2. Mengenbeziehungen, Mengenoperationen

2.1. Teilmengen, disjunkte Mengen

1. **Beispiel**
   Gegeben sind zwei Mengen $A = \{3, 4, 7\}$ und $B = \{1, 2, \ldots 8\}$

   Wir stellen fest: .....

   .....

2. **Definition**

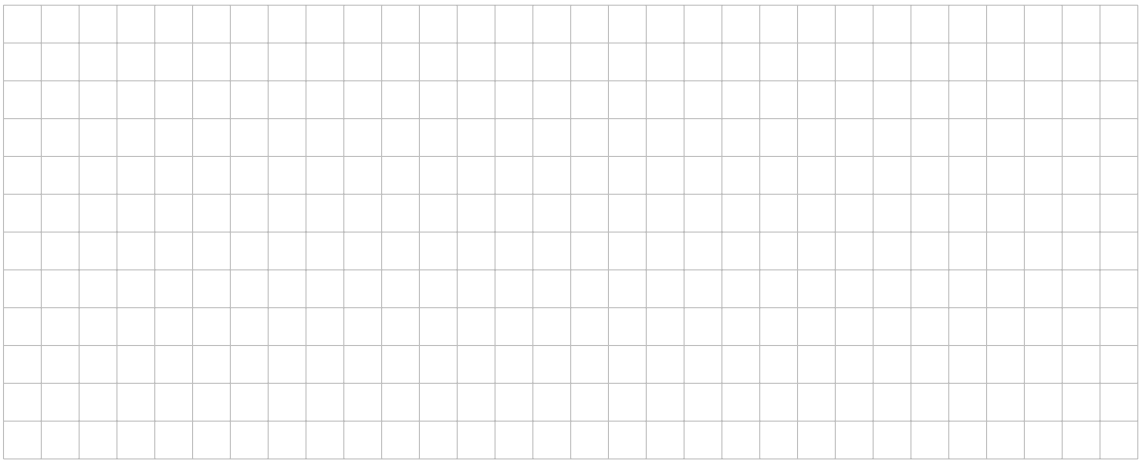
   .....

   .....

   .....

   .....

3. **Übung**
   Notiere alle Teilmengen von $\{a, b, c\}$



4. **Wahr oder falsch?**
   a) $\mathbb{N} \subset \mathbb{N}$? .....

   .....

   b) $T_{60} \subset T_{150}$? .....

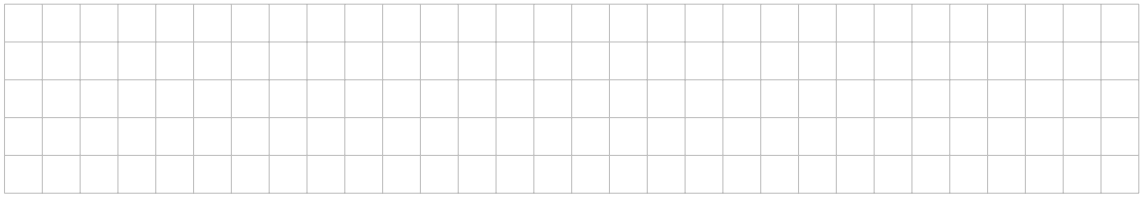
   c) $T_{36} \subset V_4$? .....

   d) $\{\} \subset \{x \in \mathbb{N} \,|\, x \text{ ist ungerade, } x > 37, x < 444\}$ .....

   .....

   .....

5. **Venn-Diagramm**
   Wie sieht das Mengendiagramm zweier Mengen A und B aus, wenn $A \subset B$ gilt?



6. **Beispiel**
   Gegeben sind zwei Mengen $A = \{1, 5, 7\}$ und $B = \{2, 3, 8\}$

   Wir stellen fest: .....

   .....

