,
.

,   :

1.
$$A \cup B = B \cup A \qquad\qquad A \cap B = B \cap A$$

2.
$$A \cup (B \cup C) = (A \cup B) \cup C \qquad A \cap (B \cap C) = (A \cap B) \cap C$$

3.
$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \qquad A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

4.
$$A \cup (A \cup B) = A \qquad\qquad A \cap (A \cap B) = A$$

5.
$$A \cup A = A \qquad\qquad A \cap A = A$$

6.
$$\overline{A \cup B} = \overline{A} \cap \overline{B} \qquad\qquad \overline{A \cap B} = \overline{A} \cup \overline{B}$$

7.
$$A \cup \overline{A} = U$$

8.
$$A \cap \overline{A} = \varnothing$$

9.   :
$$A \cup U = U \qquad\qquad A \cap U = A$$

10.   :
$$A \cup \varnothing = A \qquad\qquad A \cap \varnothing = \varnothing$$
$$\overline{U} = \varnothing \qquad\qquad \overline{\varnothing} = U$$

11.
$$\overline{\overline{A}} = A$$
$$A \setminus B = A \cap \overline{B}$$
$$A \Delta B = (A \setminus B) \cup (B \setminus A) = (A \cap \overline{B}) \cup (B \cap \overline{A})$$

$\vdots$

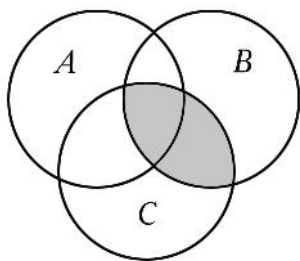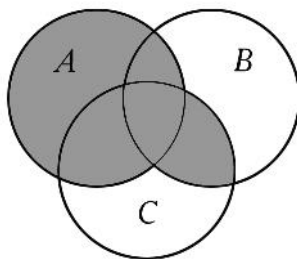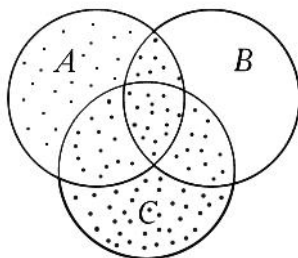)   (=),   .
)   , $A \subseteq B$ $B \subseteq A.$

$\vdots$

-   ,
-
-   .

( )
.

1–5
$\vdots$

- – $X = Y\,;$
- ;
- .

1–2 $X = Y,$ X Y –
,   )   )
.

)
.
a , $a \in X,$, $a \in Y,$
, $a \notin X,$ $a \notin Y\,.$,
X Y ,   ,   ), $X = Y\,.$
) $X = Y,$ $X \subseteq Y$ $Y \subseteq X\,.$

$X \subseteq Y$ $Y \subseteq X\,.$

3
- X
,   ,
: X' $X'',$,   :
$X' = X''$ . . $X' = X'' = X\,.$

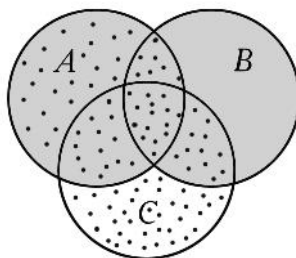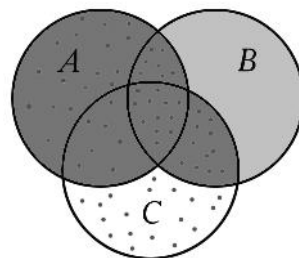1–4   ,
.

5

Q

Q

1.

$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$$

(

$\cup$

$\cap$).

$(B \cap C)$

$A \cup (B \cap C)$

$(A \cup C)$

$(A \cup B)$

$(A \cup B) \cap (A \cup C)$

) $X = Y$,

),

a

$a \in A \cup (B \cap C)$,

$a \in (A \cup B) \cap (A \cup C)$.

1. $a \in A \cup (B \cap C)$.

$a \in A \cup (B \cap C)$

$a \in A$ $a \in (B \cap C)$.

1.1. , $a \in A$ $a \notin (B \cap C)$.

1 :

1.1.1. $a \in A, a \notin B, a \notin C$
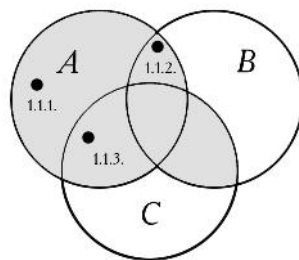
1.1.2. $a \in A, a \in B, a \notin C$

1.1.3. $a \in A, a \notin B, a \in C$

, , $a \in A$, a

. $a \in (A \cup B)$ $a \in (A \cup C)$.

, a : $a \in (A \cup B) \cap (A \cup C)$.
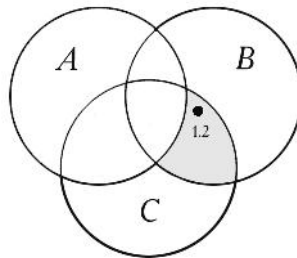
, 1.1, :

1.2. , $a \notin A, a \in (B \cap C)$.

