Diskrētā matemātika
2. patstāvīgais darbs

Kopa $M = \mathcal{P}(U)$, kur U ir dotā kopa, ir sakārtota kopa attiecībā pret sakārtojumu $\subset$. Apskatām kopu $A \subset M$. Atrast:

- minimālus un maksimālus elementus kopā A;

- kopas A minimumu un maksimumu;

- kopas A augšējo un apakšējo konusu kopā M;

- kopas A infīmu un suprēmu kopā M.

1. $U = \{a; q; f; g; y; e; b\}$,

$$A = \Big\{ \{f; q\}; \{e; b\}; \{a; q\}; \{q; e; y; b; y; a\}; \{e; f; a; b\}; \{f; b; f; q\}; \{f; q; y; b; e; b; f; q\};$$
$$\{f; y\}; \{y; y; y\}; \{a; b; b; a\} \Big\};$$

2. $U = \{3; 5; 1; 9; 2; 7; 4\}$,

$$A = \Big\{ \{3; 5; 1\}; \{3; 5; 9; 9; 7; 7; 7; 4\}; \{9; 1; 5; 3\}; \{4; 7; 1; 4; 7; 3\}; \{5; 4; 4; 1; 9; 5; 3; 5\}; \{1; 9; 5; 3\};$$
$$\{3; 3; 3; 3\}; \{3; 5; 1; 1; 5\}; \{5; 1; 4; 9; 7\} \Big\};$$

3. $U = \{\alpha; \beta; \gamma; \theta; \varphi; \psi; \omega\}$,

$$A = \Big\{ \{\psi; \varphi; \varphi; \alpha\}; \{\gamma; \gamma; \omega; \varphi\}; \{\omega; \alpha; \beta\}; \{\alpha; \beta; \varphi; \psi; \omega\}; \{\gamma; \gamma; \gamma; \gamma\}; \{\varphi; \psi; \omega; \beta\};$$
$$\{\alpha; \beta\}; \{\gamma; \gamma; \alpha\}; \{\alpha; \varphi; \psi\}; \{\beta; \beta; \omega\} \Big\};$$

4. $U = \{\oplus; \ominus; \circlearrowleft; \otimes; \oslash; \odot; \bigcirc\}$,

$$A = \Big\{ \{\oplus; \ominus; \odot\}; \{\odot; \otimes\}; \{\bigcirc; \otimes; \ominus; \oslash; \odot\}; \{\oplus; \ominus; \bigcirc\}; \{\oslash; \otimes\}; \{\odot; \odot; \odot\}; \{\odot; \oplus; \oplus\};$$
$$\{\otimes; \bigcirc; \odot; \bigcirc\}; \{\oslash; \otimes\}; \{\oplus\} \Big\};$$

5. $U = \{\cap; \cup; \uplus; \dagger; \sqcap; \sqcup; \vee\}$,

$$A = \Big\{ \{\cup; \uplus\}; \{\sqcap; \sqcup\}; \{\vee\}; \{\vee; \sqcup; \sqcap; \uplus\}; \{\sqcup; \wedge; \vee; \wedge; \sqcup\}; \{\uplus; \uplus; \sqcap; \uplus; \cup; \cap\}; \{\sqcap; \sqcup; \vee; \wedge\};$$
$$\{\vee; \sqcup; \sqcap; \uplus \sqcap\}; \{\sqcap; \uplus; \uplus; \sqcup; \vee; \wedge\} \Big\};$$

6. $U = \{3; 5; 6; 2; 9; 1; 8; 10; 4\}$,

$$A = \Big\{ \{4; 6\}; \{6; 10\}; \{6; 4\}; \{2; 6; 5; 9\}; \{9; 6; 8; 3; 2\}; \{8; 6; 4; 5; 4; 8\}; \{10; 2; 9; 6\};$$
$$\{5; 8; 6; 9; 3\}; \{4; 3; 6; 5; 9; 2\} \Big\};$$

7. $U = \{⊎;∩;∪;†;□;⊔;∨;⊓\}$,

$$A = \Big\{\{∪;⊔\};\{⊓;⊔\};\{⊎;⊔;⊓;⊎\};\{⊔;∧;∨;∩;⊔\};\{⊎;⊎;⊓;⊎;∨;∩\};\{⊓;∧;∨;∧\};$$
$$\{∨;⊎;⊓;⊎⊓\};\{⊓;⊎;∩;⊔;∨;∧\}\Big\};$$

8. $U = \{Γ;Δ;Θ;Λ;Ξ;Π;Ω\}$,

$$A = \Big\{\{Θ;Λ\};\{Λ;Θ\};\{Θ;Θ;Δ;Δ\};\{Ξ;Γ;Θ;Δ;Π\};\{Π;Π;Θ;Γ;Γ;Λ\};\{Λ;Λ;Θ;Γ\};$$
$$\{Π;Γ;Θ;Π;Δ\};\{Δ;Θ;Θ;Π;Π;Γ\}\Big\};$$