7. **Definition**

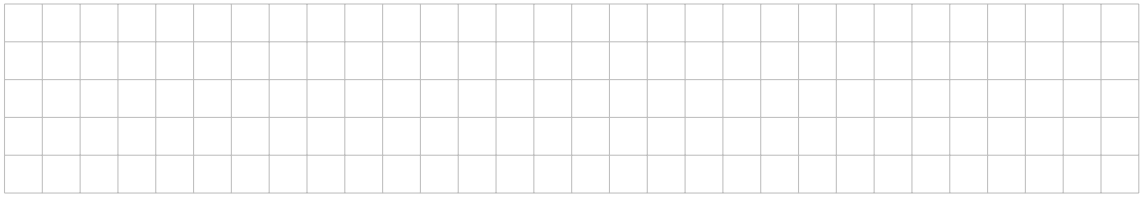
   .....

   .....

   .....

   .....

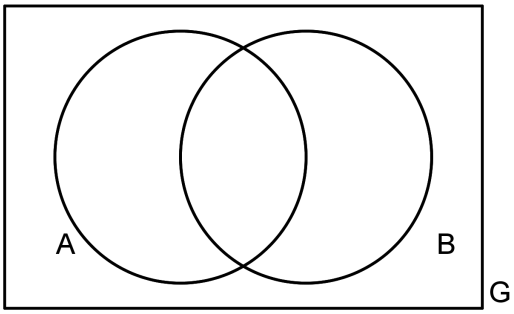
8. **Venn-Diagramm**
   Wie sieht das Mengendiagramm zweier Mengen A und B aus, wenn A und B disjunkt sind?



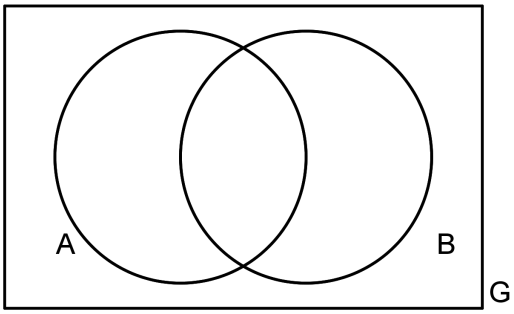
Übung
Notiere alle Teilmengen von T_{15}.
Welche davon sind zur Menge V_3 disjunkt?
Und welche davon sind Teilmenge von T_5?

