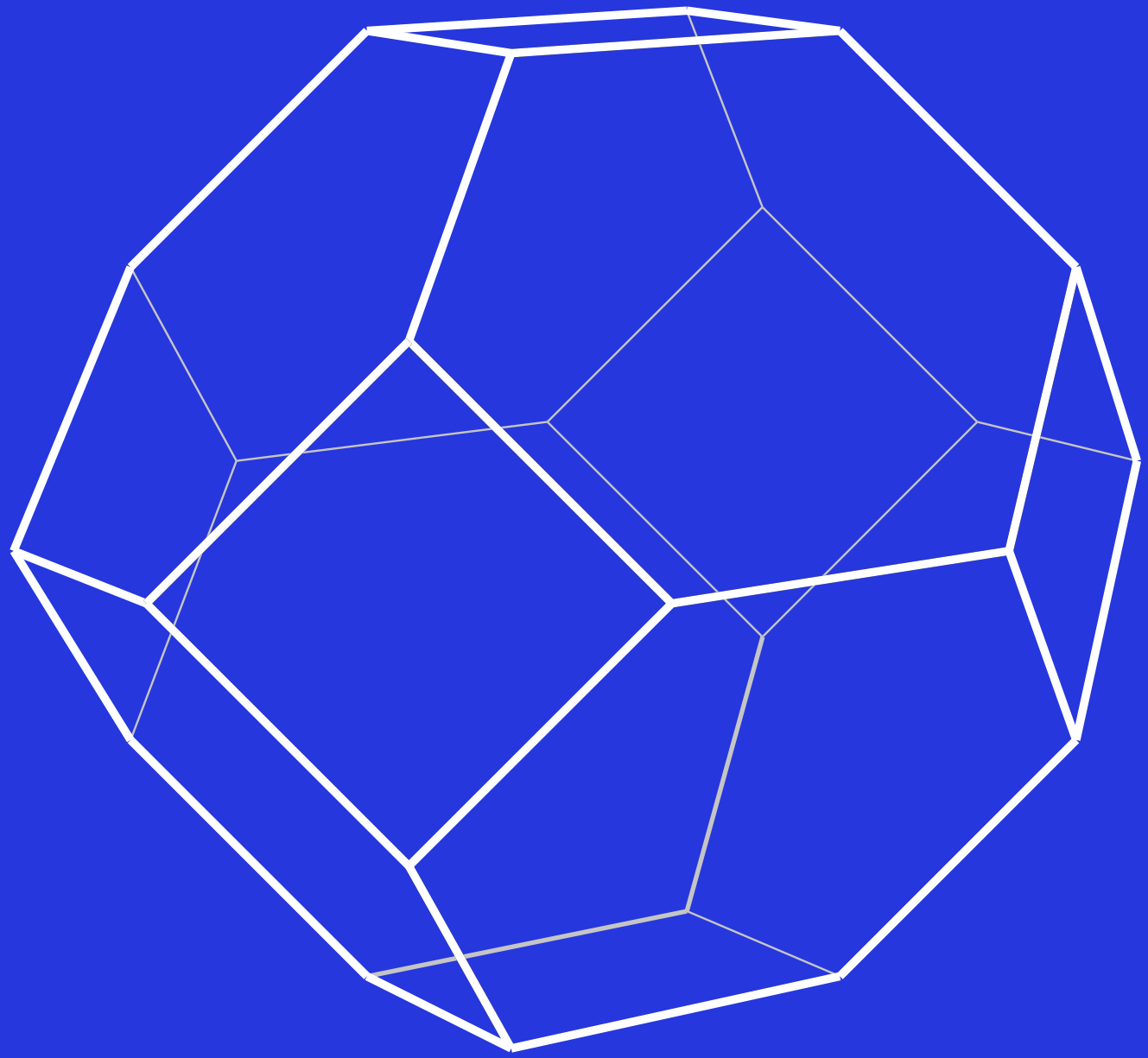
Minimal Experiments

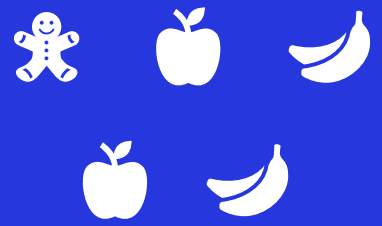
Healy,Leo



What is the simplest experiment?

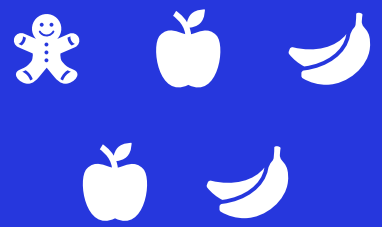
Choice-from-Sets Experiments.

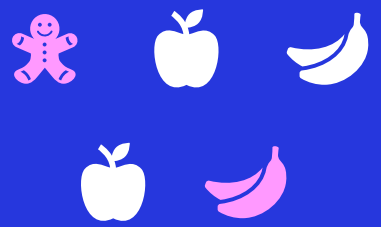
Determine Menus



Choice-from-Sets Experiments.

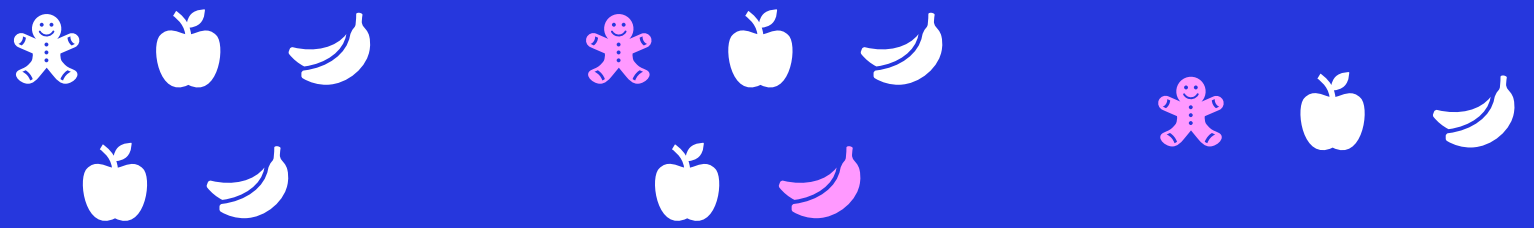
Subjects Choose





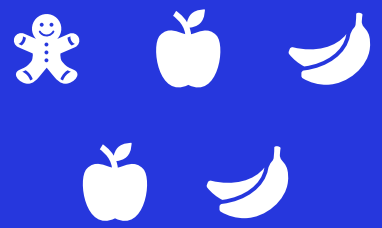
Choice-from-Sets Experiments.

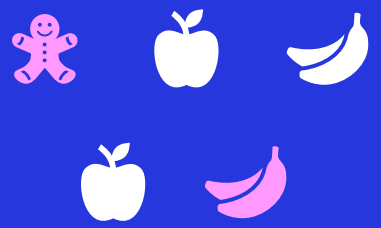
Randomize



Choice-from-Sets Experiments.

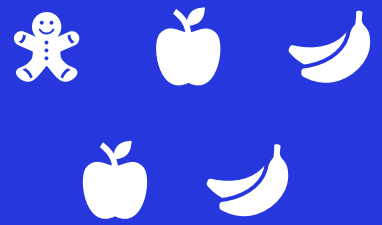
Pay



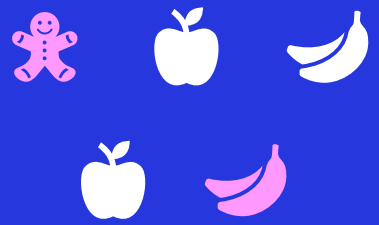


Choice-from-Sets Experiments.

Determine Menus → Subjects Choose → Randomize → Pay



Simplest- Fewest Sets



Will the Braves Win the World Series?

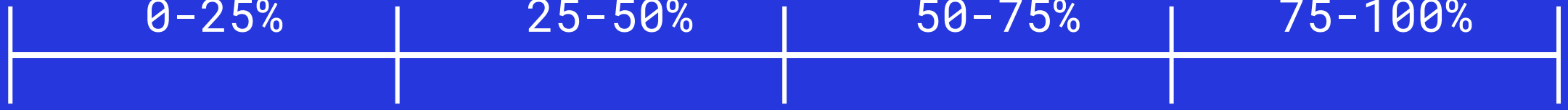
Will the Braves Win the World Series?

0-33% | 33-66% | 66-100%

We can help you with that.

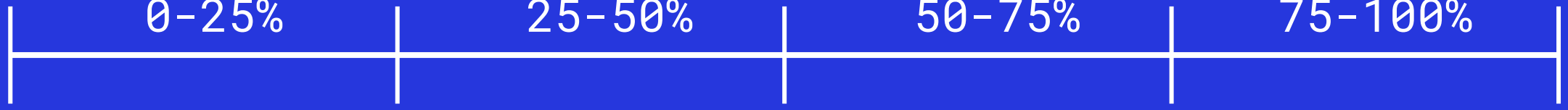

0-33%
33-66%
66-100%

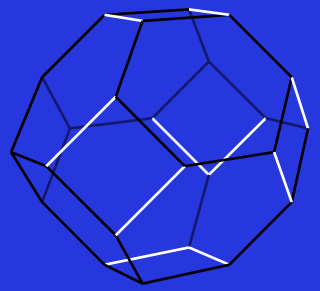
$10 if *Braves Win*, $10 if *Astros Win*, $10 with 66%


