

1)

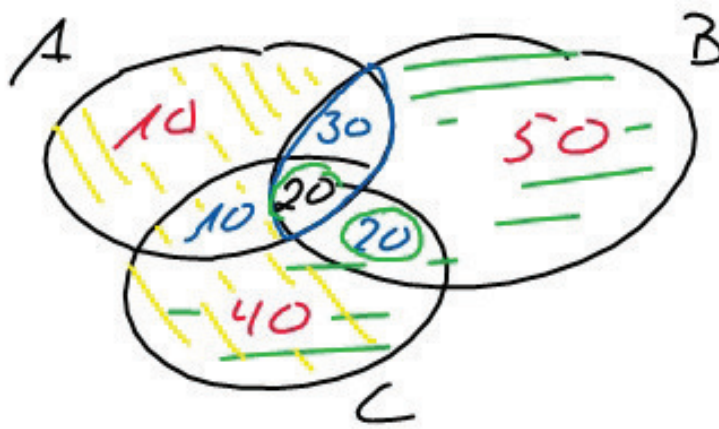
$$A \cup B \cup C = \{x \in \mathbb{N} \setminus \{9\} \mid 1 \leq x \leq 10\}$$

$$B \cap C \setminus A = \{3\}$$

$$(A \cap B) \cap (C \cap A) = \{2\}$$

$$A \setminus (B \cup C) = \{4, 6, 8, 10\} = \{x \in \mathbb{N} \mid \underline{x \bmod 2 = 0} \wedge \underline{4 \leq x \leq 10}\}$$

2)



Venn'sches Diagramm

$$A \cup B = 140$$

$$A \cup B \cup C = 180$$

$$\bar{A} \cap B \cap C = 20$$

$$\bar{A} \cap \bar{B} \cap C = 40$$

$$\begin{aligned}
 1) & \quad A \cap (A \cup B) \\
 & \quad (A \cap A) \cup (A \cap B) \\
 & \quad A \cup (A \cap B) \\
 & \quad (A \cup A) \cap (A \cup B) \\
 & \quad A \cap (A \cup B)
 \end{aligned}$$

neutral element

$$\begin{aligned}
 & \quad \cancel{A \cap \Omega} \\
 & \quad (A \cup \{\}) \cap (A \cup B) \quad \text{distrib.} \\
 & \quad A \cup (\{\} \cap B) \\
 & \quad A \cup \{\} \\
 & \quad \underline{\underline{A}}
 \end{aligned}$$

$$\begin{aligned}
 \rightarrow A \cup (A \cap B) &= (A \cap \Omega) \cup (A \cap B) \\
 &= A \cap (\Omega \cup B) \\
 & \quad \underbrace{\Omega \cup B}_A \\
 & \quad \underline{\underline{A}}
 \end{aligned}$$

$$\begin{aligned}
 3) & \quad \overline{A \cup B} \cup \overline{A \cup \bar{B}} \\
 & \quad (A \cup B) \cap (A \cup \bar{B}) \\
 & \quad A \cup (B \cap \bar{B}) \\
 & \quad A \cup \{\} \\
 & \quad \underline{\underline{A}}
 \end{aligned}$$

} de Morgan
 } distributiv
 } komplement
 } neutral

$$(2i^3 - 4i)^2 = ((2i)^3)^2 - 2 \cdot 2i^3 \cdot 4i + 16i^2$$

$$(a - b)^2 = a^2 - 2 \cdot a \cdot b + b^2$$

$$= 4i^6 - 16i^4 + 16i^2$$

$$6 \bmod 4 = 2 \rightarrow i^2 = (\sqrt{-1})^2 = -1$$

$$i^4 = i^2 \cdot i^2 = (\sqrt{-1})^2 \cdot (\sqrt{-1})^2 = (-1) \cdot (-1) = 1$$

$$\rightarrow -4 - 16 - 16 = \underline{\underline{-36}}$$

$$i^{11} = i^4 \cdot i^4 \cdot i^3$$

$$= 1 \cdot 1 \cdot i \cdot i^2 = -i$$

$$1) (2 - 3i)^2 \cdot [2i^5 \cdot (3-i) \cdot (6+2i)]$$

$$2) \frac{i-3}{2+i} - \frac{i^2+2}{3i-2}$$

$$1) (2+3i)^2 \cdot [2i(3-i)(3+i) \cdot 2]$$

$$(4+12i+9i^2) \cdot [4i(9-i^2)]$$

$$(4-9+12i) \cdot 40i = 480i^2 - 360i = -480 - 360i$$

$$2) \frac{(i-3)(3i-2) - (1) \cdot (2+i)}{(2+i)(3i-2)} = \frac{3-11i-2-i}{4i-7}$$

$$\frac{55}{-65} + \frac{-80}{-65} i = \frac{1-12i}{4i-7} \cdot \frac{4i+7}{4i+7} = \frac{-80i+55}{16i^2-49}$$