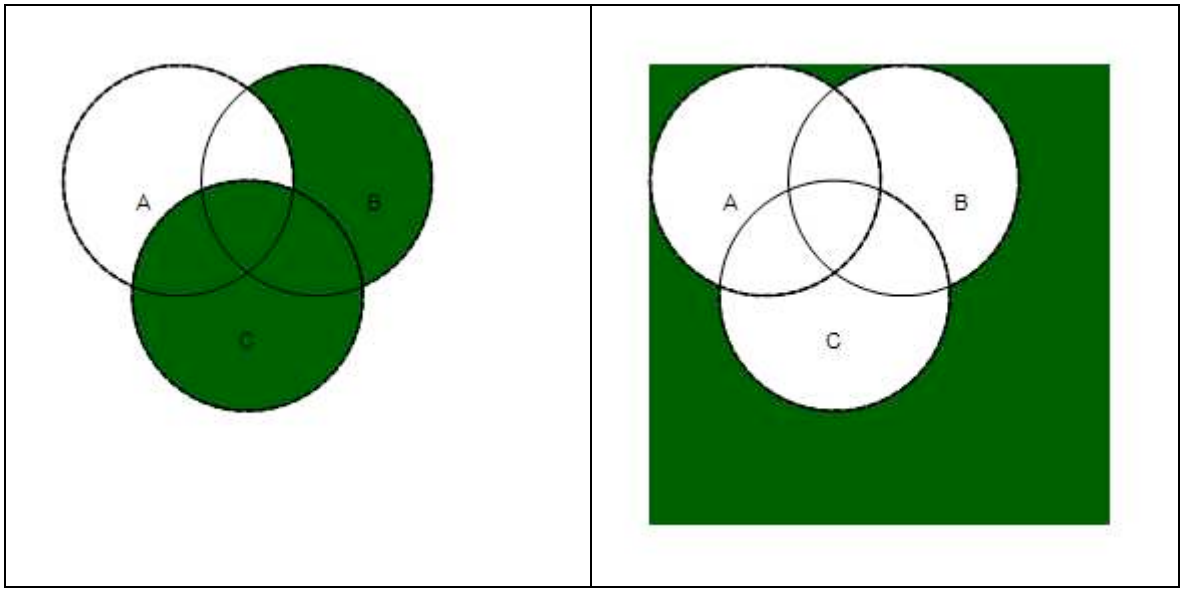




d.

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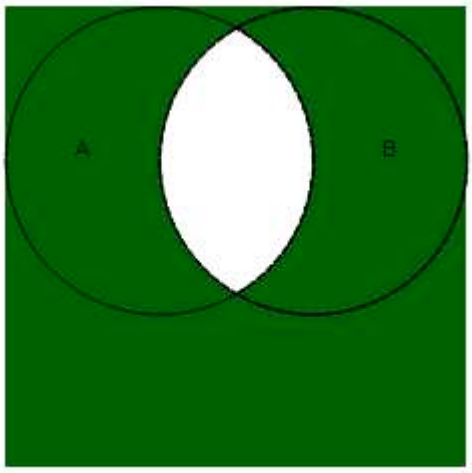
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ANSWER: b

56. Choose the Venn diagram that correctly represents the following sets $(A \cap B)'$

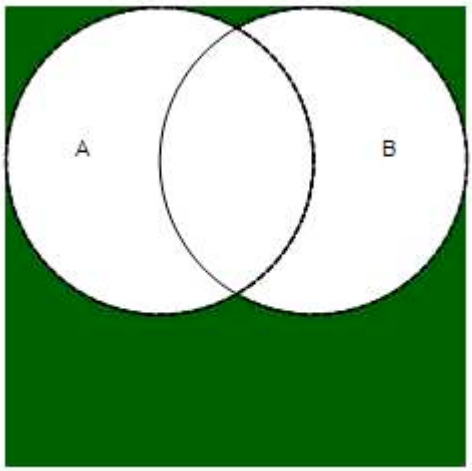
a.



