Worksheet G

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The Standard Sets and Notation To Be Memorised:

$\mathbb{R}$, the set of real numbers. The points on the line.

$$\longleftrightarrow$$

$\mathbb{N}$ is the set of natural numbers. $\mathbb{N} = \{1, 2, 3, \ldots\}$

$\mathbb{N}_p$ the set of natural numbers up to and including p.

$$\mathbb{N}_p = \{1, 2, 3, \ldots, (p-1), p\}$$

$\mathbb{N}^*$, the set of natural numbers or zero.

$$\mathbb{N} = \{0, 1, 2, 3, \ldots\}$$

$\mathbb{N}^*_p$ the set of natural numbers or zero up to and including p.

$$\mathbb{N}^*_p = \{0, 1, 2, 3, \ldots, (p-1), p\}$$

$\mathbb{Z}$ the set of integers.

$$\mathbb{Z} = \{0, 1, -1, 2, -2, 3, \ldots\}$$

$\mathbb{Q}$ the set of rational numbers.

$$\mathbb{Q} = \{x | x = \tfrac{p}{q}, p \in \mathbb{Z}, q \in \mathbb{Z}, q \neq 0\}$$

$\mathbb{I}$ the set of irrational numbers.

$$\mathbb{I} = \{x | x \notin \mathbb{Q} (x \in \mathbb{R})\}$$
$$\mathbb{I} = \mathbb{R} - \mathbb{Q}$$

Questions and Exercises

Problems 1 - 25.

Let U be the well defined universe $\mathbb{N}_9$.

Let $A = \{x | x < 4\}$ Let $B = \{x | \exists p \in \mathbb{N}_9 \ni x = 2 \cdot p\}$, $C = B^c$,

$D = \{x | \ \exists p \in \mathbb{N}_9 \ni x = 3 \cdot p\}$, $E = \{1, 4, 9\}$,

$F = \{x | \ \exists p \in \mathbb{N}_9 \ni x = 3 \cdot p + 1\}$, $G = \{3, 4, 5, 6\}$, and $H = \{1, 7\}$.

1. Find $A \cap B$
2. Find $A \cup C$
3. Find $E \cap B$
4. Find $F - G$
5. Find $A \cup (B \cup D)$
6. Find $A \cup (B \cap D)$
7. Find $A \cap (B \cup D)$
8. Find $A \cap (B \cap D)$
9. Find $(D \cup B)^c - E$
10. Find $A \cap (B \cup D)$
11. Find $A \cap (B \cap D)$
12. Find $(D \cup B) - E^c$
13. Find $A \cap (B \cup D)^c$
14. Find $A \cap (B^c \cap D)$
15. Find $(D^c \cup B^c) - E$
16. Find $D \cup (B - E)$
17. Find $D \cup B - E$
18. Find $G \cap C \cap A$
19. Find $G \cup C \cup A$
20. Find $A \cap (B - C)$
21. Find $A \cap (B - A) \cap C$
22. Find $\mathcal{P}(H)$
23. Find $\mathcal{P}(G)$
24. Find $\emptyset \cup B$
25. Find $\emptyset \cap B$
26. Find $(A \cap B) - (A \cap C)$
27. Find $A \cap (B - A \cap C)$

Problems 28 - 55.
Let U be the well defined universe $\mathbb{R}$
Let $J = \{x|x < 4\}$, $K = \{x|x < 5 \vee x \geq 10\}$,
$L = \{x|\ \ x < x\}$, $M = [5, 11]$, $P = K^c$,
$Q = \{x|\ \ \exists p \in \mathbb{N} \ni x = 2 \cdot p\}$,
$R = \{x|\ \ \exists p \in \mathbb{Z} \ni x = 2 \cdot p\}$,
$S = \{1, 9\}$, $T = (1, 9]$, $W = [1, 9]$,
$X = (1, 9)$, and $Y = \{x|4 \leq x < 9\}$
W is an example of an interval.
X is an example of a segment.
Y is an example of a half-interval (also called half-segment).
L is a constructive example of $\emptyset$.

28. Find $X \cap K$
29. Find $Y - W$
30. Find $J \cup (K \cup P)$
31. Find $J \cup (K \cap P)$
32. Find $J \cap (K \cup P)$
33. Find $J \cap (K \cap P)$
34. Find $(P \cup K) - X$
35. Find $J \cap (K \cup P)$
36. Find $J \cap (K \cap P)^c$
37. Find $(P \cup K^c) - X$
38. Find $S \cap X$
39. Find $S - X$
40. Find $X - S$
41. Find $P \cup (K - X)$
42. Find $P \cup K - X$
43. Find $W \cap M \cap J$
44. Find $W \cup M \cup J$
45. Find $J \cap (K - M)$
46. Find $J \cap K - J \cap M$
47. Find $J \cap K$
48. Find $J \cup M$
49. Find $\emptyset \cap P$
50. Find $S \cap T$
51. Find $R - Q$
52. Find $Q - R$
53. Find $S \cap W$
54. Find $S - W$
55. Find $W - S$