A game from the war

hayward@ualberta.ca + toft

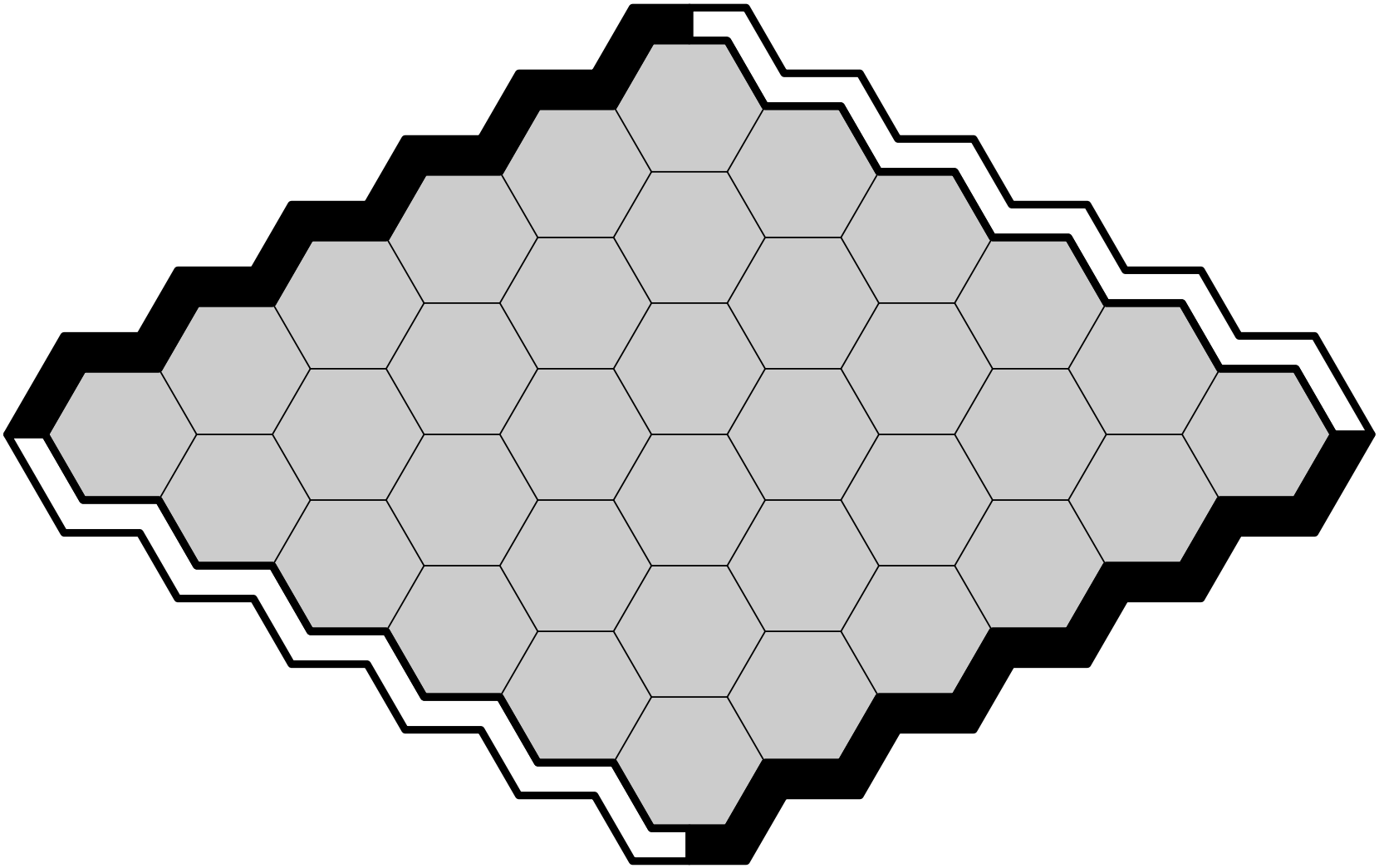
computing.science university of alberta supported by NSERC

2019-26

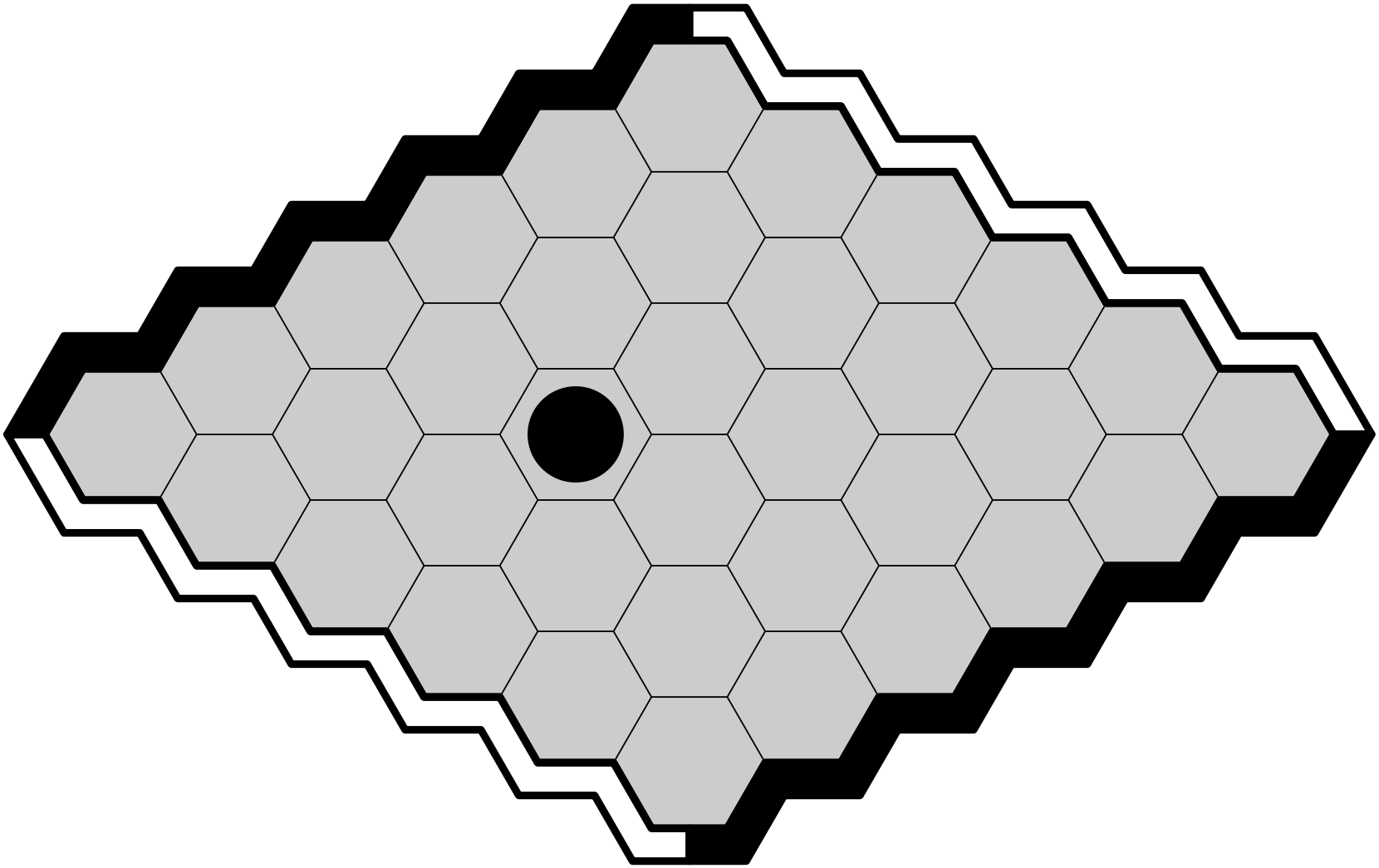
THANK YOU

- Hex research team
  Michael Johanson, Yngvi Björnsson, Morgan Kan, Nathan Po, Jack van Rijswijck, Broderick Arneson, Philip Henderson, Jakub Pawlewicz, Aja Huang (AlphaGo), Kenny Young, Noah Weninger, Chao Gao, Martin Müller (Fuego)
- Bjarne Toft

