

**TMA4140**  
**DISKRET MATEMATIKK – DISCRETE MATHEMATICS**  
**NTNU, HØST/FALL2020**

EXERCISE SET 4 / ØVING 4

The solutions must be submitted via OVSYS (to the assigned group/TA).  
Løsningene må sendes inn via OVSYS (til den tildelte gruppen/TA).

Deadline for submission: **Wednesday, 23 September, 1:00pm**  
Innleveringsfrist: **Wednesdag 23. September, kl. 13:00**

Textbook: K. H. Rosen, *Discrete Mathematics and Its Applications*, 8. edition

**Exercise/Oppgave**

1. Use the rules of inference to show that the following argument is true:

$$\neg(\neg p \vee q) \wedge (\neg z \rightarrow \neg s) \wedge ((p \wedge \neg q) \rightarrow s) \wedge (\neg z \vee r) \rightarrow r$$

**Exercise/Oppgave**

2. Let  $C := \{n \in \mathbb{N} \mid n \text{ is a multiple of } 12\}$  and

$$D := \{n \in \mathbb{N} \mid n \text{ is a multiple of } 2 \text{ and } n \text{ is a multiple of } 6\}.$$

Which of the statements is true:  $C \subset D$ ,  $D \subset C$ ,  $C = D$ . Provide a detailed answer.

**Exercise/Oppgave**

3. Let  $x$  and  $y$  be positive integers. Define the function  $F$  recursively:

$$F(x, y) = \begin{cases} 0, & x < y \\ F(x - y, y) + 1, & y \leq x \end{cases}$$

Compute explicitly  $F(2, 3)$ ,  $F(3, 2)$ ,  $F(23, 6)$ ,  $F(14, 3)$ ,  $F(15, 3)$ . Is  $F$  injective? Justify your answer.

**Exercise/Oppgave**

4. Section/Sektion 4.1: 6, 17d, 18d, 39b, 44

**Exercise/Oppgave**

5. Section/Sektion 4.2: 3b, 7b, 24a

**Exercise/Oppgave**

6. Section/Sektion 4.3: 6, 12, 33c, d, 39e, 49

**Exercise/Oppgave**

7. Section/Sektion 4.4: 5b, c, 8, 11a, b