CS 2102 - DMT1 - Spring 2020 — Luther Tychonievich
Practice exercise in class friday february 21, 2020

# Practice 05

problem 1 *Set definition*

Let $A = \{1, 2, 3, 4\}$, $B = \{2x \mid (x \in \mathbb{N}) \wedge x < 5\}$, $C = \mathcal{P}(\{2, 3\})$. Show the full set of members in each of the following sets using curly-brace notation (not set-builder or operator-defined notation):

1. $B =$ $\{0, 2, 4, 6, 8\}$
2. $C =$ $\{\{\}, \{2\}, \{3\}, \{2, 3\}\}$
3. $|C| =$ $4$
4. $A \cup B =$ $\{0, 1, 2, 3, 4, 6, 8\}$
5. $A \cap B =$ $\{2, 4\}$
6. $A \setminus B =$ $\{1, 3\}$
7. $A \cup C =$ $\{1, 2, 3, 4, \{\}, \{2\}, \{3\}, \{2, 3\}\}$
8. $A \cap C =$ $\{\}$
9. $\{x \mid x \in A \wedge x \in B\} =$ $\{2, 4\}$
10. $\{x \mid x \in A \vee x \in B\} =$ $\{0, 1, 2, 3, 4, 6, 8\}$
11. $\{x \mid x \in A \wedge 2x \in A\} =$ $\{1, 2\}$
12. $\left\{x \mid (x \in B) \wedge (\forall y \in A \,.\, x > y)\right\} =$ $\{6, 8\}$
13. $\left\{X \mid (X \in C) \wedge (\exists y \in X \,.\, y \in B)\right\} =$ $\{\{2\}, \{2, 3\}\}$

PROBLEM 2 *Set definition*

Let $A = \{0, 2, 3\}$, $B = \{x^2 \mid (x \in \mathbb{N}) \wedge x^2 < 10\}$, and $C = \mathcal{P}(\{4, 9\})$. Show the full set of members in each of the following sets using curly-brace notation (not set-builder or operator-defined notation):

14. $B =$ $\{0, 1, 4, 9\}$

15. $C =$ $\{\{\}, \{4\}, \{9\}, \{4, 9\}\}$

16. $A \cup B =$ $\{0, 1, 2, 3, 4, 9\}$

17. $A \cap B =$ $\{0\}$

18. $A \setminus B =$ $\{2, 3\}$

19. $B \cup C =$ $\{0, 1, 4, 9, \{\}, \{4\}, \{9\}, \{4, 9\}\}$

20. $\{x \mid (x \in A) \oplus (x \in B)\} =$ $\{1, 2, 3, 4, 9\}$

21. $\{x \mid (x \in B) \wedge (\forall y \in A \,.\, x \neq y)\} =$ $\{1, 4, 9\}$

22. $\{x \mid (x \in B) \wedge (\exists Y \in C \,.\, x \in Y)\} =$ $\{4, 9\}$

PROBLEM 3 *Fall 2019 Quiz 12 questions on sets*

Consider the following **sets**: $A = \{8, 4, 5\}$, $B = \{2, 3, 4\}$, $C = \mathcal{P}(\{8, 2\})$

PROBLEM 4 *Show all members of each set*

23. _____ $= C$

24. _____ $= A \cup B$

25. _____ $= A \cap B$

26. _____ $= A \setminus B$

27. _____ $= \{3x \mid (x \in \mathbb{N}) \wedge (2x \in A)\}$

28. _____ $= \{1\} \cap \mathcal{P}(\{1\})$

29. _____ $= \{x \mid (x \in A) \wedge (2x \in B)\}$

30. _____ $= \{\{a, b\} \mid (a \in A) \wedge (b \in \{4, 5\})\}$

PROBLEM 5 *Answer each question*

31. _____ $= |A|$

32. _____ $= |\mathcal{P}(A)|$

33. _____ $= |\mathcal{P}(\mathcal{P}(A))|$

34. _____ $= 8 \in A$

35. _____ $= \{8\} \in A$

36. _____ $= \{\{8\}\} \in A$

PROBLEM 6 *Fall 2019 Final Quiz questions on sets*

Consider the following **sets**: $A = \{2, 4, 8\}$, $B = \{1, 2, 4\}$, $C = \mathcal{P}(\{1, 2\})$

PROBLEM 7 *Show all members of each set*

37. _____ $= C$

38. _____ $= A \cup B$

39. _____ $= A \cap B$

40. _____ $= A \setminus B$

41. _____ $= \{x \mid (x \in \mathbb{N}) \wedge (2x \in B)\}$

42. _____ $= B \cap C$

43. _____ $= \{x \mid (x \in A) \wedge (2x \in B)\}$

44. _____ $= \Big\{\{a, b\} \;\Big|\; (a \in A) \wedge \big(b \in \{4, 8\}\big)\Big\}$

PROBLEM 8 *Answer each question*

45. _____ $= |\{1, 2, 3, 4\}|$

46. _____ $= |\mathcal{P}(A)|$

47. _____ $= \Big|\mathcal{P}\big(\mathcal{P}(\{1, 2\})\big)\Big|$

48. _____ $= 8 \in C$

49. _____ $= \{8\} \in C$

50. _____ $= \{\{8\}\} \in C$

Want more practice? See http://www.cs.virginia.edu/luther/DMT1/S2020/set-practice.html