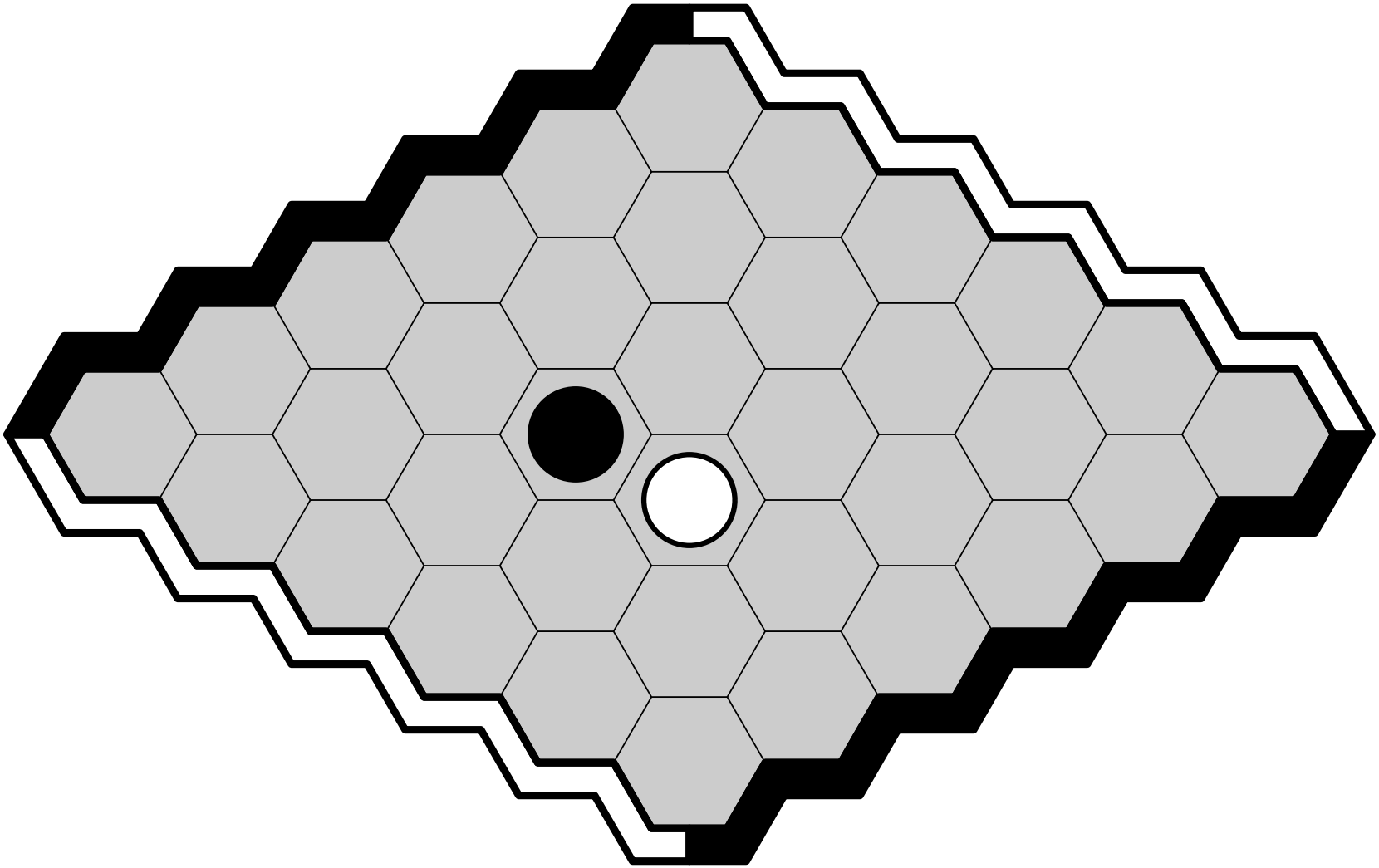
Hex: rules



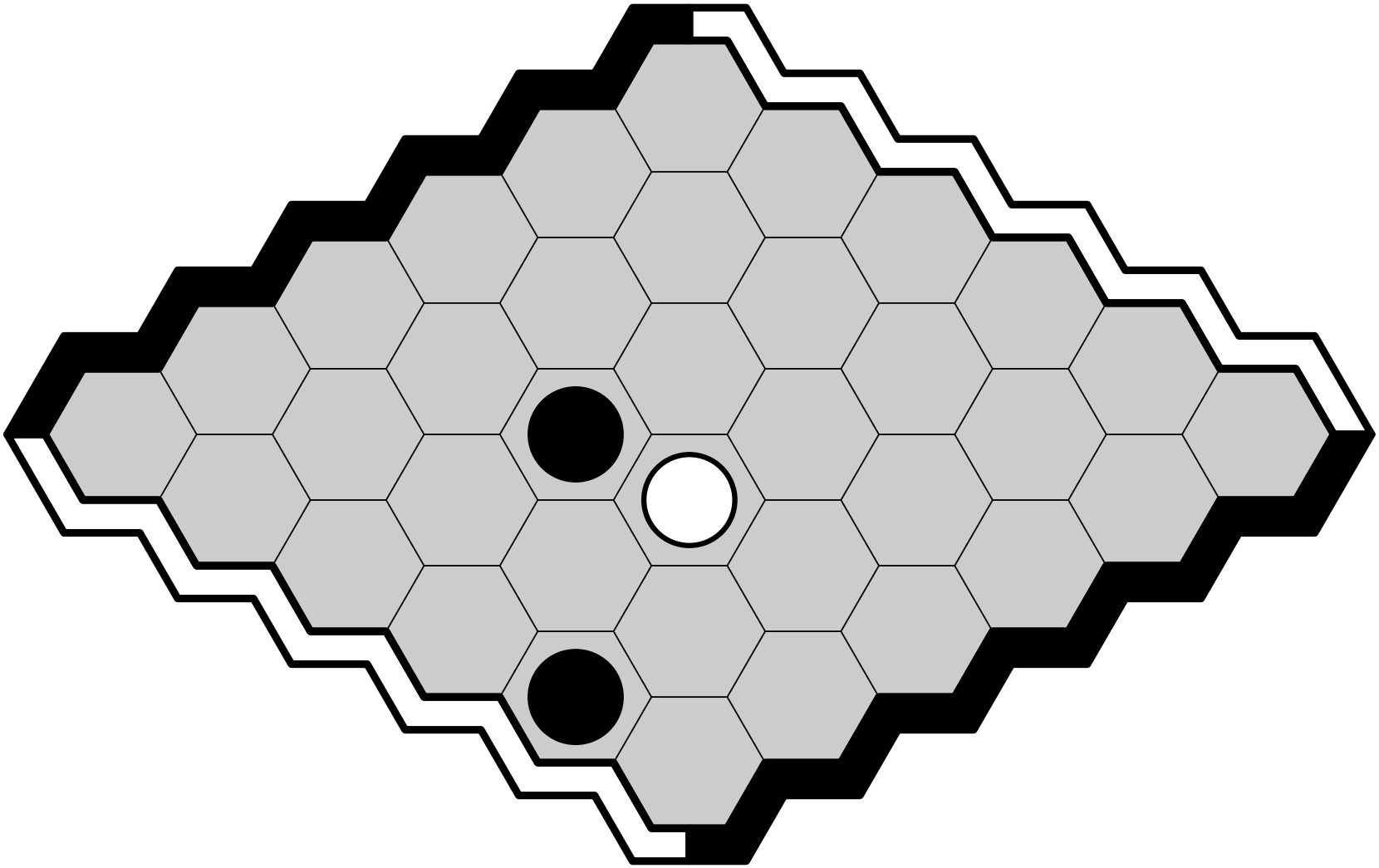
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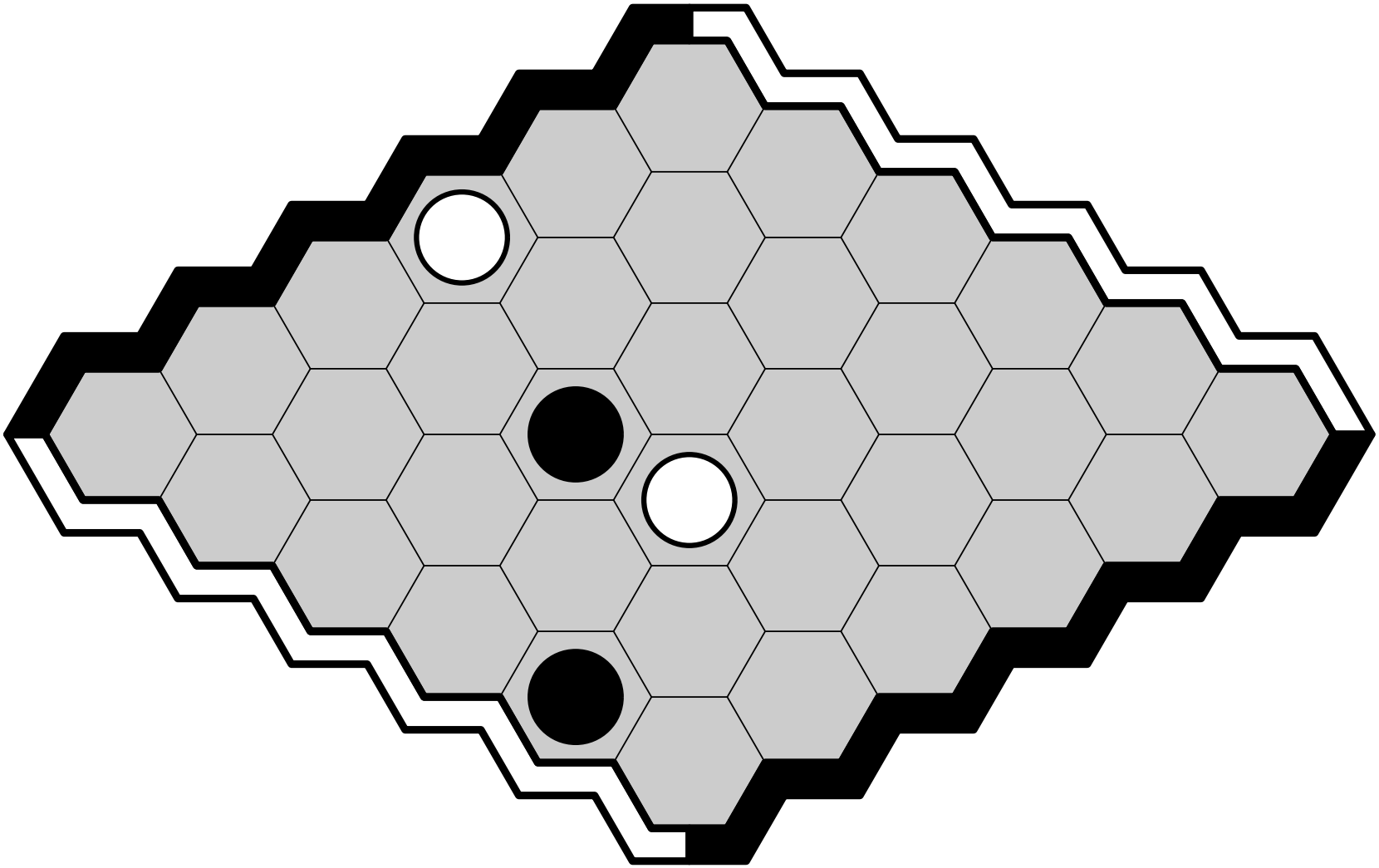
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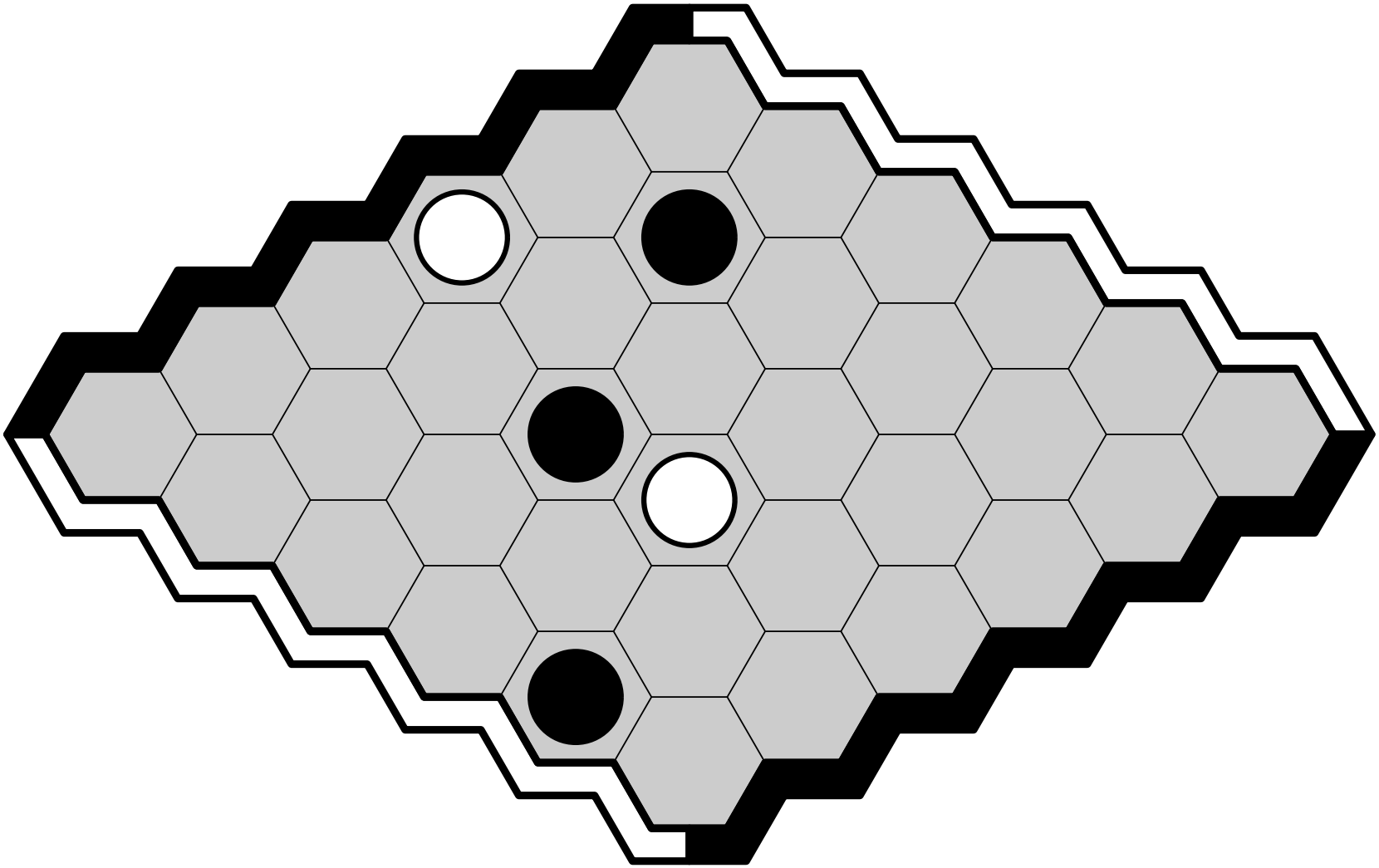
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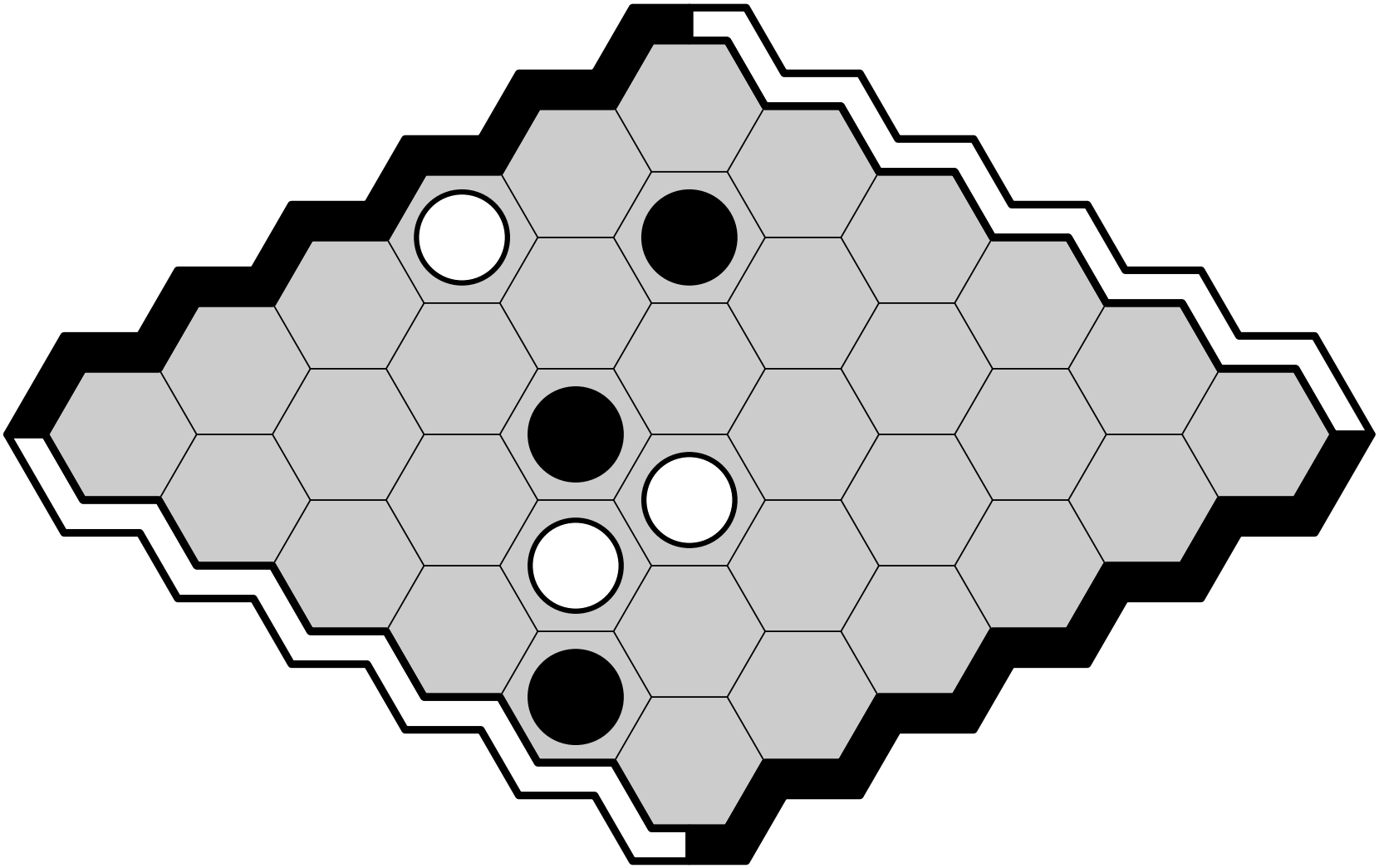
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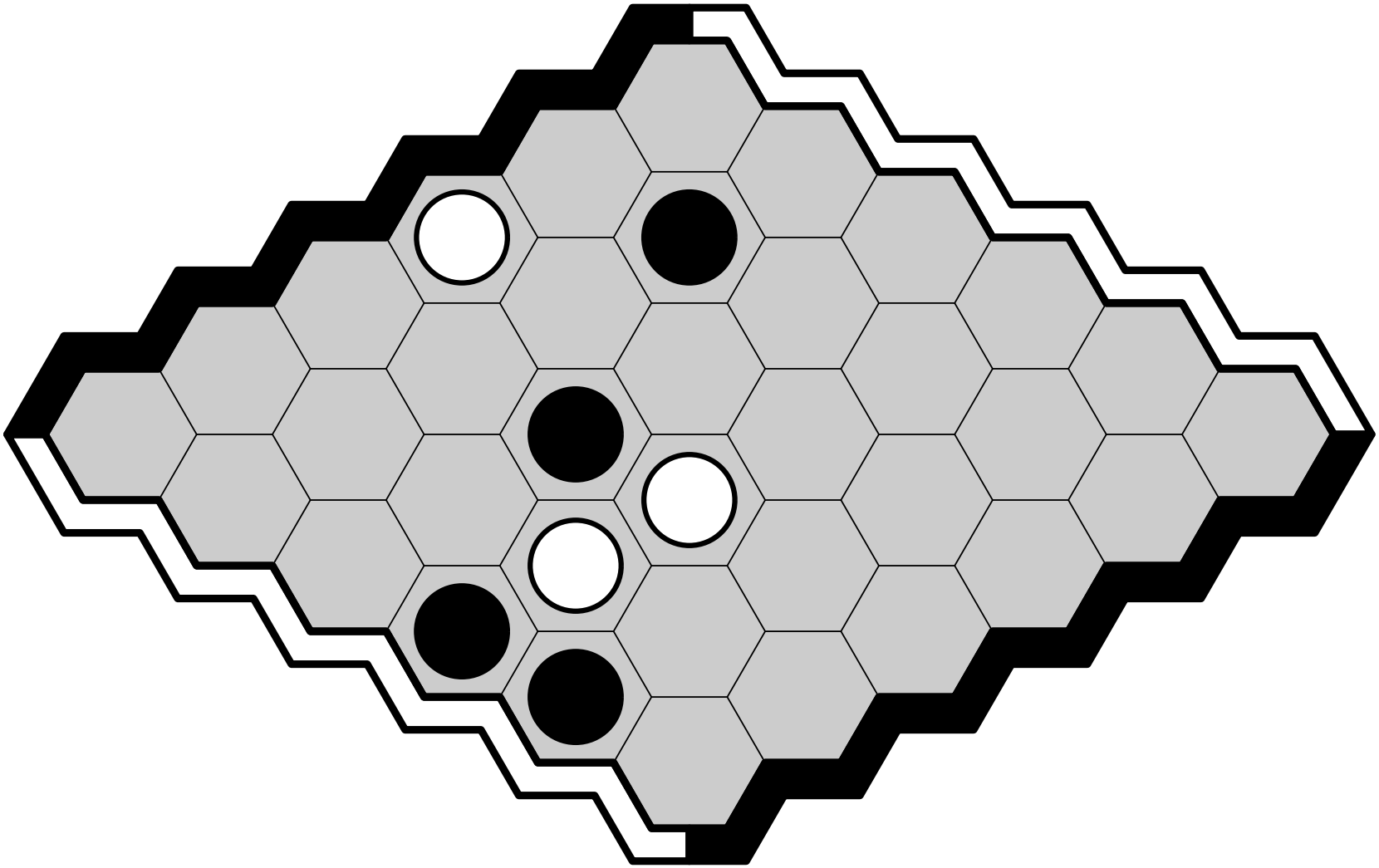
