Set Theory — Inequality Definitions and Complements

Core Worksheet

Worked Examples & Guided Practice

I Do (Teacher Model) $\mathcal{E} = \{\text{integers } x \text{ such that } 10 \leqslant x \leqslant 22\}$
$A = \{x \text{ such that } x < 16\}$
$B = \{x \text{ such that } 14 \leqslant x \leqslant 19\}$
(a) List the members of the set $A \cap B$.
(b) List the members of the set $(A \cup B)'$.

We Do (Guided Practice) $\mathcal{E} = \{\text{integers } x \text{ such that } 1 \leqslant x \leqslant 15\}$
$A = \{x \text{ such that } x \text{ is odd }\}$
$B = \{x \text{ such that } 6 \leqslant x < 12\}$
(a) List the members of the set $A \cap B$.
(b) List the members of the set $(A \cup B)'$.

You Do (Independent Practice) $\mathcal{E} = \{\text{integers } x \text{ such that } 30 \leqslant x \leqslant 45\}$
$A = \{x \text{ such that } x \leqslant 38\}$
$B = \{x \text{ such that } 35 \leqslant x \leqslant 42\}$
(a) List the members of the set $A \cap B$.
(b) List the members of the set $(A \cup B)'$.

Challenge (Extension) $\mathcal{E} = \{\text{integers } x \text{ such that } 1 \leqslant x \leqslant 20\}$
$A = \{x \text{ such that } x^2 < 50\}$
$B = \{x \text{ such that } x \text{ is a prime number }\}$
List the members of the set $(A \cap B)'$.

Practice Perfect Questions

Q1. $\mathcal{E} = \{\text{integers } x \text{ such that } 5 \leqslant x \leqslant 15\}$, $A = \{x \mid x < 10\}$, $B = \{x \mid 8 \leqslant x \leqslant 13\}$. List $A \cap B$.

Q2. Using the sets in Q1, list the members of $(A \cup B)'$.

Q3. $\mathcal{E} = \{\text{integers } x \text{ such that } 10 \leqslant x \leqslant 20\}$, $A = \{x \mid x \text{ is even}\}$, $B = \{x \mid 12 < x \leqslant 18\}$. List $A \cap B$.

Q4. Using the sets in Q3, list the members of $(A \cup B)'$.

Q5. $\mathcal{E} = \{\text{integers } x \text{ such that } 1 \leqslant x \leqslant 10\}$, $A = \{x \mid x \leqslant 5\}$, $B = \{x \mid x > 7\}$. List $(A \cup B)'$.

Q6. $\mathcal{E} = \{\text{integers } x \text{ such that } 1 \leqslant x \leqslant 30\}$, $A = \{x \mid x \text{ is a multiple of } 3\}$, $B = \{x \mid x > 20\}$. List the members of $A \cap B$.

Answers & Worked Solutions

Model Solutions

I Do: (a) E = {10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22}.
A = {10, 11, 12, 13, 14, 15}; B = {14, 15, 16, 17, 18, 19}; A ∩ B = {14, 15}.
(b) A ∪ B = {10, 11, 12, 13, 14, 15, 16, 17, 18, 19}; (A ∪ B)' = {20, 21, 22}.

- **We Do:** (a) $A = \{1, 3, 5, 7, 9, 11, 13, 15\}$, $B = \{6, 7, 8, 9, 10, 11\} \implies A \cap B = \{7, 9, 11\}$.
  (b) $A \cup B = \{1, 3, 5, 6, 7, 8, 9, 10, 11, 13, 15\} \implies (A \cup B)' = \{2, 4, 12, 14\}$.
- **You Do:** (a) $A = \{30, 31, \ldots, 38\}$, $B = \{35, 36, \ldots, 42\} \implies A \cap B = \{35, 36, 37, 38\}$.
  (b) $A \cup B = \{30, 31, \ldots, 42\} \implies (A \cup B)' = \{43, 44, 45\}$.

Challenge: A = {1, 2, 3, 4, 5, 6, 7}; B = {2, 3, 5, 7, 11, 13, 17, 19}.
A ∩ B = {2, 3, 5, 7}.
(A ∩ B)' = {1, 4, 6, 8, 9, 10, **11**, 12, 13, 14, 15, 16, 17, 18, 19, 20}.

Practice Perfect Questions Solutions

Q1. $A \cap B = \{8, 9\}$

Q2. $A \cup B = \{5, 6, 7, 8, 9, 10, 11, 12, 13\} \implies (A \cup B)' = \{14, 15\}$

Q3. $A = \{10, 12, 14, 16, 18, 20\}$, $B = \{13, 14, 15, 16, 17, 18\} \implies A \cap B = \{14, 16, 18\}$

Q4. $A \cup B = \{10, 12, 13, 14, 15, 16, 17, 18, 20\} \implies (A \cup B)' = \{11, 19\}$

Q5. $A \cup B = \{1, 2, 3, 4, 5, 8, 9, 10\} \implies (A \cup B)' = \{6, 7\}$

Q6. $A \cap B = \{21, 24, 27, 30\}$