

EXERCISES (SOLUTIONS) : SET THEORY

1. A is finite; B is infinite; C is an empty set; D is an empty set; E is infinite; F is a singleton set; G is finite; H is an empty set; I is finite; J is an empty set.
2. For instance: $1 \in A, 100 \notin A; 21 \in B, 1 \notin B; a \notin C; \text{monday} \notin D; 5 \in E, 6 \notin E; 2 \in F, 4 \notin F; a \in G, 1 \notin G; 1 \notin H; 3 \in I, 4 \notin I; a \notin J$.
3. $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$
 B can only be written (formally) in an intensional way. We can write $B = \{21, 22, 23, \dots\}$.
 $C = \emptyset$
 $D = \emptyset$
 E can only be written (formally) in an intensional way. We can write $E = \{5, 7, 9, \dots\}$.
 $F = \{2\}$
 $G = \{a, e, i, o, u\}$
 $H = \emptyset$
 $I = \{2, 3, 5, 7\}$
 $J = \emptyset$
4. $A \cup B = \{c, a, s, o, m, l\}; A \cap B = \{a, o\}; A - B = \{c, s\}; B - A = \{m, l\}; \bar{A} = \{u, d, l, m\}; \bar{B} = \{c, s, u, d\}; A \cup \bar{B} = \{c, a, s, o, u, d\}; \bar{A} \cap \bar{B} = \{u, d\}; \overline{A \cup B} = \{u, d\}; \bar{A} - \bar{B} = \{m, l\}$.
5. $A = \{m, a, l, o\}; B = \{c, a, l, o\}$.
6. We have to take into account the universal set $U = \{a, b, c, d, e, f, g, h, i, j\}$ and that $B = C$. Then, $\bar{B} \cap A = \{b, c, d\}; A \cap (B \cap C) = \{a, e\}; C - B = \emptyset$
7. Venn diagrams
8. $\bar{E} \cup \bar{D} = \{\text{not European people or not sporty people}\} = \{\text{all people except for sporty europeans}\}$
 $(E \cap \bar{H}) \cap D = \{\text{sporty european women}\}$
9. a) $B \subset A; C \not\subset A$
 b) $C \subset B; A \subset B$. (Or $(C \cup A) \subset B$)
 c) $A \subset (C \cap B); B \not\subset C$
10. a) $(A \cap C) \subset E$
 b) $(E \cap F) \subset G$
 c) $D \cap F = \emptyset$
 d) $F \subset [(A \cup B) \cap E]$
 e) $(B - D) \subset (F \cap G)$
11. 50 people have read both newspapers.
12. a) 16 students do not take any exam.

- b) 28 students take any of the two exams.
 - c) 10 students take both exams.
13. a) 5 users did not read books of any of these two categories.
b) 17 users read adventure but not mystery books.
14. There are 100 women who are not single.
15. 2 of them study both languages. 7 students study Arabic but not Chinese. 37 students study only one of the three languages.
16. There are no students who do not play any of the three sports. 2 students play tennis and football but not basketball.
17. Any of the respondents like only reggaeton. The 2% of the respondents does not listen any of the three styles.
18. There are 27 markers that are not blue. There are 144 objects in total.
19. 38 students pass at least two exams. It is possible to answer the question by using only the cardinalities 48, 19 and 9.
20. There are 30 respondents who do not have an account in any of the three social networks. There are 40 users having exactly two social networks.
21. There are 15 blond boys who do not use glasses. 28 girls use glasses.
22. They are 80 friends.
23. The 25% of the students repeated the school year.
24. a) There are no families with three pets.
b) 15 families have a cat as the only pet of their house
c) 20 families have no pets
d) There are 61 pets in total in the neighborhood.
25. 12 students have mobile and computer.
26. 3 students live in Oviedo but use a means of transport to go to school. 6 students neither live in Oviedo nor go by feet to school.
27. 220 people have answered the survey; 80 of them play only basketball.