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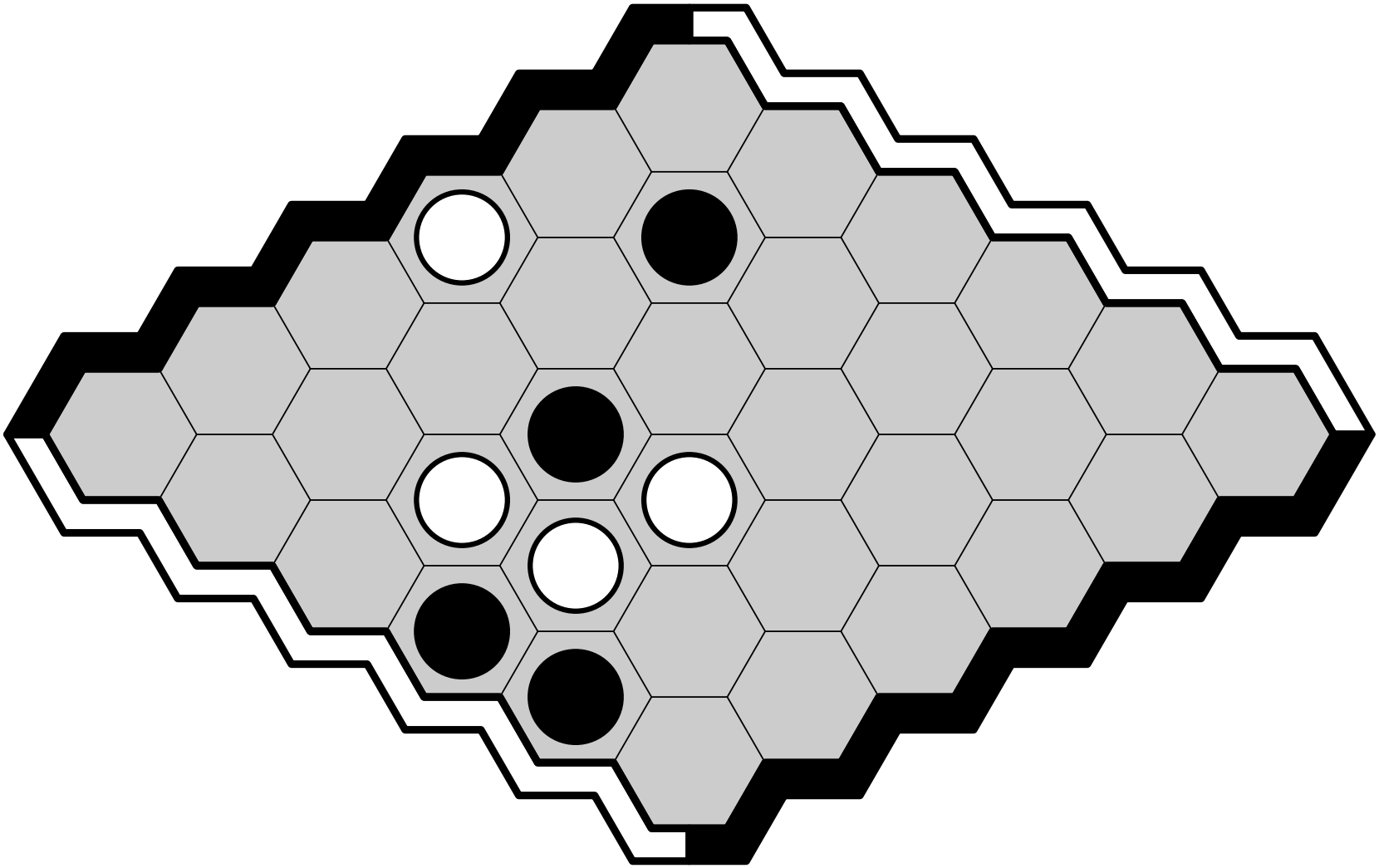
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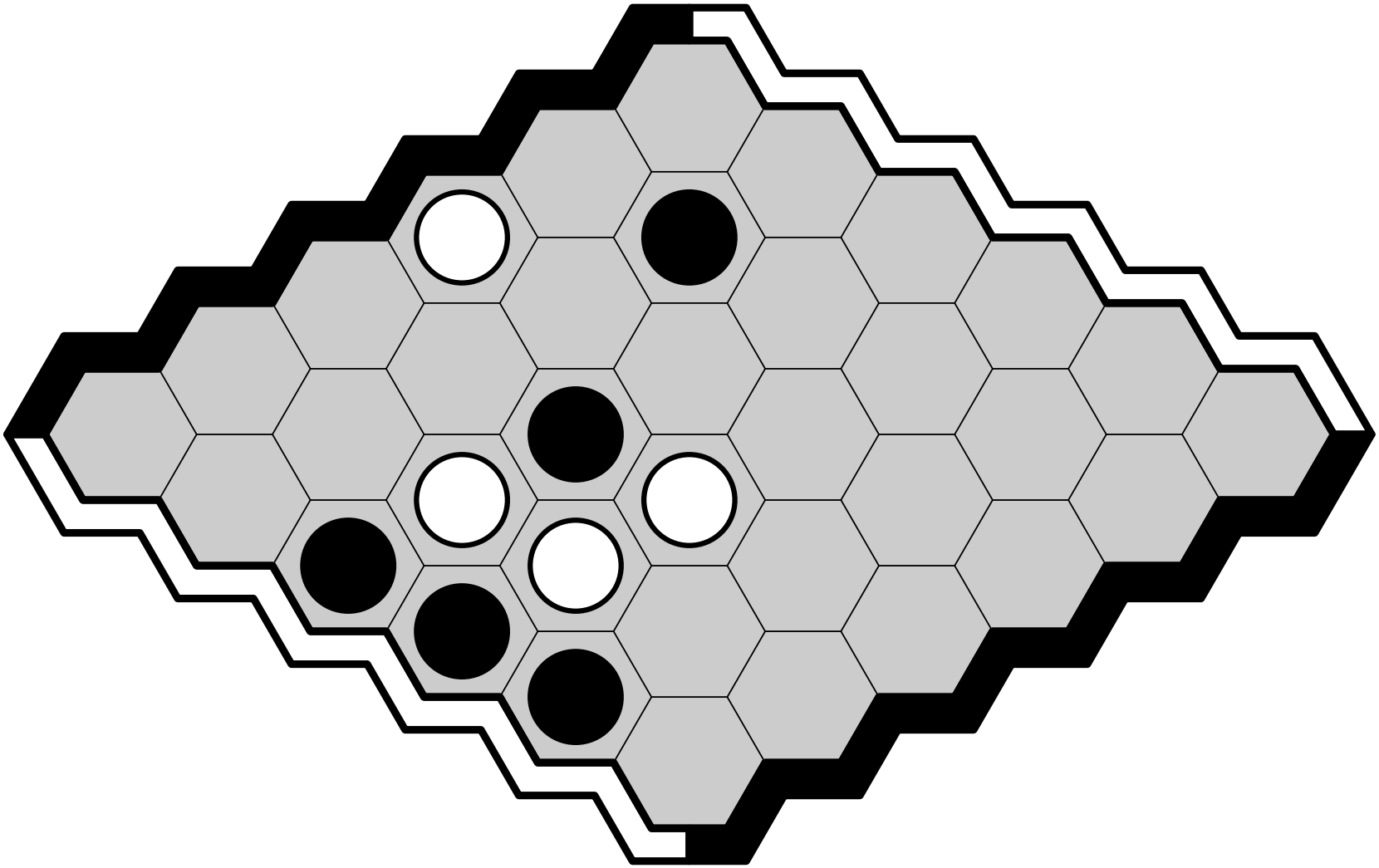
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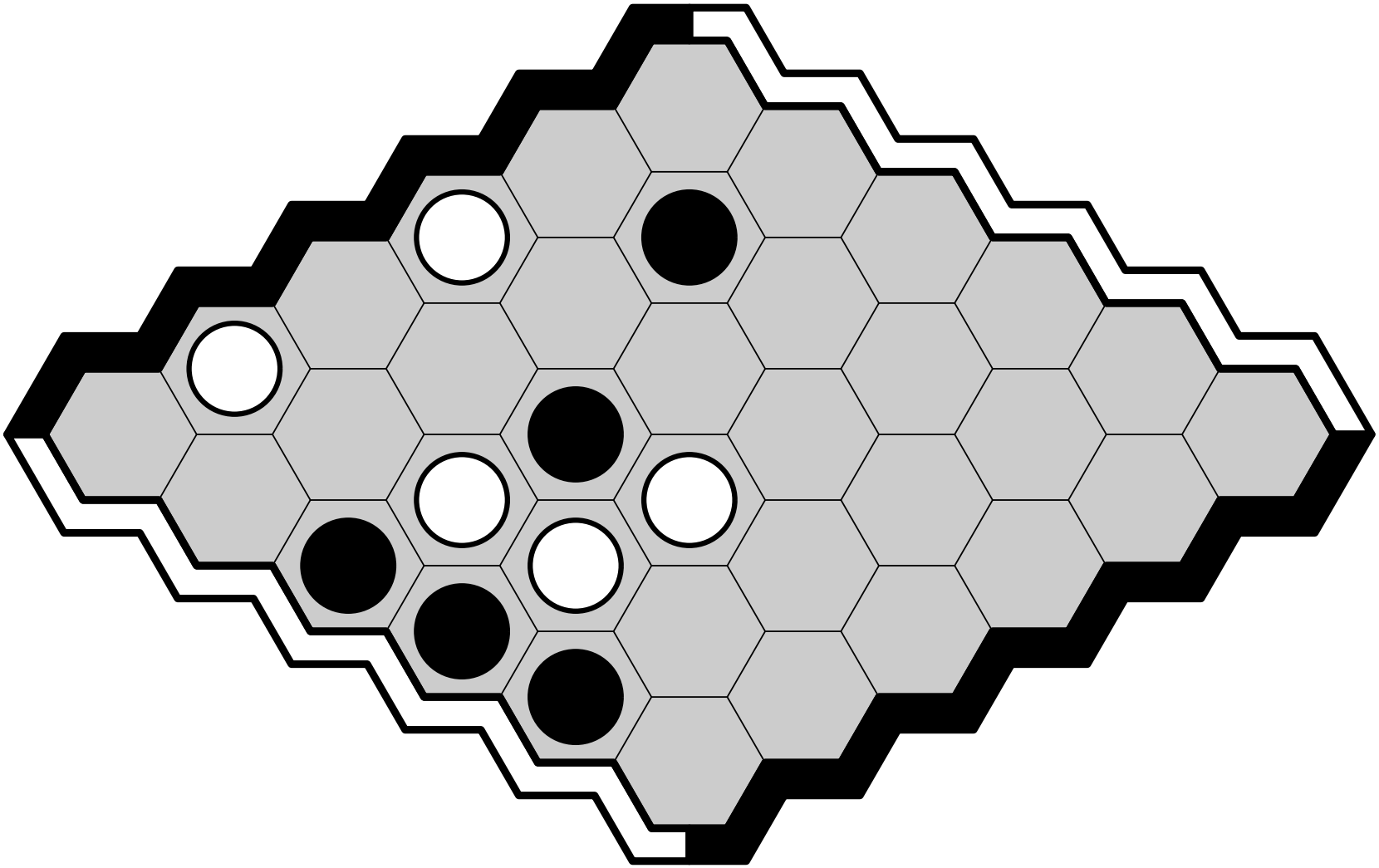
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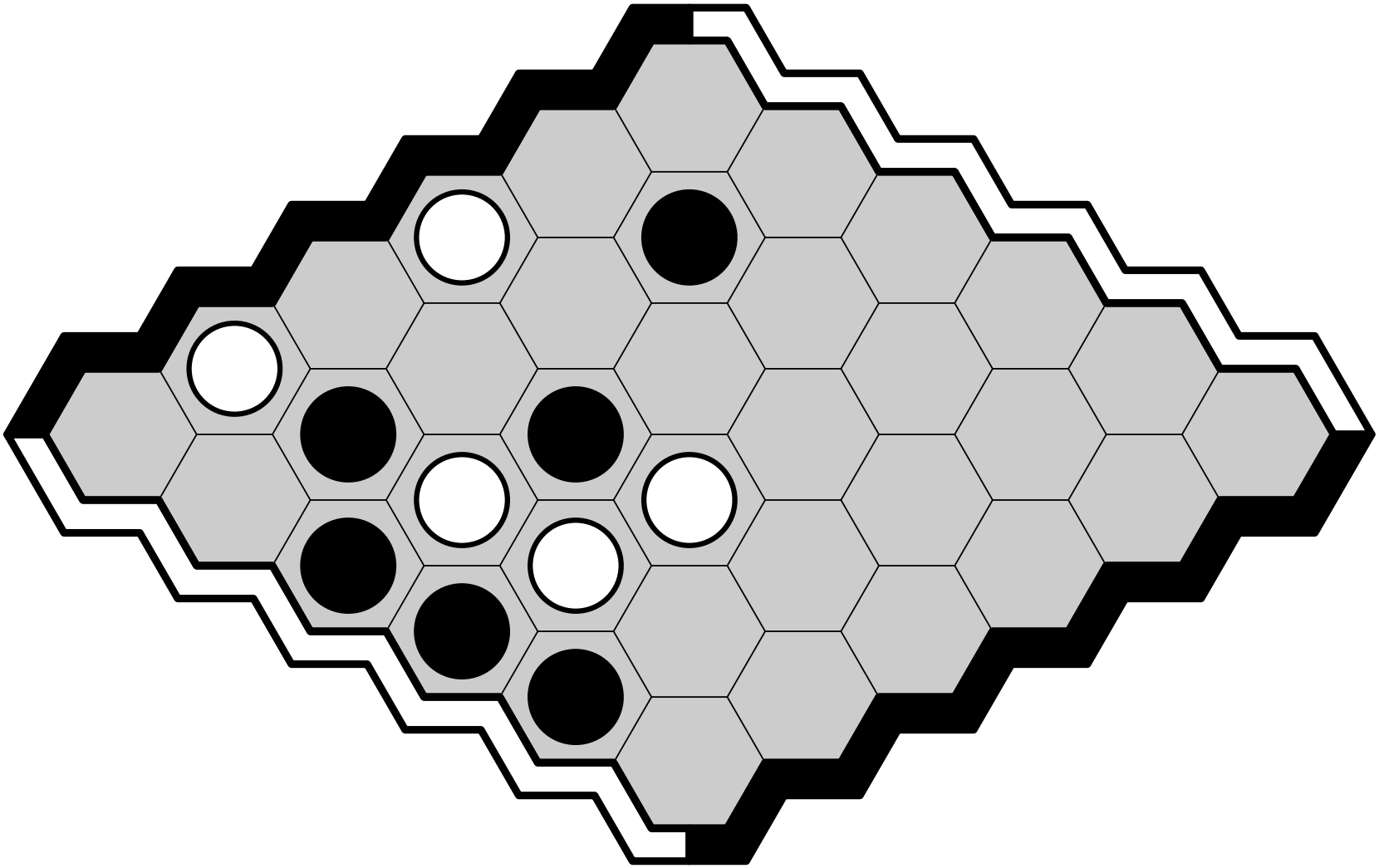
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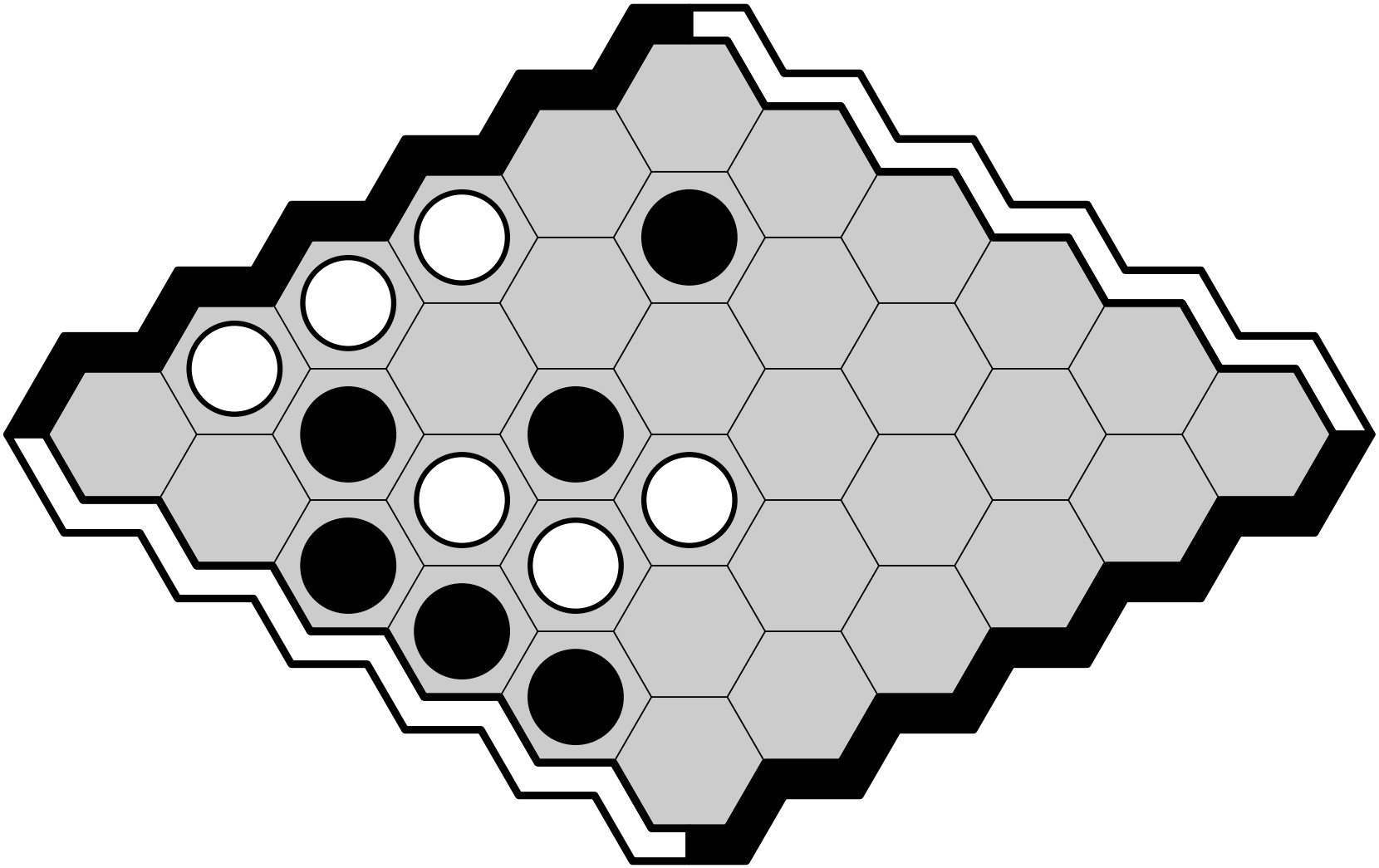
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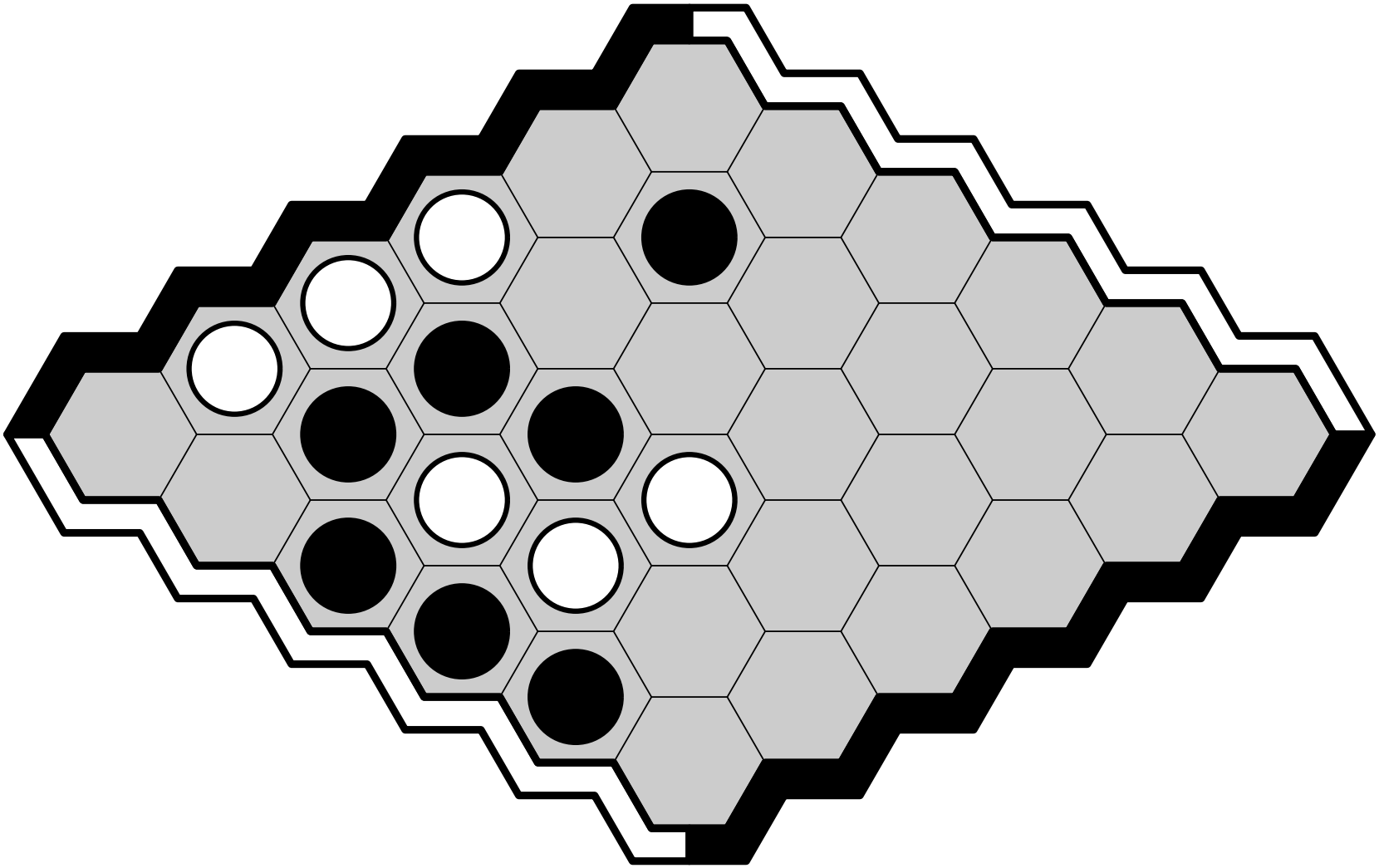