0-25%
25-50%
50-75%
75-100%

$10 if *Braves*, $10 if Astros, $10 with 75%

$10 if Braves, $10 with 50%

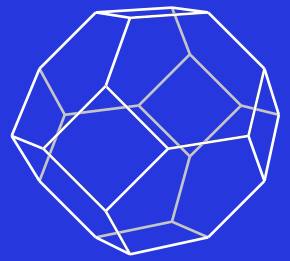




Theorem

The App

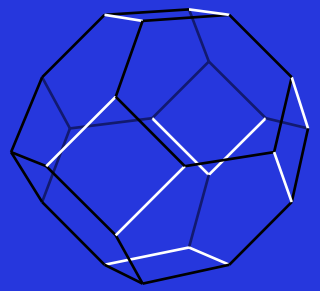
Geometry



Desert

Models

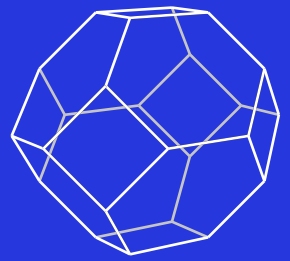
{CAB,CBA},{ABC,ACB,BAC,BCA}



Theorem

The App

Geometry

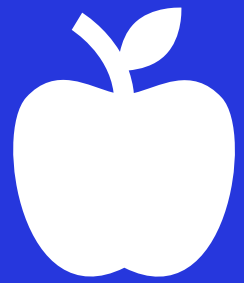


Desert

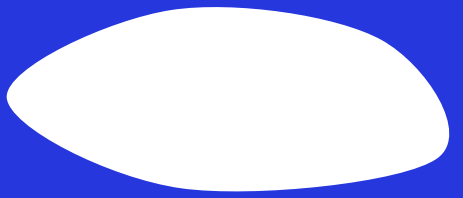
Models

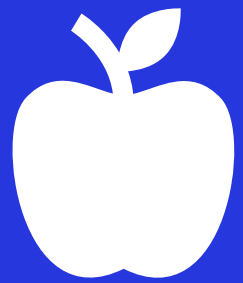
{CAB,CBA},{ABC,ACB,BAC,BCA}

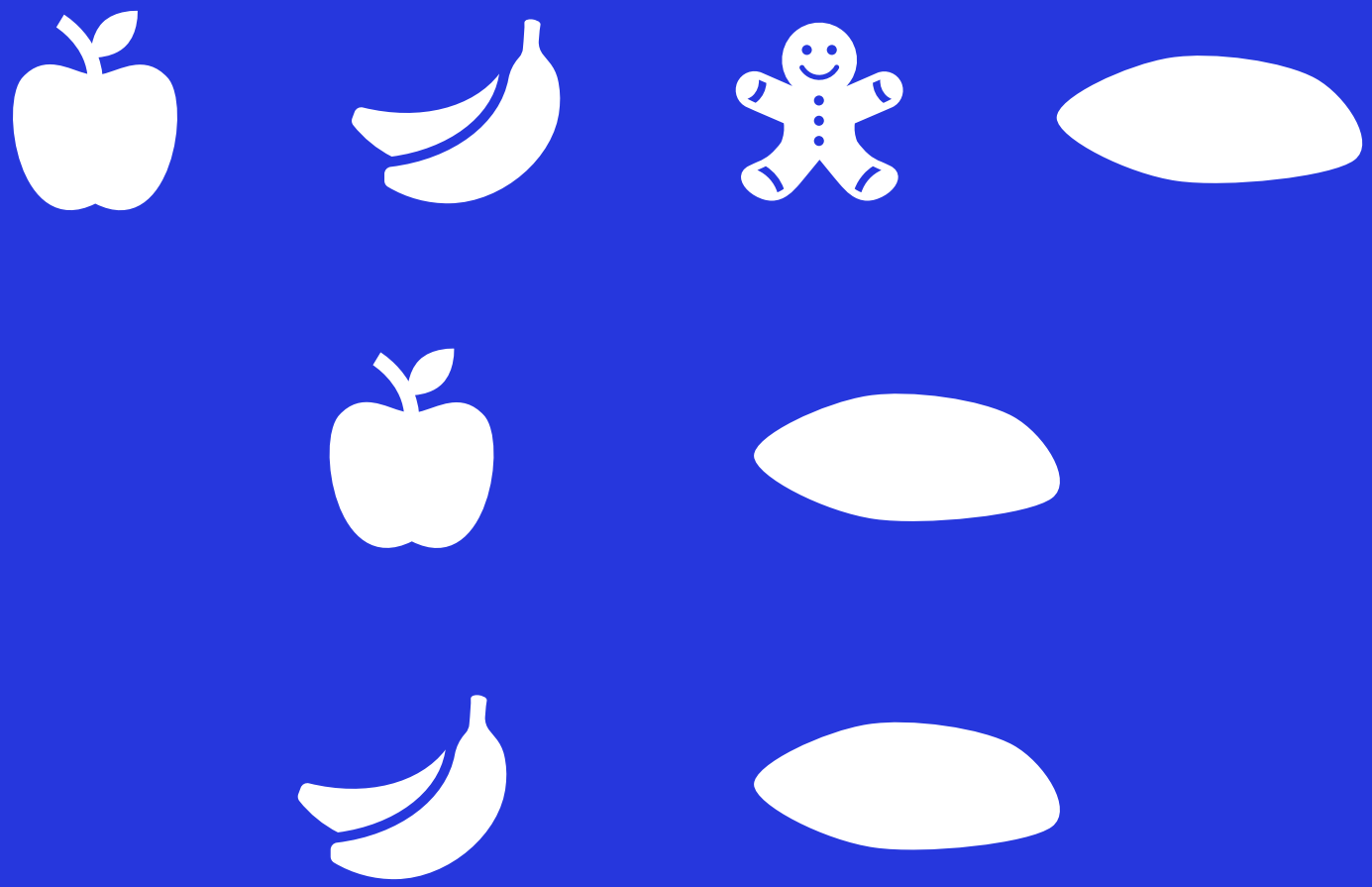
Everyone likes cookies better than apples and bananas.

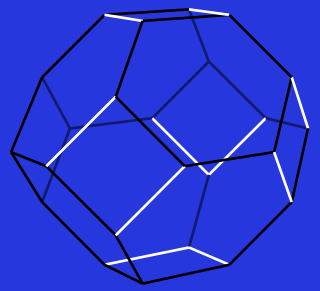


Everyone either likes dates best and anyone who doesn’t like dates best likes cookies best and dates worst.









Theorem

The App

Geometry

Desert

Models

{CAB,CBA},{ABC,ACB,BAC,BCA}

Objects.

Anything a subject can be compensated with.

$10 if the Red Sox win the 2021 world series

$10 if the Braves win the 2021 world series

$10 with a 66% chance

$5 with a 100% chance

$10 with a 50% chance

$8 with a 75% chance

$10 Now.

$20 Next Week.

$30 Next Month.

($10 for you, $0 for other)

($8 for you, $2 for other)

($5 for you, $5 for other)

Apple

Banana

Cookie

Rankings.

ABC, ACB, BAC, BCA, CAB, CBA

Model.

$$\{CAB, CBA\}, \{ABC, ACB, BAC, BCA\}$$

Everyone likes cookies better than apples and bananas.

Test Theory.

{CAB,CBA},{ABC,ACB,BAC,BCA}

Everyone likes cookies better than apples and bananas.

Categorize and Test Theory.

$$\{DABC, DACB, DBAC, DBCA, DCAB, DCBA\}, \{CBAD, CABD\}, \{\mathit{Rest}\}$$

Everyone likes dates best, or cookies best and dates worst.

Assume Theory / Just Categorize.

{DABC,DACB,DBAC,DBCA,DCAB,DCBA},{CBAD,CABD}

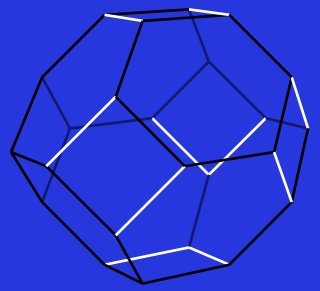
How hard is this?

N=3

127

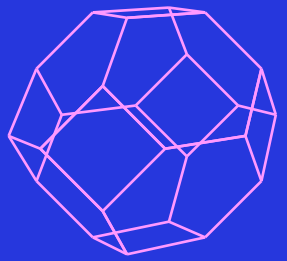
N=9

6,703,903,964,971,298,549,787,012,499,102,923,063,739,682,910,296,196,688,861,780,721,860,882,015,036,773,488,400,937,149,083,451,713,845,015,929,093,243,025,426,876,941,405,973,284,973,216,824,503,042,047



Theorem

The App



Geometry

Desert

Models

{CAB,CBA},{ABC,ACB,BAC,BCA}

Neighbors.

Differ by one Inversion.

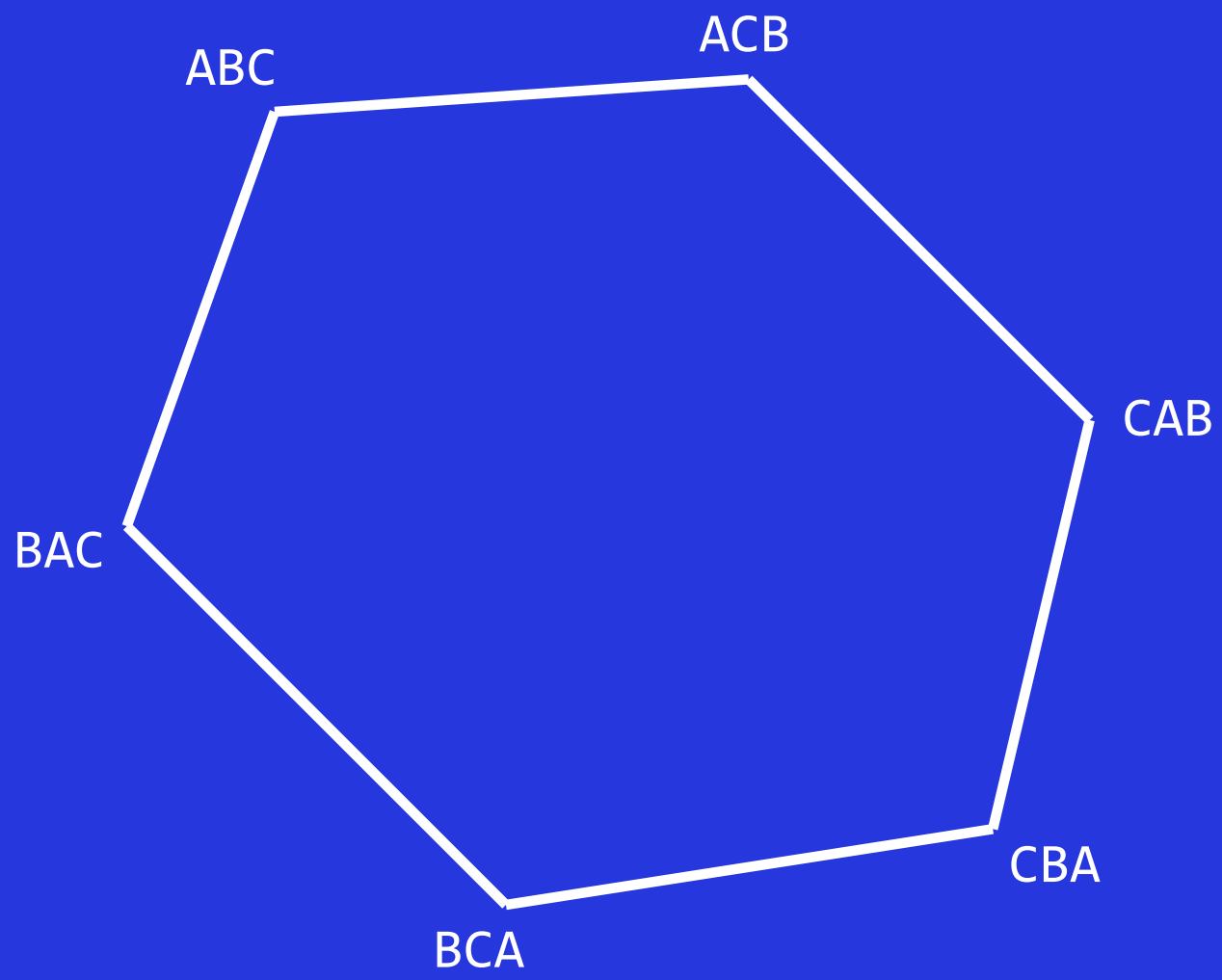
ABC, ACB, BAC, BCA, CAB, CBA

Neighbors.