, $a \in B, a \in C$.

$a \in B$, $a \in (A \cup B)$ $a \in C$ $a \in (A \cup C)$.

a ,

$a \in (A \cup B) \cap (A \cup C)$.
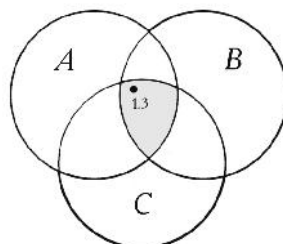
, 1.2, :

1.3. : $a \in A, a \in (B \cap C)$.

$a \in A$, $a \in (A \cup B)$

$a \in (A \cup C)$.

$a \in (A \cup B) \cap (A \cup C)$.

, 1.3, :

): $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad a$

$\qquad a \notin A \cup (B \cap C),$

$\qquad\quad a \notin (A \cup B) \cap (A \cap C).$ $\qquad\qquad\quad :$

2. $a \notin A \cup (B \cap C).$

$\qquad\qquad a$ $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad ,$

$\qquad\qquad\qquad\qquad . \qquad\qquad a \notin A \quad a \notin (B \cap C), \quad . \quad .$

$\qquad\qquad\qquad :$

2.1.1. $a \notin A, a \notin B, a \in C$

2.1. 2. $a \notin A, a \in B, a \notin C$

2.1.3. $a \notin A, a \notin B, a \notin C$

$\qquad\qquad\qquad\qquad :$

2.1.1. $\qquad\quad a \notin A, \ a \notin B, \quad a \notin (A \cup B), \qquad\qquad\qquad ,$

$\quad a \notin (A \cup B) \cap (A \cup C).$

2.1.2. $\qquad\quad a \notin A, \ a \notin C, \quad a \notin (A \cup C) \qquad\qquad\quad ,$

$\quad a \notin (A \cup B) \cap (A \cup C).$

2.1.3. $\qquad\quad a \notin A, \ a \notin B, \qquad\qquad\qquad\qquad , \qquad\qquad a \notin (A \cup B) \quad ,$

$\qquad\qquad , a \notin (A \cup B) \cap (A \cup C).$

$\qquad\qquad , \qquad\qquad\qquad\qquad\qquad , \quad a \notin A \cup (B \cap C), \qquad\qquad ,$

$\quad a \notin (A \cup B) \cap (A \cup C).$

$\qquad\qquad , \qquad\qquad A \cup (B \cap C) \quad (A \cup B) \cap (A \cup C)$

$\qquad\qquad)$

$\qquad\qquad A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

$\qquad\qquad .$

$\qquad\qquad\qquad :$

$\Rightarrow -$ $\qquad\qquad\qquad\qquad\qquad M \Rightarrow N \qquad\qquad\qquad «$

$M , \qquad\qquad\qquad N ».$

$\Leftrightarrow -$ $\qquad\qquad\qquad\qquad M \Leftrightarrow N \qquad\qquad «$

$\quad , \qquad » \quad « \qquad\qquad\qquad ».$

2. $\qquad\qquad\qquad\qquad\qquad :$

$\qquad (A \cup B) \cap C = (A \cup C) \cap (B \cup C).$

($\qquad\qquad\qquad\qquad\qquad\qquad\qquad \cap$

$\qquad\qquad\qquad\qquad\qquad\qquad \cup).$

$$X = Y, \qquad X \subseteq Y \qquad Y \subseteq X.$$

$(A \cup B) \cap C \subseteq (A \cup C) \cap (B \cup C),$ . .

a

$a \in (A \cup B) \cap C.$

$a \in (A \cup B) \qquad a \in C \Rightarrow$

$\Rightarrow (a \in A \qquad a \in B) \qquad a \in C \Rightarrow$

$\Rightarrow (a \in A \quad a \in C) \qquad (a \in B \quad a \in C) \Rightarrow$

$\Rightarrow a \in (A \cap C) \qquad a \in (B \cap C) \Rightarrow$

$\Rightarrow a \in (A \cap C) \cup (B \cap C)$

$$(A \cup B) \cap C \subseteq (A \cup C) \cap (B \cup C).$$

, $(A \cup C) \cap (B \cup C) \subseteq (A \cup B) \cap C,$ . .

a

$a \in (A \cap C) \cup (B \cap C).$

$a \in (A \cap C) \qquad a \in (B \cap C) \Rightarrow$

$\Rightarrow (a \in A \quad a \in C) \qquad (a \in B \quad a \in C) \Rightarrow$

$\Rightarrow (a \in A \qquad a \in B) \qquad a \in C \Rightarrow$

$\Rightarrow a \in (A \cup B) \quad a \in C \Rightarrow$

$\Rightarrow a \in (A \cup B) \cap C$

, $(A \cup C) \cap (B \cup C) \subseteq (A \cup B) \cap C.$

$(A \cup B) \cap C = (A \cup C) \cap (B \cup C),$.

3.   , U

$\overline{A},$ $A \subseteq U,$.

A $A \subseteq U$

, B C $U,$

, . .

