Introduction à la science informatique

Semaine 1

Logistique

Équipe enseignante

- Chargé de CM/TD : Antonio E. Porreca
- Chargés de TP :
  - Antonio E. Porreca (groupe 3a)
  - Yahia Idriss Benalioua (groupe 3b)

On va apprendre 😊

- Concevoir le traitement informatisé d'informations de différentes natures

- Modéliser un problème concret sous la forme d'un problème algorithmique connu

- Évaluer l'efficacité et la correction d'une solution algorithmique

- Être familiarisé avec les concepts fondamentaux de complexité et de calculabilité

- Implémenter nos algorithmes sous forme du code Python à l'ordinateur

On ne va pas apprendre ☹️

- Utiliser des logiciels bureautiques
- Installer Linux sur son ordinateur
- Faire du web design
- Jouer aux ou réaliser des jeux vidéos
- Sécurité informatique

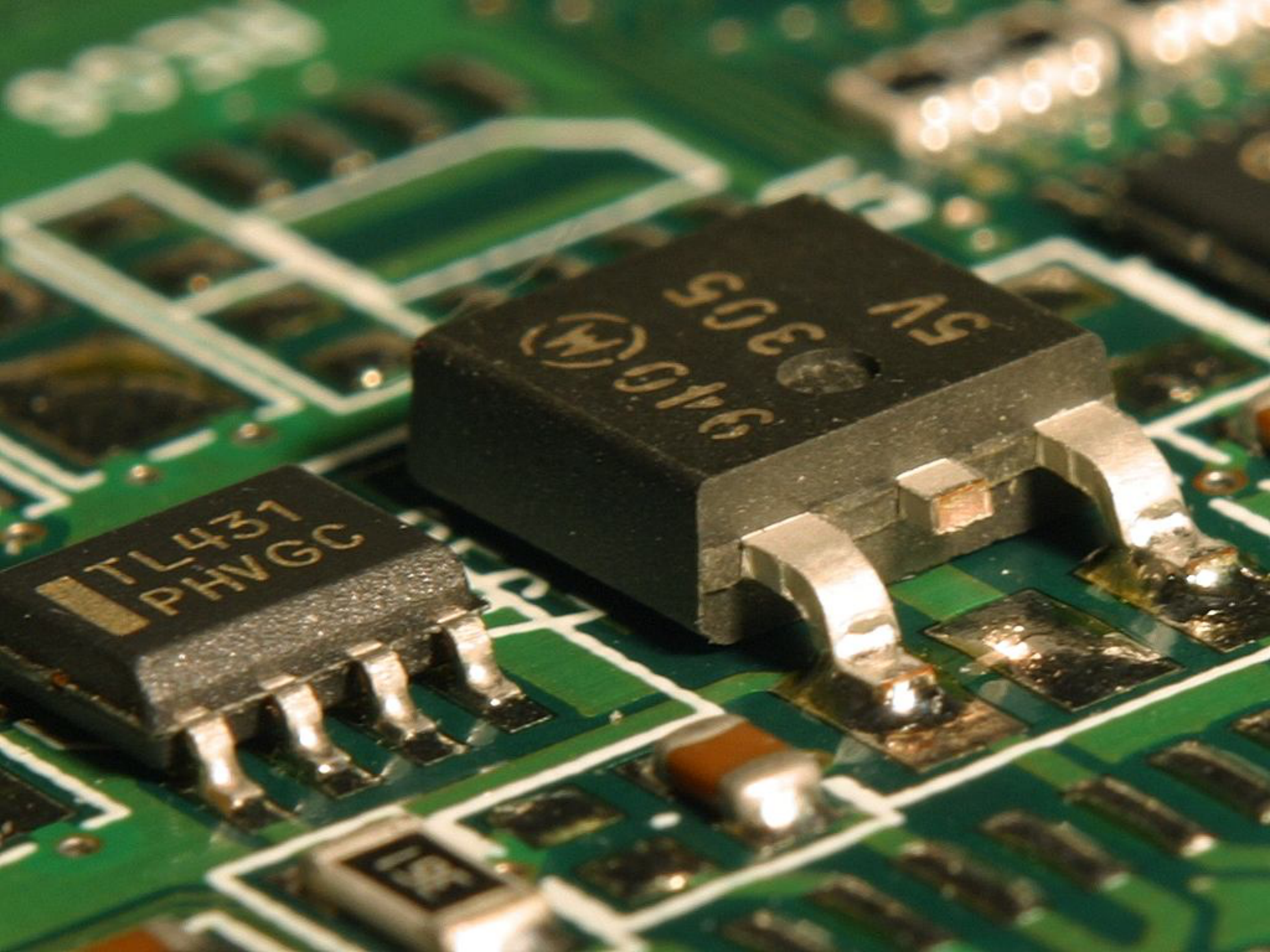
Organisation de l’UE

- 42h de CM/TD intégré en 21 séances de 2h
- 18h de TP en 9 séances de 2h
- Travail personnel
  - Prise de notes pendant les cours
  - Travail de révision entre les séances
- Tutorat

Évaluation

- Un partiel sur papier (sans documents ni calculatrice)
- Un partiel en salle machines à l'ordinateur
- Un examen terminal en janvier
- Note = max(0,3 TP + 0,7 E,
  0,2 P + 0,3 TP + 0,5 E)
- 2e session (rattrapage, en juin) : note de l'examen

C’est quoi l’informatique ?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TL431
PHVGC

C’est aussi de la science

- On définit des modèles mathématiques du calcul
- On prouve des résultats
- On peut faire des choix techniques

Objets d'étude de l'informatique

- Le stockage de l'information
- La transmission de l'information
- Le traitement de l'information 👉 algorithmes !
- L'information elle-même

Quelques personnages

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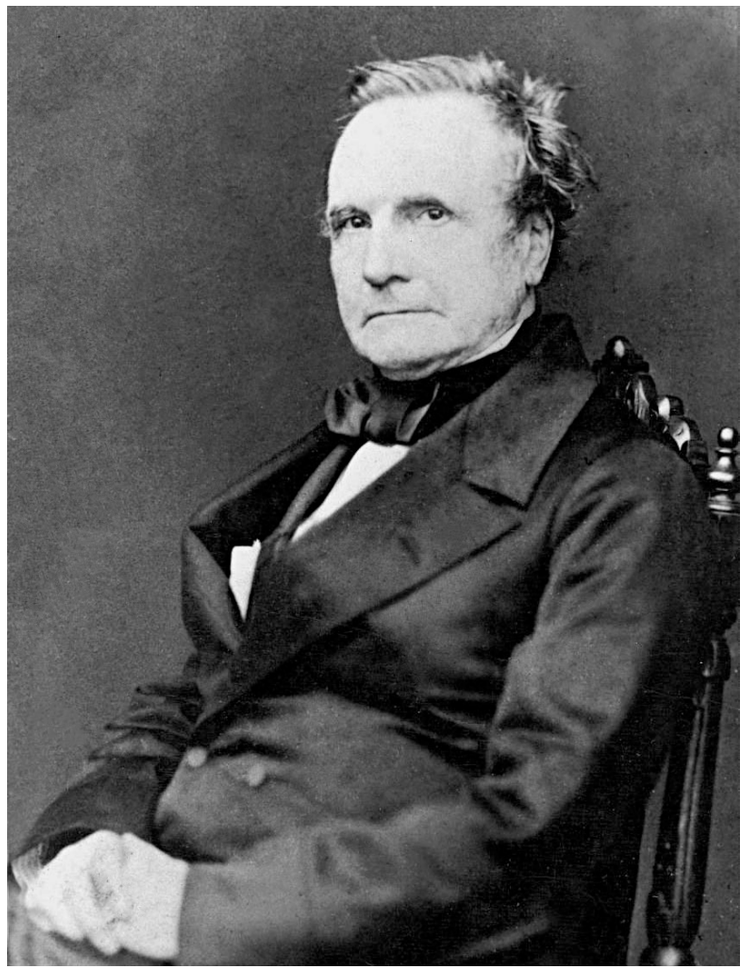
Muḥammad ibn Mūsā al-Khwārizmī