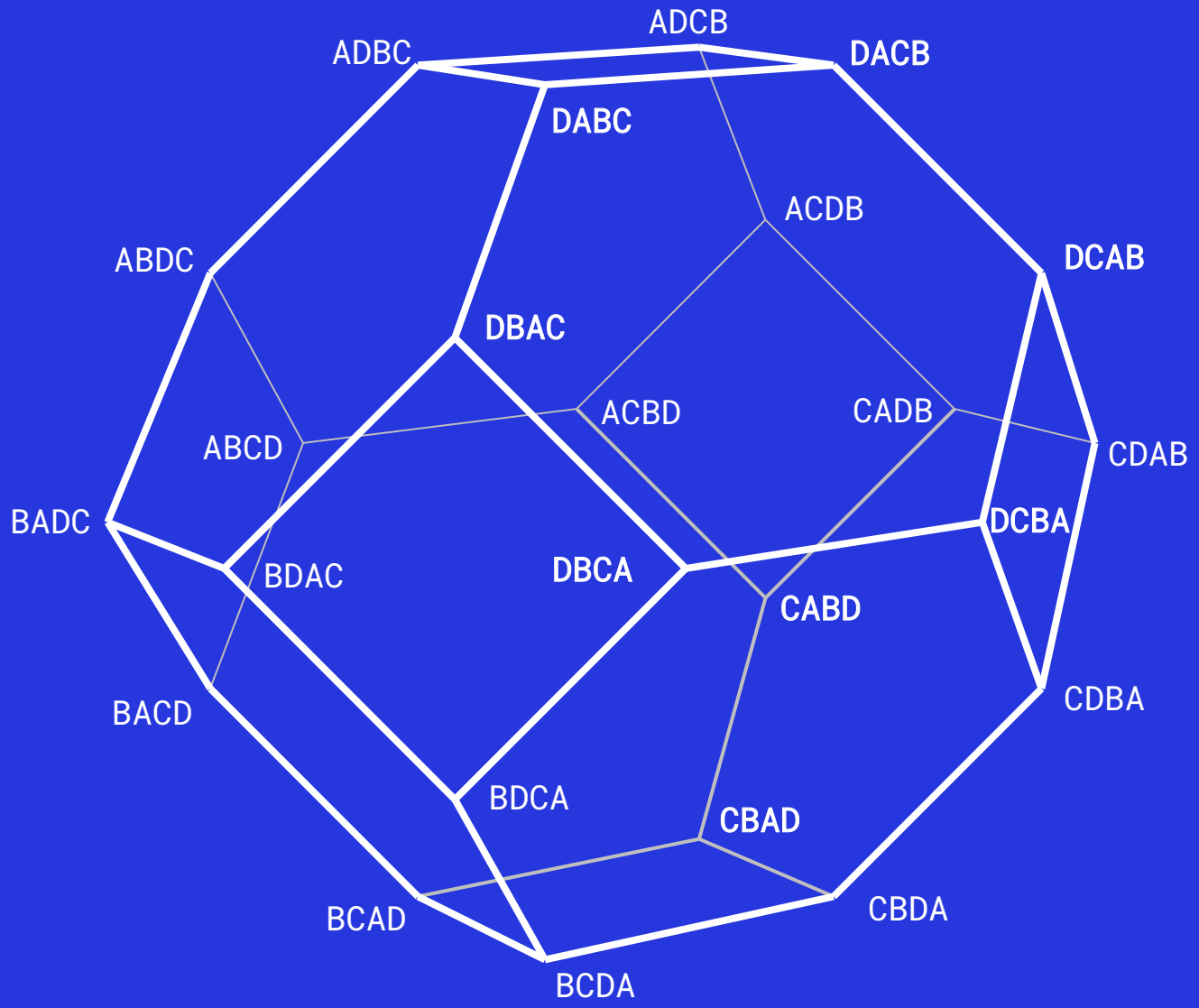
Differ by one Inversion.

ABC, ACB, BAC, BCA, CAB, CBA

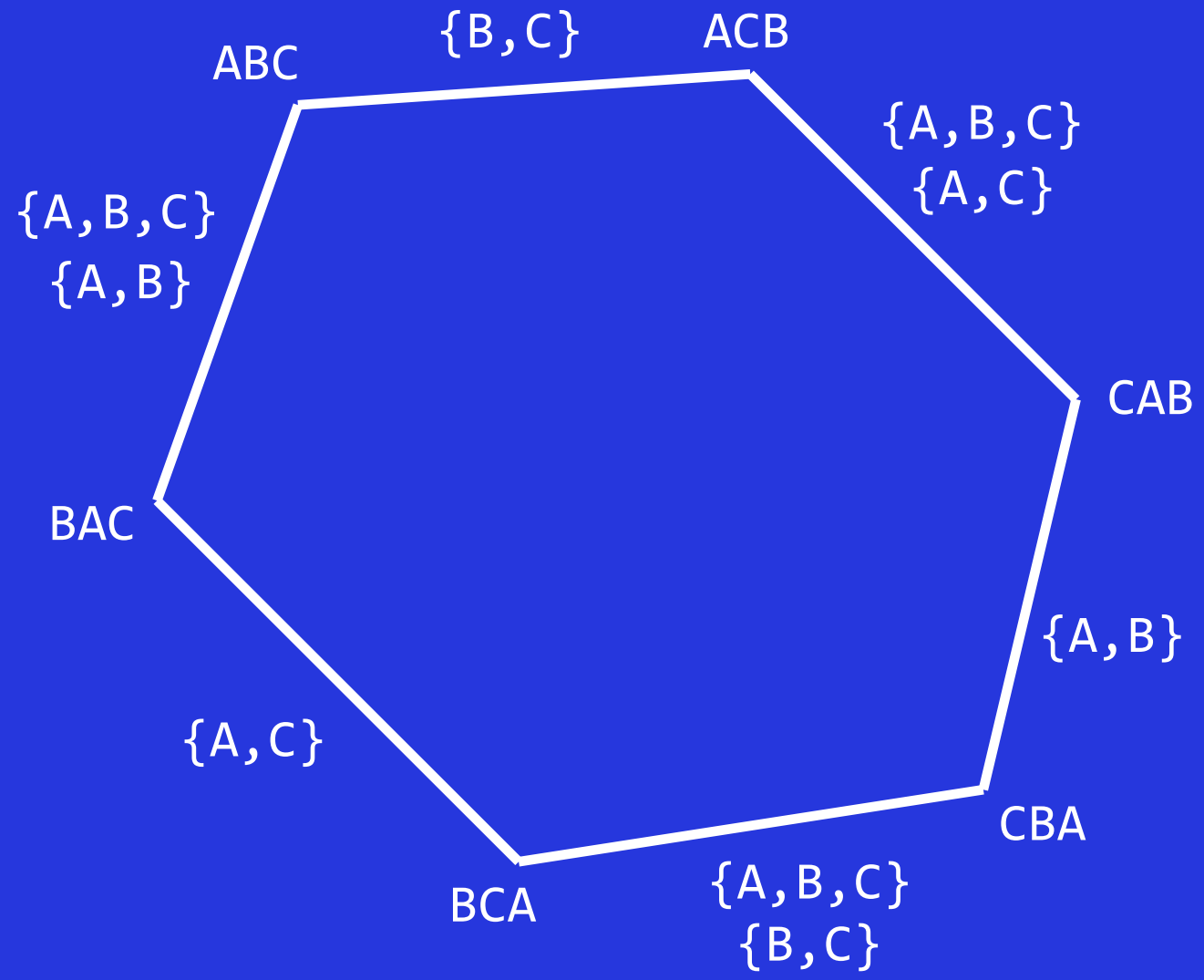
Permutahedron.

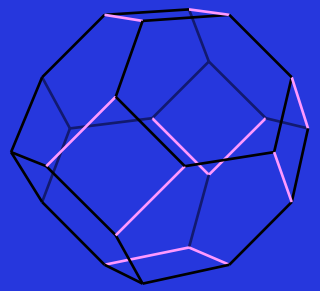


Permutahedron.



Differentiating Vertices.