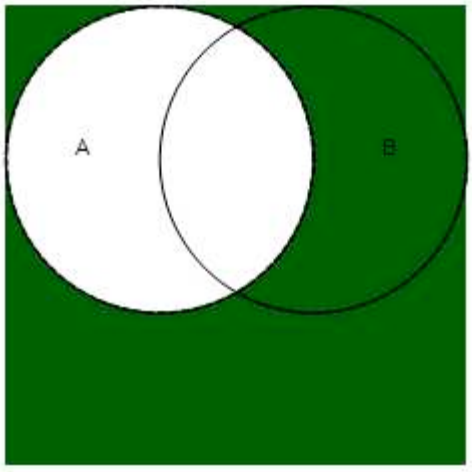
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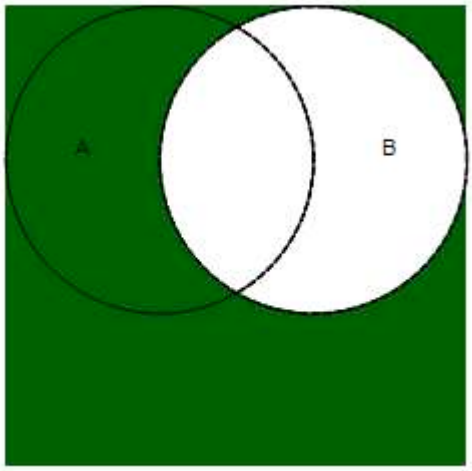
b.



c.



d.



ANSWER: a

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57. Determine whether $(A \cap B) \cap C = A \cap (B \cap C)$ for all sets A, B, and C.

a. Yes, by the Commutative property of intersection.
b. Yes, by the Associative property of intersection.
c. Yes, by the Associative property of union.
d. No, $(A \cap B) \cap C \neq A \cap (B \cap C)$

ANSWER: b

58. Find $A - B$ if the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$A = \{1, 2, 3, 6, 9\}$
$B = \{1, 4, 5, 6, 7\}$

a. $A - B = \emptyset$
b. $A - B = \{2, 3, 7\}$
c. $A - B = \{3, 5, 7\}$
d. $A - B = \{5, 7, 8\}$
e. $A - B = \{2, 3, 9\}$

ANSWER: e

59. Let $U = \{3, 6, 8, 12, 15, 16\}$, $A = \{3, 6, 12, 16\}$, and $B = \{15, 16\}$. Find $A - B$.

a. $A - B = \{3, 6, 12\}$
b. $A - B = \{15, 16\}$
c. $A - B = \{3, 6, 12, 16\}$
d. $A - B = \{3\}$
e. $\emptyset$

ANSWER: a

60. Let $A = \{2, 6, 11, 18\}$ and $B = \{14, 18\}$. Find $n(A \cup B)$.

a. $n(A \cup B) = 6$
b. $n(A \cup B) = 2$
c. $n(A \cup B) = 4$
d. $n(A \cup B) = 5$
e. $n(A \cup B) = 3$

