Lösung zur Hausaufgabe 23.10.2009

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$\Omega = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$E_1 = \{1, 2, 3, 4\}$, $E_2 = \{2, 4, 6, 8\}$, $E_3 = \{6, 7, 8\}$

a) $E_1 \cap E_2 = \{2, 4\}$
   $E_1 \cup E_2 = \{1, 2, 3, 4, 6, 8\}$
   $\overline{E}_1 \cap \overline{E}_3 = \{5, 6, 7, 8\} \cap \{1, 2, 3, 4, 5\} = \{5\}$
   $\overline{E_1 \cap E_3} = \overline{\emptyset} = \Omega$
   $E_1 \setminus \overline{E}_2 = E_1 \setminus \overline{\{2, 4, 6, 8\}} = \{1, 2, 3, 4\} \setminus \{1, 3, 5, 7\} = \{2, 4\}$
   $\overline{E}_2 \cup \overline{E}_3 = \{1, 3, 5, 7\} \cup \{1, 2, 3, 4, 5\} = \{1, 2, 3, 4, 5, 7\}$
   $\overline{E_2 \cap E_3} = \overline{\{6, 8\}} = \{1, 2, 3, 4, 5, 7\}$

b) $E_1 \cap \overline{E}_2 = \{1, 2, 3, 4\} \cap \{1, 3, 5, 7\} = \{1, 3\}$
   $E_1 \setminus (E_1 \cap E_2) = \{1, 2, 3, 4\} \setminus \{2, 4\} = \{1, 3\}$

   Hinweis: Anders als die Aufgabenstellung behauptet, „zeigen“ Sie damit nicht, dass die Formel

   $$E_1 \cap \overline{E}_2 = E_1 \setminus (E_1 \cap E_2)$$

   gilt ...

c) Zu den de-Morgan-Regeln:

   - $\overline{E_1 \cap E_2} = \overline{\{2, 4\}} = \{1, 3, 5, 6, 7, 8\}$,
     $\overline{E}_1 \cup \overline{E}_2 = \{5, 6, 7, 8\} \cup \{1, 3, 5, 7\} = \{1, 3, 5, 6, 7, 8\}$
   - $\overline{E_1 \cup E_2} = \overline{\{1, 2, 3, 4, 6, 8\}} = \{5, 7\}$,
     $\overline{E}_1 \cap \overline{E}_2 = \{5, 6, 7, 8\} \cap \{1, 3, 5, 7\} = \{5, 7\}$