Theorem

The App

Geometry

Desert

Models

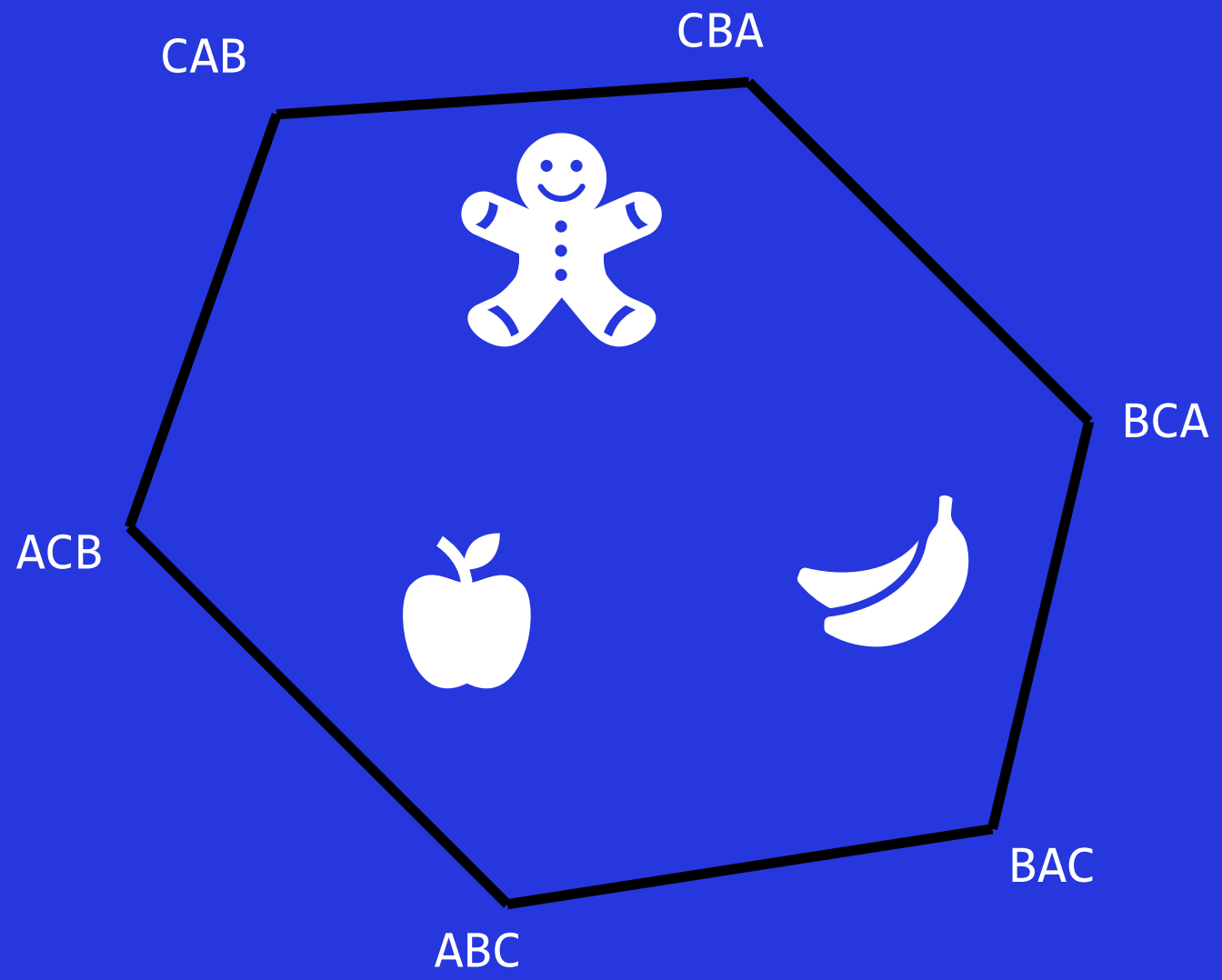
{CAB,CBA},{ABC,ACB,BAC,BCA}

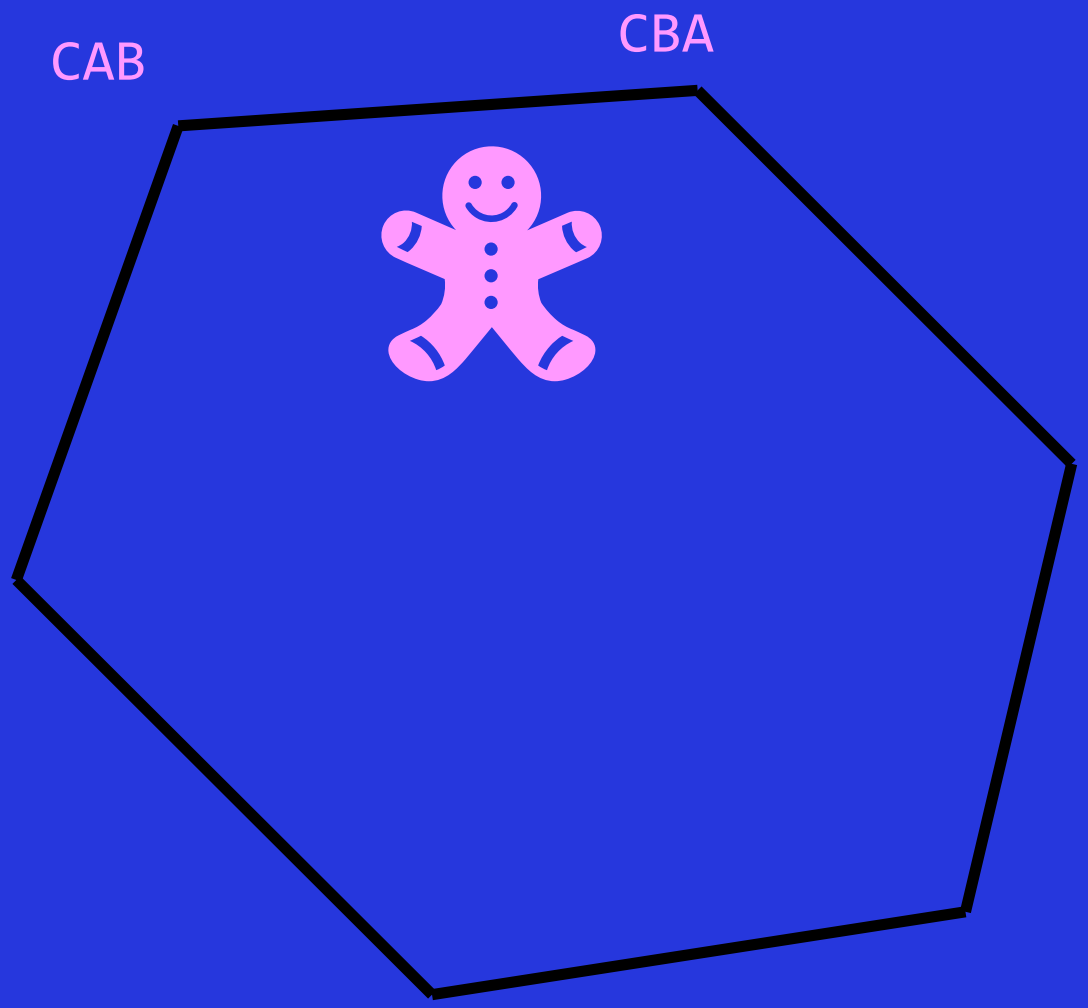
Theorem.

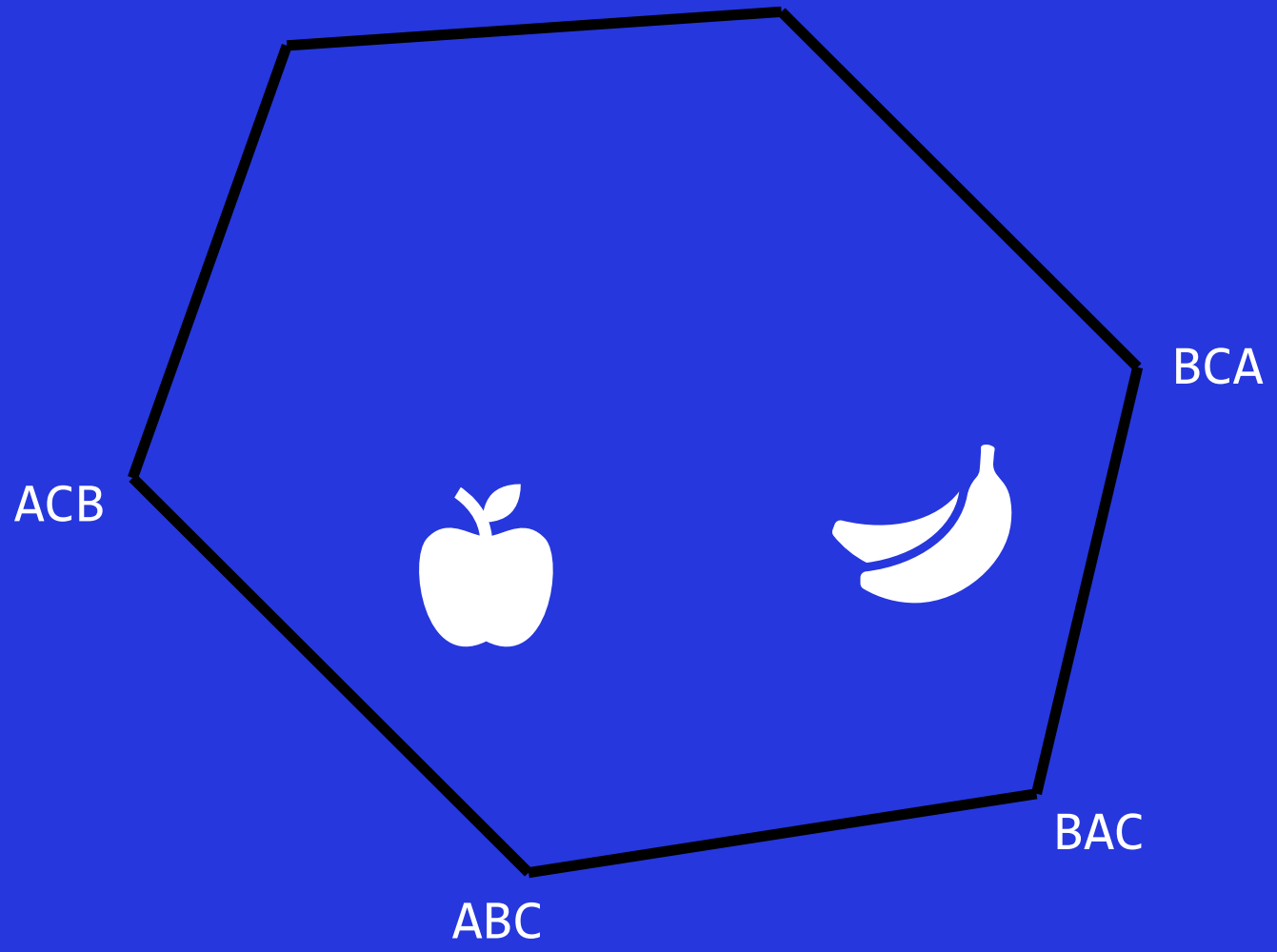
An experiment tests a model M:

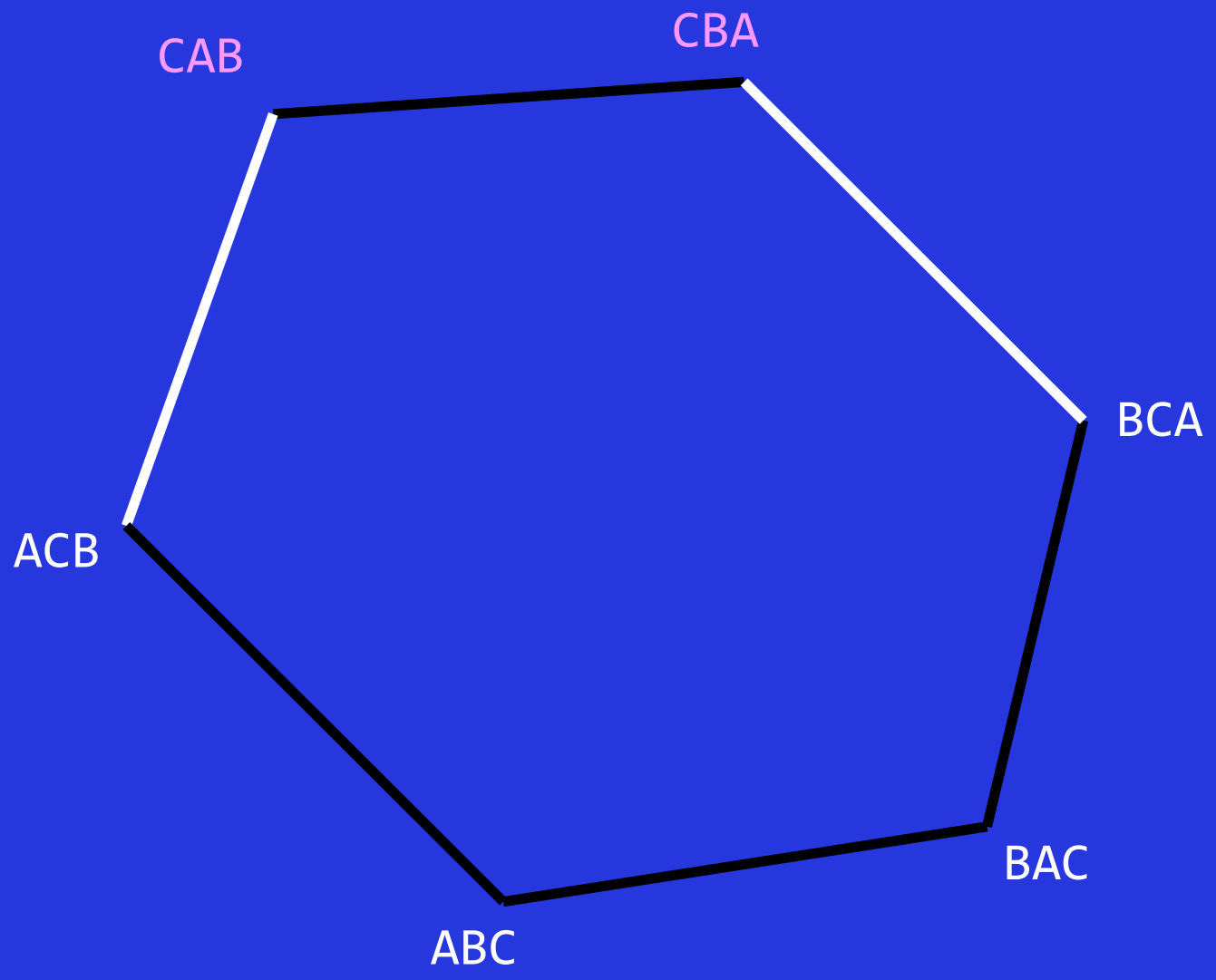
if and only if

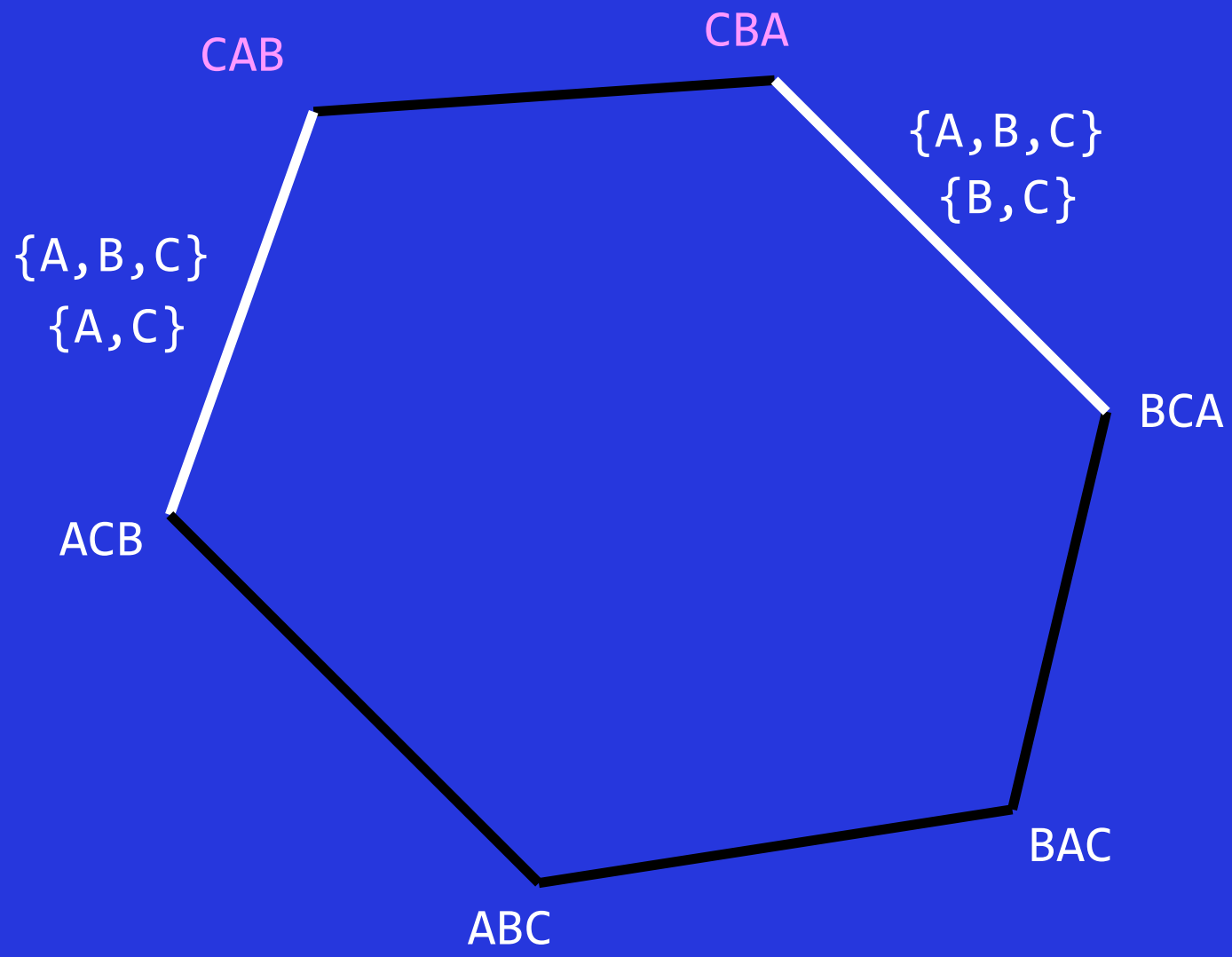
it includes *at least one set* from each edge between *neighbors* that are *not in the same set* under *M*.