2.2. Mengenoperationen

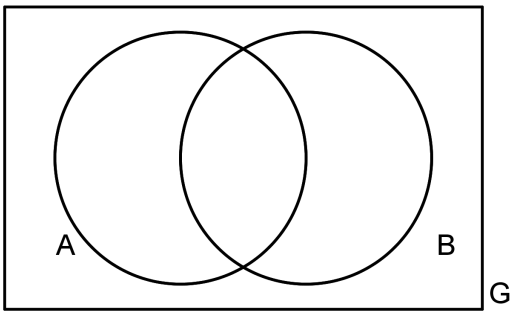
1. **Schnittmenge**



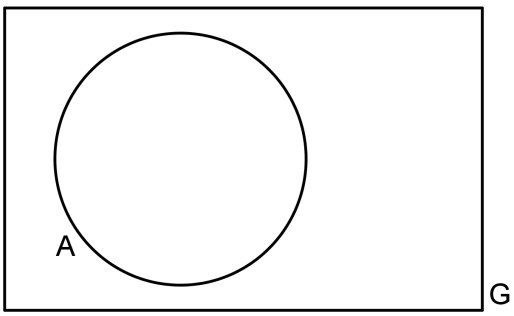
2. **Vereinigungsmenge**



3. **Differenzmenge**



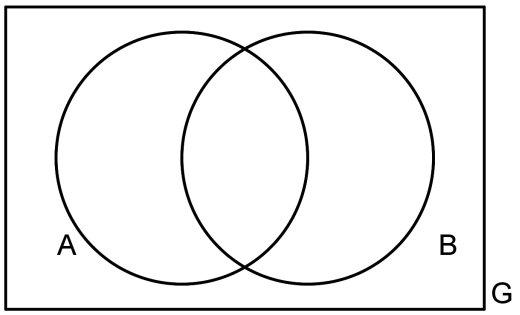
4. **Komplementärmenge**



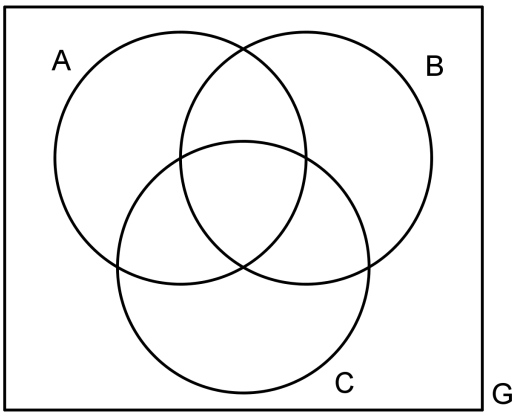
5. **Mengen bestimmen**

Markiere die beschriebene Menge in einem Mengendiagramm

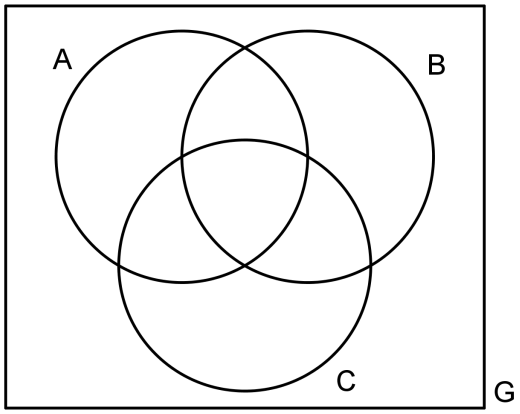
$(A \cup B) \backslash (B \cap A)$



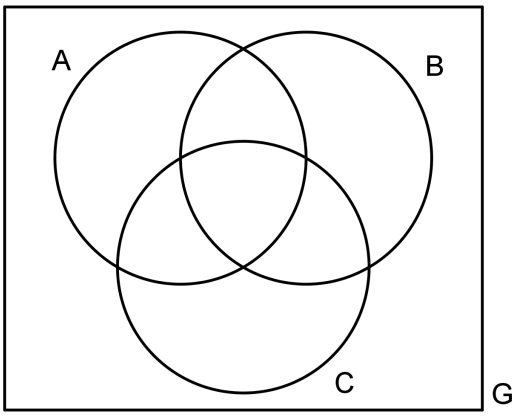
$(A \backslash B) \cup (B \backslash C)$



$(A \cup B) \cap C$

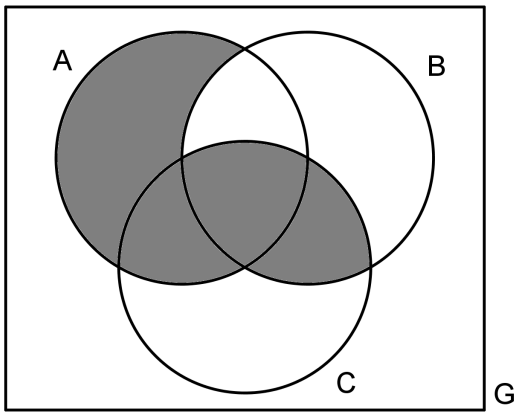


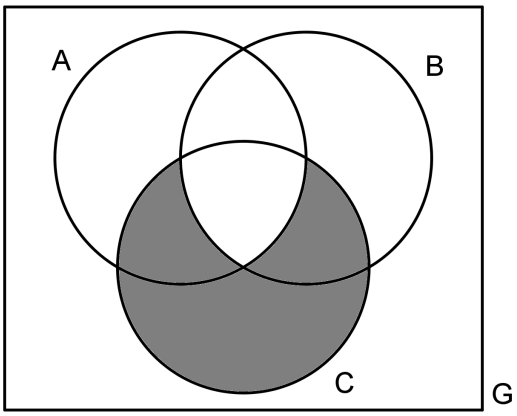
$(A \backslash B) \cup C$



6. **Mengen beschreiben**

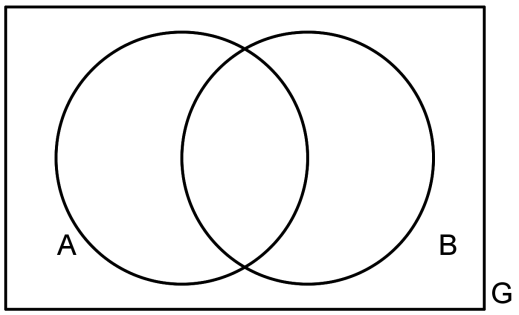
Beschreibe die markierten Mengen. (Suche verschiedene Möglichkeiten.)