Quelques personnages

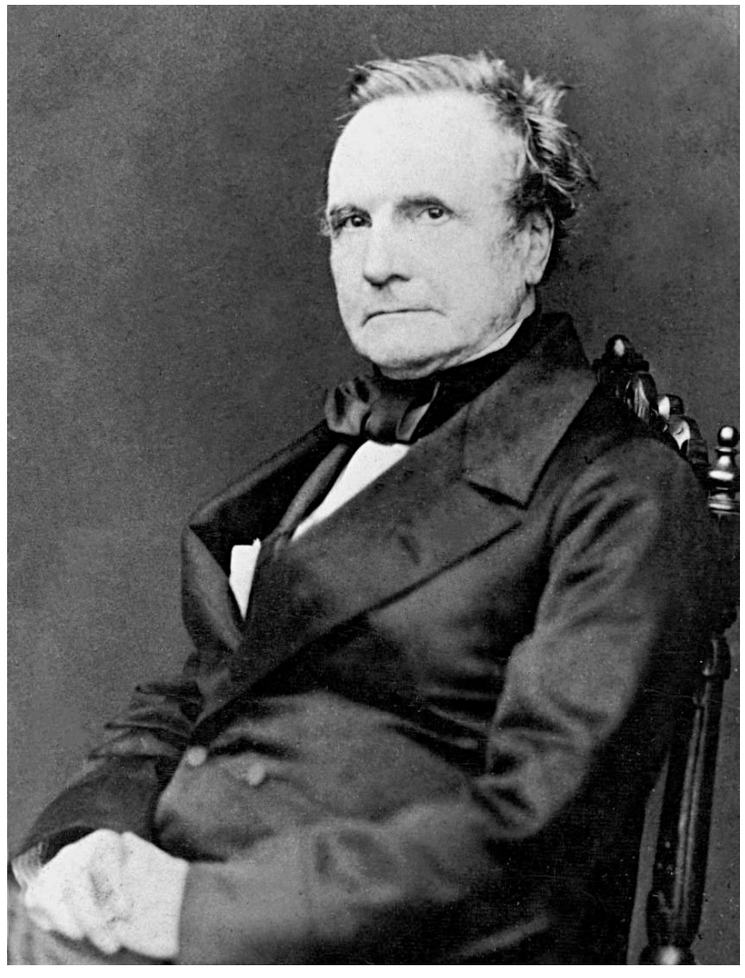
Muḥammad ibn Mūsā al-Khwārizmī



Charles Babbage

Quelques personnages

Muḥammad ibn Mūsā al-Khwārizmī



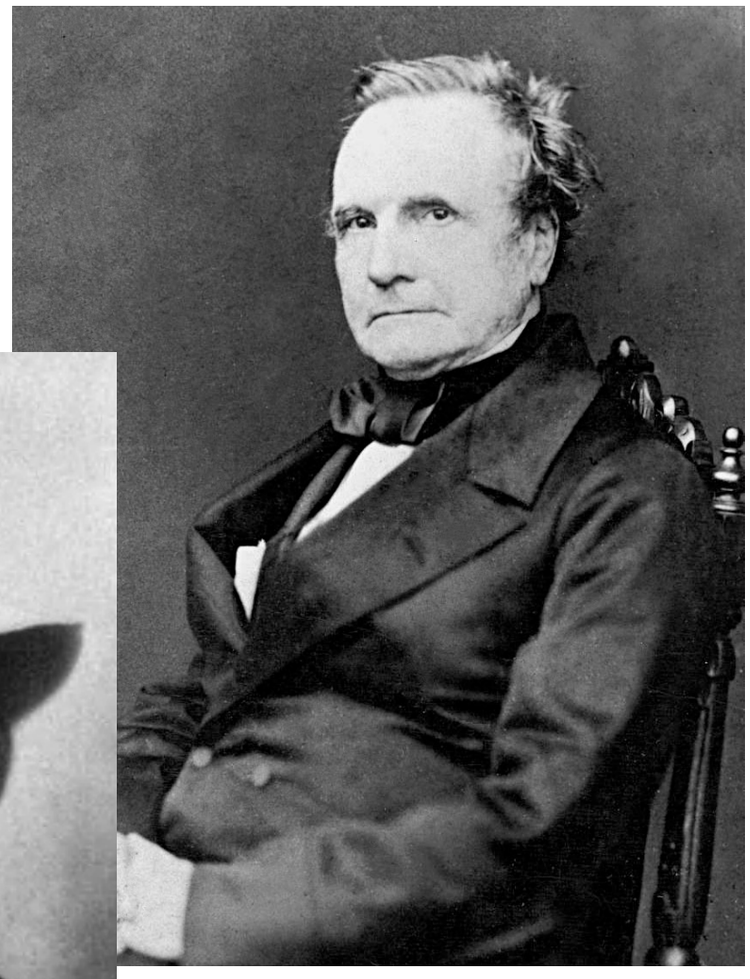
Charles Babbage

Ada Lovelace

Quelques personnages

Muh

David Hilbert



Charles Babbage

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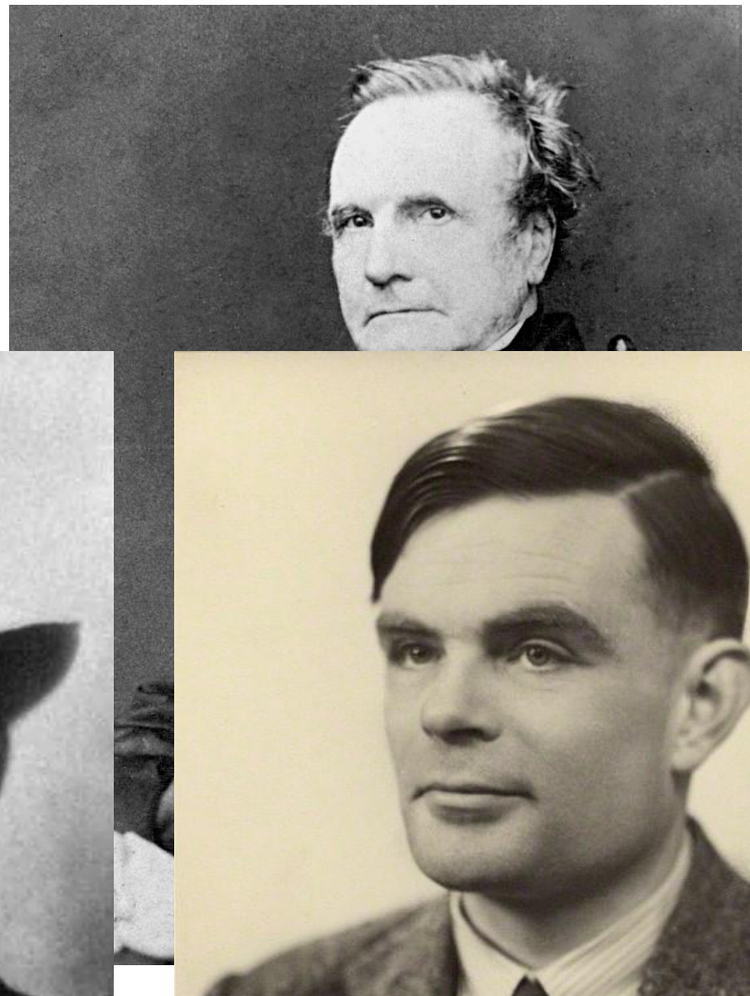


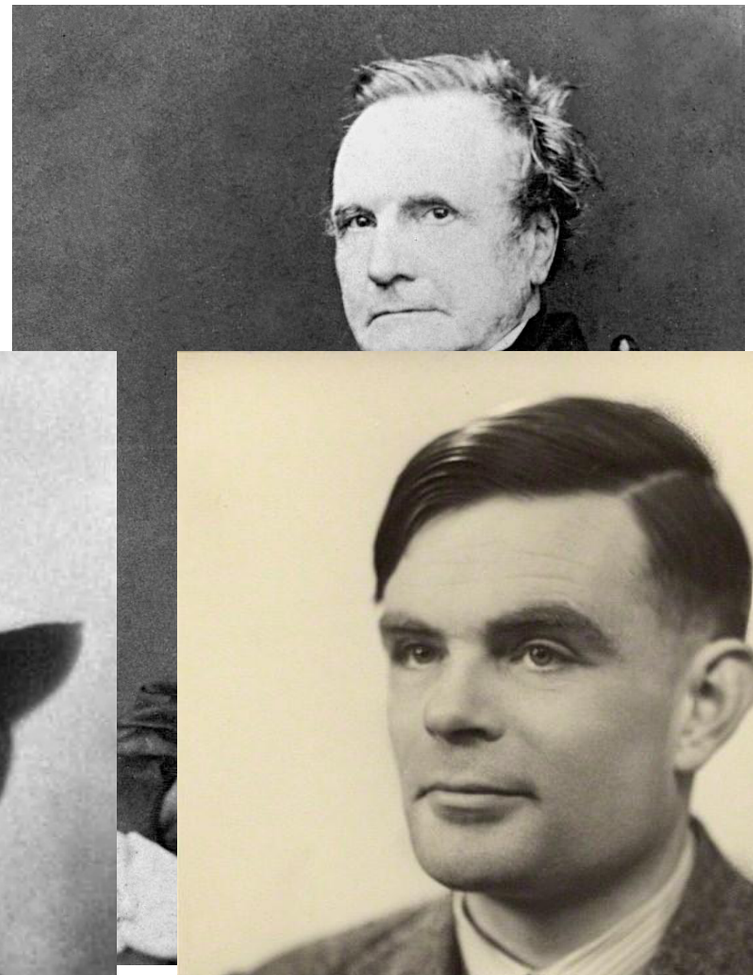
C

Alan M. Turing

Ada Lovelace

Quelques personnages

Muh



C

David Hilbert

Alan M. Turing

Grace Hopper

L’informatique : une histoire de femmes

- Les calculatrices humaines étaient souvent des femmes
- 1er algorithme pour ordinateur : Ada Lovelace (1843)
- 1er compilateur : Grace Hopper (1951)
- Invention des bases du Wifi : Hedy Lamarr (1942)
- 1ère thèse en Informatique en France :
  Marion Créhange (1961)

Algorithmes non formalisés

Algorithme de la somme de l’école primaire

Opération élémentaire

+	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10	11
3	3	4	5	6	7	8	9	10	11	12
4	4	5	6	7	8	9	10	11	12	13
5	5	6	7	8	9	10	11	12	13	14
6	6	7	8	9	10	11	12	13	14	15
7	7	8	9	10	11	12	13	14	15	16
8	8	9	10	11	12	13	14	15	16	17
9	9	10	11	12	13	14	15	16	17	18

Calculer 1323 + 256

Calculer 1323 + 256

1 3 2 3

Calculer 1323 + 256

1 3 2 3 +

Calculer 1323 + 256

1 3 2 3 +

2 5 6

Calculer 1323 + 256

1 3 2 3 +

2 5 6 =

Calculer 1323 + 256

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline \end{array}$$

Calculer 1323 + 256

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ \underline{2\ 5\ 6\ =} \end{array}$$

Calculer 1323 + 256

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline 9 \end{array}$$

Calculer 1323 + 256

👇

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline 9 \end{array}$$

Calculer 1323 + 256

👇

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline 7\ 9 \end{array}$$

Calculer 1323 + 256

👇

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline 7\ 9 \end{array}$$

Calculer 1323 + 256

👇

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline 5\ 7\ 9 \end{array}$$

Calculer 1323 + 256

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$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 2\ 5\ 6\ = \\ \hline 5\ 7\ 9 \end{array}$$

Calculer 1323 + 256

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$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 0\ 2\ 5\ 6\ = \\ \hline 5\ 7\ 9 \end{array}$$

Calculer 1323 + 256

👇

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 0\ 2\ 5\ 6\ = \\ \hline 1\ 5\ 7\ 9 \end{array}$$

Calculer 1323 + 256

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$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 0\ 2\ 5\ 6\ = \\ \hline 1\ 5\ 7\ 9 \end{array}$$

Calculer 1323 + 256

$$\begin{array}{r} 1\ 3\ 2\ 3\ + \\ 0\ 2\ 5\ 6\ = \\ \hline 1\ 5\ 7\ 9 \end{array}$$

Combien d’opérations élémentaires ?

$$\begin{array}{r} 1\ 3\ 2\ 3 \\ +\ 0\ 2\ 5\ 6 \\ \hline 1\ 5\ 7\ 9 \end{array} =$$

Combien d'opérations élémentaires ?

$$\begin{array}{cccc} 1 & 3 & 2 & 3 \\ 0 & 2 & 5 & 6 \\ \hline 1 & 5 & 7 & 9 \end{array} \quad +\ =$$

Combien d'opérations élémentaires ?

$$\begin{array}{r} 1\ 3\ 2\ 3 + \\ 0\ 2\ 5\ 6 = \\ \hline 1\ 5\ 7\ 9 \end{array}$$

Combien d’opérations élémentaires ?

$$\begin{array}{r} 1\ 3\ 2\ 3 \\ +\ 0\ 2\ 5\ 6 \\ \hline 1\ 5\ 7\ 9 \end{array} =$$

Combien d'opérations élémentaires ?

$$\begin{array}{cccc} 1 & 3 & 2 & 3 \\ 0 & 2 & 5 & 6 \\ \hline 1 & 5 & 7 & 9 \end{array} +\ =$$

Combien d’opérations élémentaires ?

$$\begin{array}{cccc} 1 & 3 & 2 & 3 \\ 0 & 2 & 5 & 6 \\ \hline 1 & 5 & 7 & 9 \end{array} +$$

=

4 op

Exercice 1 du TD1

Calculer 265 + 3761

Calculer 265 + 3761

2 6 5 +

3 7 6 1 =

Calculer 265 + 3761

2 6 5 +

3 7 6 1 =

Calculer 265 + 3761

$$\frac{2\ 6\ 5\ +\ 3\ 7\ 6\ 1}{6} =$$

Calculer 265 + 3761

👇

$$\frac{2\ 6\ 5\ +\ 3\ 7\ 6\ 1}{6} =$$

Calculer 265 + 3761

👇

$$\begin{array}{r} 2\ 6\ 5\ + \\ \hline 3\ 7\ 6\ 1\ = \\ \hline 2\ 6 \end{array}$$

Calculer 265 + 3761

1 👇

2 6 5 +

3 7 6 1 =

---

2 6

Calculer 265 + 3761

1

2 6 5 +

3 7 6 1 =

---

2 6

👆

Calculer 265 + 3761

1

2 6 5 +

3 7 6 1 =

0 2 6

Calculer 265 + 3761

1 1

2 6 5 +

3 7 6 1 =

---

0 2 6

Calculer 265 + 3761

1 1

2 6 5 +

3 7 6 1 =

---

0 2 6

Calculer 265 + 3761

1 1

0 2 6 5 +

3 7 6 1 =

---

0 2 6

👆

Calculer 265 + 3761

1 1

0 2 6 5 +

3 7 6 1 =

---

4 0 2 6

👆

Calculer 265 + 3761

1 1

0 2 6 5 +

3 7 6 1 =

---

4 0 2 6

Calculer 265 + 3761

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ \ \ \ \ \ } \\ 0\ 2\ 6\ 5\ + \\ 3\ 7\ 6\ 1\ = \\ \hline 4\ 0\ 2\ 6 \end{array}$$

Combien d’opérations élémentaires ?

	1	1		
	0	2	6	5	+
	3	7	6	1	=
4	0	2	6	

Combien d'opérations élémentaires ?

	1	1		
	0	2	6	5	+
	3	7	6	1	=
	4	0	2	6	

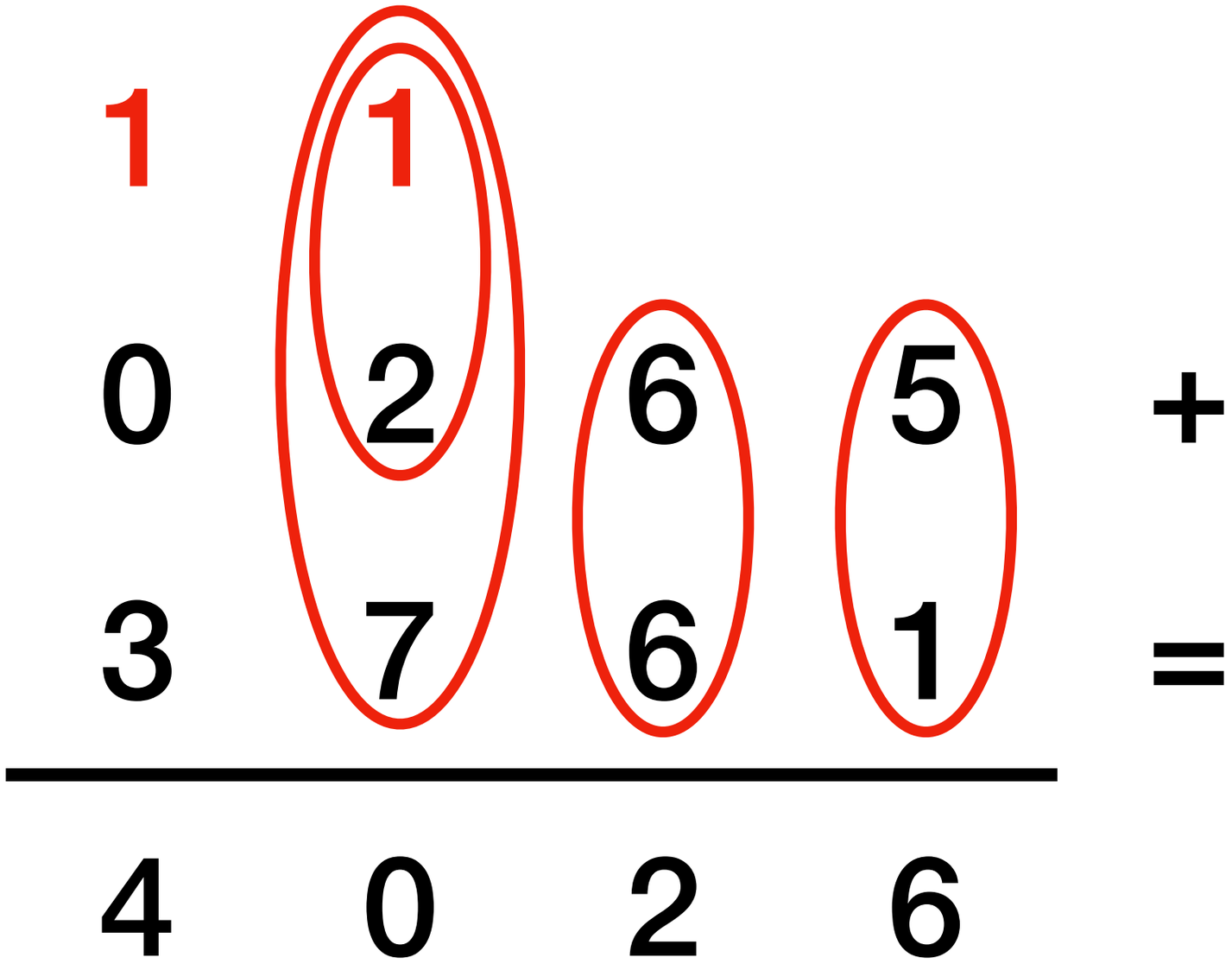
Combien d'opérations élémentaires ?