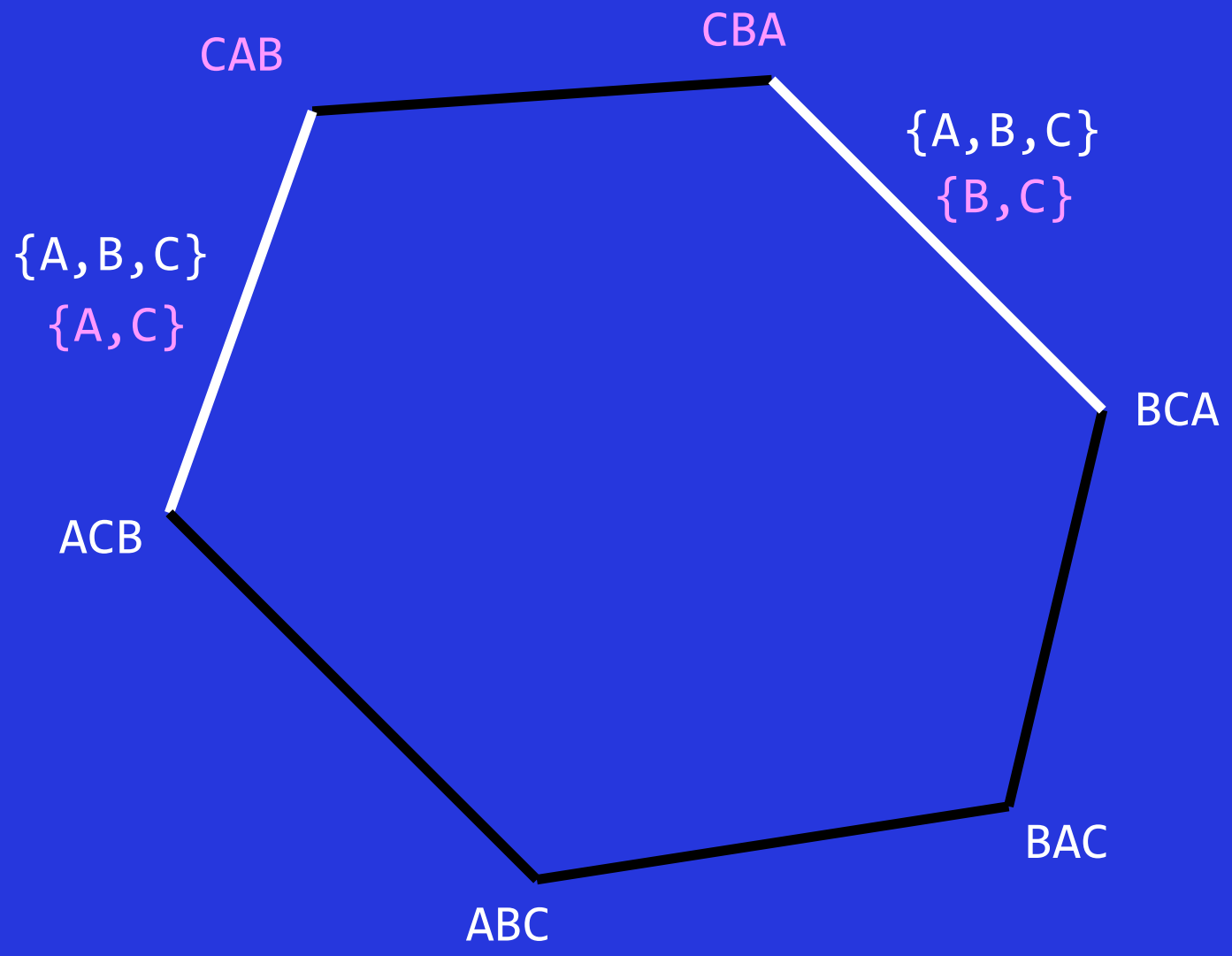

CAB
CBA
BCA
ACB
BAC
ABC

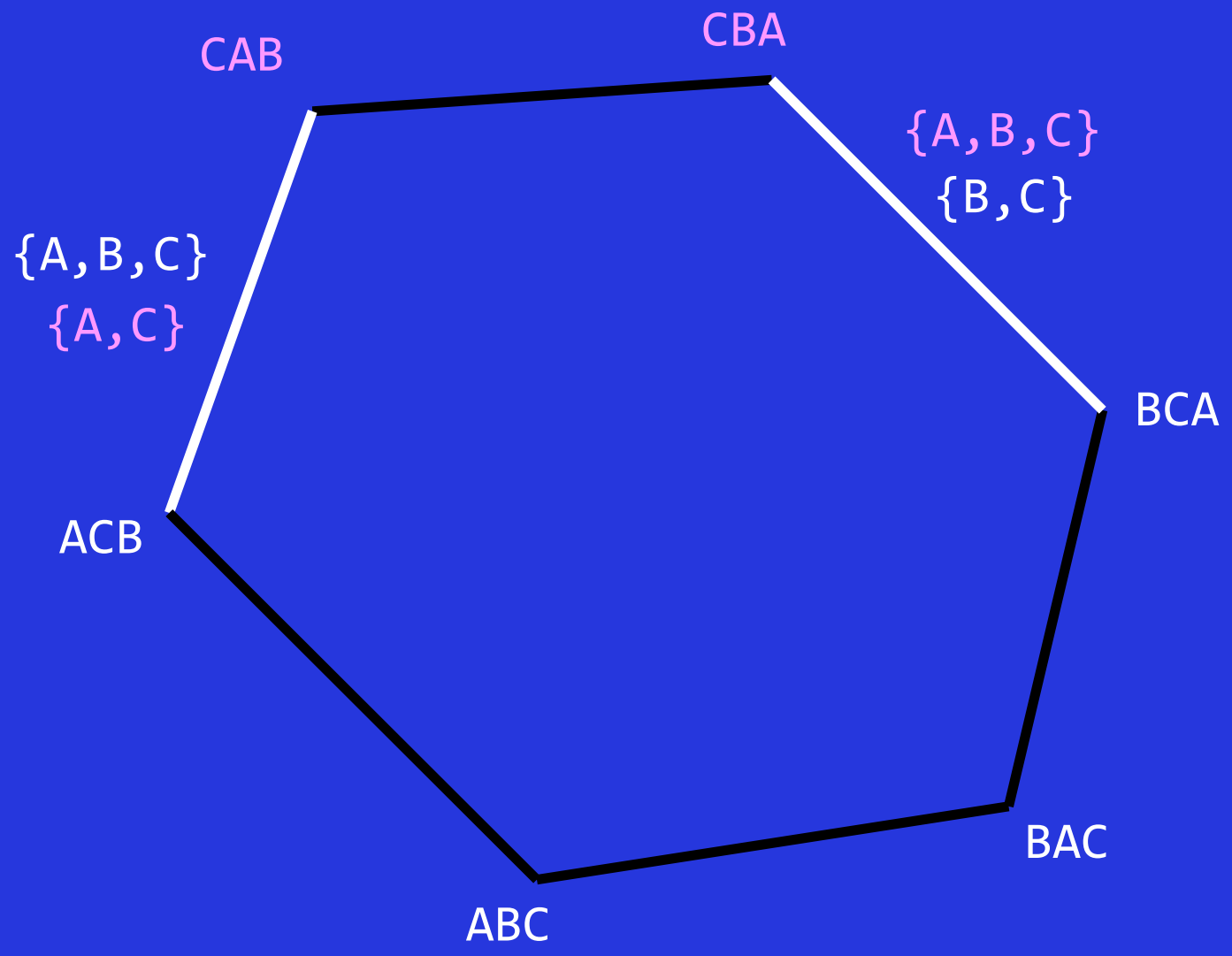

CAB
CBA

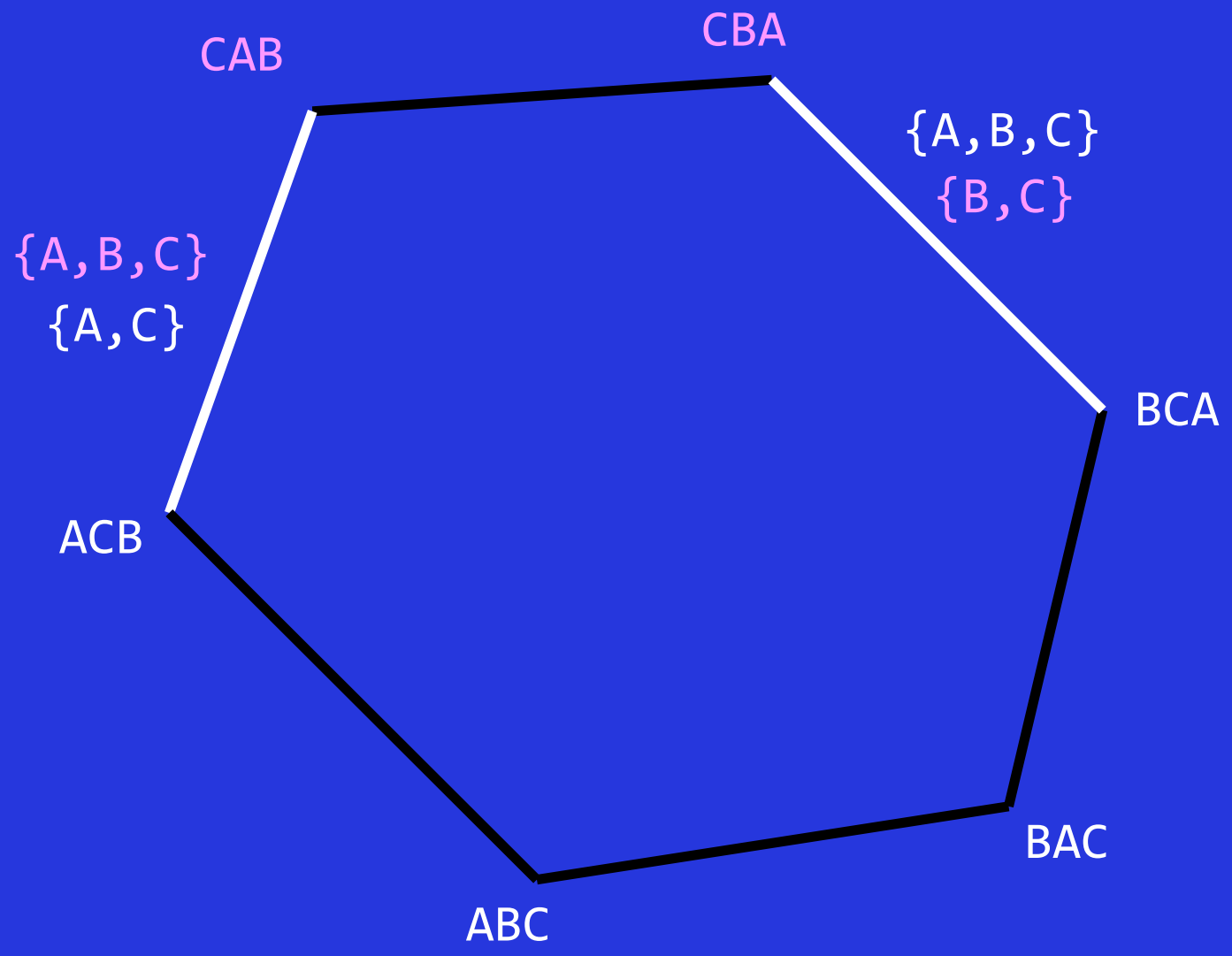

BCA
ACB
BAC
ABC

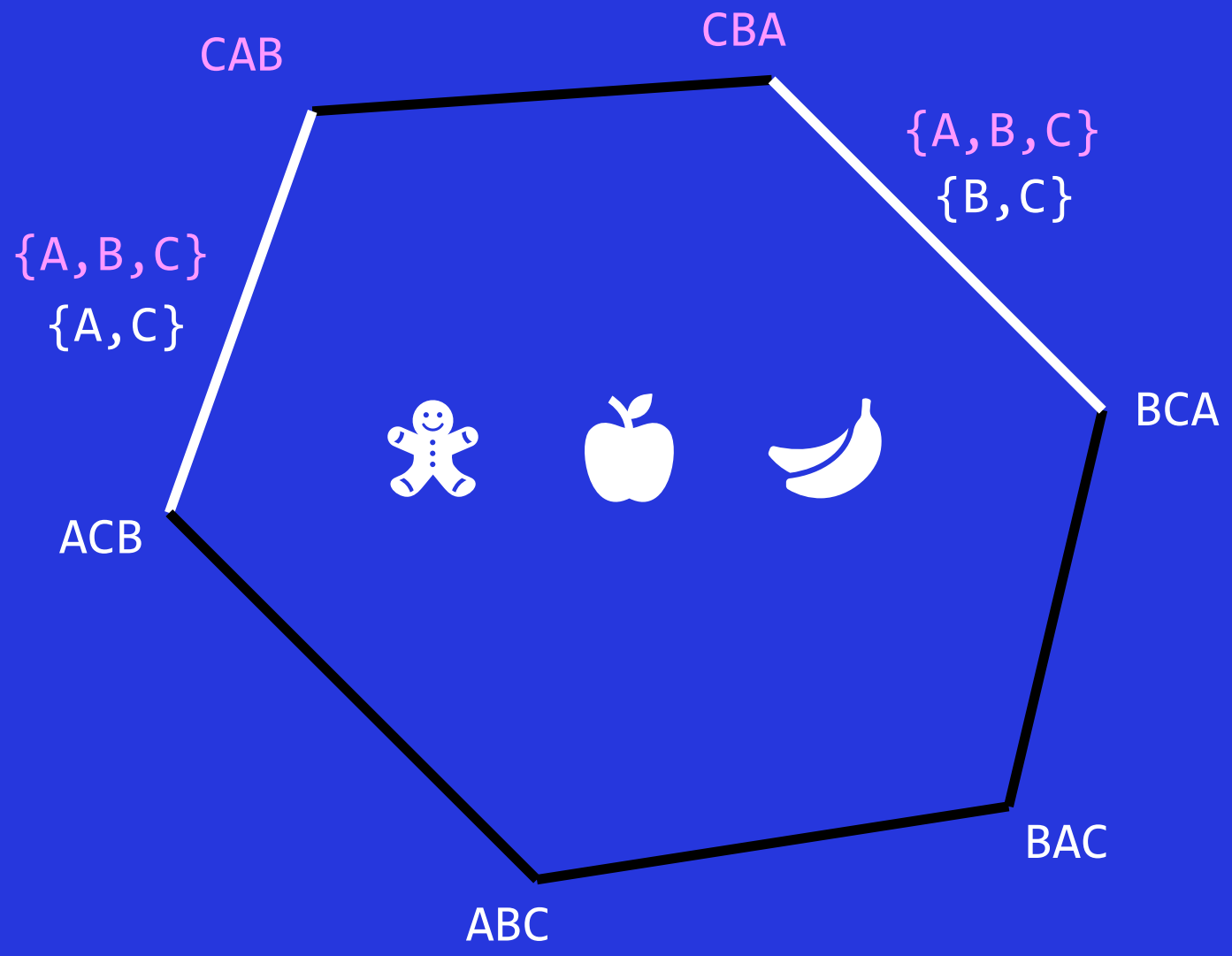

CAB
CBA
BCA
ACB
BAC
ABC


CAB
CBA
{A,B,C}
{B,C}
{A,B,C}
{A,C}
BCA
ACB
BAC
ABC


CAB
CBA
{A,B,C}
{B,C}
{A,B,C}
{A,C}
BCA
ACB
BAC
ABC


CAB
CBA
{A,B,C}
{B,C}
{A,B,C}
{A,C}
BCA
ACB
BAC
ABC


CAB
CBA
{A,B,C}
{B,C}
{A,B,C}
{A,C}
BCA
ACB
BAC
ABC


CAB
CBA
{A,B,C}
{B,C}
{A,B,C}
{A,C}
BCA
ACB
BAC
ABC

Cookies and Dates.