9. $U = \left\{\frac{1}{2};\frac{2}{3};\frac{1}{4};\frac{3}{5};\frac{1}{6}\right\}$,

$$A = \left\{\left\{\frac{2}{3};\frac{1}{2}\right\};\left\{\frac{2}{3};\frac{1}{4}\right\};\left\{\frac{1}{2};\frac{2}{3};\frac{3}{5};\frac{1}{4}\right\};\left\{\frac{3}{5};\frac{2}{3};\frac{1}{4};\frac{3}{5};\frac{3}{5}\right\};\left\{\frac{3}{5};\frac{2}{3};\frac{1}{4};\frac{1}{2};\frac{3}{5};\frac{1}{4}\right\};\right.$$
$$\left.\left\{\frac{1}{2};\frac{1}{4};\frac{2}{3};\frac{2}{3}\right\};\left\{\frac{3}{5};\frac{1}{4};\frac{2}{3};\frac{3}{5};\frac{1}{2}\right\};\left\{\frac{1}{2};\frac{2}{3};\frac{1}{2};\frac{1}{4};\frac{3}{5};\frac{1}{4}\right\}\right\};$$

10. $U = \{↑;⇑;↓;⇓;↕;⇕\}$,

$$A = \Big\{\{↕;↑\};\{↕;⇕\};\{⇓;↕;↑;⇕\};\{↑;↕;↕;⇓;⇑\};\{⇑;↑;↕;⇓;↕;↑\};\{↕;↕;↑;⇕\};$$
$$\{↑;↕;⇑;↑;⇕\};\{↕;⇑;⇕;↑;⇕;⇓\}\Big\};$$

11. $U = \{a;q;f;t;g;y;e;b\}$,

$$A = \Big\{\{f;q;a\};\{e;b;b\};\{q;e;y;b;y;a\};\{a;y;q\};\{e;f;a;b\};\{f;b;f;q\};$$
$$\{a;q;a;f;g;y;e;y;;b\};\{f;y;e;q\};\{y;y;y\};\{a;b;b;a\}\Big\};$$

12. $U = \{3;5;1;9;2;8;7;4;13\}$,

$$A = \Big\{\{3;5;1;8\};\{3;5;9;9;7;7;7;4\};\{9;1;5;8;5;3\};\{1;4;7;1;4;7;3\};\{5;4;4;1;9;5;3;5\};$$
$$\{1;9;5;3\};\{3;3;3;3\};\{3;5;1;1;5;5\};\{5;1;9;4;9;7\}\Big\};$$

13. $U = \{μ;α;β;γ;θ;λ;φ;ψ;ω\}$,

$$A = \Big\{\{ψ;φ;μ;φ;α\};\{γ;γ;ω;μ;φ\};\{ω;α;β\};\{α;β;φ;ψ;ω\};\{γ;μ;γ;γ;γ\};\{φ;ψ;μ;ω;β\};$$
$$\{α;β\};\{γ;γ;α\};\{α;φ;ψ\};\{β;β;μ;μ;μ;ω\}\Big\};$$

14. $U = \{⊕;⊖;↺;↻;⊗;⊖;∅;⊙;◯\}$,

$$A = \Big\{\{⊕;⊖;⊙\};\{⊙;⊗\};\{◯;↻;⊗;⊖;∅;⊙\};\{⊕;⊖;◯\};\{∅;⊗\};\{⊙;⊙;⊙;↻\};\{⊙;⊕;⊕\};$$
$$\{⊗;◯;⊙;◯\};\{∅;↻;↺;⊗\};\{↻;⊕\}\Big\};$$

15. $U = \{\cap; \cup; \uplus; \dagger; \boxminus; \sqcap; \sqcup; \vee\}$,

$A = \Big\{ \{\cup; \cap; \uplus\}; \{\sqcap; \boxminus; \sqcup\}; \{\vee\}; \{\vee; \cap; \sqcup; \sqcap; \uplus\}; \{\sqcup; \wedge; \vee; \wedge; \sqcup\}; \{\uplus; \uplus; \sqcap; \uplus; \cup; \cap; \boxminus\};$
$\{\sqcap; \sqcup; \cap; \vee; \wedge\}; \{\vee; \sqcup; \sqcap; \cap; \boxminus; \uplus\sqcap\}; \{\sqcap; \uplus; \uplus; \sqcup; \cap; \vee; \wedge\} \Big\}$;

