Test Your Understanding: sets

Test yourself by filling in the blanks.

1. The notation $x \in A$ is read ____.
2. The notation $A \subseteq B$ is read ____ and means that ____.
3. A set A equals a set B if, and only if, A and B have ____.
4. An element x is in $A \cup B$ if, and only if, ____.
5. An element x is in $A \cap B$ if, and only if, ____.
6. An element x is in $A - B$ if, and only if, ____.
7. An element x is in A^c if, and only if, ____.
8. The empty set is a set with ____.
9. The power set of a set A is ____.
10. Sets A and B are disjoint if, and only if, ____.
11. A collection of nonempty sets $A_1, A_2, \ldots, A_n$ is a partition of a set A if, and only if, ____.
12. Given sets A and B, the Cartesian product of A and B, $A \times B$, is ____.
13. Given sets $A_1, A_2, \ldots, A_n$, the Cartesian product $A_1 \times A_2 \times \cdots \times A_n$ is ____.
14. To use an element argument for proving that a set X is a subset of a set Y, you suppose that ____ and show that ____.
15. To use the basic method for proving that two sets X and Y are equal, you prove that ____ and that ____.
16. To prove a proposed set identity involving set variables A, B, and C, you suppose that ____ and show that ____.
17. If $\emptyset$ is a set with no elements and A is any set, the relation of $\emptyset$ and A is that ____.
18. To use the element method for proving that a set X equals the empty set, you prove that X has ____. To do this, you suppose that ____ and you show that this supposition leads to ____.
19. To show that a set X is not a subset of a set Y, ____.
20. Given a proposed set identity involving set variables A, B, and C, the most common way to show that the proposed identity is false is to find ____.

Answers

1. x is an element of the set A
2. the set A is a subset of the set B;
   for all x, if $x \in A$ then $x \in B$ (in other words, every element of A is also an element of B)
3. exactly the same elements
4. x is in A or x is in B
5. x is in A and x is in B
6. x is in A and x is not in B
7. x is not in A
8. no elements
9. the set of all subsets of A
10. $A \cap B = \emptyset$ (in other words, A and B have no elements in common)
11. $A = A_1 \cup A_2 \cup \cdots \cup A_n$ and $A_i \cap A_j = \emptyset$ for all $i, j = 1, 2, \ldots, n$ (in other words, A is the union of all the sets $A_1, A_2, \ldots, A_n$ and no two of these sets have any elements in common)
12. the set of all ordered pairs (a, b), where a is in A and b is in B
13. the set of all ordered n-tuples $(a_1, a_2, \ldots, a_n)$, where a_i is in A_i for all $i = 1, 2, \ldots, n$
14. x is any *[particular but arbitrarily chosen]* element of X
    x is an element of Y
15. $X \subseteq Y$; $Y \subseteq X$
16. A, B, and C are any *[particular but arbitrarily chosen]* sets; the left-hand and right-hand sides of the equation are equal for those sets
17. $\emptyset \subseteq A$
18. no elements; there is at least one element in X; a contradiction
19. show that there is an element of X that is not an element of Y
20. concrete sets A, B, and C for which the left-hand and right-hand sides of the equation are not equal