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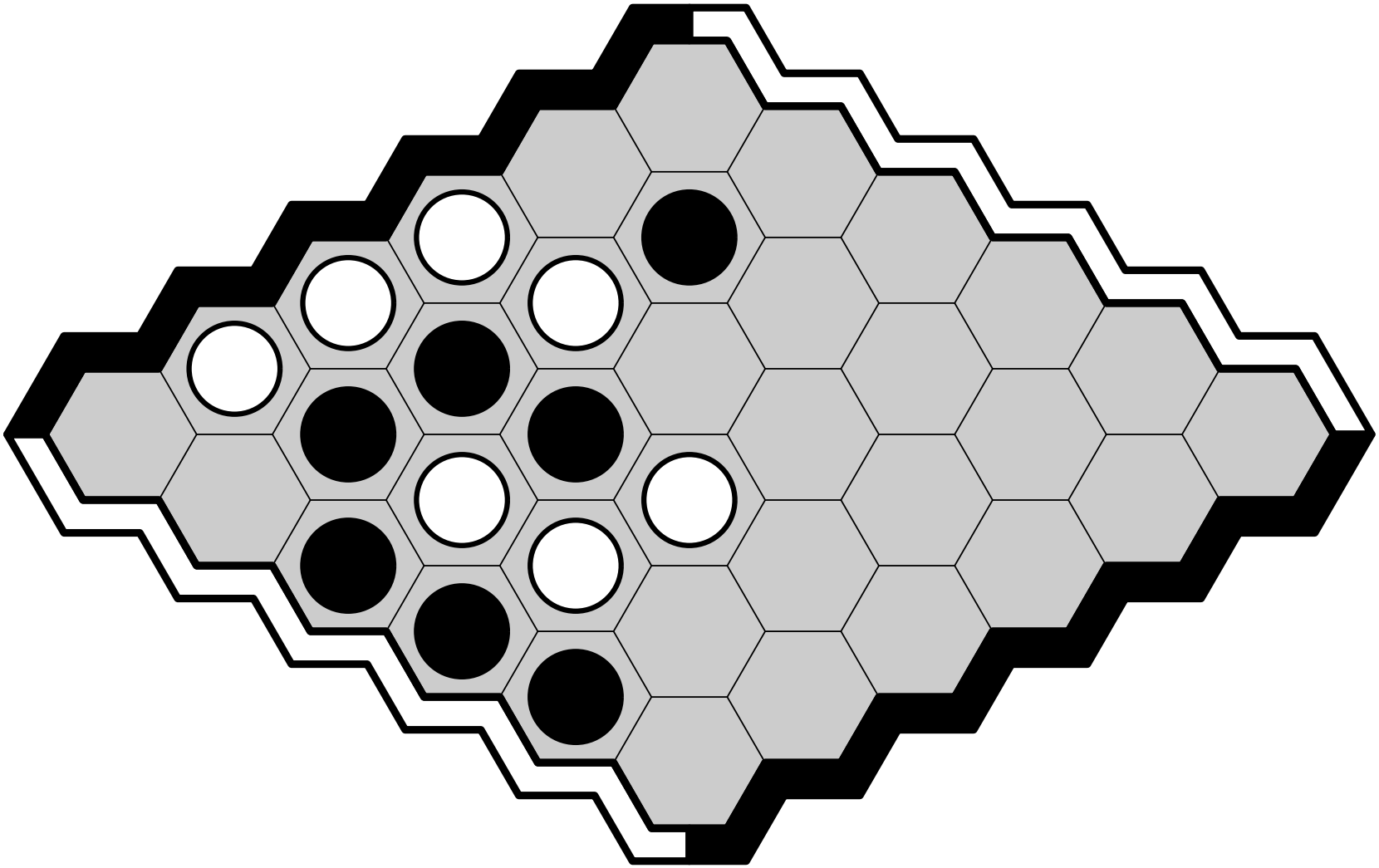
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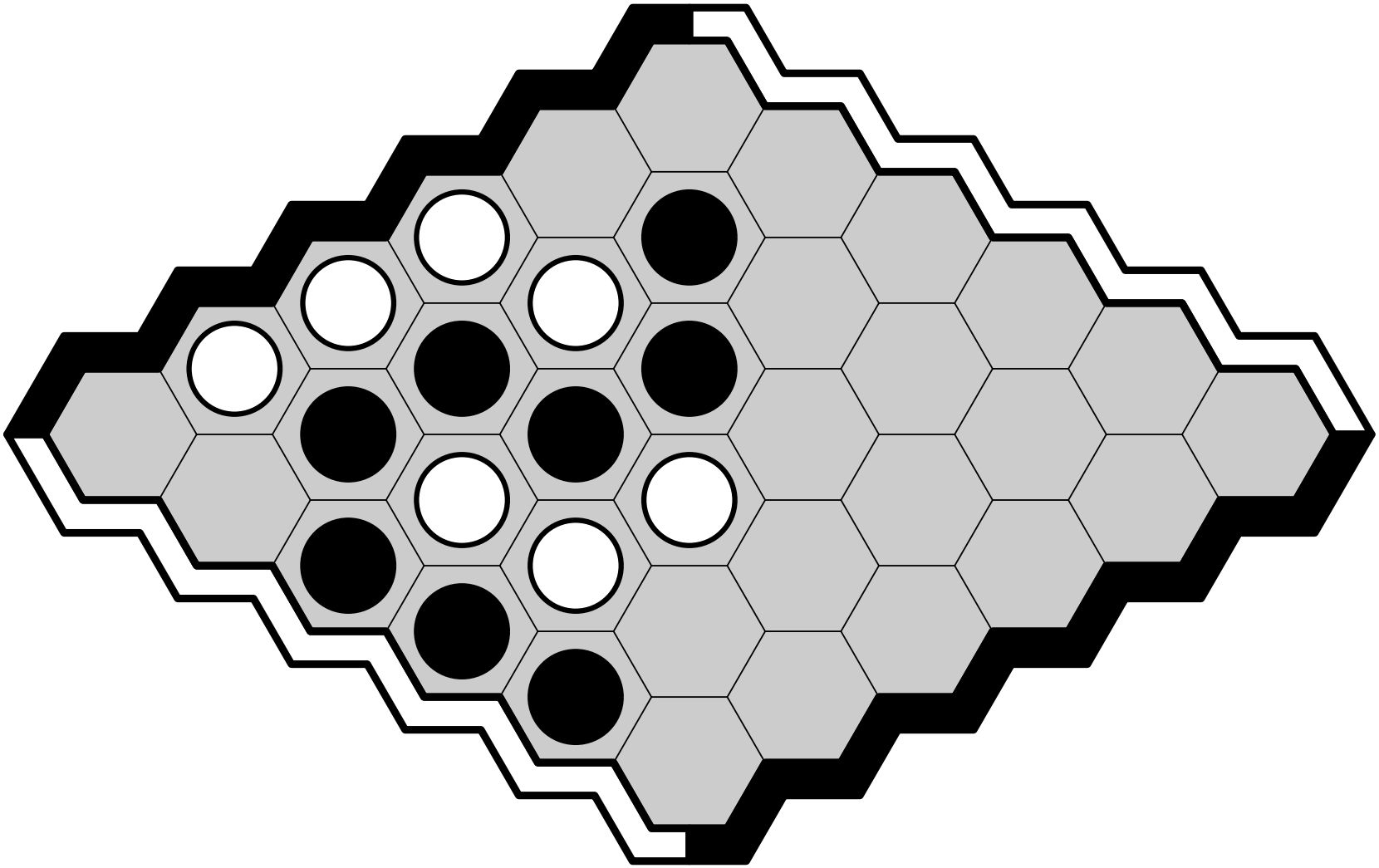
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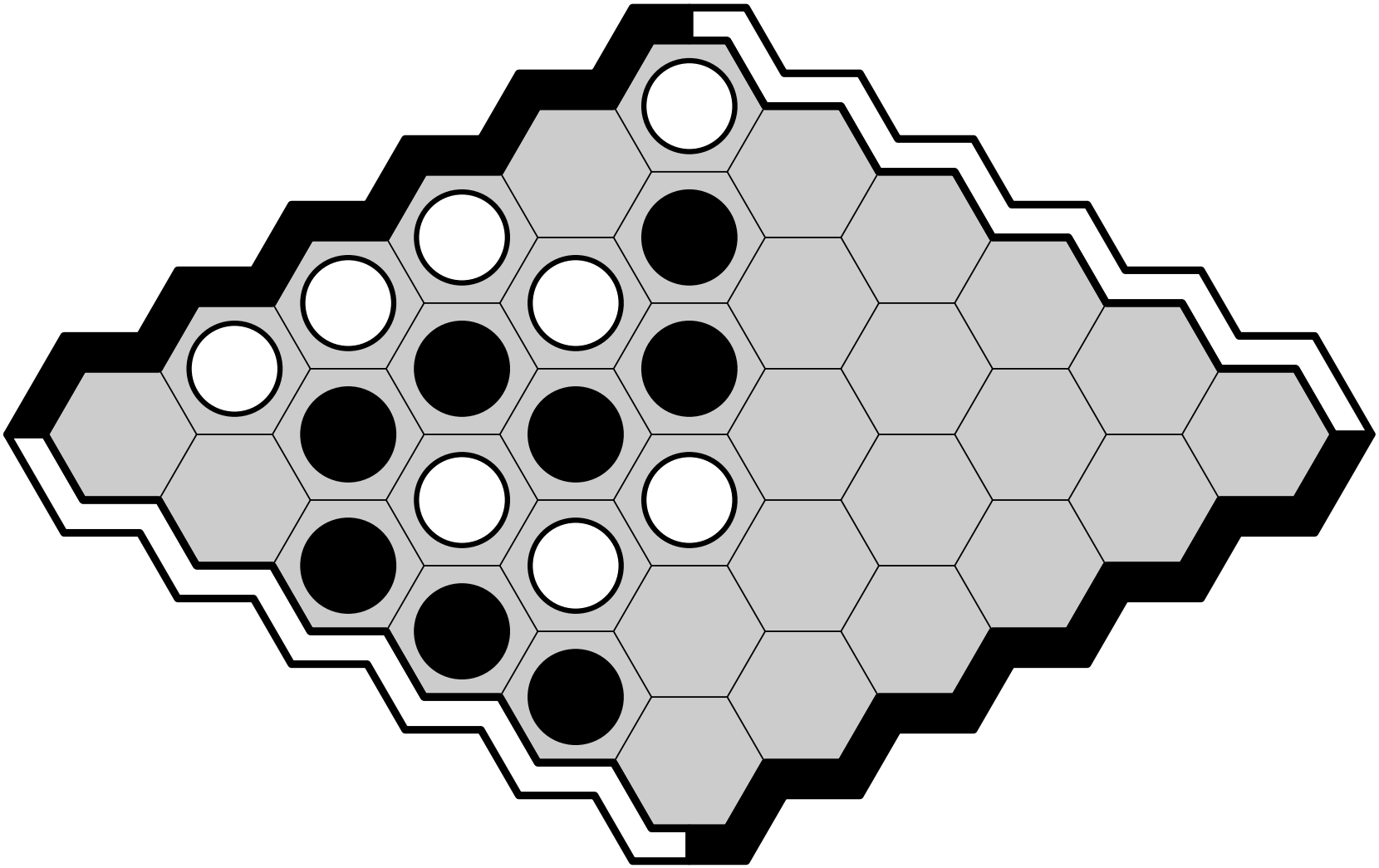
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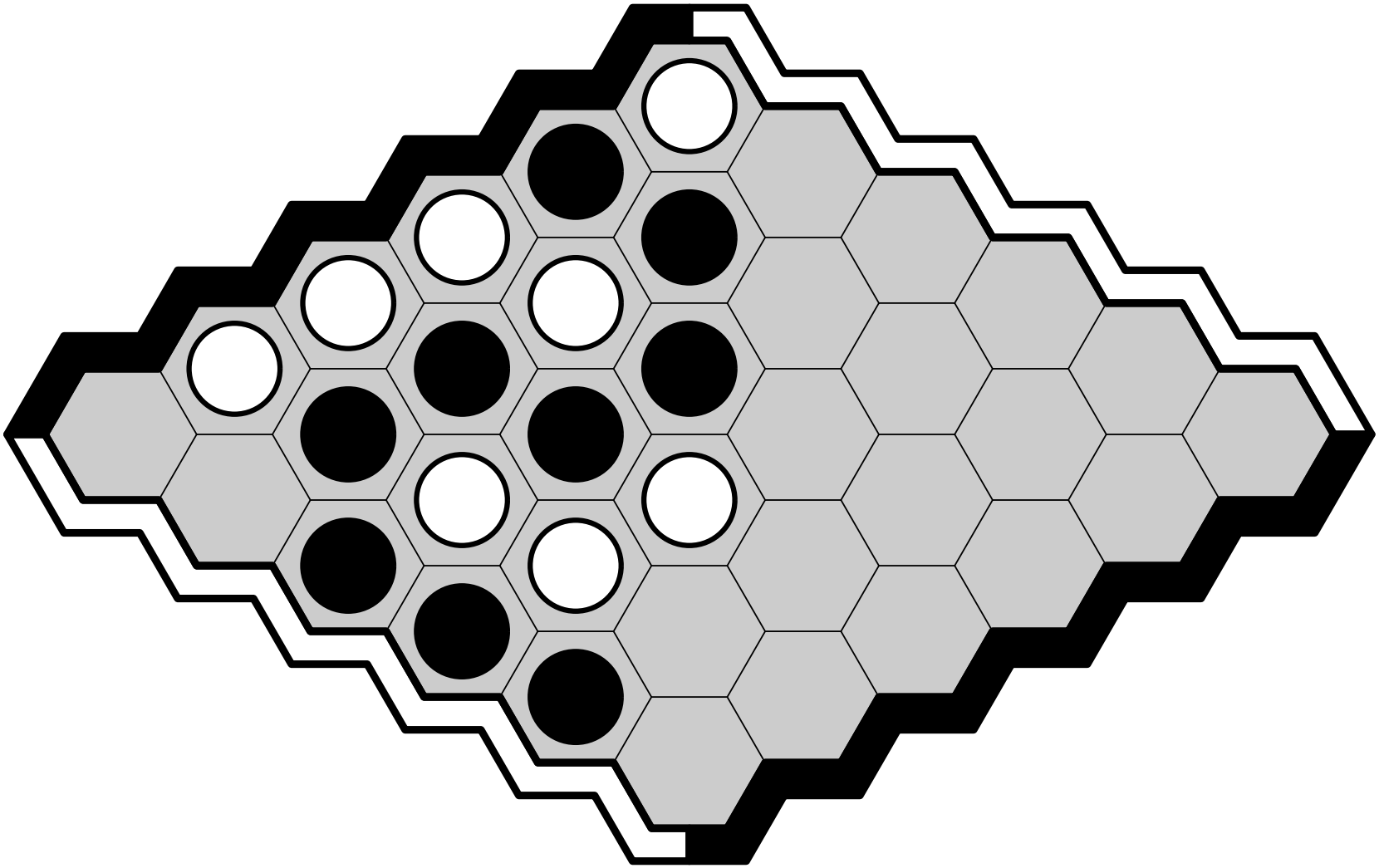
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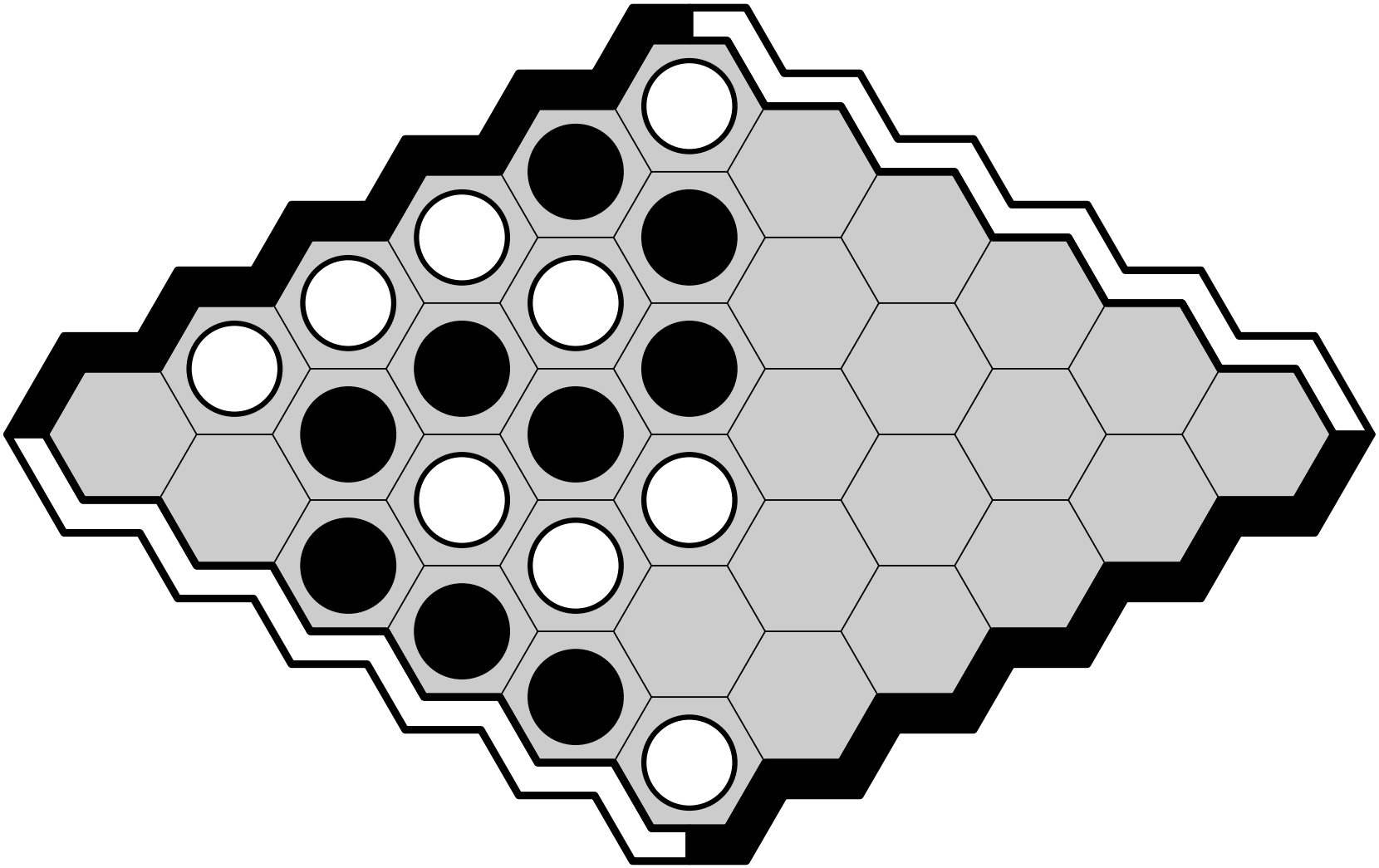
