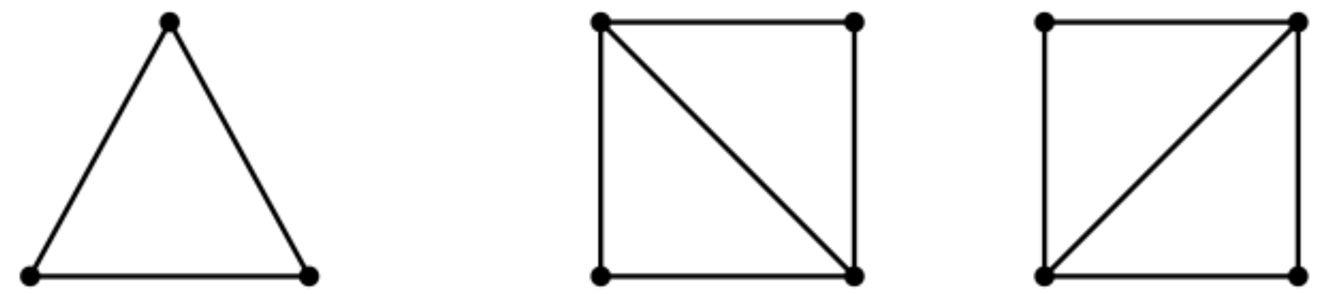
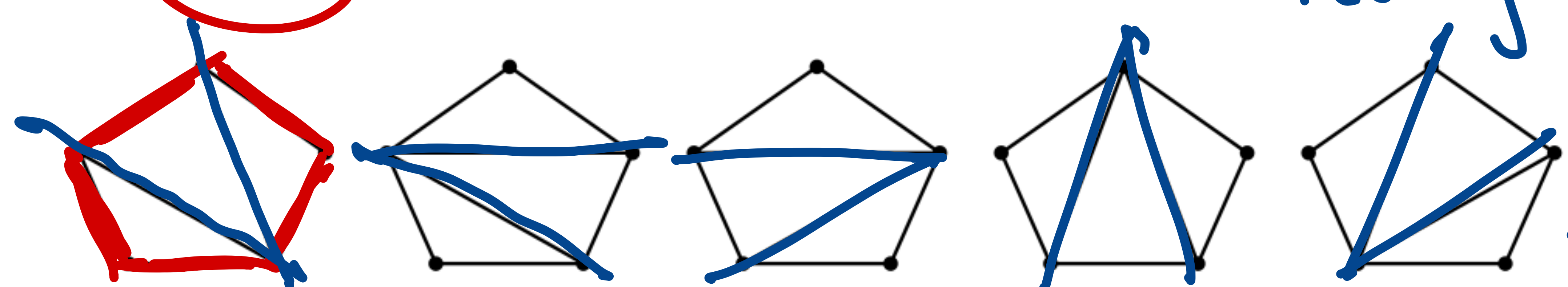
$n = 2$, there is only 1 such dissection and for $n = 3$, there are 2 such

how many triangulations as function of n?



$n = 2$ $n = 3$

$n = 4$, there are 5 such dissections.