ANSWER: d

61. Let $A = \{2, 5, 11, 17\}$, $B = \{14, 17\}$, and $C = \{11, 17, 22\}$. Find $n(A \cap B \cap C)$.

a. $n(A \cap B \cap C) = 0$
b. $n(A \cap B \cap C) = 1$

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c. $n(A \cap B \cap C) = 2$

d. $n(A \cap B \cap C) = 3$

e. $n(A \cap B \cap C) = 4$

ANSWER: b

62. If $n(A \cup B) = 25$, $n(A \cap B) = 1$, and $n(B) = 19$ find $n(A)$.

a. 6
b. 7
c. 44
d. 24

ANSWER: b

63. If $n(A) = 22$, $n(B) = 12$, and $n(A \cap B) = 5$ find $n(A \cup B)$.

ANSWER: 29

64. If $n(A \cup B) = 32$, $n(A \cap B) = 2$, and $n(A) = 10$ find $n(B)$.

a. 22
b. 24
c. 42
d. 30

ANSWER: b

65. If $n(A) = 10$, $n(B) = 23$, and $n(A \cup B) = 31$ find $n(A \cap B)$.

a. 1
b. 2
c. 4
d. 5

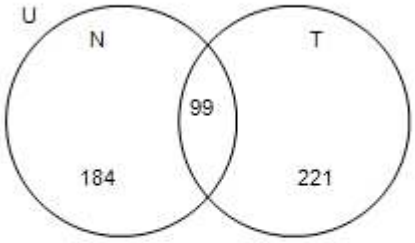
ANSWER: b

66. A large soft drink company conducted a poll of 1,000 families to determine how many had seen its television and newspaper advertisements. The results are shown in the diagram.

U = the set of families polled
T = the set of families who saw the television ad
N = the set of families who saw the newspaper ad

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Based on the facts in the diagram, which is a valid conclusion?

a. 542 families saw neither the television ad nor the newspaper ad.
b. Only 221 saw the television ad.
c. 283 families saw at least 1 of the ads.
d. 99 families saw both the television ad and the newspaper ad.

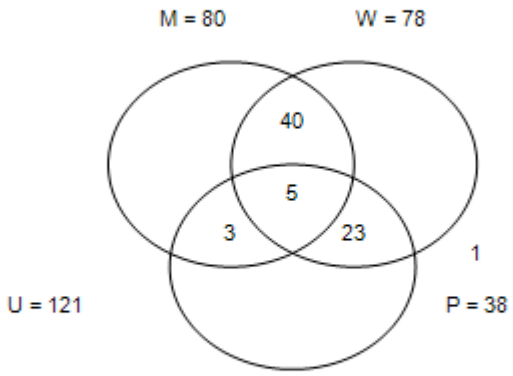
ANSWER: d

67. The Venn diagram displays the results of a survey of 119 families regarding kitchen appliances.

M represents the number of families with a microwave.
P represents the number of families with a pasta maker.
W represents the number of families with a dishwasher.
U represents all the families surveyed.

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How many families have a microwave and a dishwasher?

a. 45
b. 5
c. 40
d. 37

ANSWER: a

68. Ms. Teller surveyed the 38 students in her class about their families. 28 students have a brother or a sister, 15 students have a brother, and 8 students have both a brother and a sister. How many students have only a sister?

a. 22
b. 16
c. 21
d. 23

ANSWER: c

69. **Survey analysis** In a survey of the dining preferences of 110 dormitory students at the end of the spring semester, the following facts were discovered about Adam's Lunch (AL), Pizza Tower (PT), and the Dining Hall (DH).

27 liked AL but not PT
13 liked AL only
43 liked AL
41 liked PT
59 liked DH
4 liked PT and AL but not DH
13 liked PT and DH

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How many liked PT or DH?

a. 57
b. 9
c. 33
d. 48
e. 87

ANSWER: e

70. **Survey analysis** In a survey of the dining preferences of 110 dormitory students at the end of the spring semester, the following facts were discovered about Adam's Lunch (AL), Pizza Tower (PT), and the Dining Hall (DH).

19 liked AL but not PT
10 liked AL only
23 liked AL
42 liked PT
48 liked DH
4 liked PT and AL but not DH
25 liked PT and DH

How many liked all three?

a. 37
b. 42
c. 18
d. 34
e. 0

ANSWER: e

71. **Survey analysis** In a survey of the dining preferences of 110 dormitory students at the end of the spring semester, the following facts were discovered about Adam's Lunch (AL), Pizza Tower (PT), and the Dining Hall (DH).