{A,B,C,D},{A,D},{B,D}

DACB

DABC

DCAB

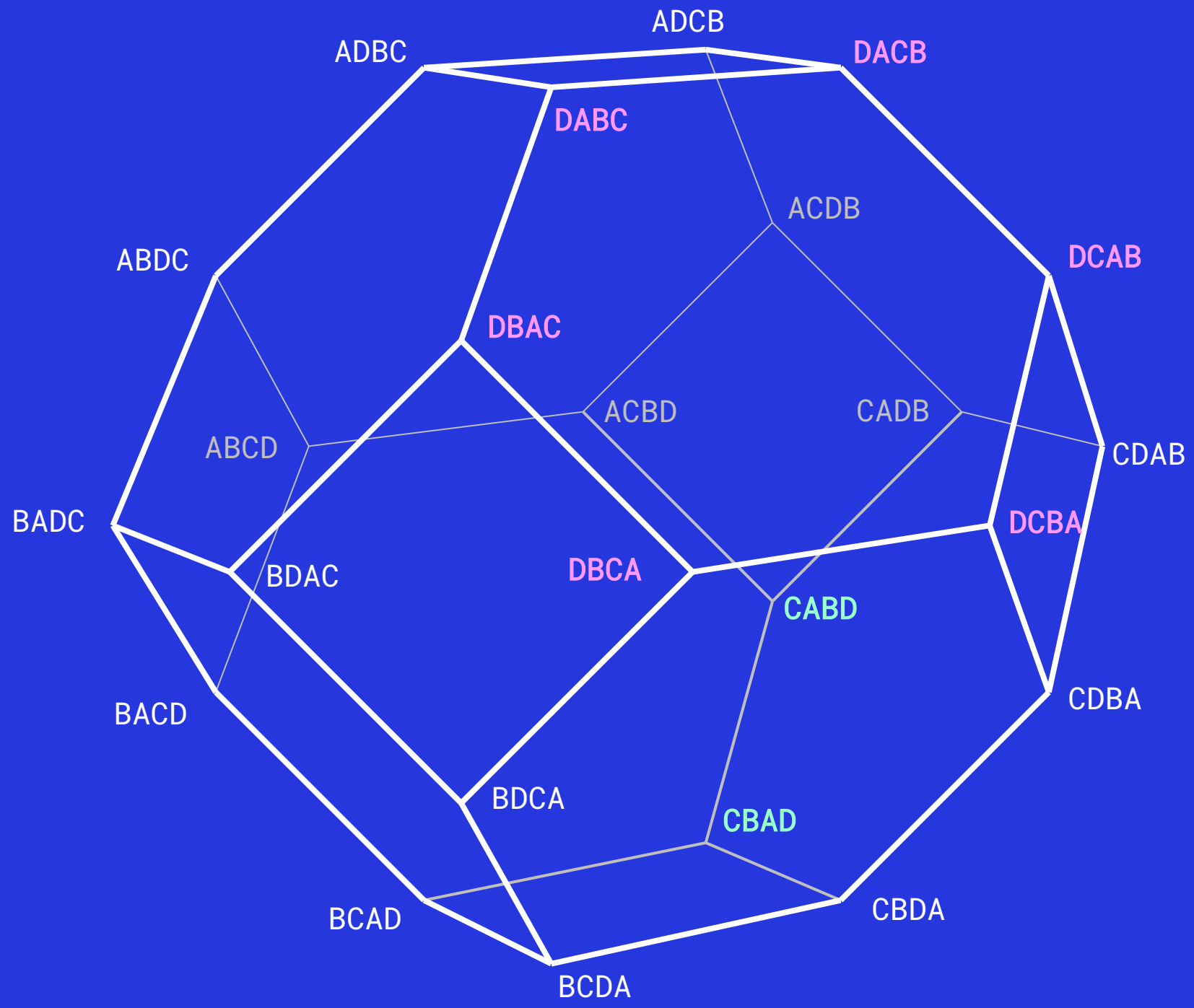
DBAC

DCBA

DBCA

CABD

CBAD


ADCB
ADBC
DACB
DABC
ACDB
ABDC
DCAB
DBAC
ACBD
CADB
ABCD
CDAB
BADC
DCBA
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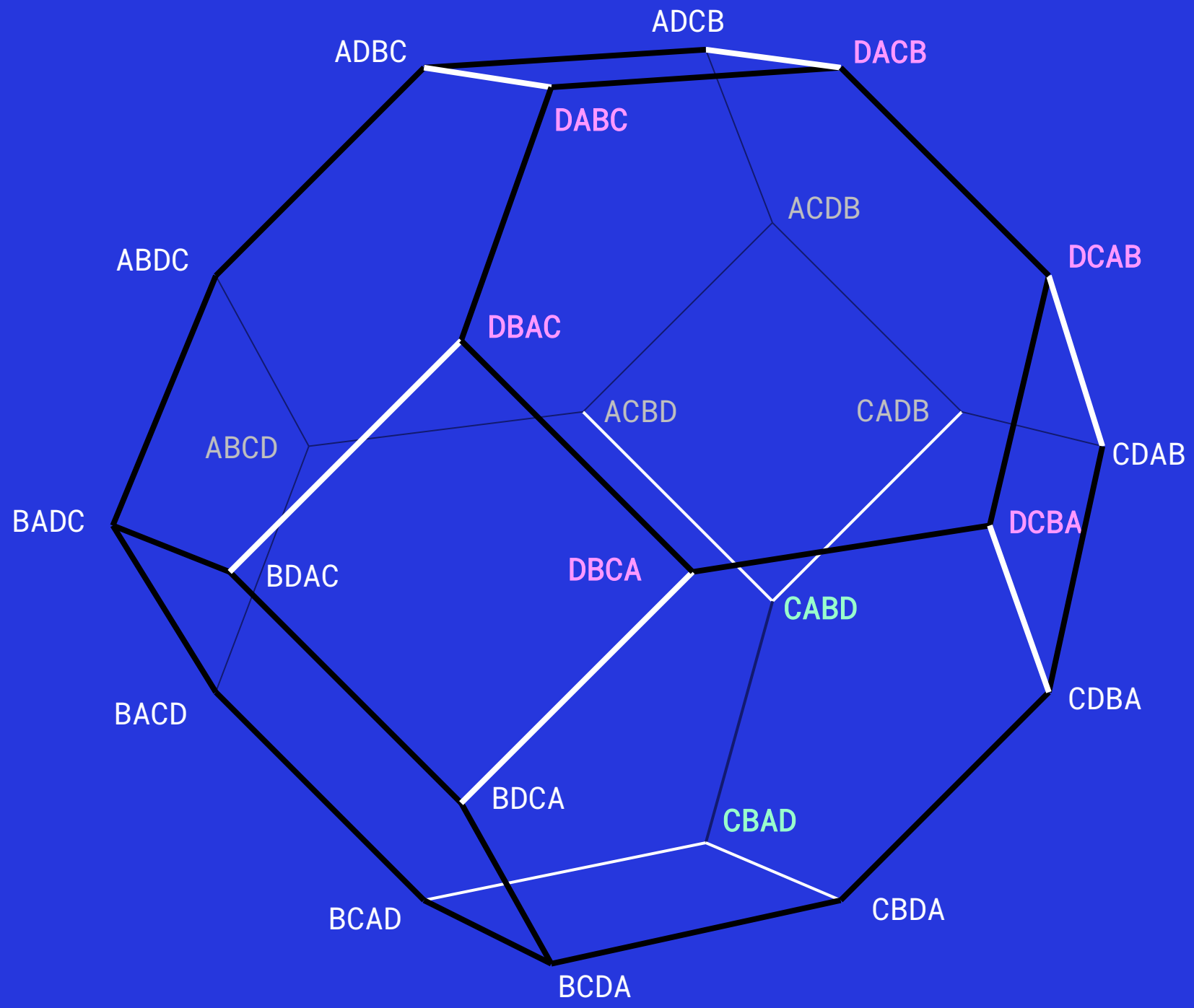
DBCA
CABD
BACD
CDBA
BDCA
CBAD
BCAD
CBDA
BCDA


ADCB
ADBC
DACB
DABC
ACDB
ABDC
DCAB
DBAC
ACBD
CADB
ABCD
CDAB
BADC
DCBA
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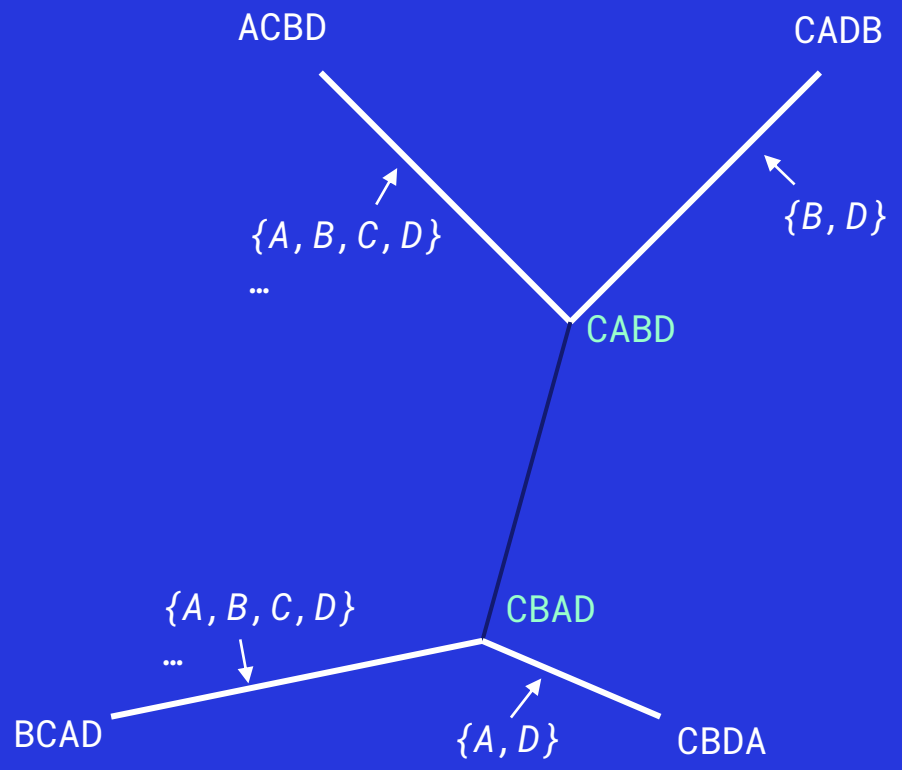
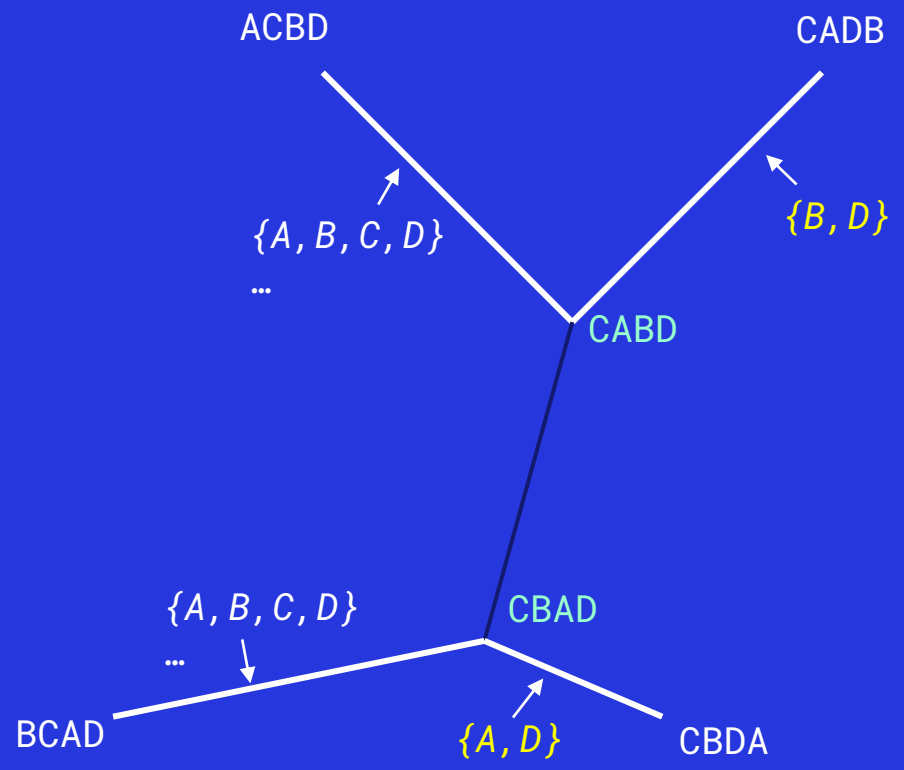
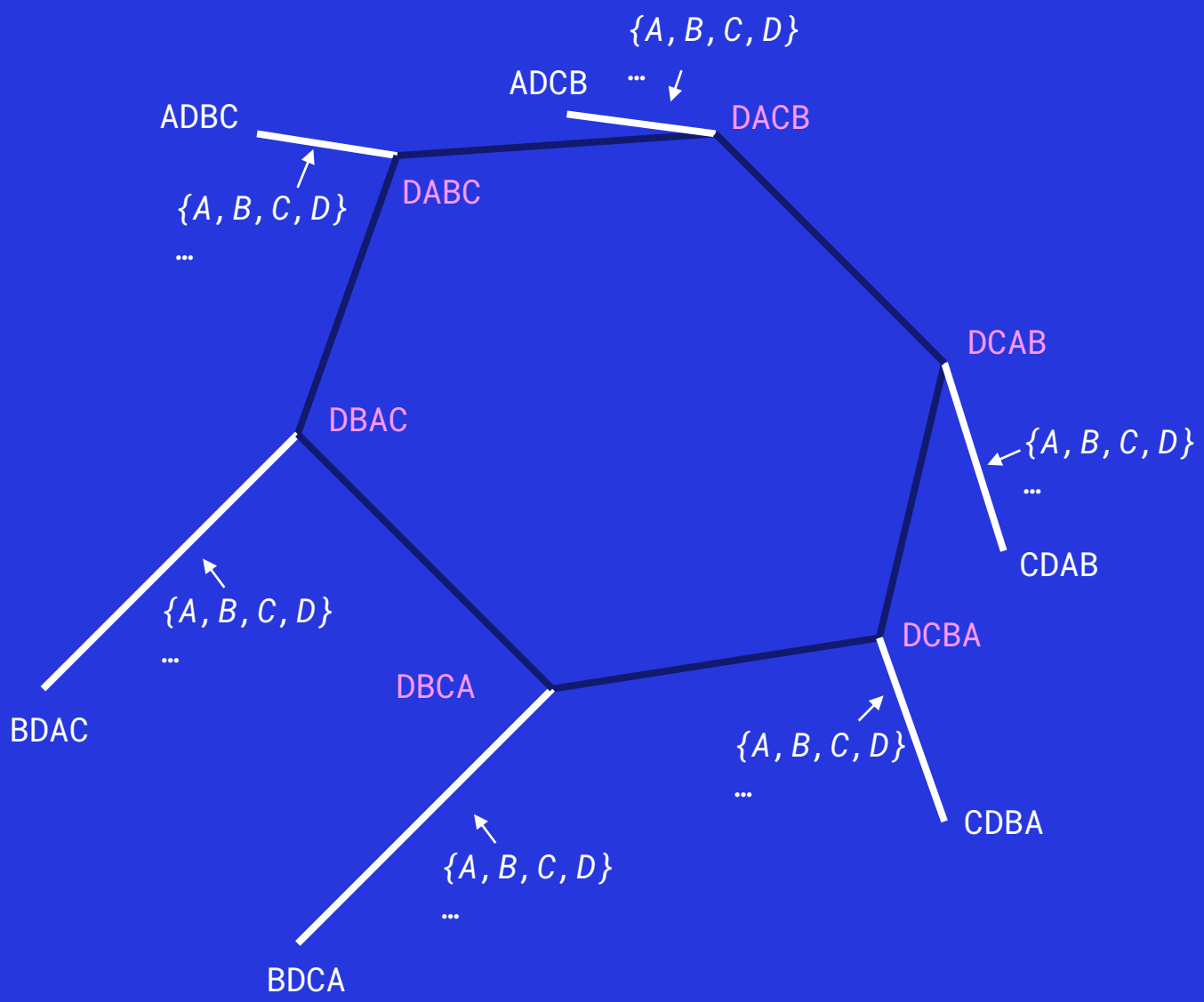
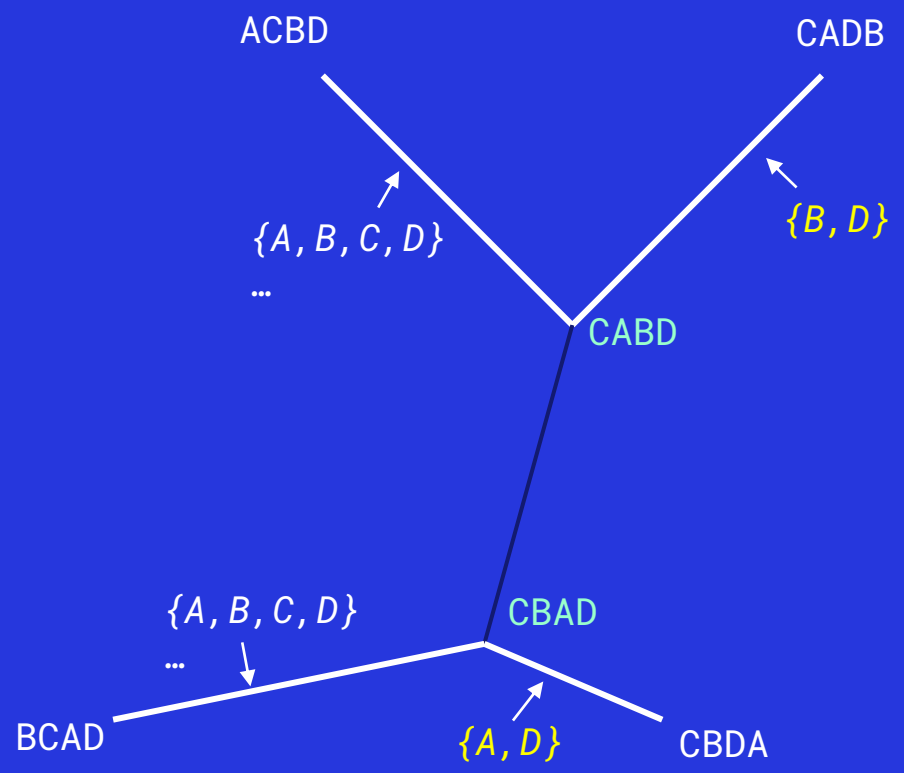
CDBA
BACD
BDCA
CBAD
BCAD
CBDA
BCDA