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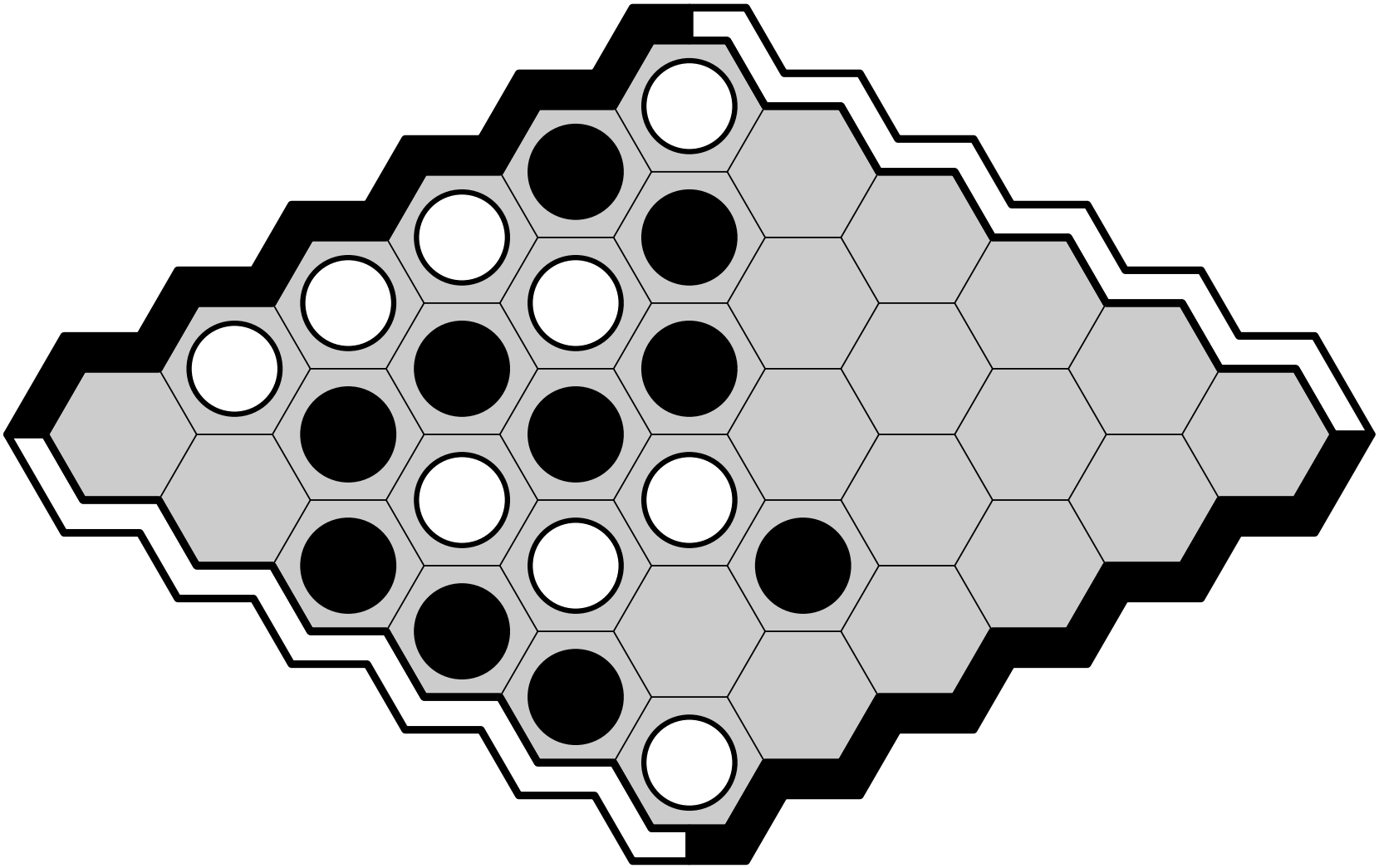
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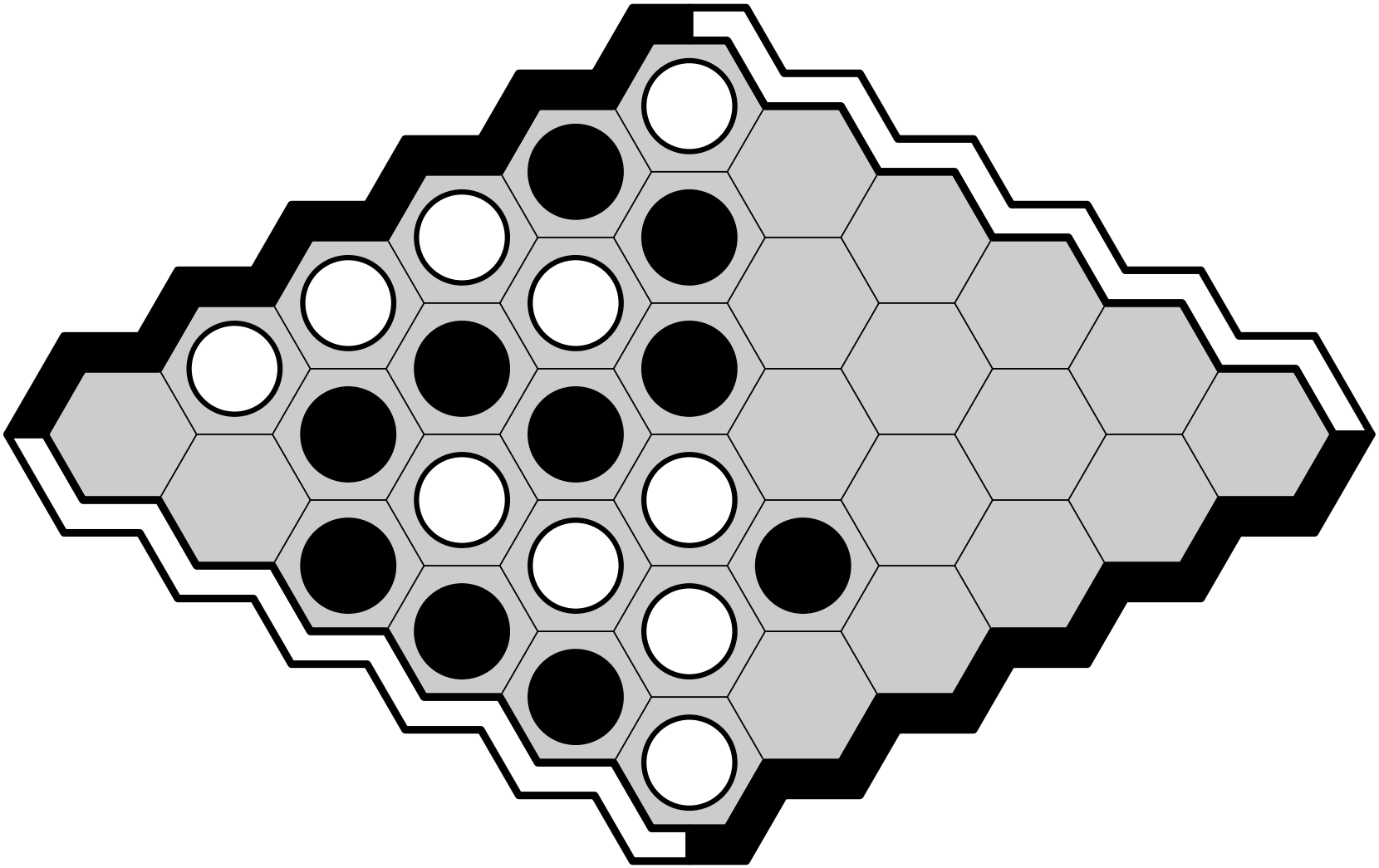
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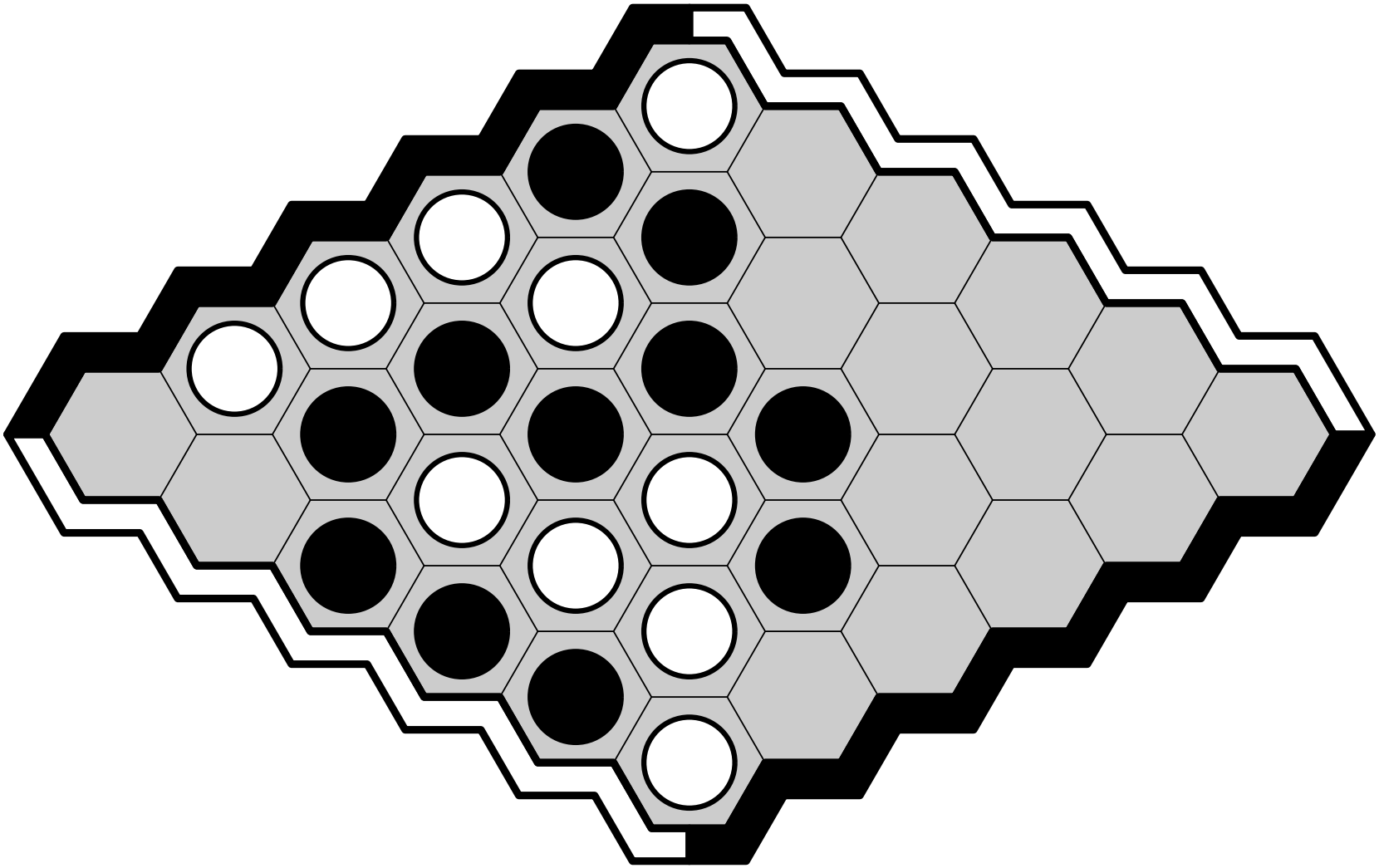
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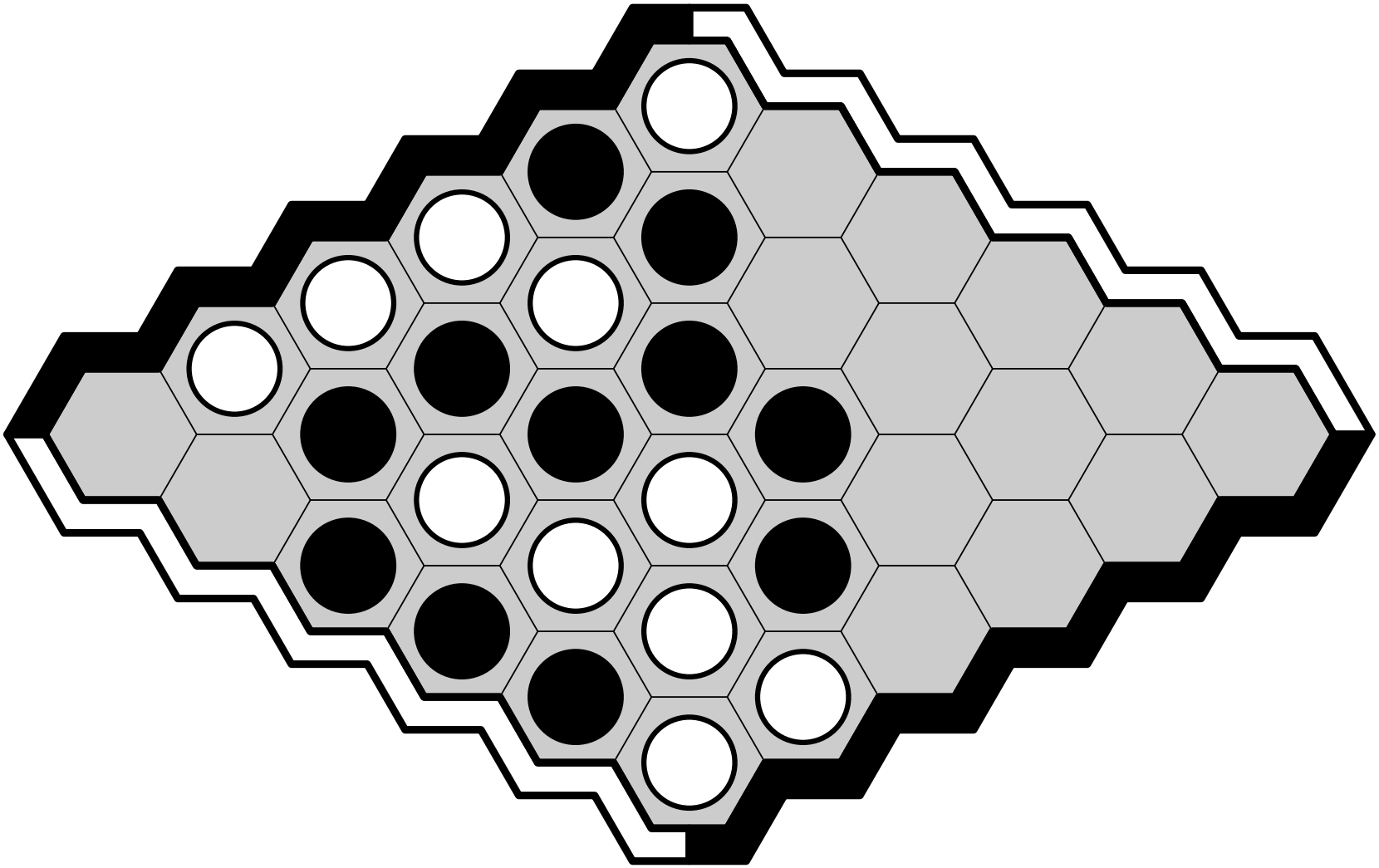
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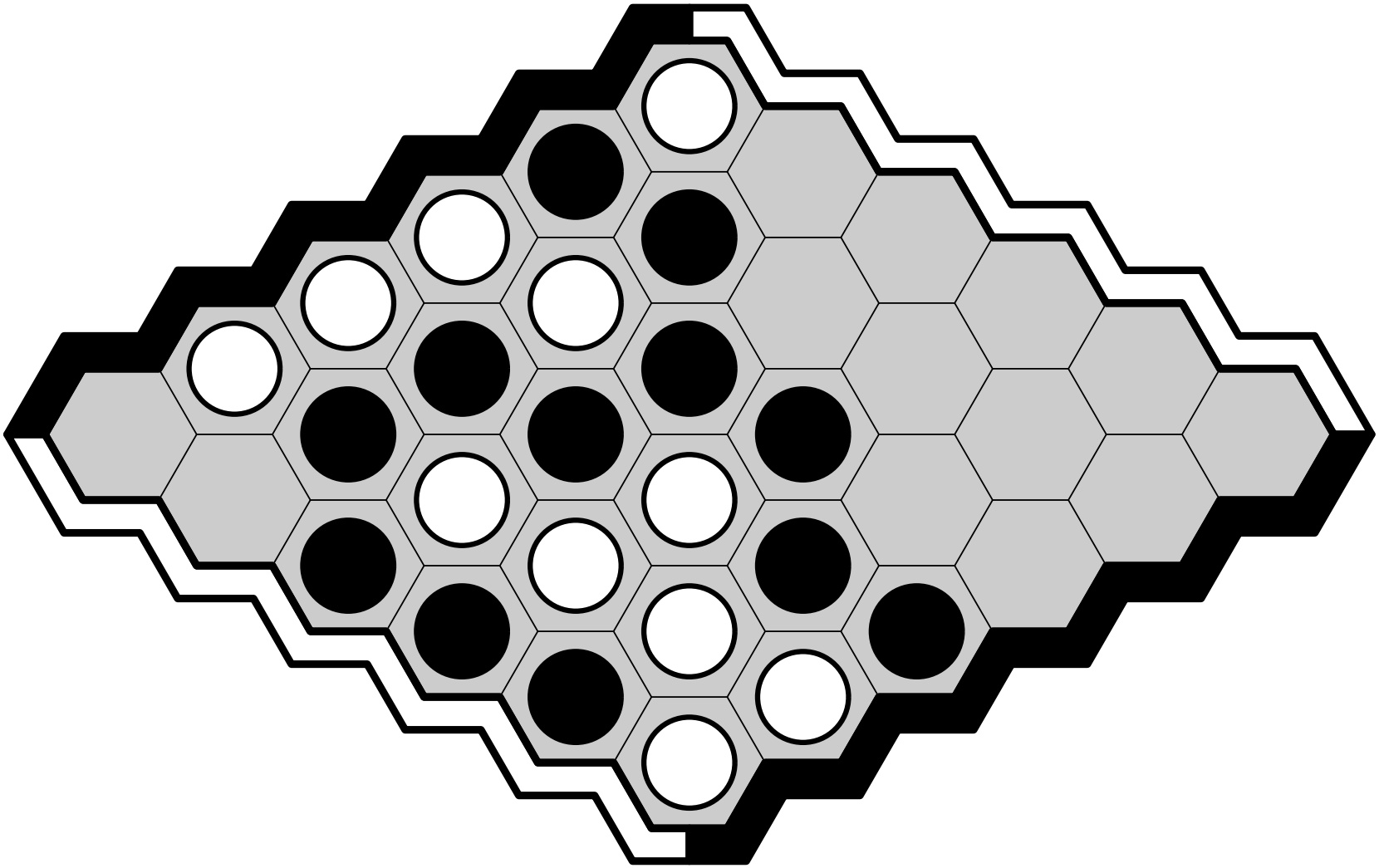
Hex: rules