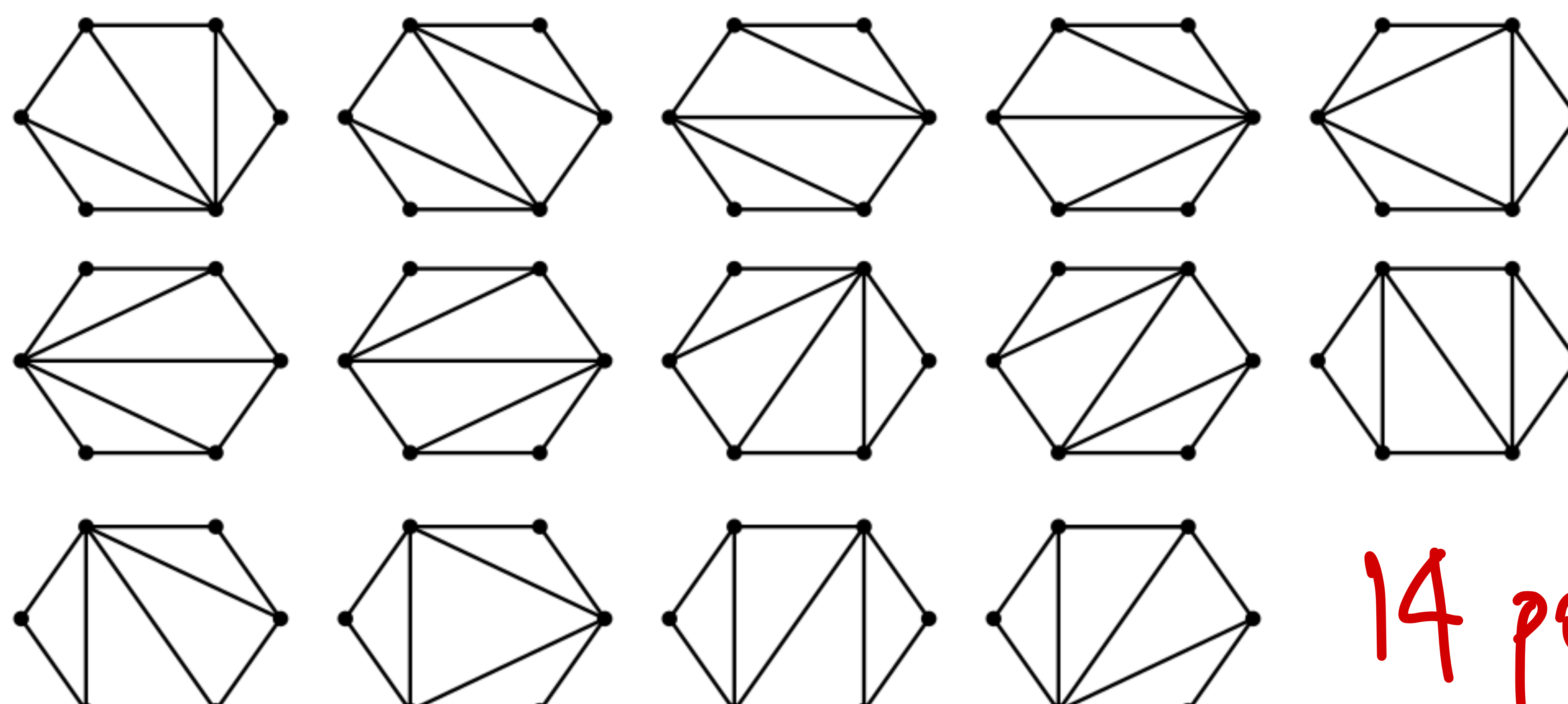
Pentagons: 2 cuts

$\Downarrow$

3 Δ

5 possibilities

$n = 5$, there are $\boxed{14 \text{ such}}$ dissections.



14 possibilities

CS 1800 Regular

- discrete math => for CS
  prereq for CS courses
- high-school level (adv.)
- taught by world-class
  pedagog (Jay or Ben)
- primarily for students with
  math difficulties.

- focus: formulas, basic mechanism
  familiarity

- → bad at math
  → not interested.

Honors

- college level math course.
- could be very dif for
  non-math students
  -oriented
- focus: math thinking,
  reasoning, proofs.
- take more time.
- rewarding for math-oriented
  students.
-

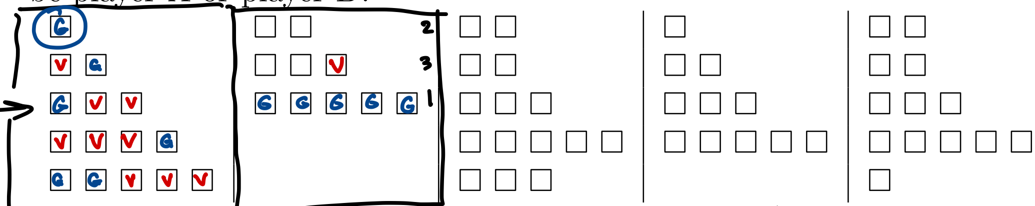
Honors Problem 1 : Square Game. Two players A and B play the following game. Starting with a stack of rows of squares (□), they take turns with player A first in removing squares. In each turn the player

- identifies one row with at least one □
- remove any number of □ from that row (all if so desired), but do not remove them from any other row.

The player who removes the last square wins.

Here are 5 boards to play with a friend. At each one, would you like to to be player A or player B?