ACBD
CADB
{A, B, C, D}
...
{B, D}
CABD
{A, B, C, D}
...
CBAD
BCAD
{A, D}
CBDA

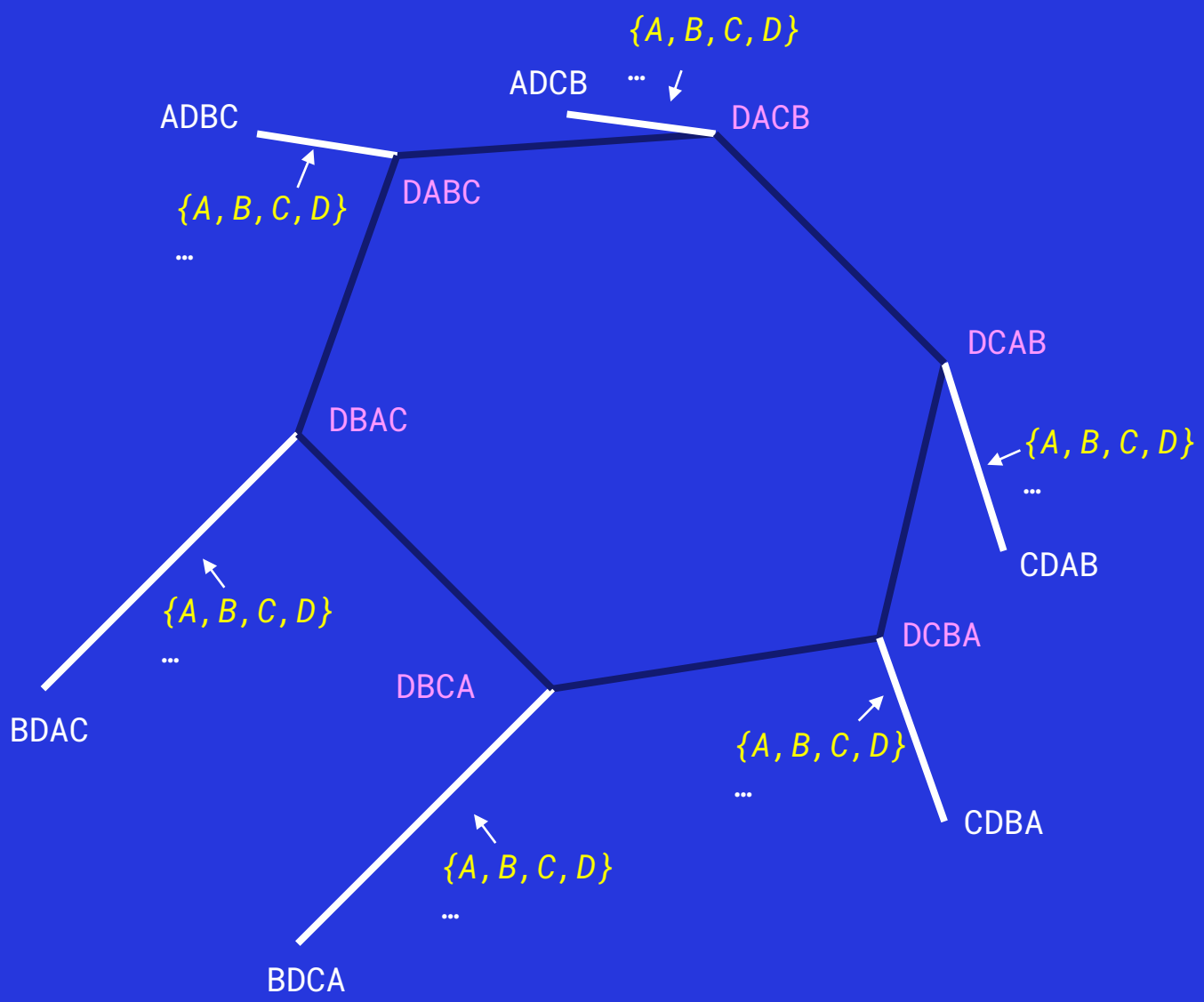


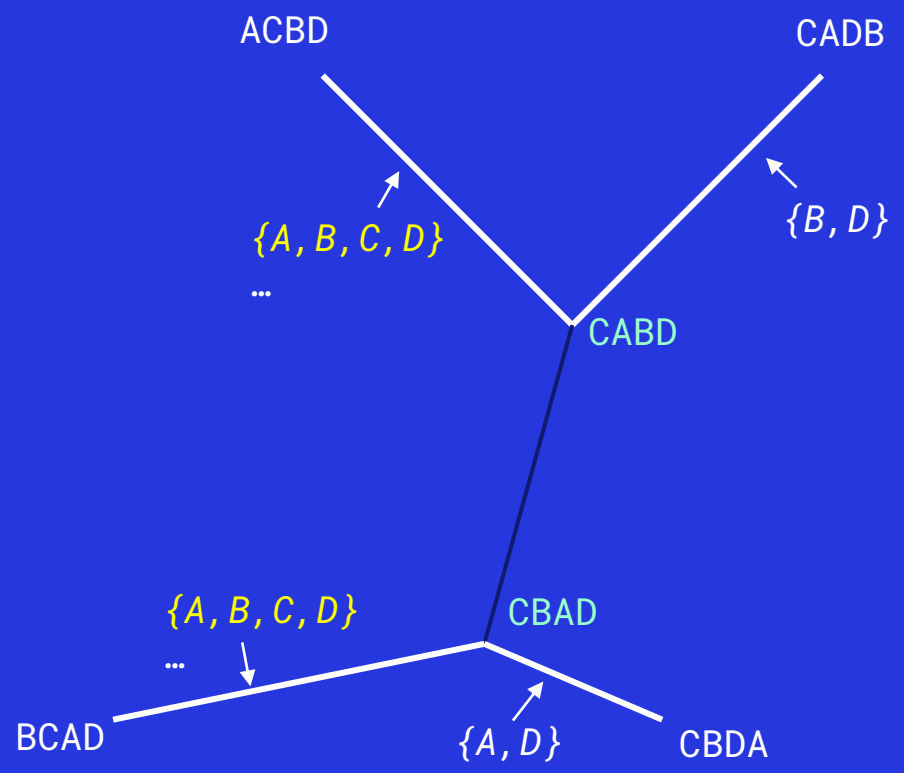
{A, D}, {B, D}


{A, B, C, D}
ADCB
...
ADBC
DACB
{A, B, C, D}
...
DABC
DCAB
DBAC
{A, B, C, D}
...
CDAB
{A, B, C, D}
...
DCBA
DBCA
BDAC
{A, B, C, D}
...
CDBA
{A, B, C, D}
...
BDCA

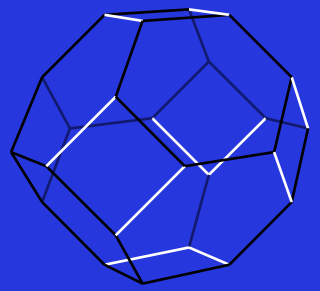

ACBD
CADB
{A, B, C, D}
...
{B, D}
CABD
{A, B, C, D}
...
CBAD
BCAD
{A, D}
CBDA

{A, D}, {B, D}


{A, B, C, D}
ADCB
...
ADBC
DACB
{A, B, C, D}
...
DABC
DCAB
DBAC
{A, B, C, D}
...
CDAB
{A, B, C, D}
...
DCBA
BDAC
DBCA
{A, B, C, D}
...
CDBA
{A, B, C, D}
...
BDCA


ACBD
CADB
{A, B, C, D}
...
{B, D}
CABD
{A, B, C, D}
...
CBAD
BCAD
{A, D}
CBDA

{A, B, C, D}, {A, D}, {B, D}



Theorem

The App

Geometry

Desert

Models

{CAB,CBA},{ABC,ACB,BAC,BCA}