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- (1) The mass of Earth is 6×10^{24} kg. If Archimedes can lift 60 kg, how long would his lever have to be to move the earth, if the moon was fixed in space and used as a pivot (the moon is approximately 44×10^5 km from earth)? Compare your result to the width of the observable universe (approximately 8.8×10^{23} km). [Don't think too much about the physicality of the question].
- (2) Let $A = \{1, 2, 3\}$. Find all the subsets of A . Do not forget the empty set $\emptyset$ and set A itself.
- (3) Let
- A =set of all people who know French
 - B =set of all people who know German
 - C =set of all people who know Russian
- Use the set notation to denote the following sets:
- (a) Set of people who don't know Russian but know at least French or German.
 - (b) Set of people who know French and Russian but not German.
 - (c) Set of people who know all three languages.
 - (d) Set of people who don't know any of these languages.
 - (e) Set of people who speak at least two languages.
- (4) Draw the following sets on the number line and describe in the interval notation:
- (a) Set of all numbers x satisfying $x \leq 3$ and $x > -10$;
 - (b) Set of all numbers x satisfying $x \leq 3$ or $x < -10$
 - (c) Set of all numbers x satisfying $x < -10$ or $x > 2$
 - (d) Set of all numbers x satisfying $x > -10$ and $x \leq 2$

- (5) Find sets A, B, C if you know that $A \cup B = \{1, 3, 4, 5, 7\}$, $B \cup C = \{1, 2, 4, 5, 6, 8, 9\}$, $(A \cup B) \cap C = \emptyset$, $(B \cup C) \cap A = \{1, 5\}$.
- (6) Find A if you know that $A \cup \{5, 7\} = \{3, 5, 7, 8\}$, $A \cap \{1, 2, 5, 7\} = \{5, 7\}$.
- (7) On the island of knights and knaves, you meet two inhabitants, X and Y. You ask X, “Are you a knight or a knave?”. X answers, but you couldn’t quite hear what he said. So you turn to Y and ask “What did X say?”, and Y replies, “X said that he’s a knave”. What is Y?
- (8) Recall the islands of knights and knaves: knights always tell the truth and knaves always lie. Give an example of a statement that cannot be uttered by any inhabitant on the island!