Set notation

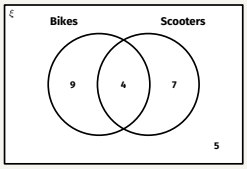
Translate between set notation, Venn diagram regions, and roster notation.

Name _____ **Date** _____

Reading set notation

$x \in A$ means x is an element of A; $x \notin A$ means it is not. $A \cap B$ is the overlap of two sets; $A \cup B$ is everything in either set; A' is the complement (everything not in A). $\emptyset$ is the empty set, and $A \subset B$ means every element of A is also in B.

Worked example State $n(\text{Bikes})$, and write the notation for "not Scooters".



$n(\text{Bikes}) = 9 + 4 = 13$.
"Not Scooters" is Scooters′; $n(\text{Scooters}') = 9 + 5 = 14$.

1. $\xi = \{1, \ldots, 15\}$. $A = \{5, 10, 15\}$. Is $10 \in A$? Is $12 \in A$?

Solution

$10 \in A$ (yes). $12 \notin A$ (no).

2. Write $C = \{\text{odd numbers from 1 to 9}\}$ using roster notation.

Solution

$C = \{1, 3, 5, 7, 9\}$

3. What does $\emptyset$ mean? Give one example of an empty set.

Solution

The set with no elements. E.g. $\{x : x \text{ is a month with 32 days}\} = \emptyset$.

4. State $n(\text{Library})$ and $n(\text{Sport})$.

Solution

$n(\text{Library}) = 9 + 6 = 15$.
$n(\text{Sport}) = 10 + 6 = 16$.

5. State $n(\text{Library} \cap \text{Sport})$ and $n(\text{Library} \cup \text{Sport})$.

Solution

$n(\text{Library} \cap \text{Sport}) = 6$.
$n(\text{Library} \cup \text{Sport}) = 25$.

6. State $n(\text{Sport}')$.

Solution

$n(\text{Sport}') = 9 + 5 = 14$ (Library only + outside).

7. Write the set notation expression for the shaded region.

Solution

$A \cap B$ (the intersection).

8. Write the set notation expression for the shaded region.

Solution

$A \setminus B$ (in A but not B).

9. Write the set notation expression for the shaded region (exactly one set).

Solution

$A \triangle B$ (symmetric difference).

Set notation (continued)

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10. Write the set notation expression for the shaded region.

Solution

$(A \cap B)'$ (everything outside the overlap).

11. Describe in words what $A \cap B'$ means.

Solution

Elements in A but NOT in B (same region as $A \setminus B$).

12. Describe in words what $(A \cup B)'$ means.

Solution

Elements in neither A nor B.

13. State $n(\text{Cake} \cap \text{Icecream})'$ (everyone NOT eating both).

Solution

$33 - 7 = 26$ (total minus the overlap).

14. State $n(\text{Cake} \cup \text{Icecream})$.

Solution

$n(\text{Cake} \cup \text{Icecream}) = 11 + 7 + 9 = 27$.

15. ξ has 25 elements. $n(A) = 14$. Find $n(A')$.

Solution

$n(A') = 25 - 14 = 11$.

16. $A = \{3, 6, 9\}$, $B = \{1, 2, \ldots, 10\}$. Is $A \subset B$? Explain.

Solution

Yes, $A \subset B$: every element of A (3, 6, 9) is also in B.

17. State $n(A \cap B \cap C)$ and $n(\text{exactly two of the three})$.

Solution

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

Exactly two $= 2 + 1 + 3 = 6$.

18. ξ has 50 elements. $n(A) = 27$, $n(B) = 20$, $n(A \cap B) = 9$. Find $n((A \cup B)')$.

Solution

$n(A \cup B) = 27 + 20 - 9 = 38$.

$n((A \cup B)') = 50 - 38 = 12$.