	1	1		
	0	2	6	5	+
	3	7	6	1	=
4	0	2	6	

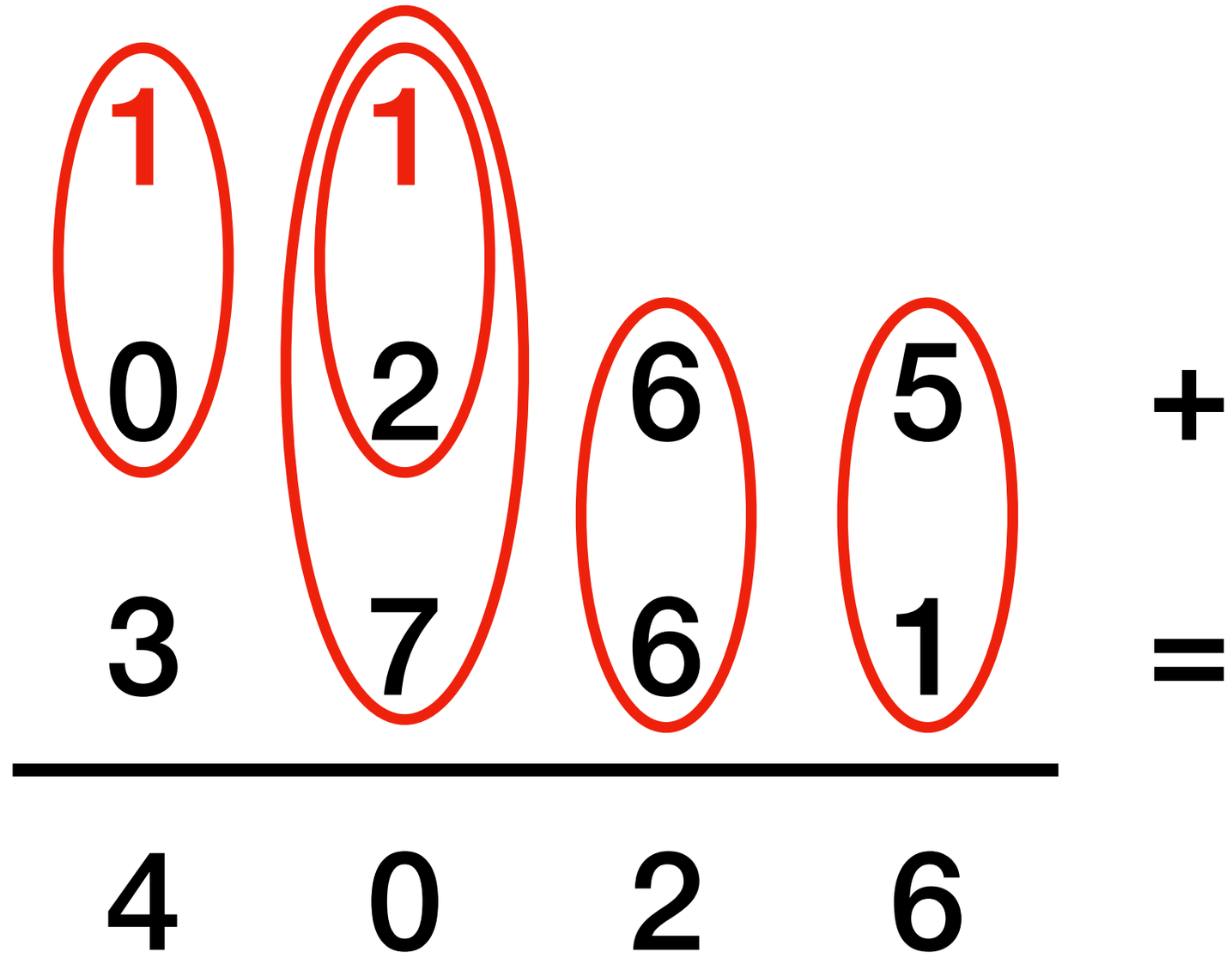
Combien d'opérations élémentaires ?

1	1			
0	2	6	5	+
3	7	6	1	=
4	0	2	6	

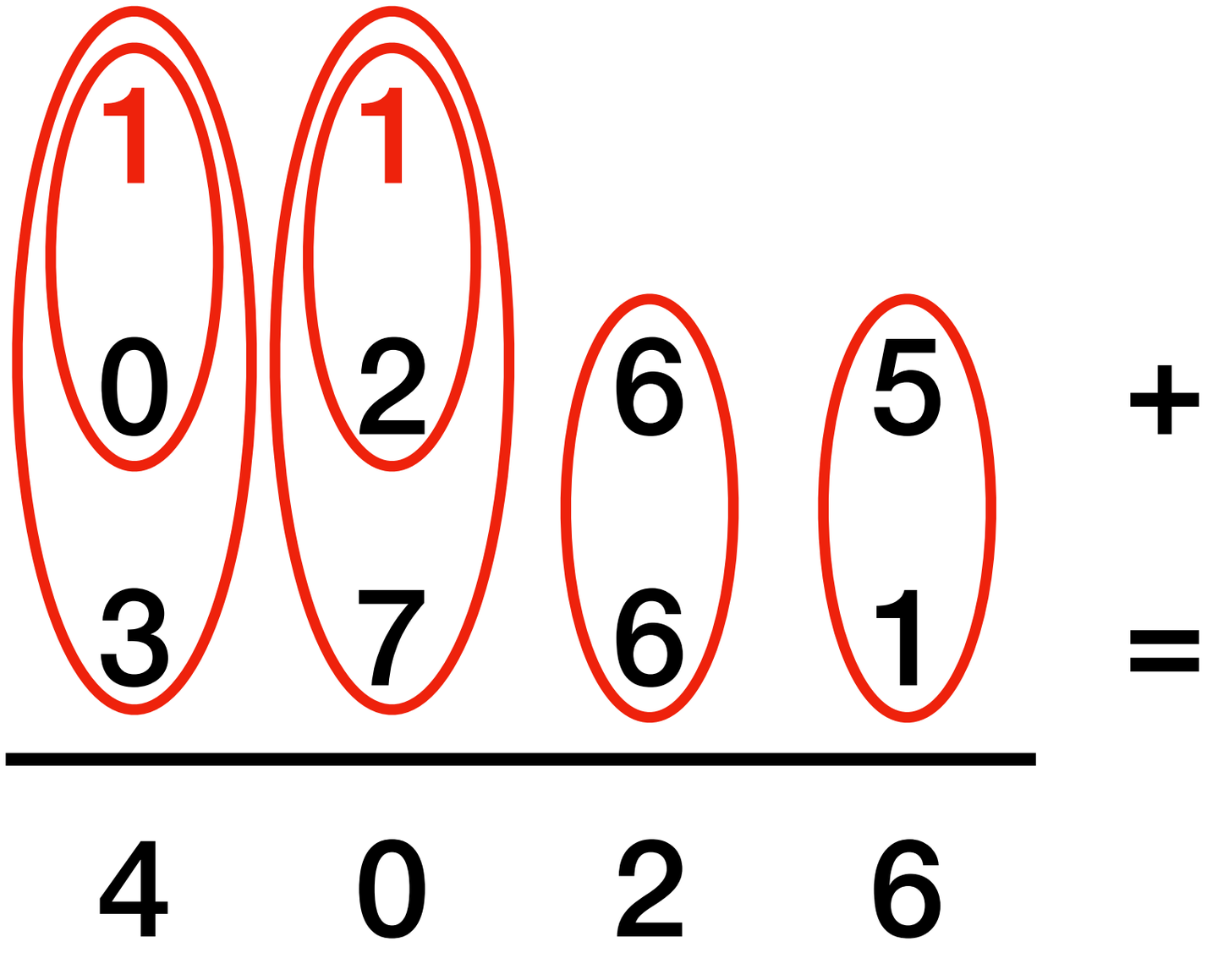
Combien d'opérations élémentaires ?



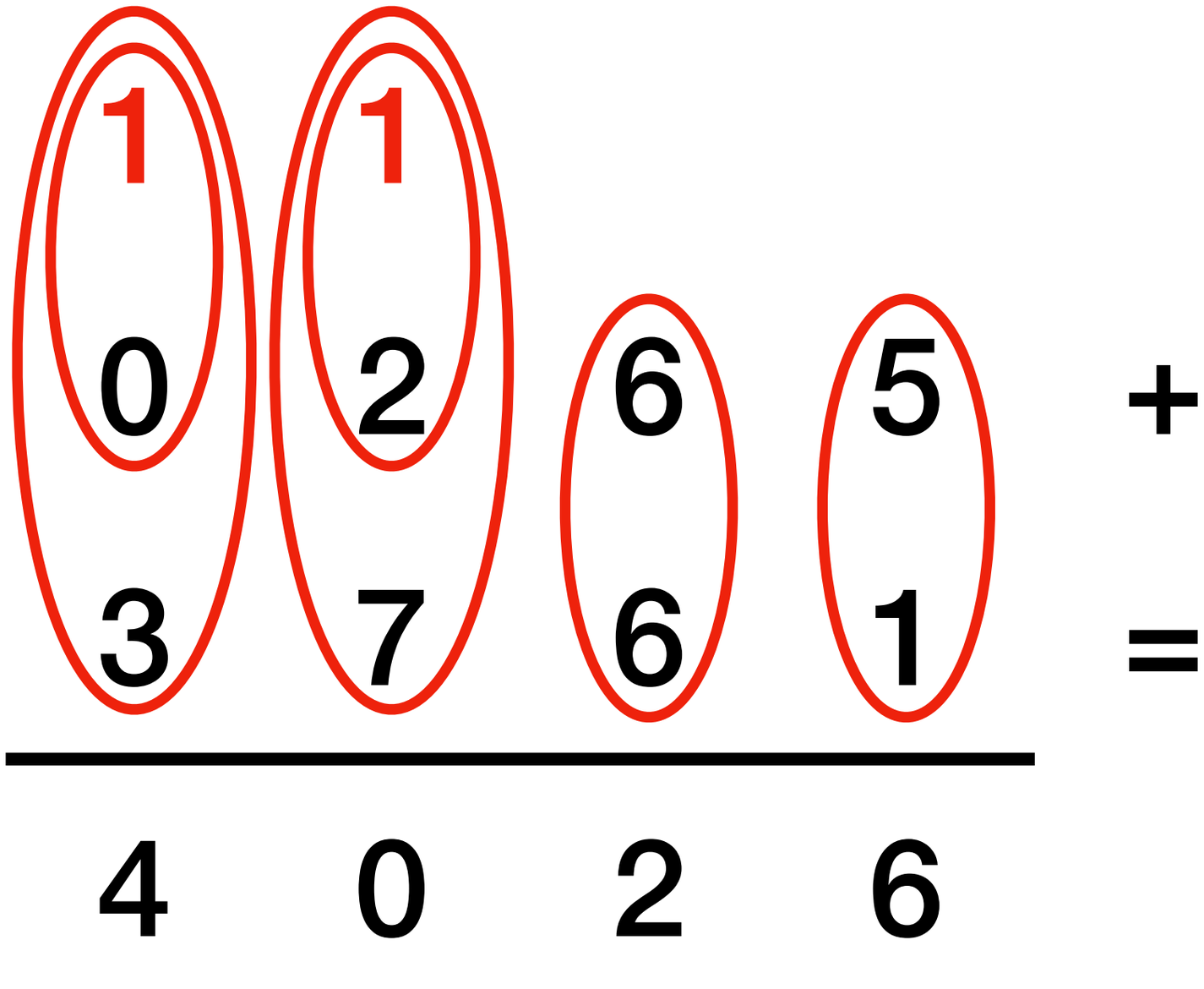
Combien d'opérations élémentaires ?



Combien d'opérations élémentaires ?



Combien d’opérations élémentaires ?