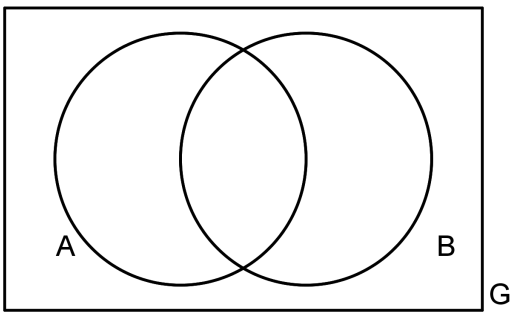


7. **Vereinfache**

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



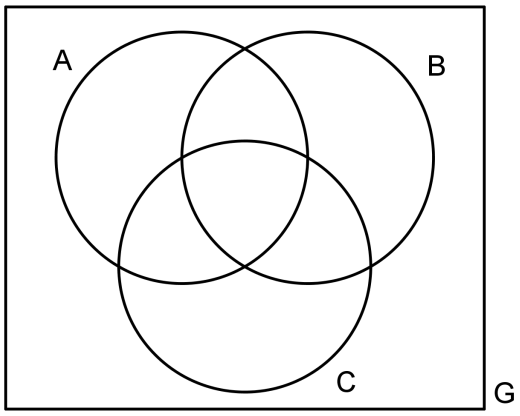
$B \cap \overline{A}$



Freiwillige Zusatzübung

Zeichne die Menge in einem Diagramm ein und vereinfache den Ausdruck so weit wie möglich.

$((B \backslash A) \cap C) \cup ((C \backslash B) \cap \overline{A})$



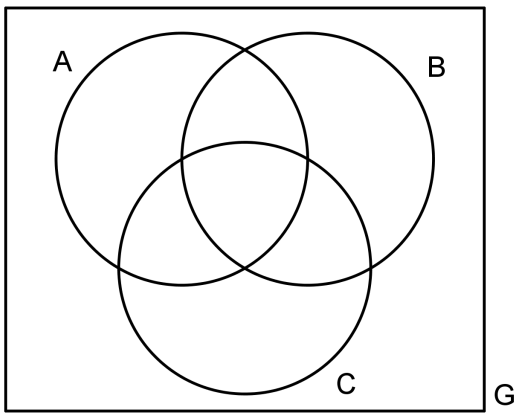
2.3. Rechengesetze für Mengenoperationen

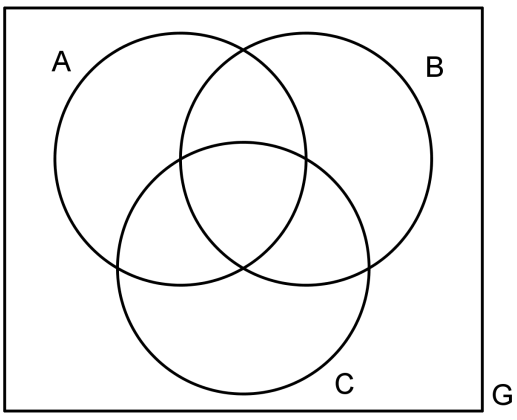
1. **Erstes Rechengesetz**
   Wir betrachten zwei Mengen A und B.
   Es gilt $A \cap B = B \cap A$

   Ebenso gilt $A \cup B = B \cup A$

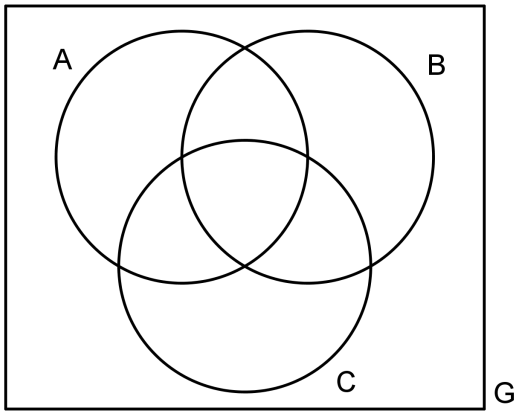
   Aber $A \backslash B \neq B \backslash A$