Hex: rules



Hex: rules



Hex, the full story, CRC Press, 2019



sources

- Berge *L'Art subtil du Hex* 1977
- *Politiken* 1942 – 1943
- Thomas Maarup MSc thesis 2005
- Martin Gardner archive, Stanford U
- Piet Hein archive, collection Hugo Hein
- Jens Lindhard archive, Aarhus University

ORIGIN

- Hein design 1942
- Lindhard drafts, Thorborg puzzle 1943

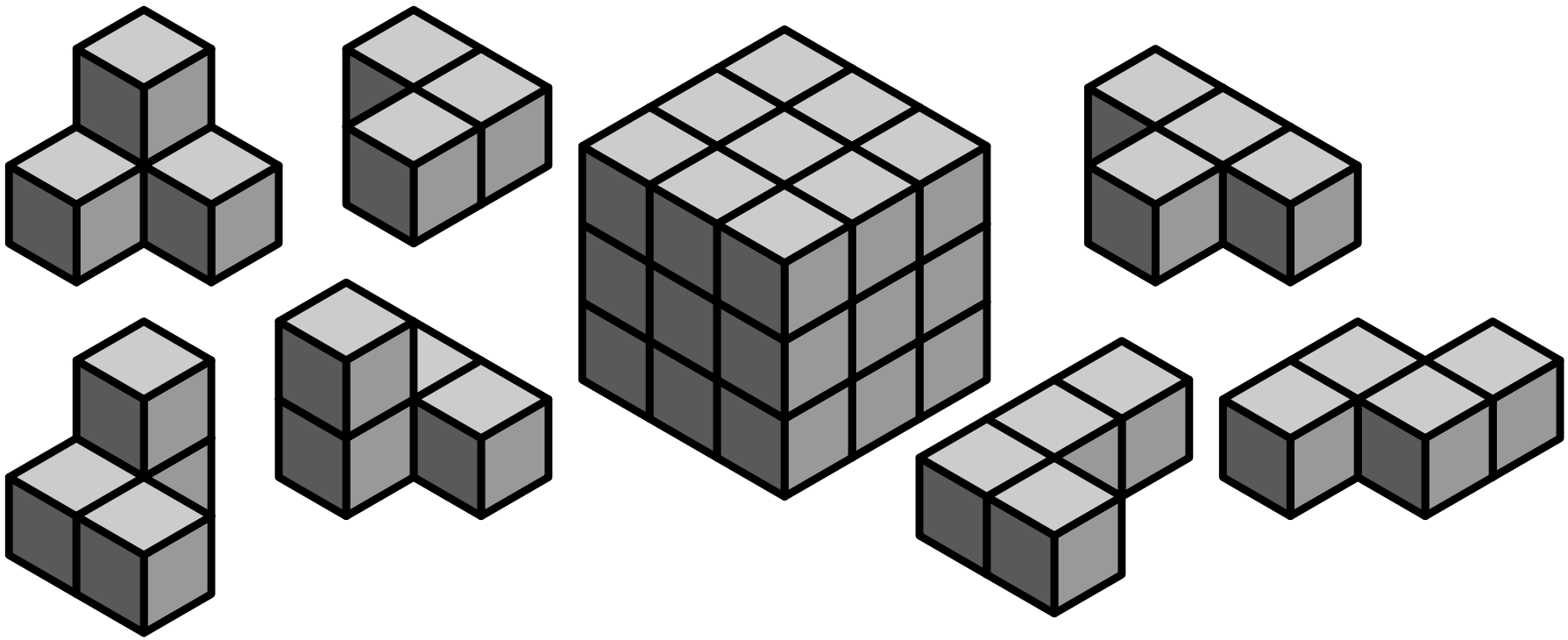
- Nash theory, Gale board 1949
- Shannon machine 1950
- Parker Brothers game 1950

- Gardner column 1957

- 1940 April 9

  Germany invades Denmark, Norway

Hein's Soma



CONSOLATION GROOK

Losing one glove
is certainly painful,
but nothing
        compared to the pain,
of losing one,
throwing away the other,
and finding
        the first one again.

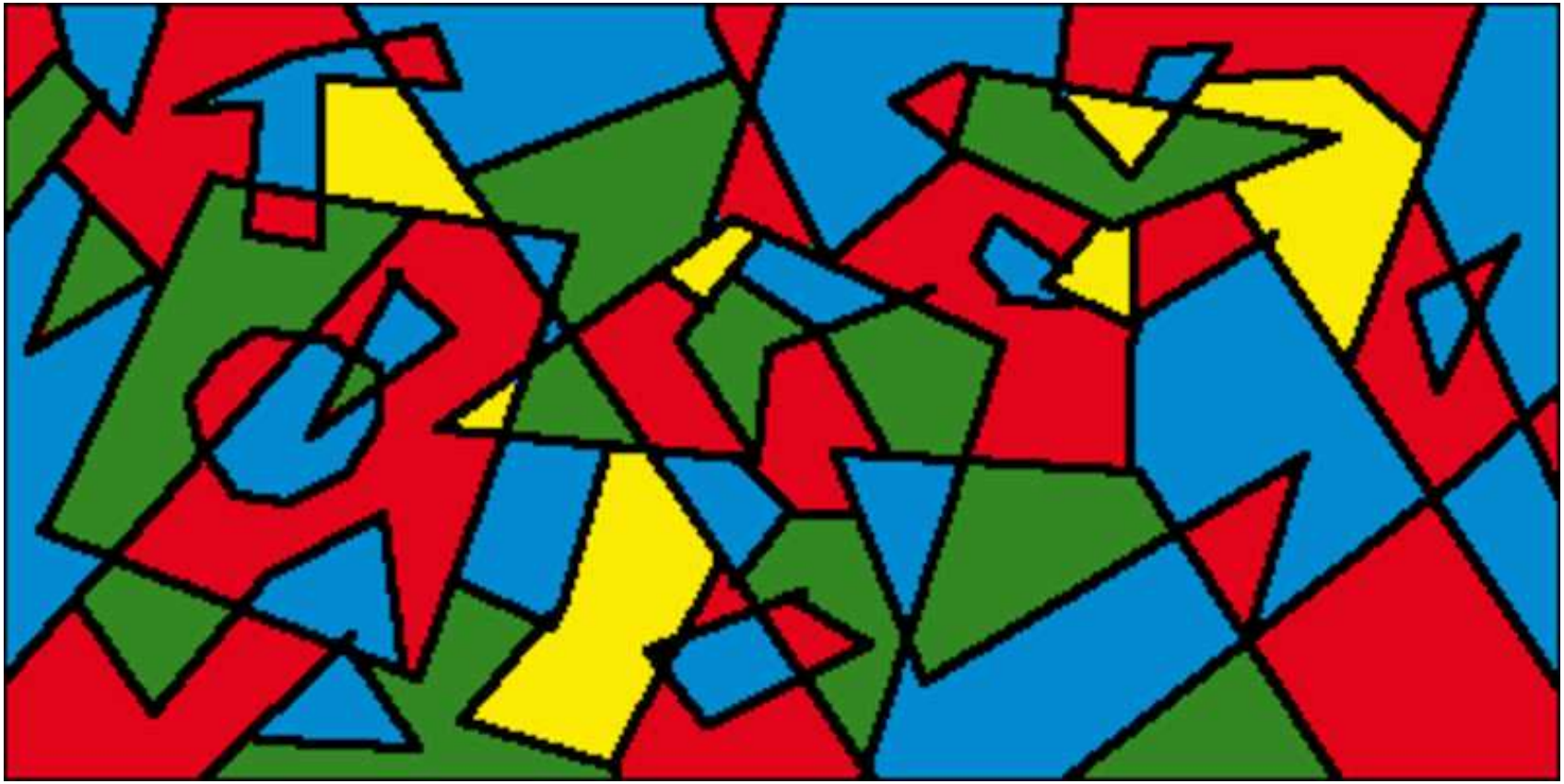
KUMBEL KUMBELL

PROBLEMS

Problems worthy
of attack
prove their worth
by hitting back.