6 op

Exercice 2 du TD1

Calculer 935 + 284

Calculer 935 + 284

$$\begin{array}{r} 9\ 3\ 5\ + \\ 2\ 8\ 4\ = \\ \hline \end{array}$$

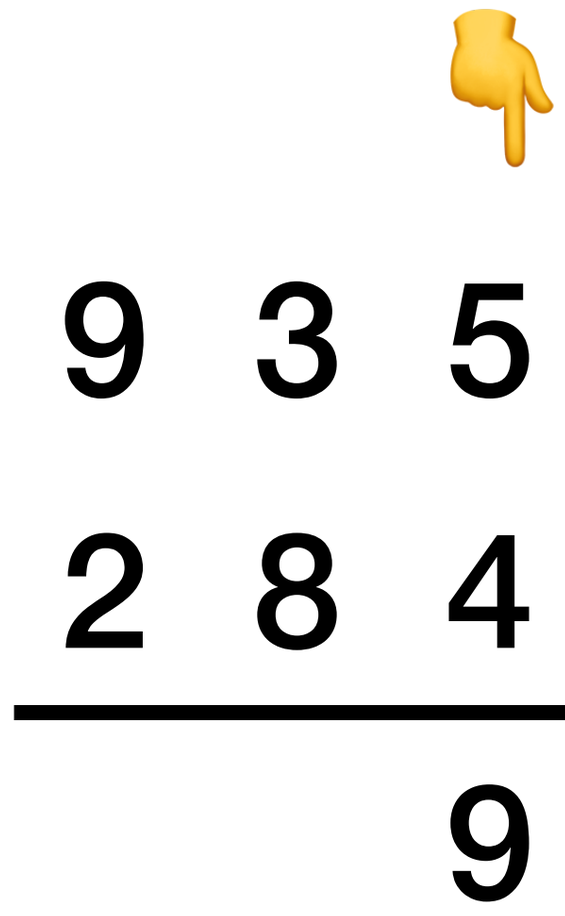
Calculer 935 + 284

👇

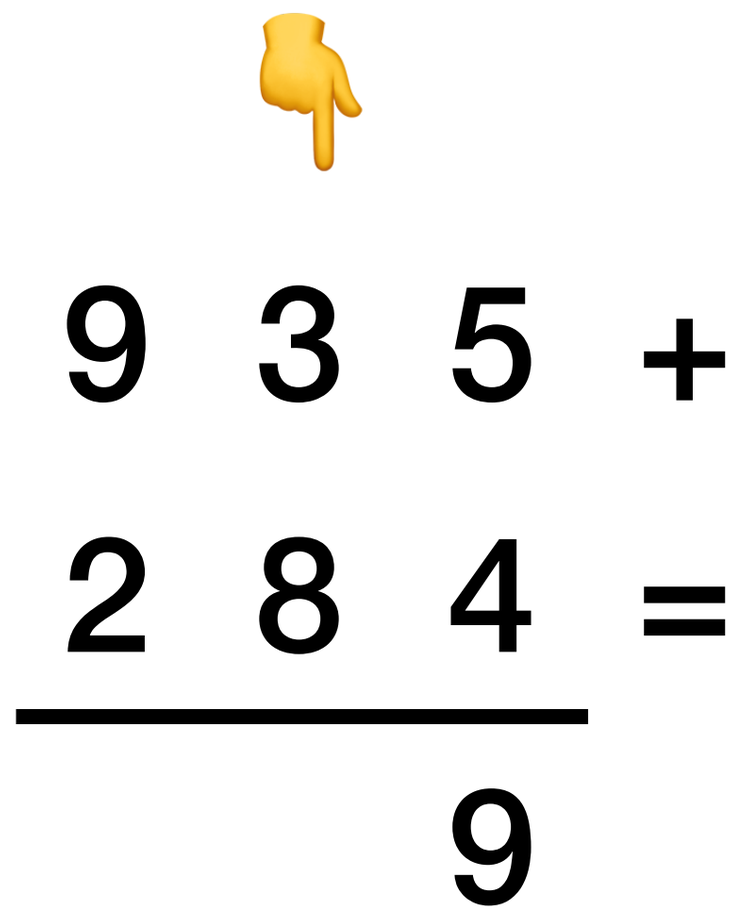
9 3 5 +

2 8 4 =

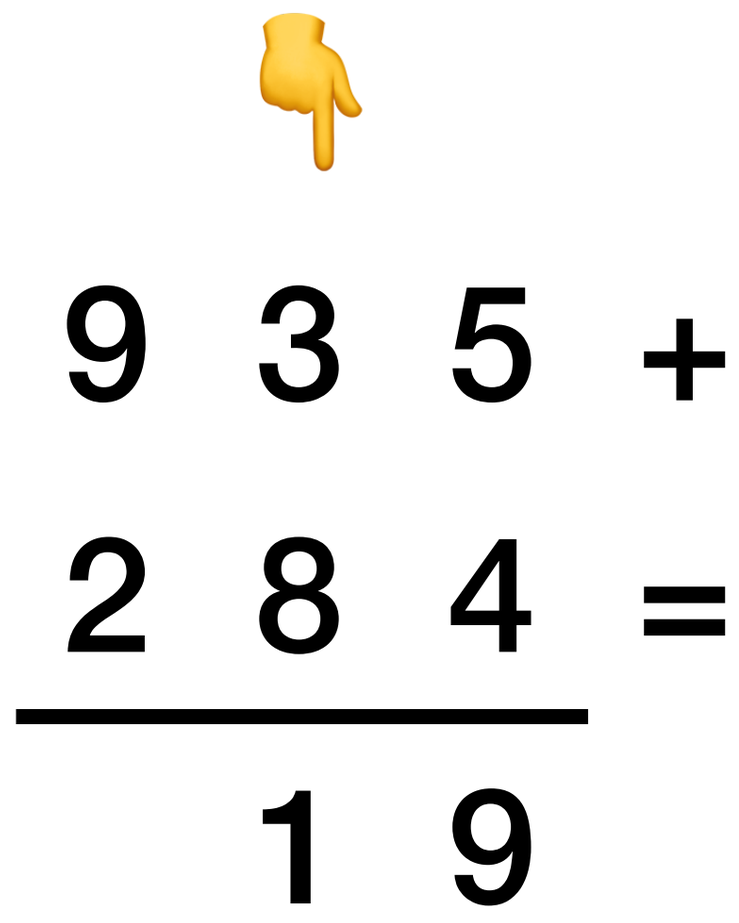
Calculer 935 + 284



Calculer 935 + 284



Calculer 935 + 284



Calculer 935 + 284

1 👇

9 3 5 +

2 8 4 =

---

1 9

Calculer 935 + 284

👇

1

9 3 5 +

2 8 4 =

---

1 9

Calculer 935 + 284

👇

```
  1  1
  9  3  5  +
  2  8  4  =
-------------
     1  9
```

Calculer 935 + 284

```
  1  1
  9  3  5  +
  2  8  4  =
-------------
  2  1  9
```

Calculer 935 + 284

👇

```
  1   1
  9   3   5   +
  2   8   4   =
-------------
  2   1   9
```

Calculer 935 + 284

👇

```
  1  1
  9  3  5  +
  2  8  4  =
-------------
  2  1  9
```

Calculer 935 + 284

👇

```
  1  1
  0  9  3  5  +
  0  2  8  4  =
-------------
     2  1  9
```

Calculer 935 + 284

👇

```
  1  1
  0  9  3  5  +
  0  2  8  4  =
-------------
  1  2  1  9
```

Calculer 935 + 284

👇

```
  1  1
  0  9  3  5  +
  0  2  8  4  =
-------------
  1  2  1  9
```

Calculer 935 + 284

$$\begin{array}{cccccc} & & 1 & 1 & & \\ & 0 & 9 & 3 & 5 & + \\ & 0 & 2 & 8 & 4 & = \\ \hline & 1 & 2 & 1 & 9 & \end{array}$$

Combien d'opérations élémentaires ?

	1		1	
0	9	3	5	+
0	2	8	4	=
1	2	1	9	

Combien d'opérations élémentaires ?

	1	1		
0	9	3	5	+
0	2	8	4	=
1	2	1	9	

Combien d'opérations élémentaires ?

	1	1		
	0	9	3	5	+
	0	2	8	4	=
	1	2	1	9	

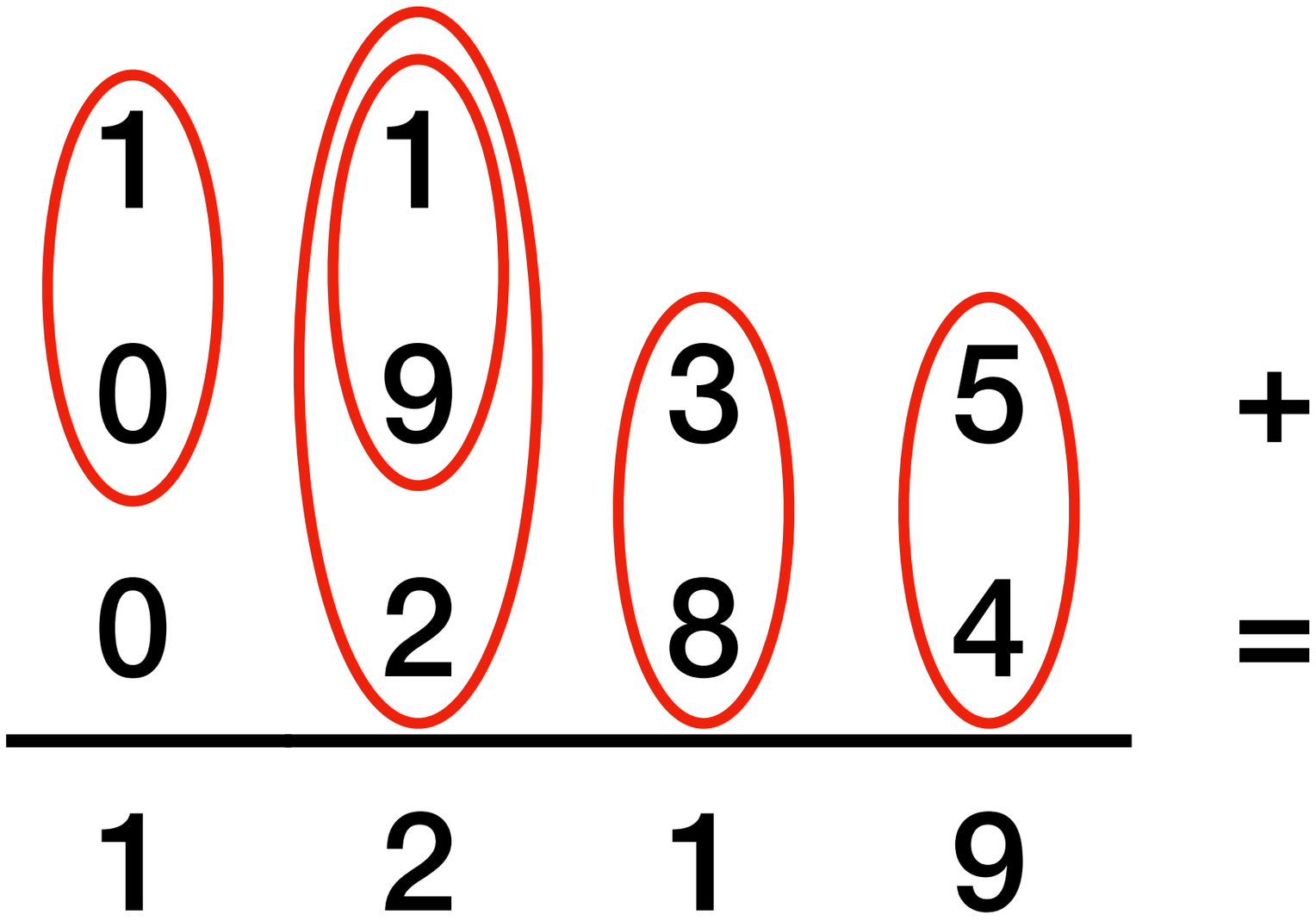
Combien d'opérations élémentaires ?

1	1			
0	9	3	5	+
0	2	8	4	=
1	2	1	9	

Combien d'opérations élémentaires ?

1	1			
0	9	3	5	+
0	2	8	4	=
1	2	1	9	

Combien d’opérations élémentaires ?