V: virgil
G: gabriel



Is there a general strategy? How does the strategy/winner depend on initial configuration of the squares? If you work on this problem, write up the explanation/solution for the general case (any board); 1 page max.

SQUARE GAME

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task: visit each part of town, crossing each bridge exactly once

Binary Numeric
base 10
base 16

Representation

$$8792_{(10)} = 8\cdot\boxed{10^3} + 7\cdot\boxed{10^2} + 9\cdot 10^1 + 2\cdot 10^0$$

thousand, hundreds, 10^s, units

base

I

power-base expansion

II

biggest power of 10 that fits in 8792 (8 times)

visual: positions

8	0	0	0
	7	0	0
		9	0
			2
8	7	9	2

+

III

INTEGER DIV

	quot	remainder
$8792 \div 10 =$	879	2
$879 \div 10 =$	87	9
$87 \div 10 =$	8	7
$8 \div 10 =$	0	8

Exercise: Representation is UNIQUE.

proof: $N = 8792 = d_k\cdot 10^k + d_{k-1}\cdot 10^{k-1} + \dots + d_1\cdot 10 + d_0$

$k=3,\ d_3=8,\ d_2=7,\ d_1=9,\ d_0=2$

different / another representation

$= c_\ell\cdot 10^\ell + c_{\ell-1}\cdot 10^{\ell-1} + \dots + c_1\cdot 10 + c_0$

Th $\Rightarrow \ell=k,\ c_\ell=d_k,\ c_{\ell-1}=d_{k-1},\ \dots$ The same.

Rationals: $0.999\ldots9\ldots = 0.(9) = 1$

2 diff representations of the rational 1

---

binary vs base 10

$22_{10} = ?_{binary} = \boxed{16} + 6 =$ base = 2

$= \boxed{16} + \boxed{4} + \boxed{2}$

binary powers

$2^0 \quad 1 = 1$

$2^1 = 2 = 10$

$2^2 = 4 = 100$

$2^3 = 8 = 1000$

$2^4 = 16 = 10000$ 4 zeros $\Rightarrow 2^4$

$2^5 = 32 = 100000$

$2^6 = 64 = 1000000$

$2^7 = 128 = 10000000$

$2^8 = 256 = 1\underbrace{0000\,0000}_{8 = \text{exponent}}$

$2^9 = 512$

$2^{10} = 1024$

$2^{11} = 2048$

$2^{12} = 4096$

$2^{13} = 8192$

	1	0	0	0	0
			1	0	0
				1	0
$22_{(10)} =$	1	0	1	1	$0_{(2)}$

$$8792_{(10)} = ?\ \text{binary} = \boxed{8192} + 600$$

$$2^{13} + \boxed{512} + 88 =$$

$$= 2^{13} + 2^9 + \boxed{64} + 24$$

$$= 2^{13} + 2^9 + 2^6 + 2^4 + 2^3$$

$2^{13} \Rightarrow 1$

bits $\in \{0, 1\}$

1 0 0 0 1 0 0 1 0 1 1 0 0 0

Excercise 8792 → binary by repeated division

base — q — r

$8792 \div 2 = 4396$ — 0 → right most digit

$4396 \div 2 = 2198$ — 0 → 2^{nd} dig from right

⋮

8792 = base 16 ?

$$= \underset{\text{hex digit}}{2} \cdot \boxed{16^3} + \underset{\text{hex digit}}{2} \cdot \boxed{16^2} +$$

8192 512 88

how many times it fits?

3×16^3 = too much . no good

$$= 2 \cdot 16^{3} + 2 \cdot 16^2 + 5 \cdot 16^1 + 8 \cdot 16^0$$

3 zeros after

write down

$2 \cdot 16^3 \to 2\,0\,0\,0$

$2 \cdot 16^2 \to 2\,0\,0$

$5\,0$

8

$$\boxed{2258_{(16)}}$$

bases = integers ≥ 2

base 10 digits $\in \{0, 1, 2, 3, \ldots 9\}$

base 2 bits $\in \{0, 1\}$

base 16 hex $\in \{0, 1, 2, \ldots, 9, \cancel{10}, \cancel{11}, \cancel{12}, \cancel{13}, \cancel{14}, \cancel{15}\}$

A B C D E F

~~A, 9~~

base − 1