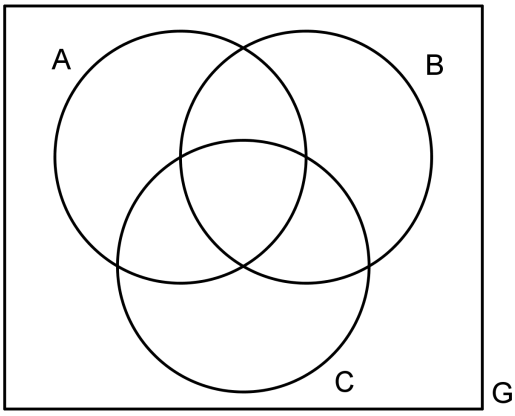
2. **Zweites Rechengesetz**
   Prüfe: $(A \cap B) \cap C = A \cap (B \cap C)$





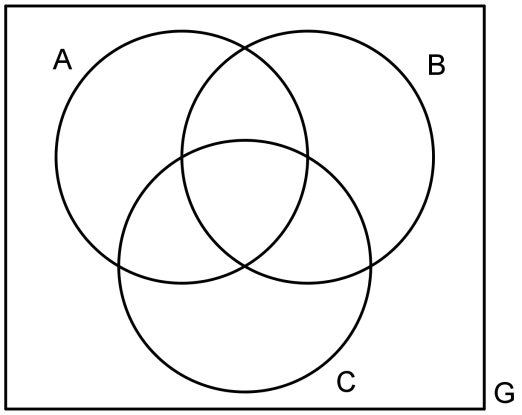
Ebenso: $(A \cup B) \cup C = A \cup (B \cup C)$

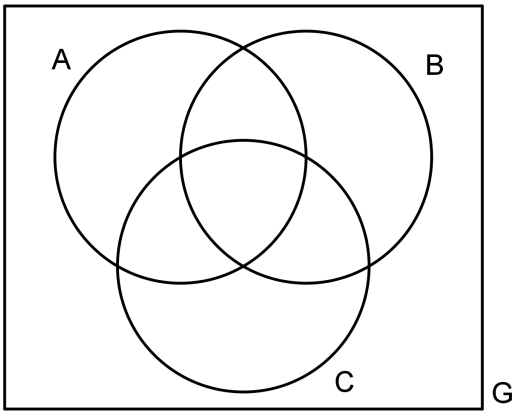




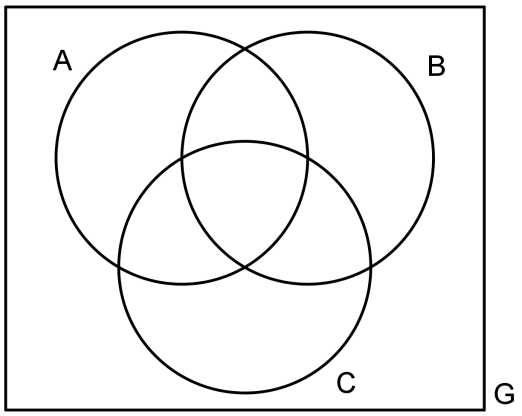
3. **Rechenbeispiel**

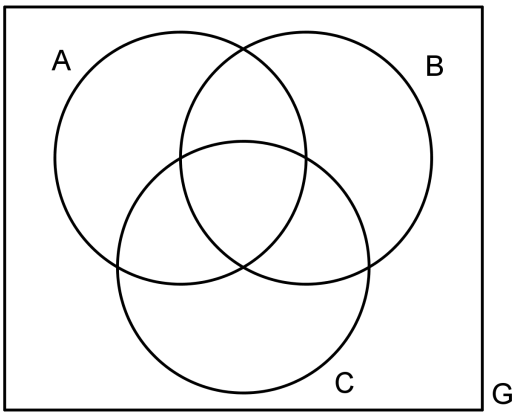
4. **Distributivgesetz**
Teste mit zwei Diagrammen, ob $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ gilt.





Prüfe ebenso in die umgekehrte Richtung, ob $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ gilt.





Übung
Gilt $A \cap (B \backslash C) = (A \cap B) \backslash (A \cap C)$?
Prüfe mit zwei Mengendiagrammen.