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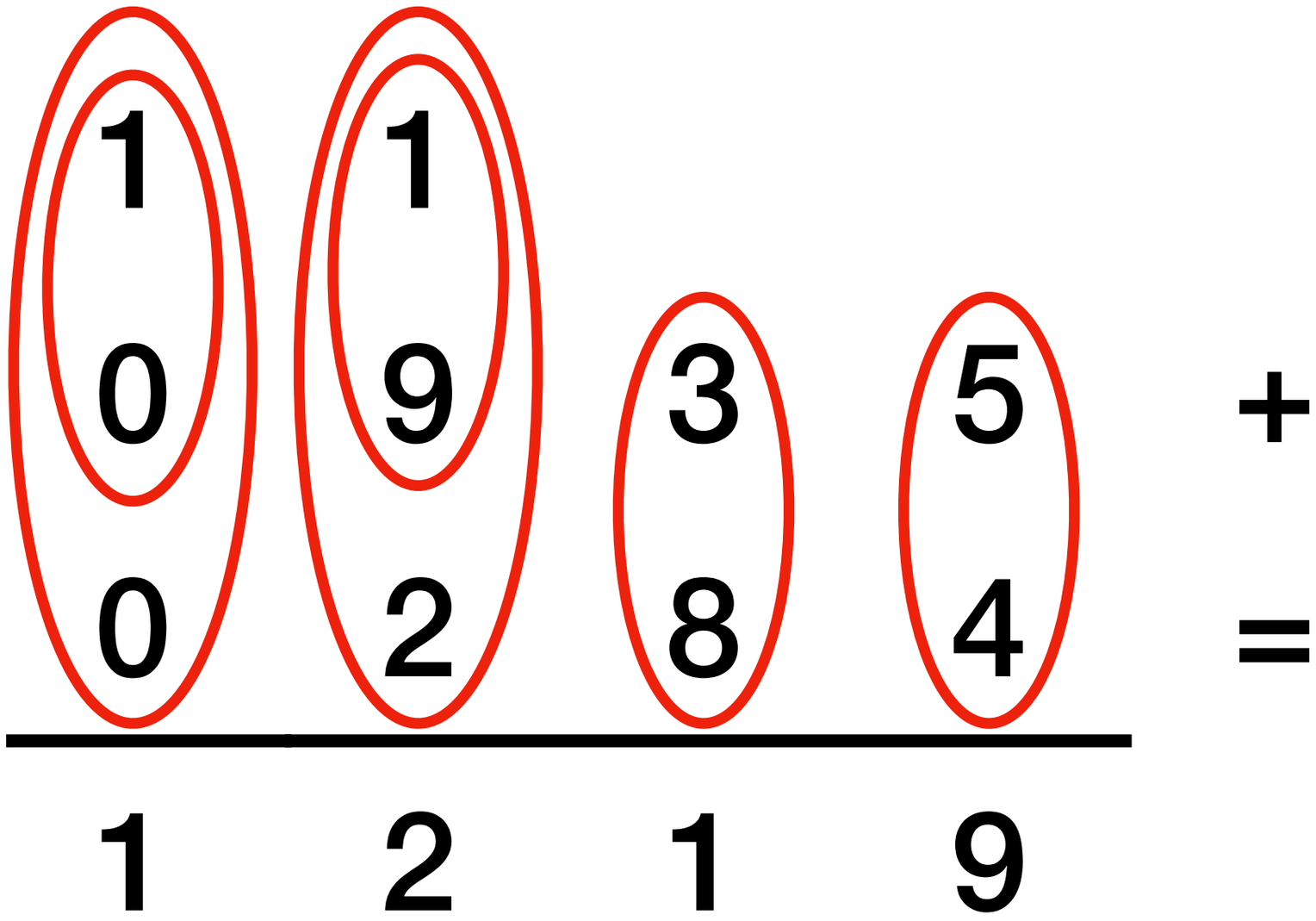

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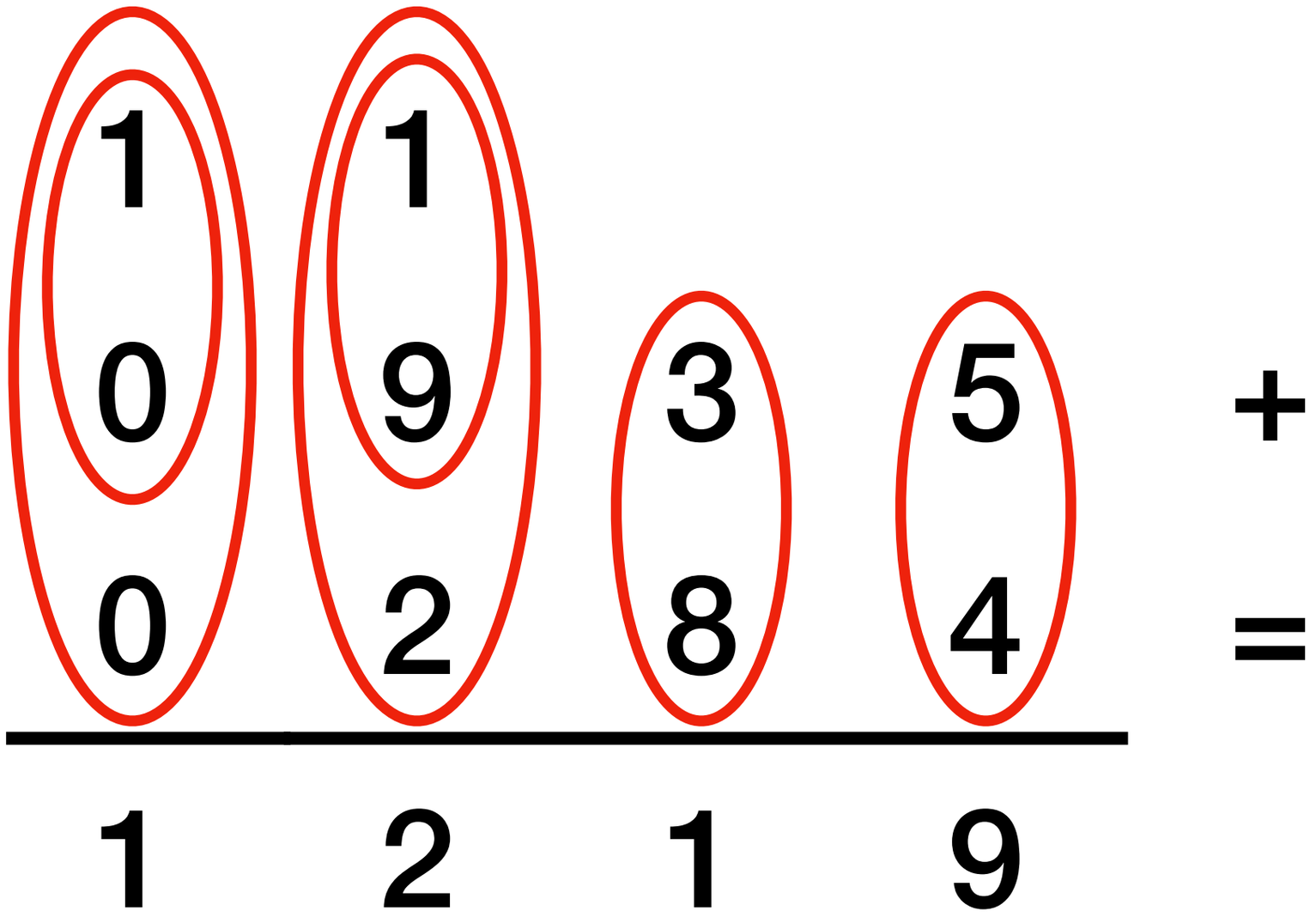


6 op

Exercice 3 du TD1

La bergère, le loup, le mouton et le chou

Le problème

Le problème

Le but

Les règles du jeu

- Les opérations élémentaires :
  - 🚣 peut traverser la rivière toute seule
  - 🚣 peut transporter l'un de 🐺, 🐑, 🥬
    à la fois et le déposer de l'autre côté
- Les contraintes :
  - 🐺 mange 🐑 s'ils sont du même côté sans 🚣
  - 🐑 mange 🥬 s'ils sont du même côté sans 🚣

Exercice 4 du TD1

La solution

transporter 🐑

La solution

transporter 🐑

La solution

transporter 🐑

La solution

transporter 🐑

La solution

transporter 🐑
traverser

La solution

transporter 🐑
traverser

La solution

transporter 🐑
traverser
transporter 🥬

La solution

transporter 🐑
traverser
transporter 🥬

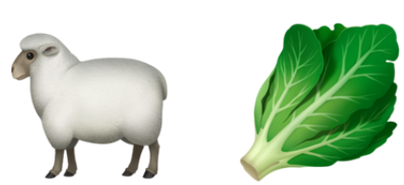
La solution

transporter 🐑
traverser
transporter 🥬

La solution

transporter 🐑
traverser
transporter 🥬

La solution



transporter 🐑
traverser
transporter 🥬
transporter 🐑

La solution

transporter 🐑
traverser
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La solution

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La solution

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La solution

La solution

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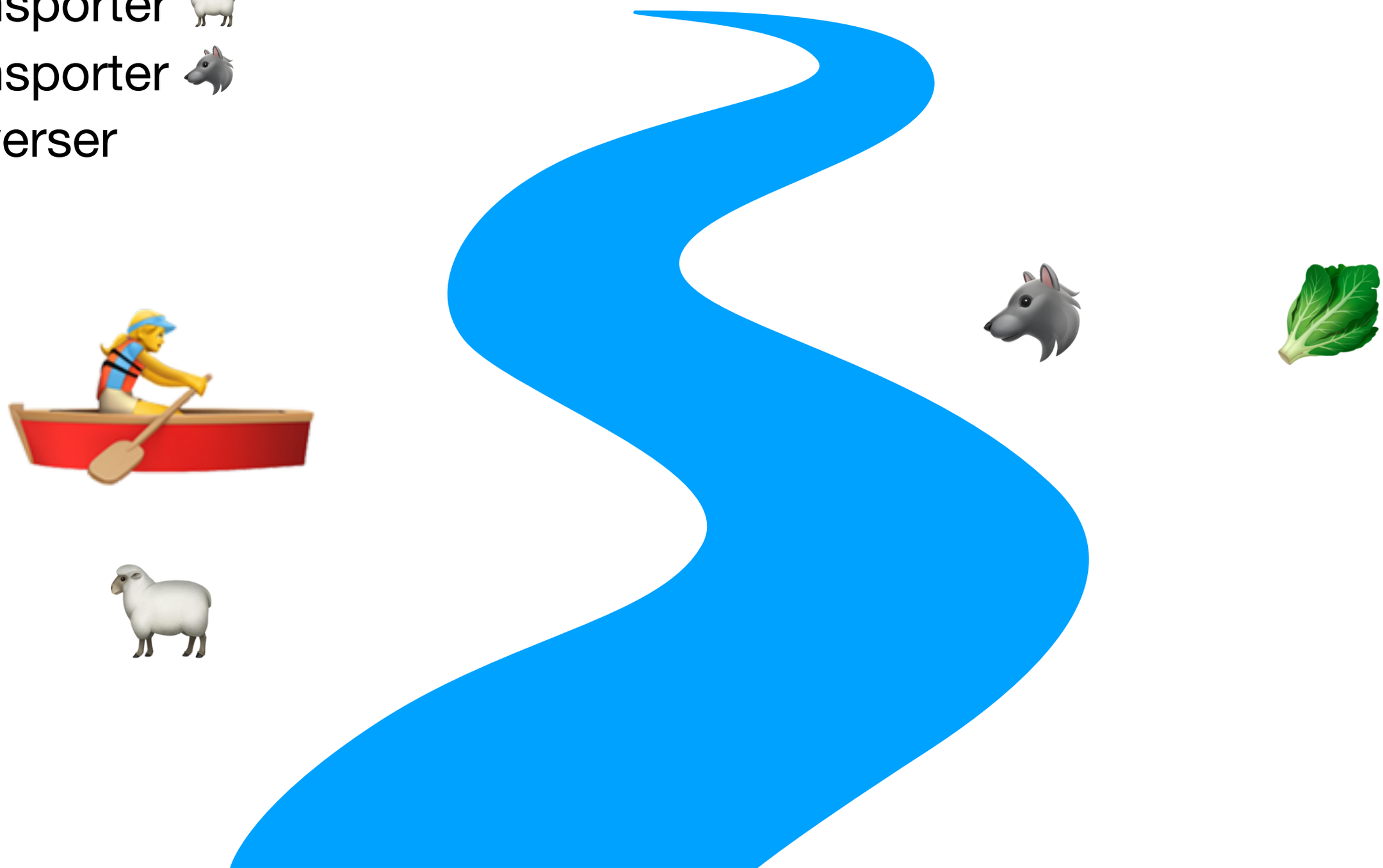
traverser