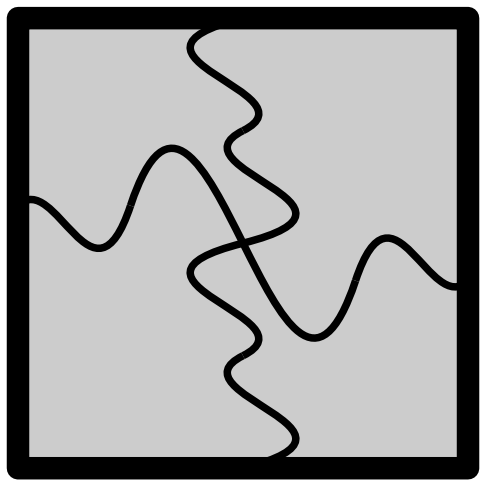
KUMBEL

Hein's new game idea

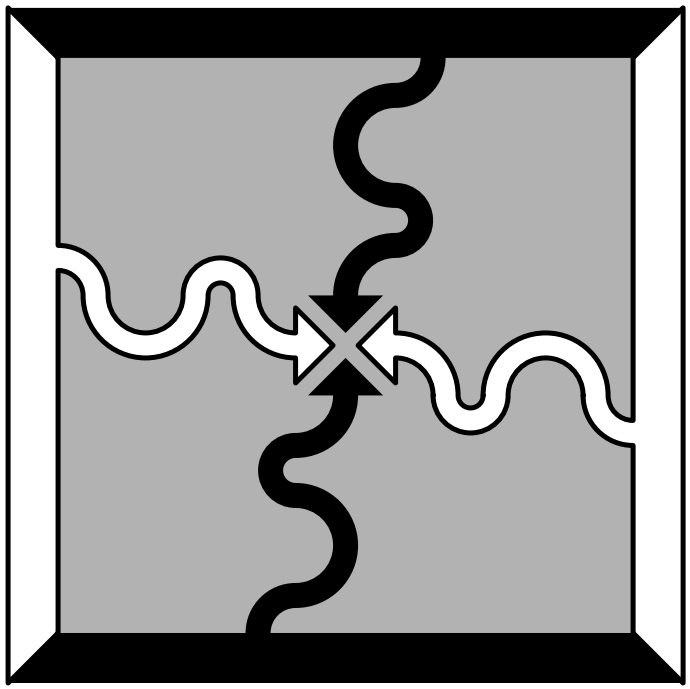


©https://www.kleemans.ch/four-color-theorem-

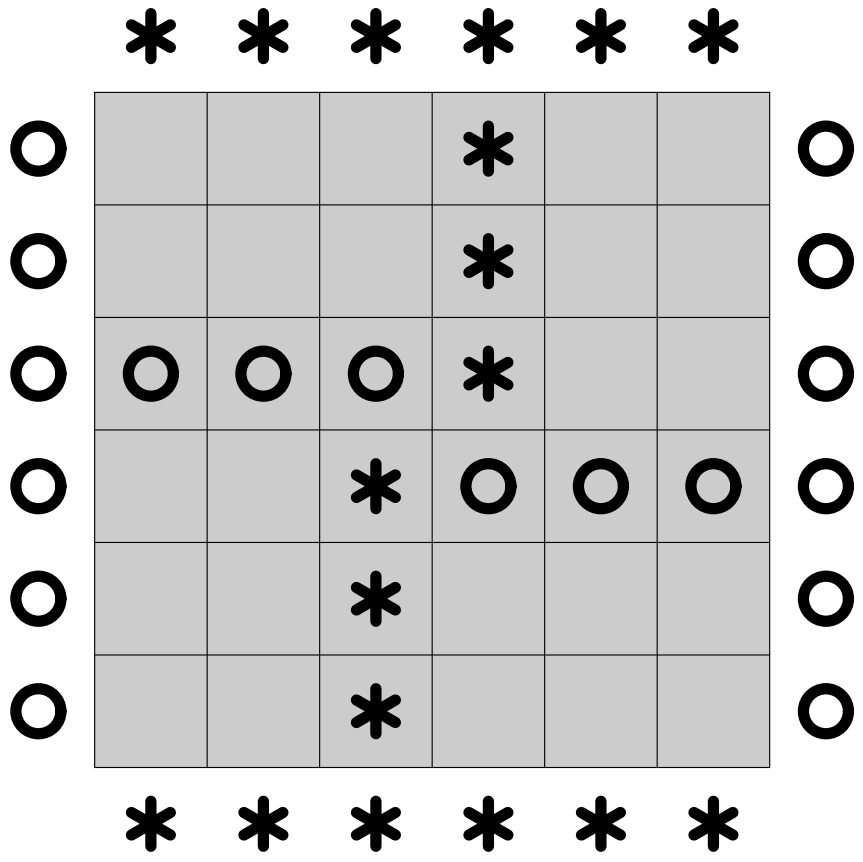
Hein's new game idea



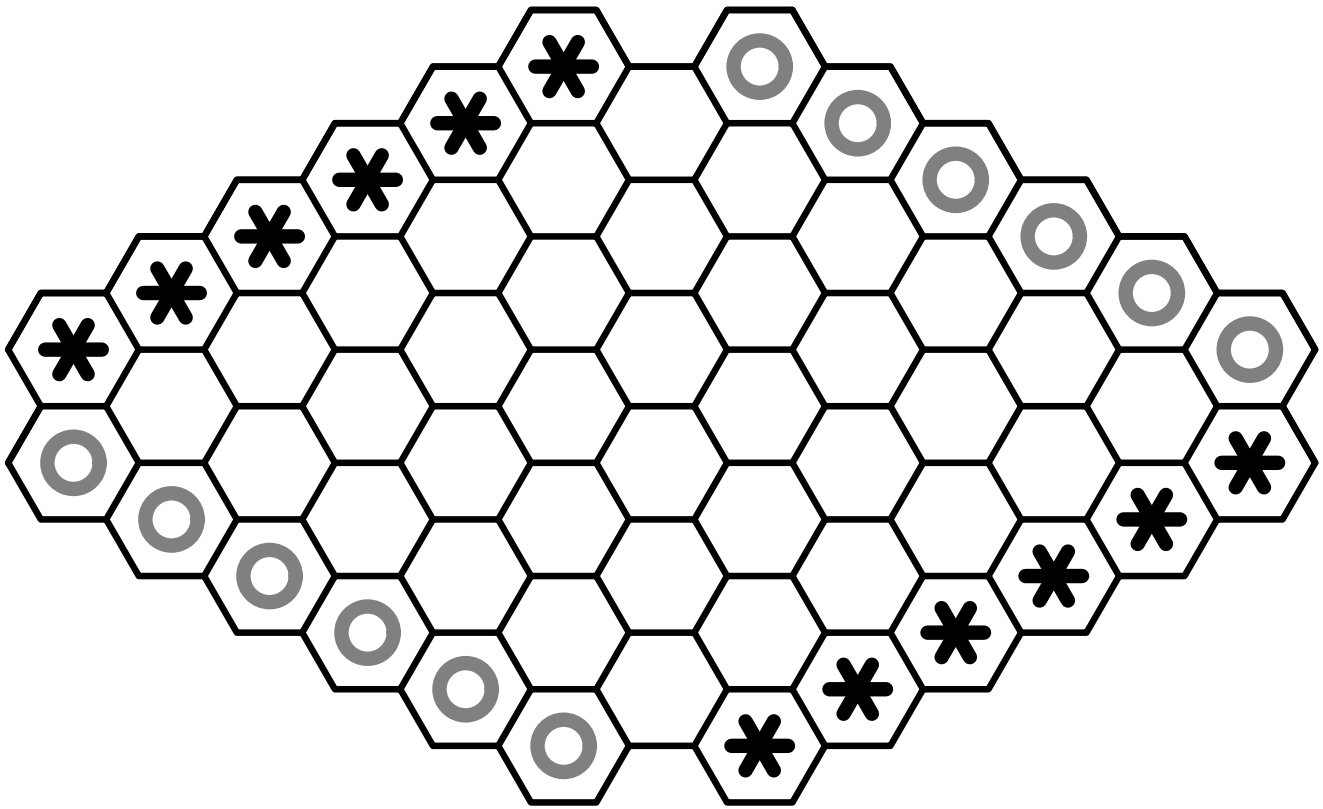
Hein's new game idea



Hein's new game idea



Hein's new game idea

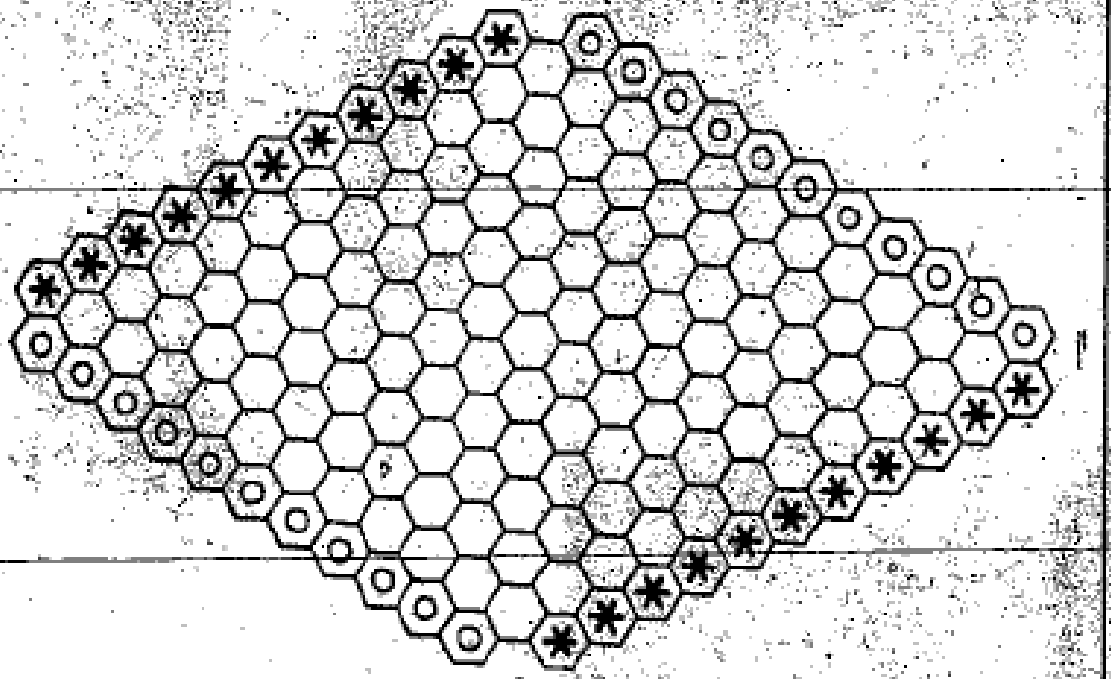


TIDEN 26. December 1942

Vil De lære Polygon?

Piet Hein har konstrueret et Spil, der med lige stor Glæde kan dyrkes af Skakeksperten og den, der blot kan holde en Blyant

„Politiken" udskriver i Dag en Præmieopgave, der vil volde Hovedbrud for Begyndere



Saaledes ser Polygon-Spillebrættet ud.

DER er dukket et helt nyt spændende Tidsfordriv frem. Forhistorien er — se Tegningen! — maa krydse hinanden. Paa Grundlag af dette maa der kunne

ten kan afbryde Forbindelsen ved at besætte det mellemliggende Felt; dens Anvendelighed bero paa Brikkernes Placering i den videre Omegn. I det hele taget viser det sig snart nødvendigt at tage en større Del af Spillebrættet med i Betragtning.

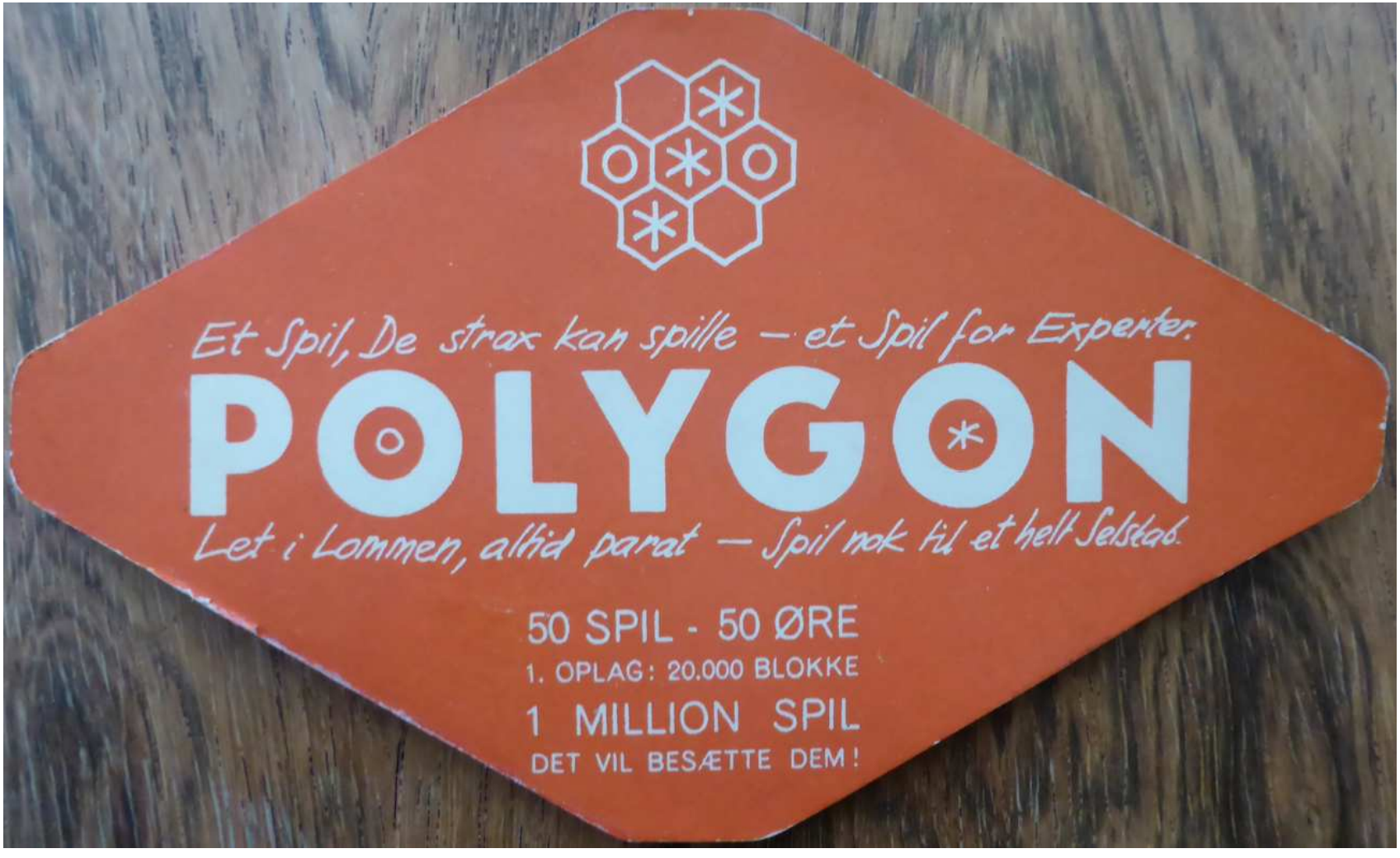
En anden Erfaring, som kommer senere, men som man kan lette Spillets Begyndelse ved at rebe, er, at det betaler sig at begynde i hvert Fald nogenlunde paa Midten. En rimelig, men paa ingen Maade nødvendig Aabning af Spillet er denne:

Paa Spillebrættet i Midten er Hvid begyndt i Midterfeltet. Sea- har Sort sat i Kontaktfeltet til det ned imod Midten af Hvids Front og derved gjort to nyttige Felter, som staar i Vinkelstilling til Midterfeltet, usikre. Hvid har saa valgt et Felt i Kontakt med sit første. Og nu svarer Sort med at besætte et Vinkelfelt, som vilde være meget nyttigt for Hvid. Hvor skal nu Hvid sætte? Der er forskellige gode Muligheder.

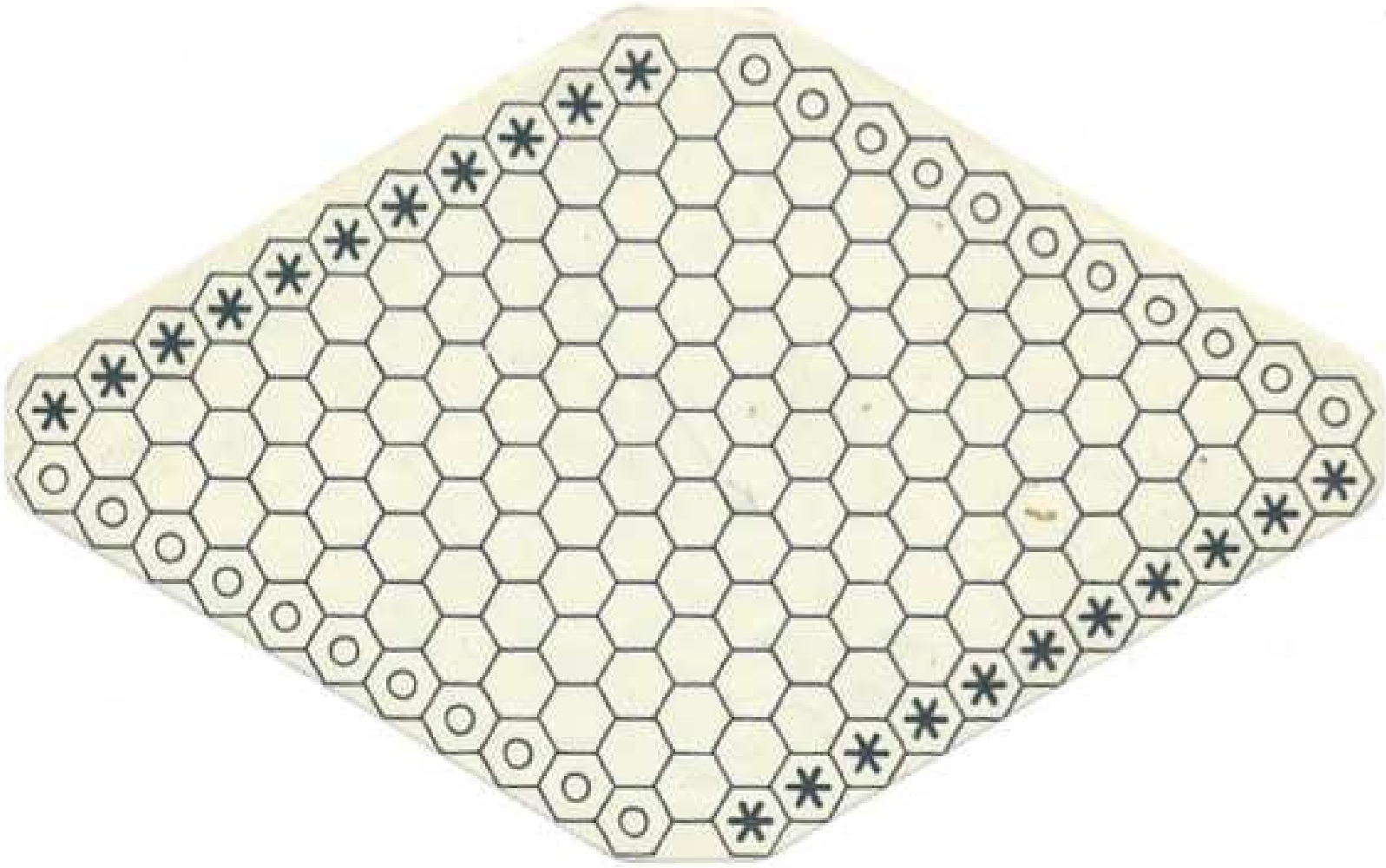
Saadan er dette Spil nu begyndt. Nu kan enhver fortsætte: Det er altsaa Hvids Tur. Man skal ikke være udspekuleret fra Begyndelsen. Der er ingen bedre Vej til at lære Spillet end at spille løs.