, $U:$

) $B \cap A = \varnothing$) $C \cap A = \varnothing$) $B \cup A = U$) $C \cup A = U$

, $B = B \cap U$.),

: $B = B \cap (C \cup A)$.

, 2, $B = (B \cap C) \cup (B \cup A)$.

,) $B = (B \cap C) \cup \varnothing$.

, $B = (B \cap C)$.

$a \in B \Rightarrow a \in B \quad a \in C \Rightarrow B \subseteq (B \cap C) \Rightarrow B \subseteq B \quad B \subseteq C$.

,)),

2:

$$C = C \cap U = C \cap (B \cup A) = (C \cap B) \cup (C \cap A) = (C \cap B) \cup \varnothing = C \cap B$$

$a \in C \Rightarrow a \in C \quad a \in B \Rightarrow C \subseteq (C \cap B) \Rightarrow C \subseteq C \quad C \subseteq B$

, $C \subseteq B \quad B \subseteq C$ . . $C = B$

$B = C = \overline{A}$ – , .

4. , , , $A \cup B \cup C = U$

A, B, C .

,

$\overline{A} = B \cup C, \overline{B} = A \cup C \quad \overline{C} = A \cup B$.

, $\overline{A} = B \cup C$.

, , , , . .

) $A \cap B = \varnothing$;

) $A \cap C = \varnothing$;

) $B \cap C = \varnothing$,

,) $A \cup B \cup C = U$, . . $A \cup (B \cup C) = U$.

2,

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$,

),) $(A \cap B) \cup (A \cap C) = \varnothing \cup \varnothing = \varnothing$.

, $A \cap (B \cup C) = \varnothing$.

, $A \quad (B \cup C)$,)

U :

$A \cap (B \cup C) = \varnothing \quad A \cup (B \cup C) = U$.

, , (

3). $\overline{A} = B \cup C$,

.

$\overline{B} = A \cup C \quad \overline{C} = A \cup B$.

5. ,

$$A \subseteq B \Leftrightarrow \overline{B} \subseteq \overline{A}.$$

, $\quad a \notin \overline{A}$, $\quad a \in A,$

, . . , $\quad A \subseteq B \quad \overline{B} \not\subseteq \overline{A}$.

1. $A \subseteq B \Rightarrow \quad a \in A, \quad a \in B.$

,

2. $\overline{B} \not\subseteq \overline{A} \Rightarrow \quad a \quad , \quad a \in \overline{B} \quad a \notin \overline{A} \Rightarrow a \in \overline{B} \quad a \in A$.

$(1) - (2):$

$a \in A \quad a \in \overline{B} \Rightarrow a \in B \quad a \in \overline{B} \Rightarrow a \in \left(B \cap \overline{B} \right) = \varnothing \quad (\qquad).$

, $\qquad \overline{B} \not\subseteq \overline{A} \qquad A \subseteq B \Leftrightarrow \overline{B} \subseteq \overline{A}$

:

1.

,
.

2.

- .

.

X:

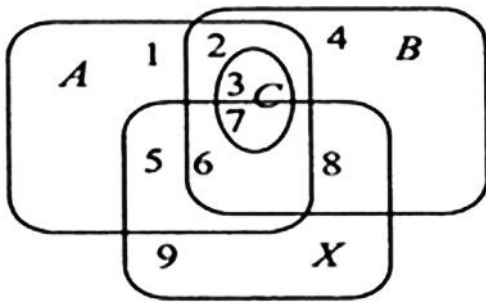$$\begin{cases} B \Delta C = X \cup A \\ X \setminus C = A \cap B \\ C \subseteq A \cap B \end{cases}$$

.

I. , , ,

$C \subseteq A \cap B$.

(.).

1   ,

, , ;   7 –   ,

,   ,   ,   . .   :

$A = \{1,2,3,5,6,7\}, B = \{2,3,4,6,7,8\}, C = \{3,7\}, X = \{5,6,7,8,9\}.$

1. $B \triangle C = \{2,4,6,8\}, X \cap A = \{5,6,7\}.$

,   ,   2, 4, 5, 7   8   .

$A = \{1,3,6\}, B = \{3,6\}, C = \{3\}, X = \{6,9\}.$

2. $X \setminus C = \{6,9\}, A \cap B = \{3,6\}.$

,   3   9   ,   , ,

, $: A = \{1,6\}, B = \{6\}, C = \varnothing, X = \{6\}.$, $X = B$,

$B \subseteq A, C = \varnothing.$

II.   , $X = B$.

$C = \varnothing, B \subseteq A,$ $C \subseteq A \cap B$ $: B = \{b\}, A = \{a,b\},$

a,b –   . $X = B = \{b\},$ $B \triangle C = B \setminus C = \{b\},$

$X \setminus C = X = \{b\},$ $\{b\} = A \setminus X, C \cap X = \{a,b\} = A \cap B.$,

, $X = B$

$B \subseteq A, C = \varnothing.$

:

$X = B, B \subseteq A, C = \varnothing.$