La solution

transporter 🐑
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La solution

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La solution

La solution

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La solution

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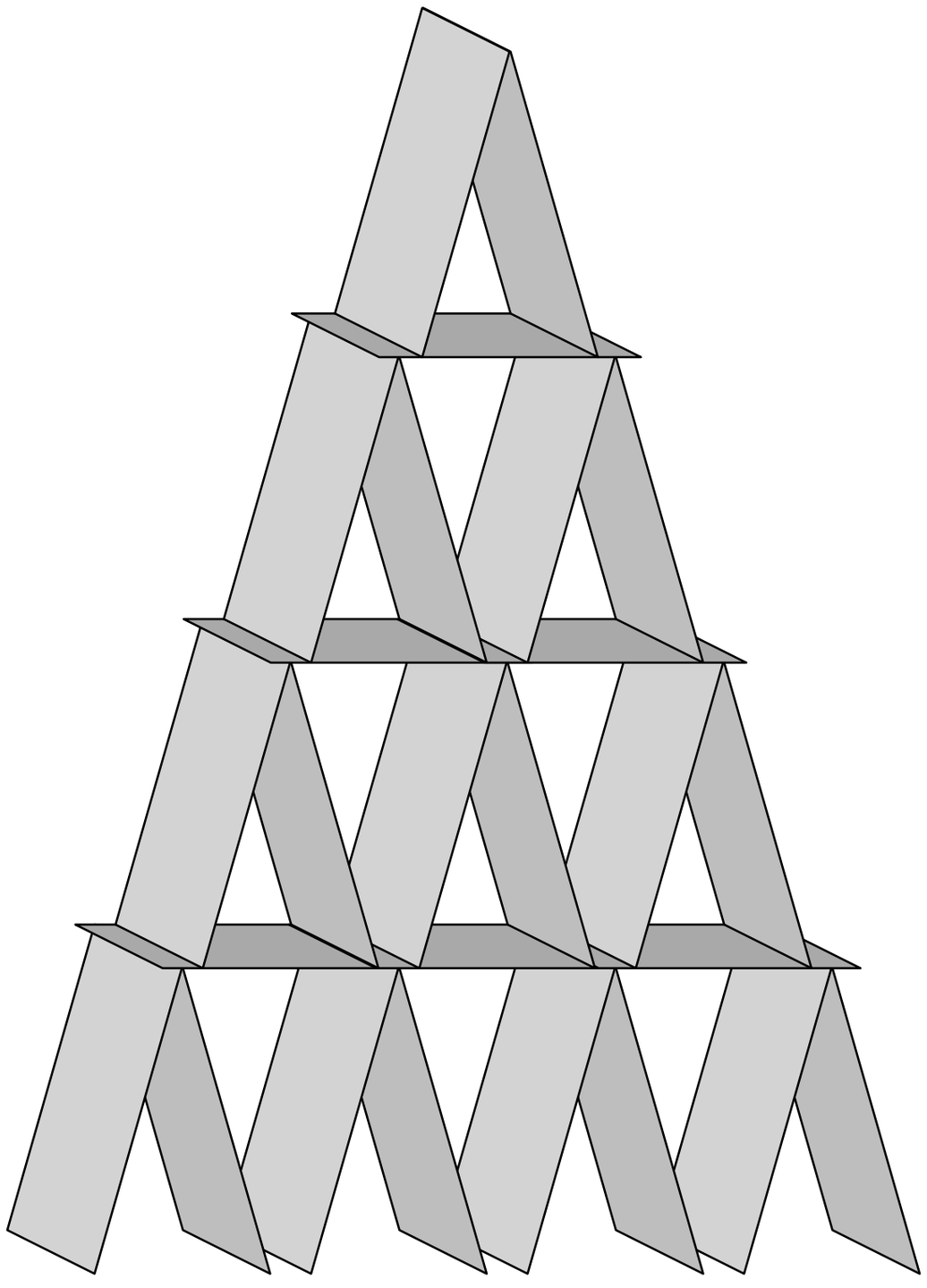
transporter 🐑

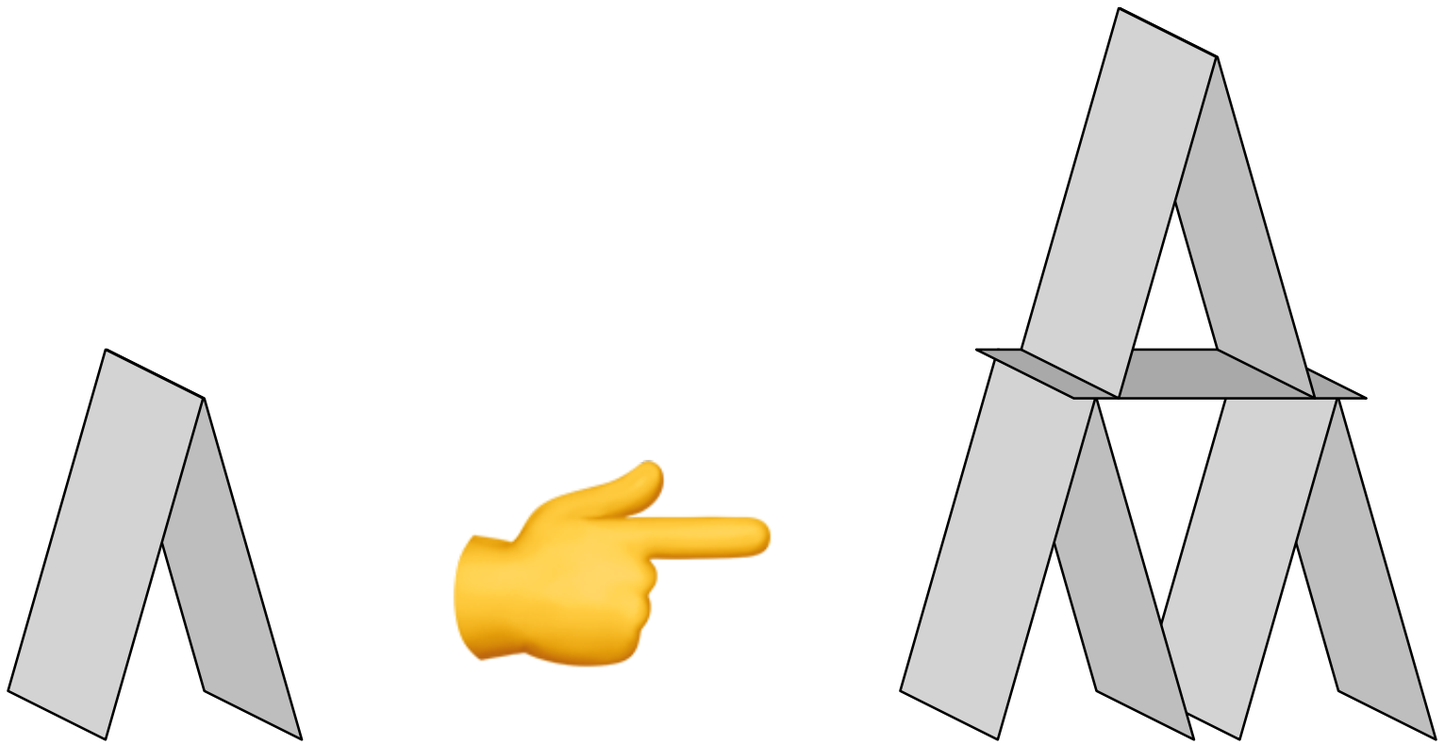
7 op

Exercice 5 du TD1

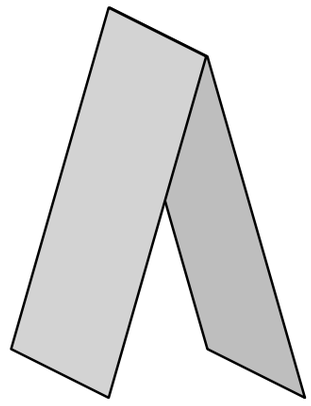
Châteaux de cartes



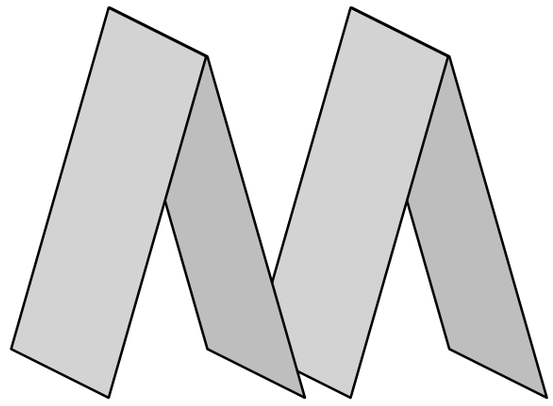
1 niveau 👉 2 niveaux ?