Det er nyttigt at se skiftevis offensivt og defensivt paa Situationen, d. v. s. skiftevis paa sine egne og Modspillernes Muligheder, for at føre en Forbindelse igennem. Den ene's Forbindelse er jo en Barrikade for den anden.

1942 Polygon [Hex]



1942 Polygon [Hex]

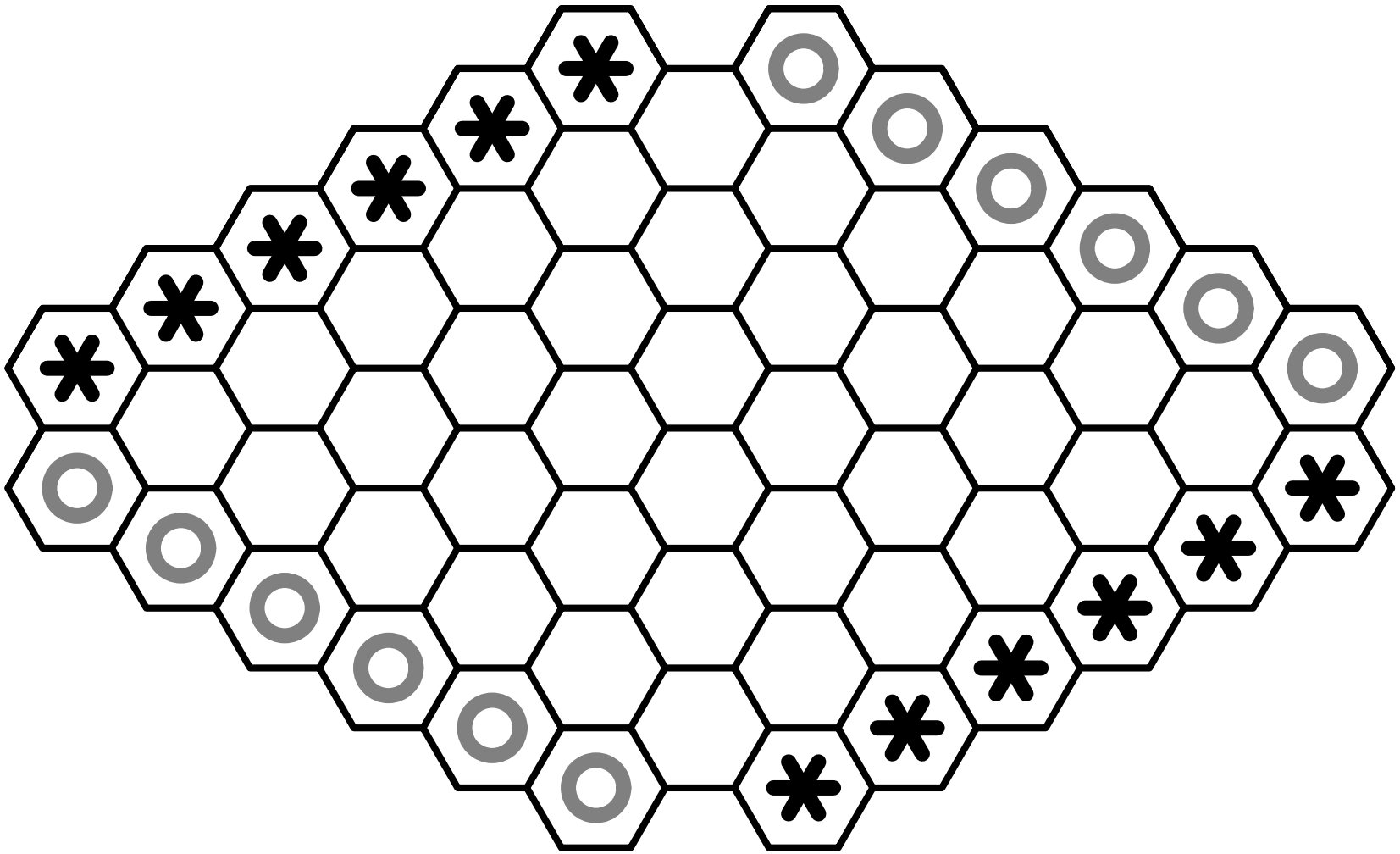


- how to prove Hein's idea works?

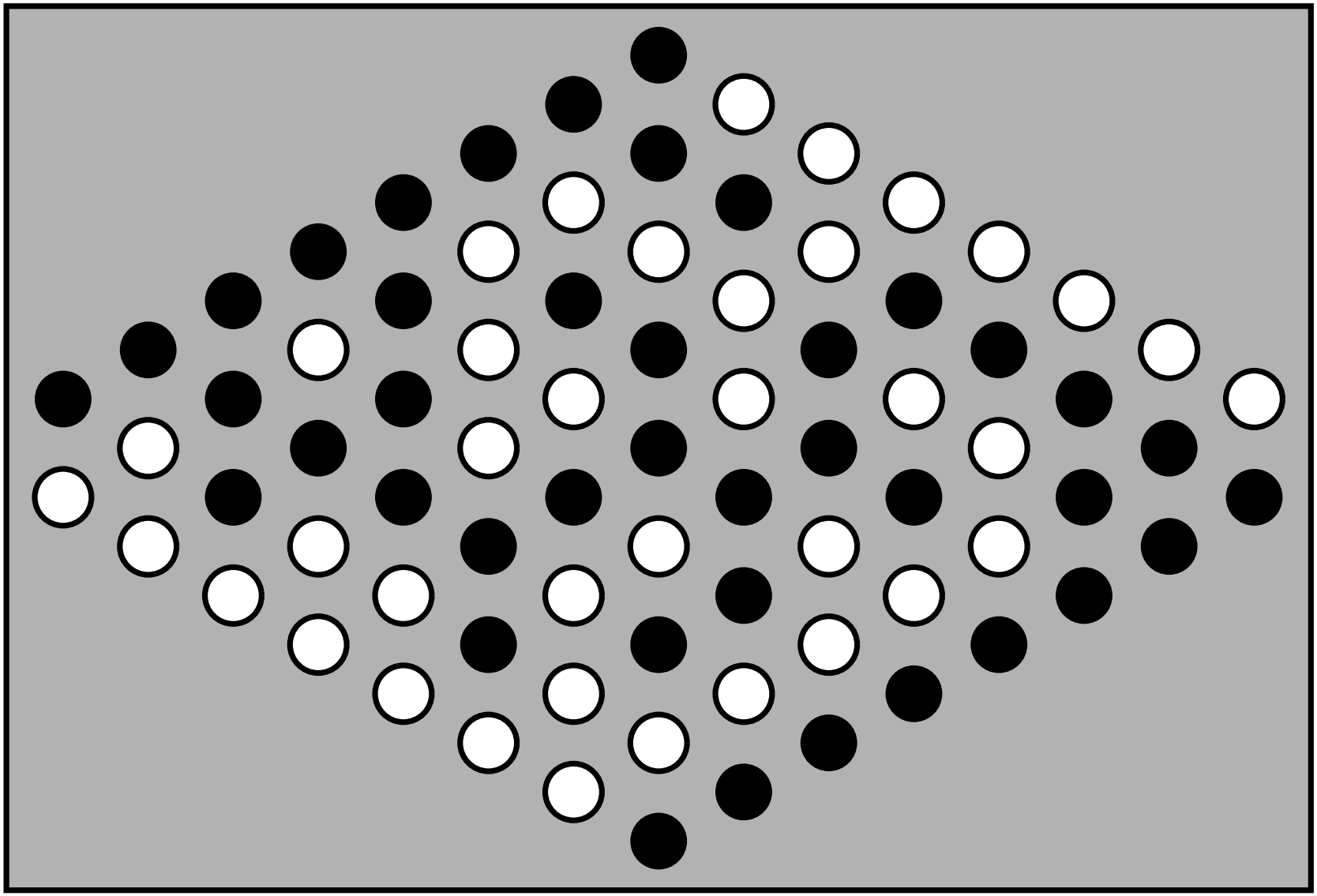
- how to prove Hein's idea works?
- theorem: no deadlocks

- how to prove Hein's idea works?
- theorem: no deadlocks
- proof?

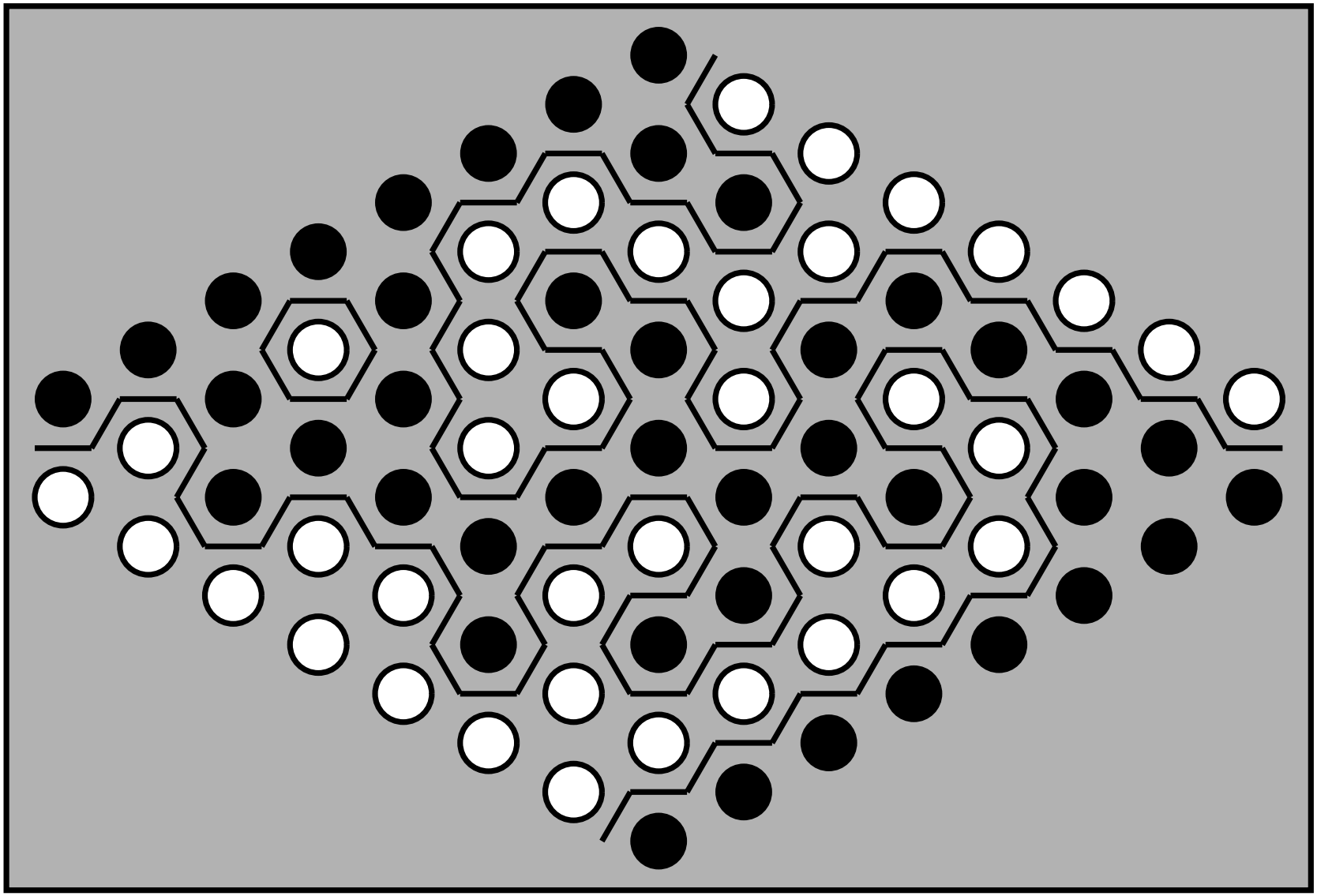
Hex: no deadlocks proof



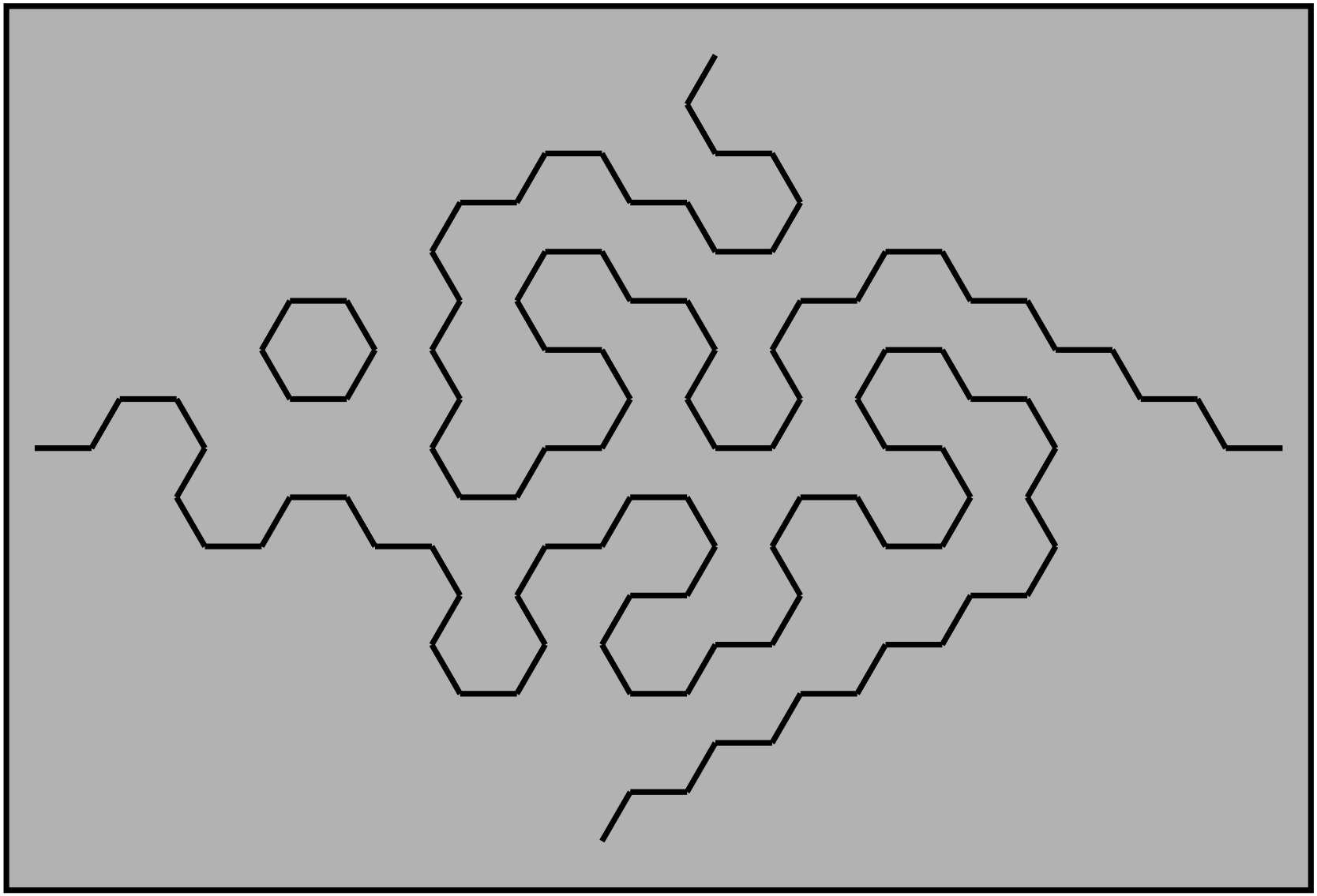
Hex: no deadlocks proof



Hex: no deadlocks proof



Hex: no deadlocks proof



Hex: no deadlocks proof