19 liked AL but not PT
10 liked AL only
23 liked AL
42 liked PT
48 liked DH
4 liked PT and AL but not DH
25 liked PT and DH

How many liked only DH?

a. 23
b. 34
c. 9
d. 25
e. 14

ANSWER: e

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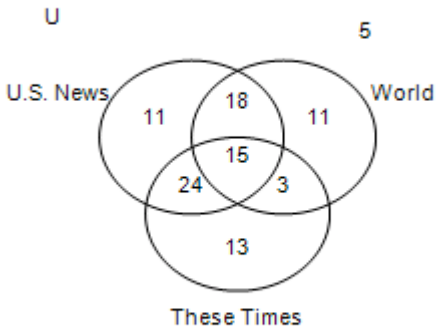
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72. ***Advertising*** Suppose that a survey of 100 advertisers in *U.S. News*, *These Times*, and *World* found the following.

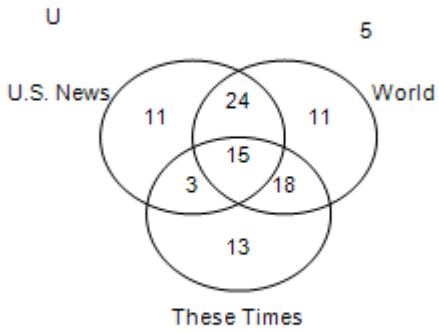
15 advertised in all three
18 advertised in *These Times* and *U.S. News*
39 advertised in *World* and *U.S. News*
33 advertised in *World* and *These Times*
49 advertised in *These Times*
53 advertised in *U.S. News*
68 advertised in *World*

Which is the correct Venn diagram representing this information?

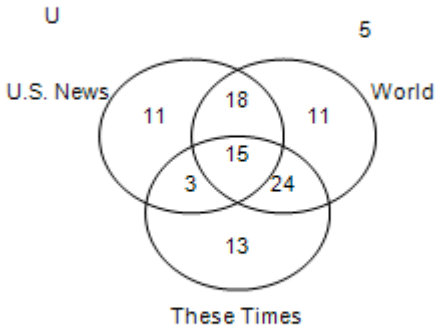
a.



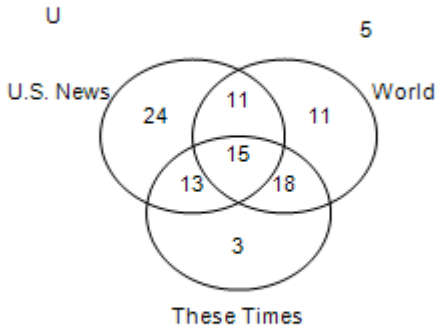
b.



c.



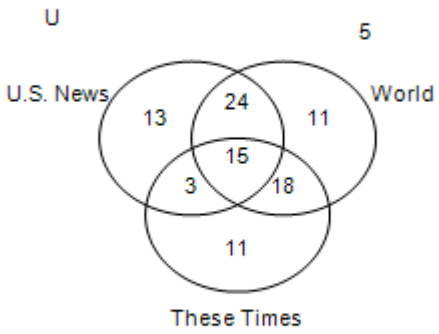
d.



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e.



ANSWER: b

73. ***National health care*** Suppose that the table below summarizes the opinions of various groups on the issue of national health care.

Opinion	Whites		Nonwhites		Total
	Rep.	Dem.	Rep.	Dem.	
Favor	50	250	100	100	500
Oppose	150	150	100	100	500
Total	200	400	200	200	1000

Identify the number of individuals in the set of Whites who oppose national health care.

a. 500
b. 600
c. 300
d. 400
e. 650

ANSWER: c

74. ***National health care*** Suppose that the table below summarizes the opinions of various groups on the issue of national health care.

Opinion	Whites		Nonwhites		Total
	Rep.	Dem.	Rep.	Dem.	
Favor	200	200	60	100	560
Oppose	250	50	20	120	440
Total	450	250	80	220	1000

Identify the number of individuals in the set of Whites or those who oppose national health care.

a. 700

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b. 440
c. 840
d. 300
e. 140

ANSWER: c

75. Given that set A has 31 elements, set B has 8 elements, and set C has 11 elements, determine the maximum possible number of elements in $A \cup B \cup C$ and the minimum possible number of elements in $A \cup B \cup C$.