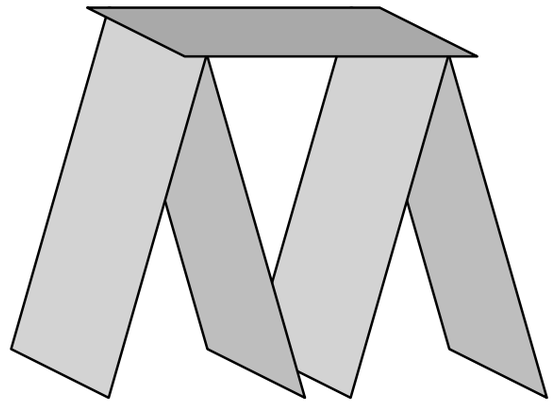
1 niveau 👉 2 niveaux



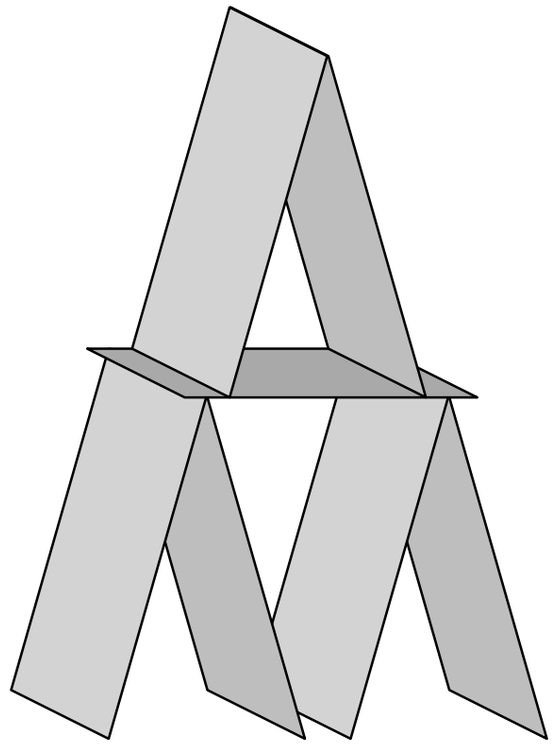
1 niveau 👉 2 niveaux



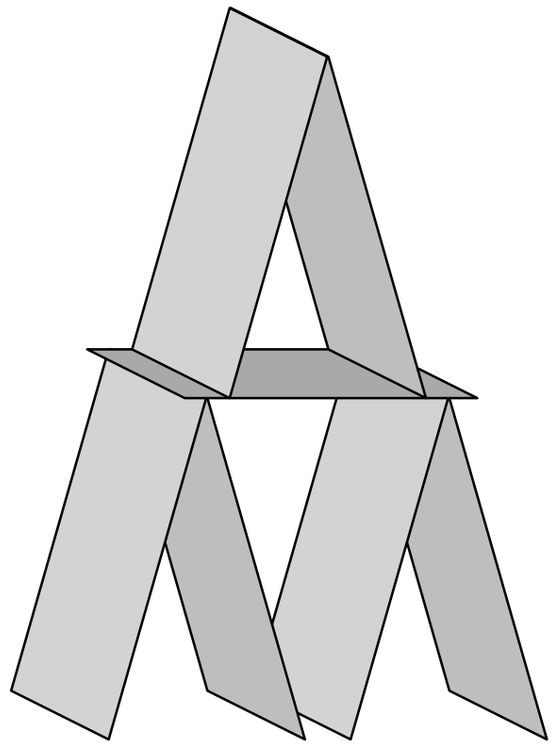
1 niveau 👉 2 niveaux



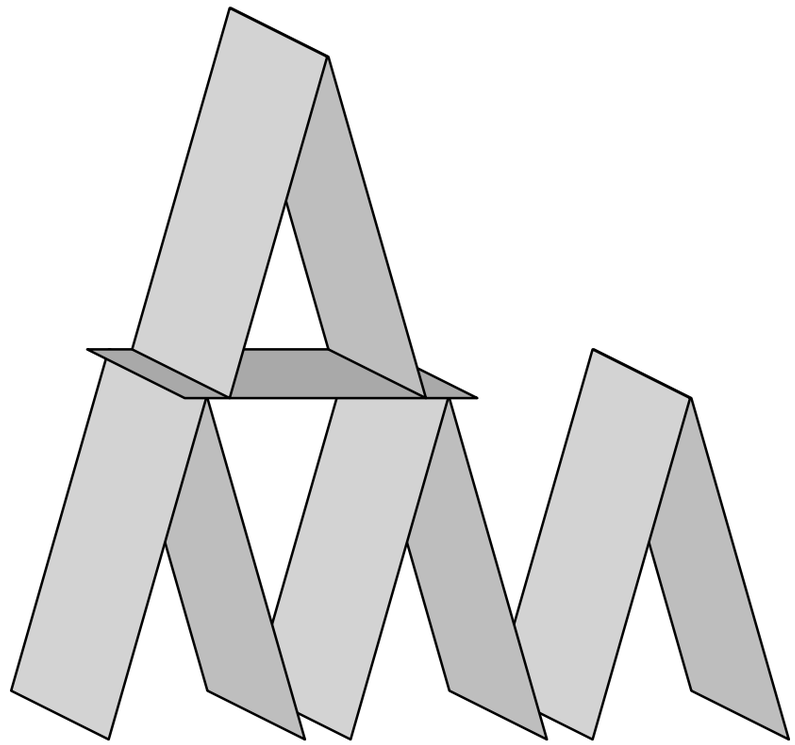
1 niveau 👉 2 niveaux



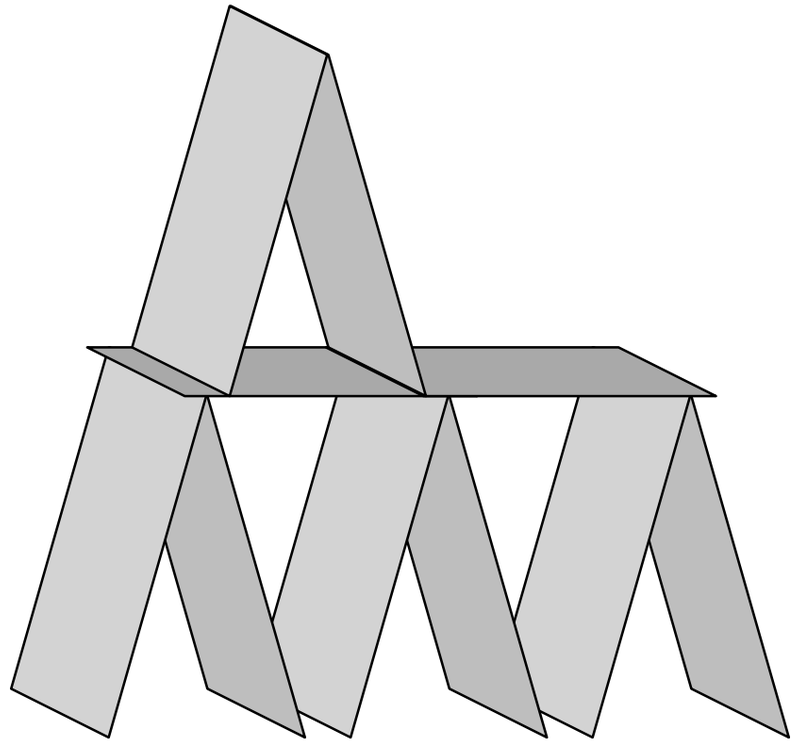
2 niveaux 👉 3 niveaux



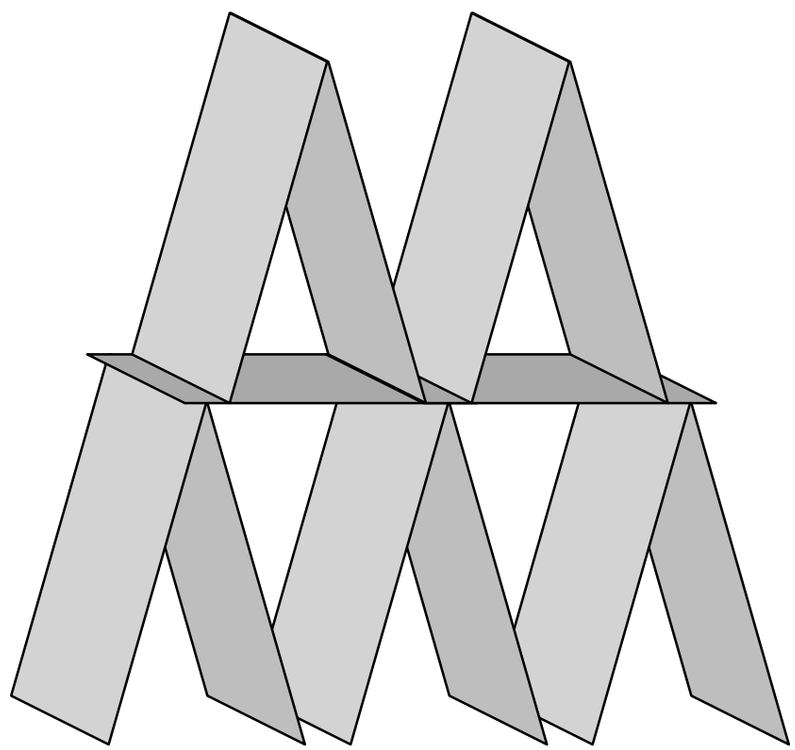
2 niveaux 👉 3 niveaux



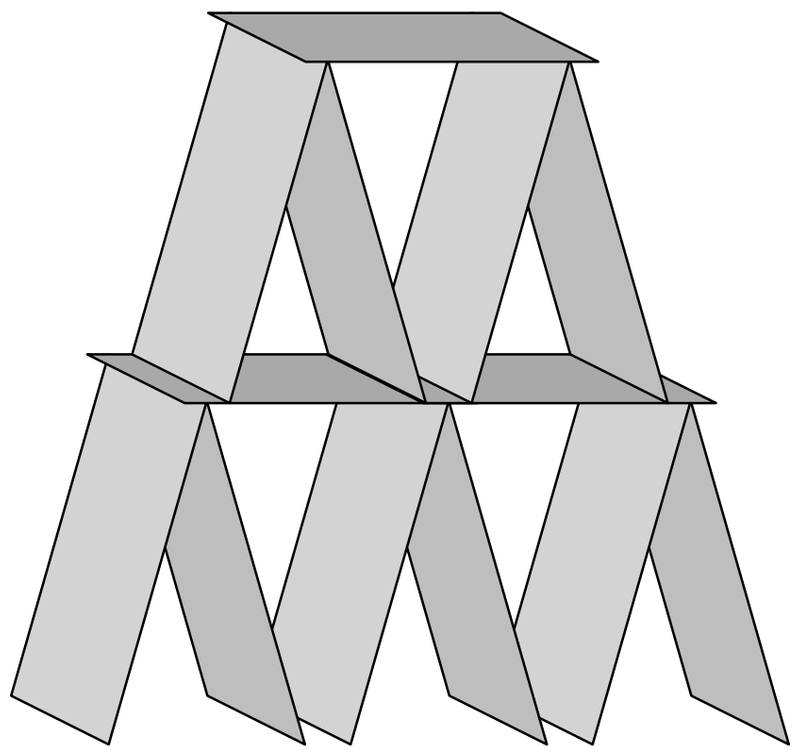
2 niveaux 👉 3 niveaux



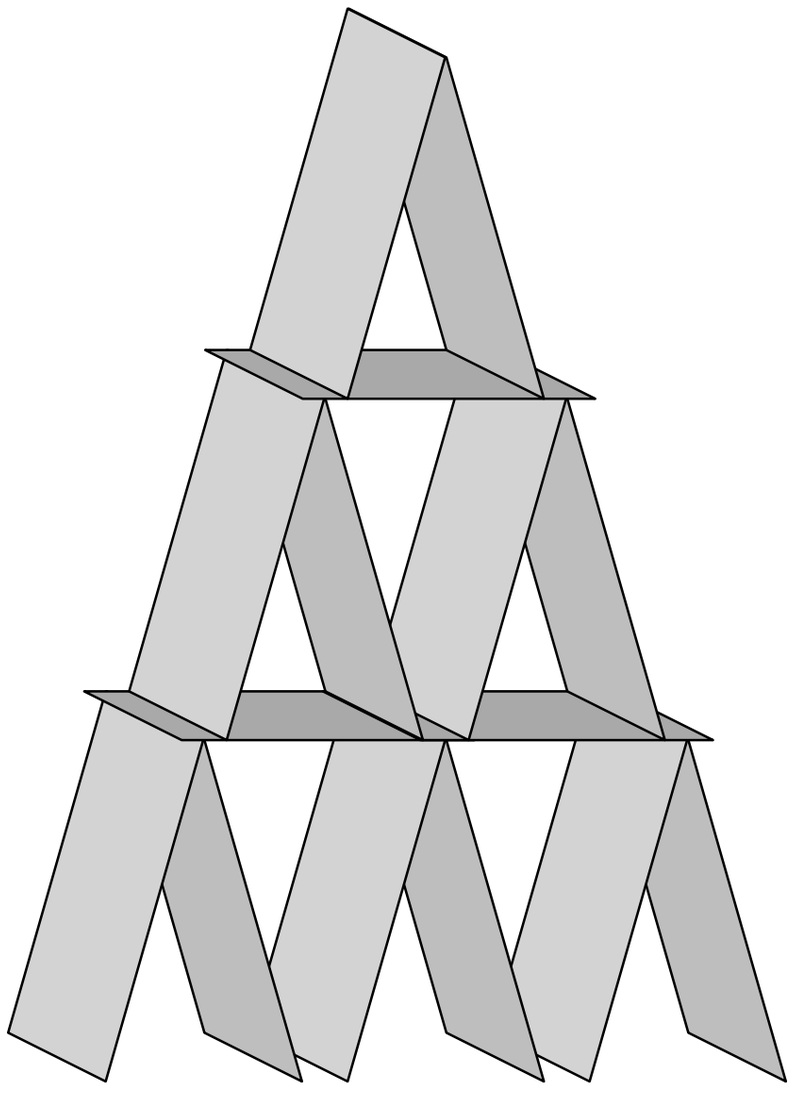
2 niveaux 👉 3 niveaux



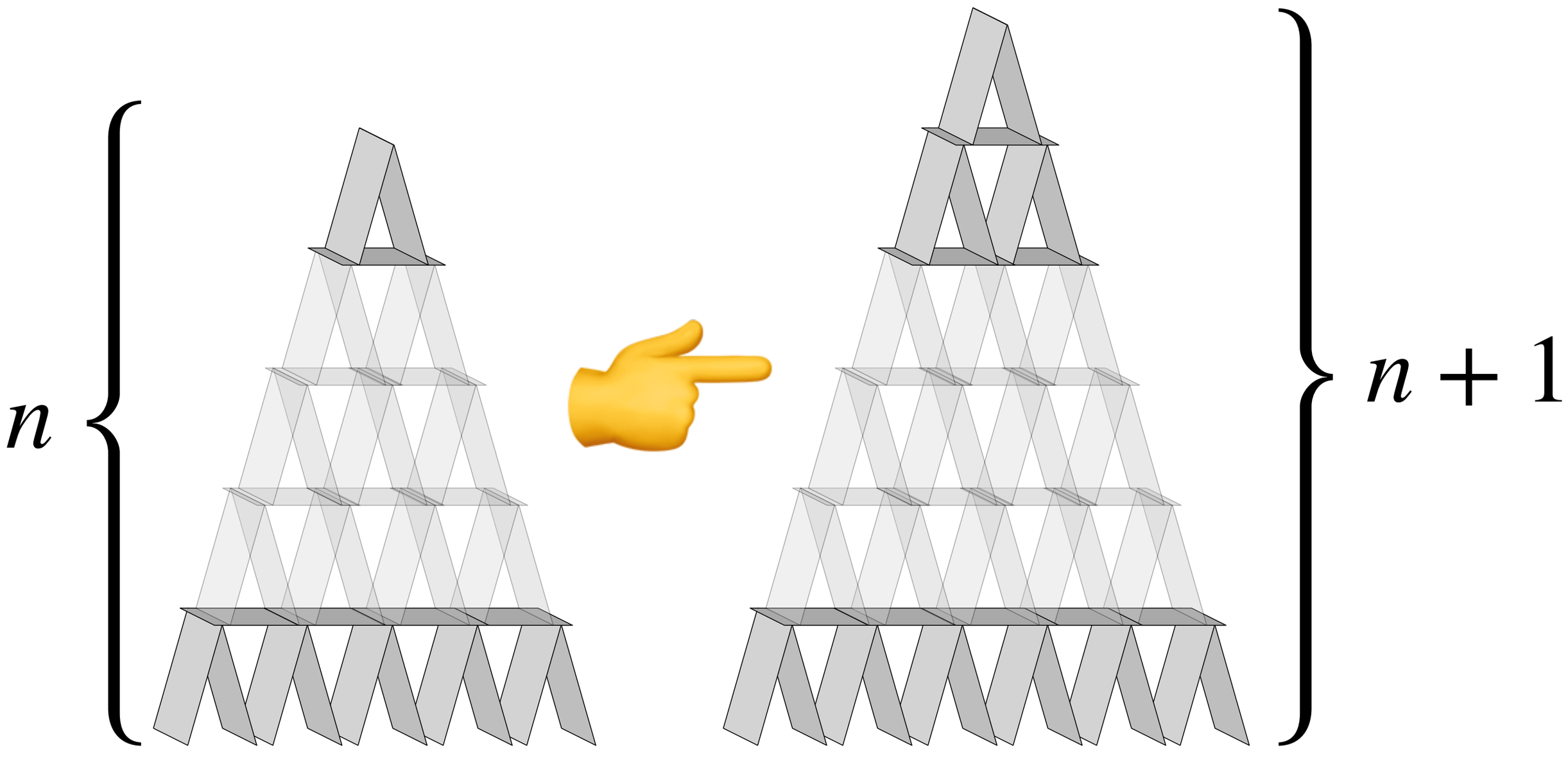
2 niveaux 👉 3 niveaux



2 niveaux 👉 3 niveaux



n niveaux 👉 $n+1$ niveaux ?