16. $U = \{3; 5; 13; 14; 6; 7; 2; 9; 1; 8; 10; 4\}$,

$A = \Big\{ \{4; 6\}; \{6; 7; 10\}; \{6; 4\}; \{2; 6; 5; 9\}; \{9; 6; 8; 3; 2\}; \{8; 6; 4; 5; 4; 8\}; \{10; 2; 7; 9; 7; 6\};$
$\{5; 8; 6; 9; 3\}; \{4; 3; 6; 5; 7; 9; 2\}; \{2; 9; 4\}; \{9; 6; 8; 3; 2\}; \{6; 4; 9\} \Big\}$;

17. $U = \{0, 2; 0, 3; 0, 4; 0, 5; 0, 6; 0, 7; 0, 8; -0, 2; -0, 9; -0, 4; 0, 12; 0, 13\}$,

$A = \Big\{ \{0, 5; -0, 2\}; \{0, 3; -0, 2; 0, 6\}; \{0, 4\}; \{0, 8\}; \{0, 5; 0, 8\}; \{-0, 9; 0, 6\}; \{0, 3; -0, 9\};$
$\{0, 4; 0, 8\}; \{-0, 2\}; \{0, 3; 0, 4; -0, 2; -0, 2\}; \{0, 3; 0, 4; 0, 3; 0, 6; \}; \{0, 7; 0, 2\} \Big\}$;

18. $U = \{A; U; Y; C; G; N; B; F; R; T; P\}$,

$A = \Big\{ \{A; F\}; \{N; P; R\}; \{A; N\}; \{G; P; A; B\}; \{B; G; Y; B; Y\}; \{U; G; B; Y; R; F\};$
$\{G; U; N; Y; F\}; \{G; F; R; G; R; U; N\}; \{Y; F; B\}; \{B; P; U; P; U\}; \{R; U; P\} \Big\}$;

19. $U = \{\subset; \supset; \subseteq; \supseteq; \sqsubseteq; \sqsupseteq; \ni; \in; \dashv; \vdash\}$,

$A = \Big\{ \{\subset; \supset\}; \{\subseteq; \sqsubseteq; \in\}; \{\sqsupseteq; \supset\}; \{\subseteq; \dashv; \subset; \dashv\}; \{\dashv; \subseteq; \supset; \subset; \subset\}; \{\sqsupseteq; \subset; \sqsupseteq; \subset; \in; \subset\};$
$\{\subset; \dashv; \subset; \sqsupseteq; \subset\}; \{\subset; \subset; \supset; \subseteq; \supset; \sqsupseteq; \in\}; \{\subseteq; \sqsubseteq; \subset\}; \{\supset; \subseteq; \sqsubseteq; \subset; \supset\}; \{\in; \sqsubseteq; \dashv\} \Big\}$;

20. $U = \{<; >; \leq; \geq; \succ; \prec; \preceq; \succeq; \gg; \ll\}$,

$A = \Big\{ \{\ll; \prec\}; \{<; \prec; \leq\}; \{\ll; >\}; \{\prec; >; \leq; \succ\}; \{\gg; <; \ll; \leq; \preceq\}; \{\prec; \leq; \prec; \leq; \preceq; \prec\};$
$\{\preceq; \gg; <; \preceq; \prec\}; \{\leq; >; \leq; \gg; \leq; \ll; \prec\}; \{<; >; \ll\}; \{<; \preceq; \gg; \succ; <\}; \{\succ; <; \succ\} \Big\}$;

21. $U = \{3; 5; 1; 9; 2; 8; 7; 4; 13; 14\}$,

$A = \Big\{ \{3; 5; 8\}; \{3; 5; 9; 9; 14; 7; 7; 4\}; \{14; 1; 5; 8; 5\};$
$\{1; 4; 7; 14; 1; 4; 7; 3\}; \{5; 4; 4; 4; 4; 1; 9; 3; 5; 3\}; \{1; 9; 5; 3; 14\}; \{5; 1; 14; 9; 4; 9; 7; 5; 1\} \Big\}$;

22. $U = \{3; 5; 6; 2; 9; 8; 1; 10; 4\}$,

$A = \Big\{ \{6\}; \{6; 10\}; \{6; 10; 2; 9; 8; 1\}; \{8; 1; 10; 10; 4; 4; 4\}; \{2; 9\};$
$\{6; 4\}; \{9; 8; 1; 10; 4\}; \{10\} \Big\}$;

23. $U = \{3; 5; 6; 2; 9; 8; 1; 10; 15\}$,

$A = \Big\{ \{3; 5; 6\}; \{5; 6; 2; 2; 2; 9; 8\}; \{2; 9; 8; 1; 1; 1\}; \{10\}; \{10; 15\};$
$\{15; 3; 1; 10\}; \{10; 6\}; \{2; 3\} \Big\}$.