a. maximum: 31
minimum: 8

b. maximum: 34
minimum: 28

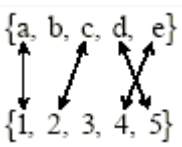
c. maximum: 50
minimum: 31

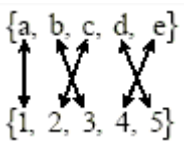
d. maximum: 50
minimum: 8

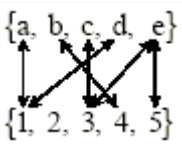
e. maximum: 31
minimum: 11

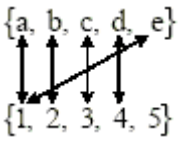
ANSWER: c

76. Which shows a one-to-one correspondence between the sets of $V = \{1, 2, 3, 4, 5\}$ and $T = \{a, b, c, d, e\}$

a.


b.


c.


d.


ANSWER: b

77. Which general correspondence establishes a one-to-one correspondence between the set of numbers $V = \{1, 2, 3, 4, 5\}$ and $T = \{6, 12, 18, 24, 30\}$?

a. $n \leftrightarrow 6n$
b. $n \leftrightarrow 6n + n$
c. $n \leftrightarrow \frac{1}{6}n$

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d. $n \leftrightarrow \frac{1}{6} + n$

ANSWER: a

78. Which general correspondence establishes a one-to-one correspondence between the set of numbers $V = \{8, 13, 18, 23, 28, \ldots, 5n + 3, \ldots\}$ and $T = \{5, 10, 15, 20, 25, \ldots, 5n, \ldots\}$?

a. $5n \leftrightarrow 5n$
b. $5n + 3 \leftrightarrow 5n$
c. $n \leftrightarrow 5n$
d. $n \leftrightarrow 5n + 3$

ANSWER: b

79. Which is the cardinality of the set $\{1, 2, 4\}$?

a. c
b. 4
c. 3
d. $\aleph_0$

ANSWER: c

80. State the cardinality of the set $\{5, -3, -11, -19, \ldots, -8n + 13, \ldots\}$.

a. 5
b. 8
c. ∞
d. $\aleph_0$
e. c

ANSWER: d

81. Which is the cardinality of the set of integers?

a. ∞
b. n
c. c
d. $\aleph_0$

ANSWER: d

82. Find the cardinality of the set of subsets of $\{30, 60, 120, 240\}$.

a. c
b. $\aleph_0$
c. 240
d. 4
e. 16

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ANSWER: e

83. Choose the proper subset of $S = \{35, 70, 105, 140, \ldots, 35n, \ldots\}$ that can be used to verify S as an infinite set.

a. $\{70, 105, 140, 175\}$
b. $\{35, 70, 105, 140\}$
c. $\{-35, -70, -105, -140, \ldots, -35n, \ldots\}$
d. $\{70, 105, 140, 175, \ldots, 35n + 35, \ldots\}$

ANSWER: d

84. Show that the set $A = \{6, 12, 18, 24, \ldots, 6n, \ldots\}$ is an infinite set by placing it in a one-to-one correspondence with a proper subset of itself.

ANSWER: Answers may vary. Sample answer:
A proper subset of $\{24, 48, 72, 96, \ldots, 24n, \ldots\}$ creating general correspondence of $6n \leftrightarrow 24n$

85. Show that the set $\{9, 13, 17, 21, 25, \ldots, 4n + 5, \ldots\}$ has a cardinality of $\aleph_0$.

ANSWER: $(4n + 5) \leftrightarrow n$

86. Show that the set $\{5, 25, 125, \ldots, 5^n, \ldots\}$ has a cardinality of $\aleph_0$ by establishing a one-to-one correspondence between the elements of this set and the elements of the set N.

a. the general correspondence is given by $n \leftrightarrow 5^n$
b. the general correspondence is given by $n \leftrightarrow 5n$
c. the general correspondence is given by $n \leftrightarrow n^5$
d. the general correspondence is given by $n \leftrightarrow n + 5$
e. the general correspondence is given by $n \leftrightarrow 5n + 5$

ANSWER: a

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