Worksheet *I*

Beginning Sets and Number Theoretic Claims

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9. Computational Exercises About Sets

Let the following be defined for the exercises:

Let $U = \mathbb{R}$

Let $A = \{1, 3, 5\}$,	$B = [2, 5]$,	$C = [3, \infty)$
$D = \{3\}$,	$E = \{5, 7\}$,	$F = (2, 5]$,
$G = (-\infty, 3)$,	$H = [2, 5)$,	$J = (2, 6]$,
$K = (-6, -2]$,	$M = [2, 5)$,	$W = (2, 5)$,

Exercise 9.1. *It is the case that $J - F = (0, 1]$. True or not? Why?*

Exercise 9.2. *It is the case that $J = K^c$. True or not? Why?*

Exercise 9.3. *It is the case that $A - C = E$. True or not? Why?*

Exercise 9.4. *Find $\mathcal{P}(E)$.*

Exercise 9.5. *Find $\mathcal{P}(A)$.*

Exercise 9.6. *Find $\mathcal{P}(E) \cap \mathcal{P}(A)$.*

Exercise 9.7. *Find $B \cap M$.*

Exercise 9.8. *Find $B \cap M \cap W$.*

Exercise 9.9. *Find $B \cap W \cap M \cap F$.*

Exercise 9.10. *Are any of the sets above equal to each other? If so, why? If not, why not?.*

10. Prove or Disprove (Number Theoretic Claims)

Claim 10.1. *$U = \mathbb{R}$. Let $a \in \mathbb{N} \wedge b \in \mathbb{N}$ Let a be odd and b be even. It is the case that $a + b$ is odd.*
Prove or disprove the claim.

Claim 10.2. *$U = \mathbb{R}$. Let $a \in \mathbb{N} \wedge b \in \mathbb{N}$ Let a be odd and b be odd. It is the case that $a + b$ is even.*
Prove or disprove the claim.

Claim 10.3. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be odd and* b *be even It is the case that* $a \cdot b$ *is even.*
Prove or disprove the claim.

Claim 10.4. $U = \mathbb{R}$. *Let* $a \in \mathbb{N}$ *It is the case that* $5a - 1$ *is a multiple of* 4.
Prove or disprove the claim.

Claim 10.5. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be odd and* b *be even. It is the case that* a^2 *is odd.*
Prove or disprove the claim.

Claim 10.6. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be odd and* b *be even. It is the case that* b^2 *is even.*
Prove or disprove the claim.

Claim 10.7. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be odd and* b *be even. It is the case that* $2a + 3b$ *is odd.*
Prove or disprove the claim.

Claim 10.8. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be odd and* b *be even. It is the case that* $2a - b$ *is even.*
Prove or disprove the claim.

Claim 10.9. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be a multiple of* 3 *and* b *be a multiple of* 5. *It is the case that* $a + b$ *is a multiple of* 8.
Prove or disprove the claim.

Claim 10.10. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be a multiple of* 3 *and* b *be a multiple of* 5. *It is the case that* $a + b$ *is a multiple of* 15.
Prove or disprove the claim.

Claim 10.11. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be a multiple of* 3 *and* b *be a multiple of* 5. *It is the case that* $a \cdot b$ *is a multiple of* 8.
Prove or disprove the claim.

Claim 10.12. $U = \mathbb{R}$. *Let* $a \in \mathbb{N} \wedge b \in \mathbb{N}$ *Let* a *be a multiple of* 3 *and* b *be a multiple of* 5. *It is the case that* $a \cdot b$ *is a multiple of* 15.
Prove or disprove the claim.

Comment: "∞" is not a real number.