

Set Theory MCQs with Solutions

Set Theory MCQs

The following multiple-choice questions test key set theory concepts. Each question includes four options, with difficulty levels ranging from low to high.

Questions

1. What is a set?
 - a) A collection of numbers only
 - b) A well-defined collection of distinct objects
 - c) A list of repeated elements
 - d) A group of random objects
2. Which of these is the tabular form of the set of even numbers from 2 to 6?
 - a) $\{2, 4, 6\}$
 - b) $\{1, 3, 5\}$
 - c) $\{2, 3, 4\}$
 - d) $\{1, 2, 3, 4\}$
3. What is the set builder notation for $\{1, 2, 3\}$?
 - a) $\{x \mid x \in \mathbb{N} \wedge x \leq 3\}$
 - b) $\{x \mid x \in \mathbb{Z} \wedge x > 3\}$
 - c) $\{x \mid x \in \mathbb{Q} \wedge x < 3\}$
 - d) $\{x \mid x \in \mathbb{R} \wedge x \geq 3\}$
4. Which set is finite?
 - a) $\{1, 2, 3, \dots\}$
 - b) $\{a, b, c\}$
 - c) $\{x \mid x \in \mathbb{R}\}$
 - d) $\{x \mid x \in \mathbb{Q}\}$
5. If $A = \{1, 2\}$ and $B = \{1, 2, 3\}$, is $A \subseteq B$?

- a) Yes
 - b) No
 - c) Only if $A = B$
 - d) Only if B is empty
6. What is the empty set?
- a) $\{0\}$
 - b) $\{\}$
 - c) $\{\emptyset\}$
 - d) $\{1, 2\}$
7. What does \in mean?
- a) Is a subset of
 - b) Is an element of
 - c) Is not an element of
 - d) Is equal to
8. What is the power set of $\{a\}$?
- a) $\{a\}$
 - b) $\{\emptyset, \{a\}\}$
 - c) $\{a, \{a\}\}$
 - d) $\{\emptyset\}$
9. If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$, what is $A \cup B$?
- a) $\{1, 2, 3, 4\}$
 - b) $\{3\}$
 - c) $\{1, 2\}$
 - d) $\{4\}$
10. If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$, what is $A \cap B$?
- a) $\{1, 2, 3, 4\}$
 - b) $\{3\}$
 - c) $\{1, 2\}$
 - d) $\{\emptyset\}$
11. Which set is equivalent to $\{x, y, z\}$?
- a) $\{1, 2\}$
 - b) $\{a, b, c\}$

- c) $\{1, 2, 3, 4\}$
d) $\{\emptyset\}$
12. If $A = \{1, 2\}$ and $B = \{2, 1\}$, are A and B equal?
a) Yes
b) No
c) Only if $A \subseteq B$
d) Only if A is empty
13. Which set is disjoint with $\{1, 2\}$?
a) $\{2, 3\}$
b) $\{3, 4\}$
c) $\{1, 3\}$
d) $\{1, 2, 3\}$
14. What is the complement of $A = \{1, 2\}$ if $U = \{1, 2, 3, 4\}$?
a) $\{3, 4\}$
b) $\{1, 2\}$
c) $\{1, 2, 3, 4\}$
d) $\{\emptyset\}$
15. What is the number of elements in the power set of $\{1, 2, 3\}$?
a) 3
b) 6
c) 8
d) 9
16. Which is a proper subset of $\{a, b, c\}$?
a) $\{a, b, c\}$
b) $\{a, b\}$
c) $\{a, b, c, d\}$
d) $\{\emptyset\}$
17. What is the set $\{x \mid x \in \mathbb{N} \wedge x + 5 = 3\}$?
a) $\{2\}$
b) $\{3\}$
c) $\{\emptyset\}$
d) $\{-2\}$

18. Which statement is true for $\{a\}$ and $\{\{a\}\}$?

- a) $\{a\} = \{\{a\}\}$
- b) $\{a\} \in \{\{a\}\}$
- c) $\{a\} \subseteq \{\{a\}\}$
- d) $a \subseteq \{\{a\}\}$

19. If $A \subseteq B$, what is $A \cap B$?

- a) A
- b) B
- c) \emptyset
- d) $A \cup B$

20. What is the set $\{x \mid x \in \mathbb{Q} \wedge x^2 = 2\}$?

- a) $\{\sqrt{2}, -\sqrt{2}\}$
- b) $\{2\}$
- c) $\{\emptyset\}$
- d) $\{1, -1\}$

Solutions with Explanations

1. **Answer: B** A set is a well-defined collection of distinct objects, not limited to numbers, and elements are unique (no repeats).
2. **Answer: A** Even numbers from 2 to 6 are 2, 4, 6, so the tabular form is $\{2, 4, 6\}$.
3. **Answer: A** The set $\{1, 2, 3\}$ consists of natural numbers up to 3, so $\{x \mid x \in \mathbb{N} \wedge x \leq 3\}$.
4. **Answer: B** A finite set has a limited number of elements. $\{a, b, c\}$ has 3 elements, while others are infinite.
5. **Answer: A** $A = \{1, 2\}$ is a subset of $B = \{1, 2, 3\}$ because all elements of A are in B .
6. **Answer: B** The empty set has no elements, denoted $\{\}$ or \emptyset . $\{0\}$ and $\{\emptyset\}$ contain elements.
7. **Answer: B** The symbol \in means an element belongs to a set, e.g., $1 \in \{1, 2\}$.
8. **Answer: B** The power set of $\{a\}$ includes all subsets: $\{\emptyset, \{a\}\}$. It has $2^1 = 2$ elements.
9. **Answer: A** $A \cup B$ combines all elements: $\{1, 2, 3\} \cup \{3, 4\} = \{1, 2, 3, 4\}$.
10. **Answer: B** $A \cap B$ includes common elements: $\{1, 2, 3\} \cap \{3, 4\} = \{3\}$.

11. **Answer: B** $\{x, y, z\}$ has 3 elements, so it's equivalent to $\{a, b, c\}$, which also has 3 elements.
12. **Answer: A** $A = \{1, 2\}$ and $B = \{2, 1\}$ have the same elements, so they are equal (order doesn't matter).
13. **Answer: B** Disjoint sets have no common elements. $\{1, 2\} \cap \{3, 4\} = \emptyset$, so they are disjoint.
14. **Answer: A** The complement A' includes elements in U not in A : $U = \{1, 2, 3, 4\}$, $A = \{1, 2\}$, so $A' = \{3, 4\}$.
15. **Answer: C** For a set with 3 elements, the power set has $2^3 = 8$ elements.
16. **Answer: B** A proper subset of $\{a, b, c\}$ must have fewer elements, like $\{a, b\}$. $\{a, b, c\}$ is improper, and $\{a, b, c, d\}$ is not a subset.
17. **Answer: C** Solving $x + 5 = 3$ gives $x = -2$, but $-2 \notin \mathbb{N}$, so the set is $\{\emptyset\}$.
18. **Answer: B** $\{a\}$ is an element of $\{\{a\}\}$, as $\{\{a\}\}$ contains the set $\{a\}$. They are not equal or subsets.
19. **Answer: A** If $A \subseteq B$, all elements of A are in B , so $A \cap B = A$.
20. **Answer: C** Solving $x^2 = 2$ gives $x = \sqrt{2}, -\sqrt{2}$, which are irrational, so no rational numbers satisfy, giving $\{\emptyset\}$.