Exercice 6 du TD1

Chiffrement de César

the rebels, the troublemakers,
the round pegs in the square holes.
The ones who see things differently.
They're not fond of rules. And they
have no respect for the status quo.
You can quote them, disagree with
them, glorify or vilify them, About
the only thing you can't do is ignore
them. Because they change

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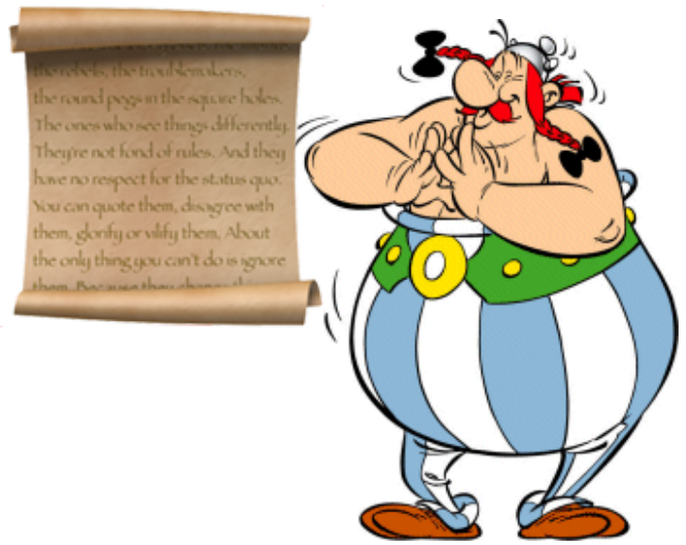
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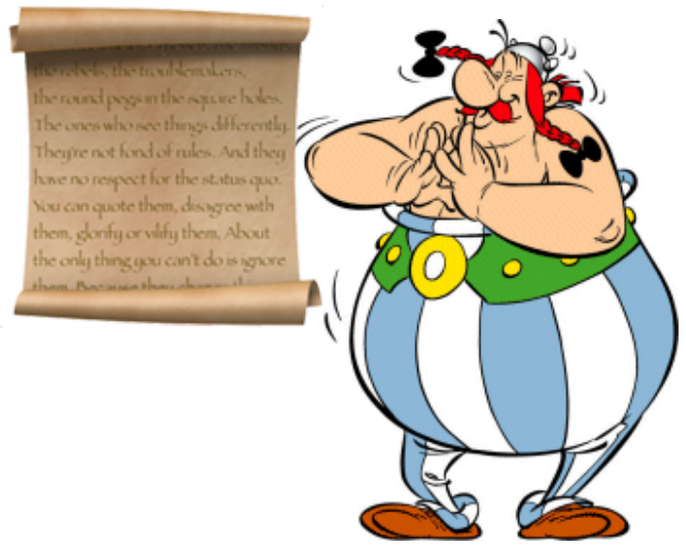
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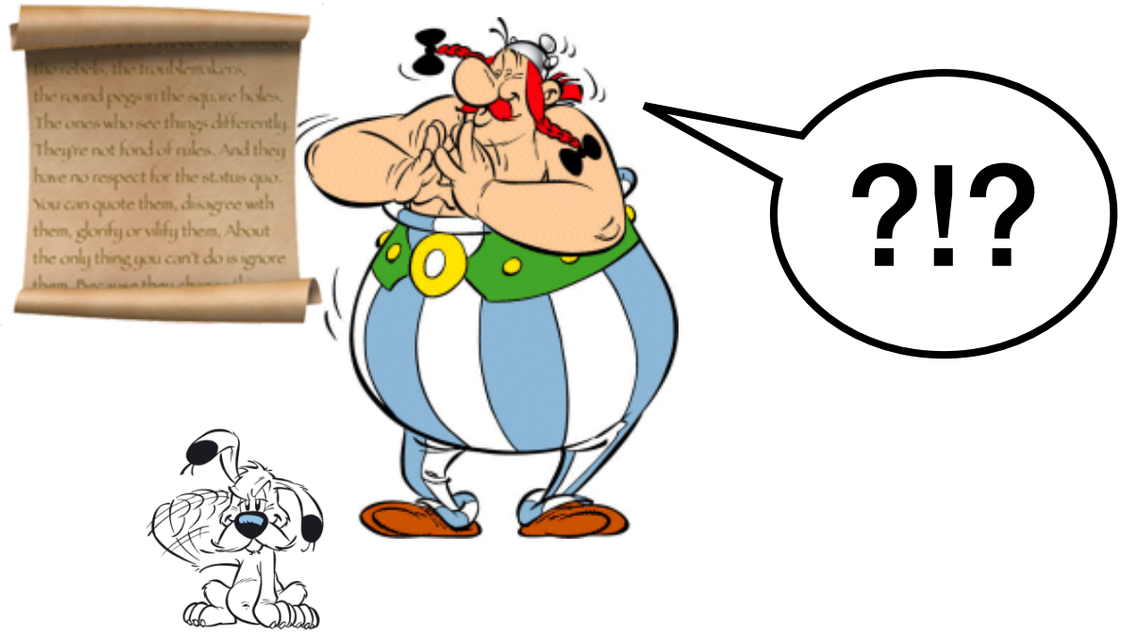
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You can quote them, disagree with
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the only thing you can't do is ignore
?!?

Chiffrement de César

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

salut

Chiffrement de César

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

🔑 = 5

salut

Chiffrement de César

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

🔑 = 5

salut

Chiffrement de César

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e

🔑 = 5

salut

Chiffrement de César

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e

🔑 = 5

salut 👉 xfqzy

Exercice 7 du TD1

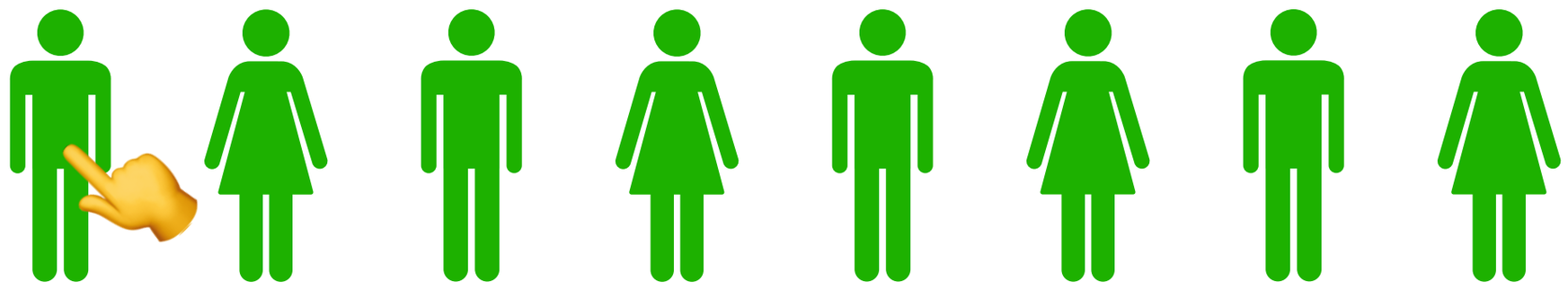
On est combien dans la salle ?

Comptage séquentiel

Comptage séquentiel

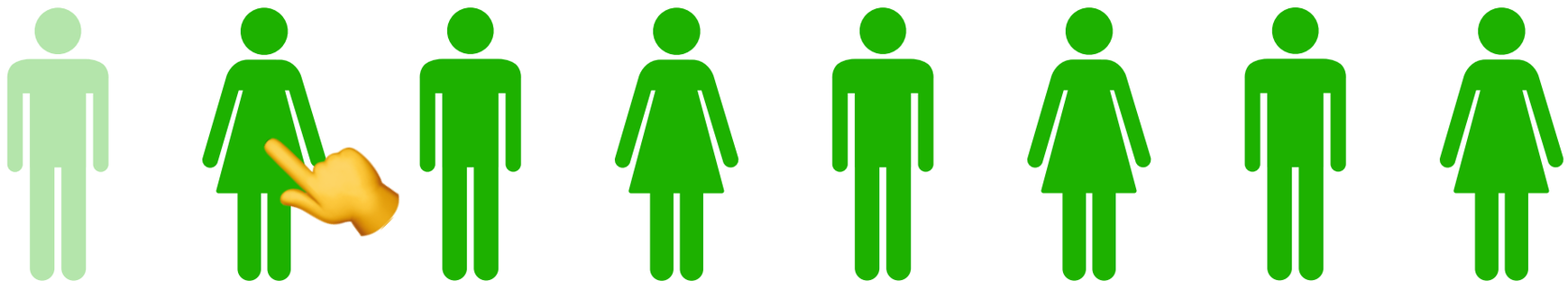
0

Comptage séquentiel



1

Comptage séquentiel



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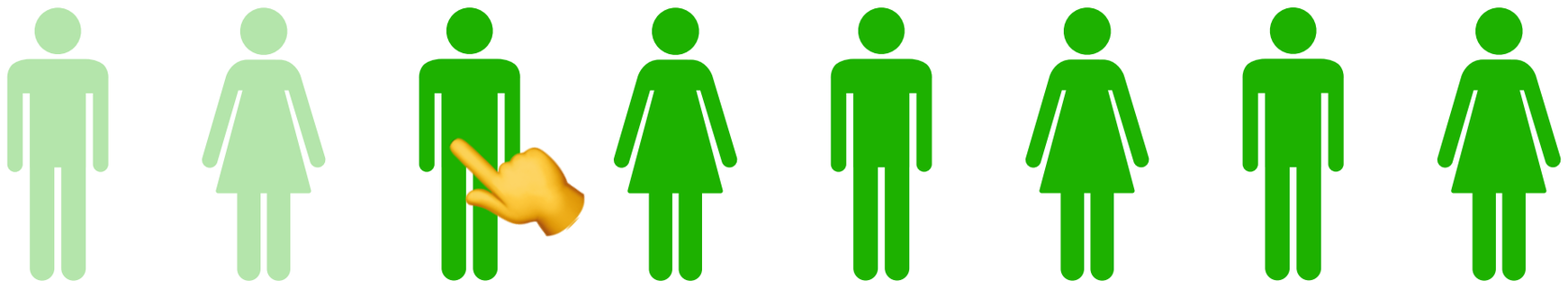


3

Comptage séquentiel

23

Comptage séquentiel

24

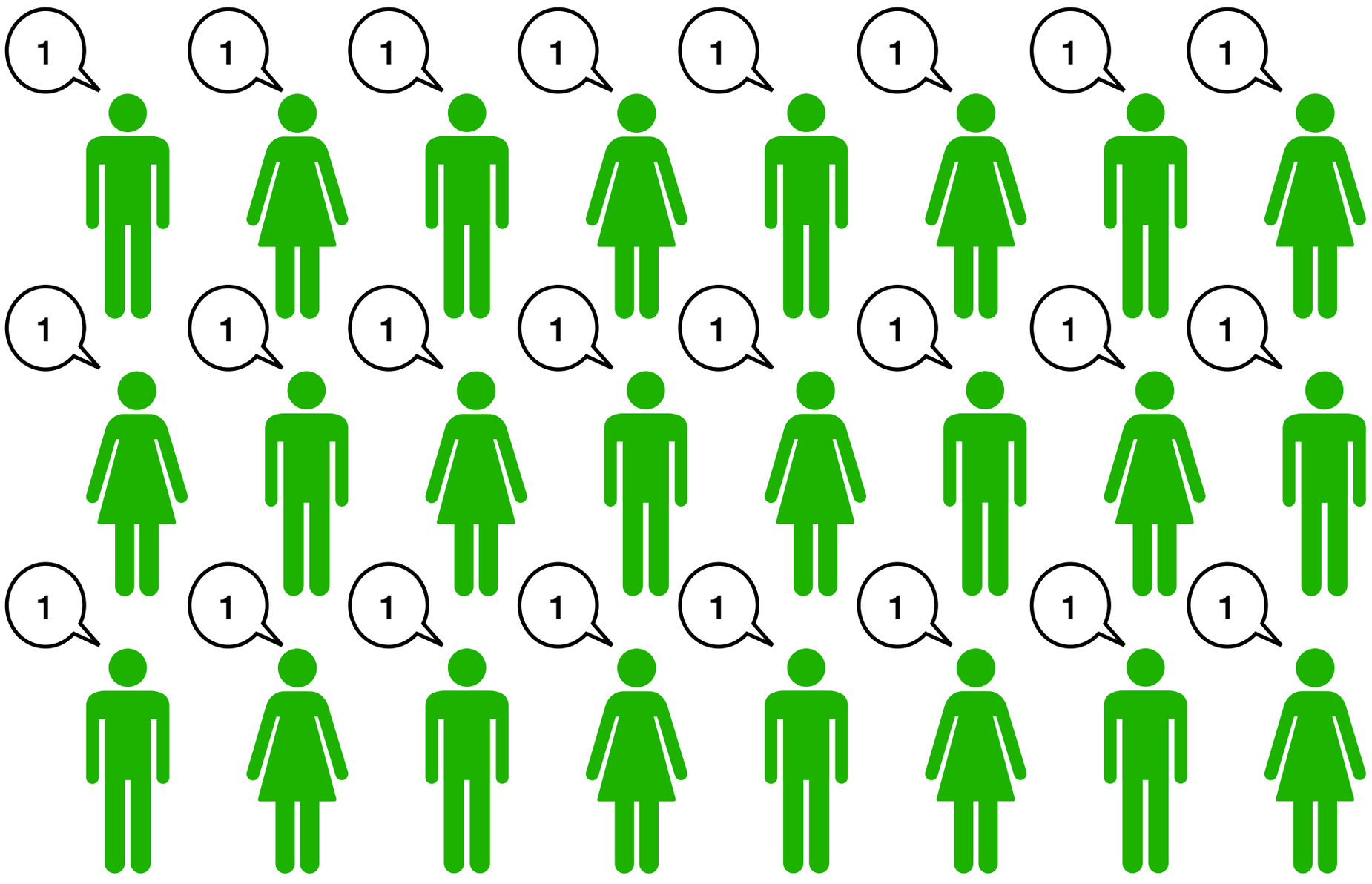
Comptage séquentiel

24

Est-qu’on peut compter plus vite ?

Comptage distribué

Comptage distribué



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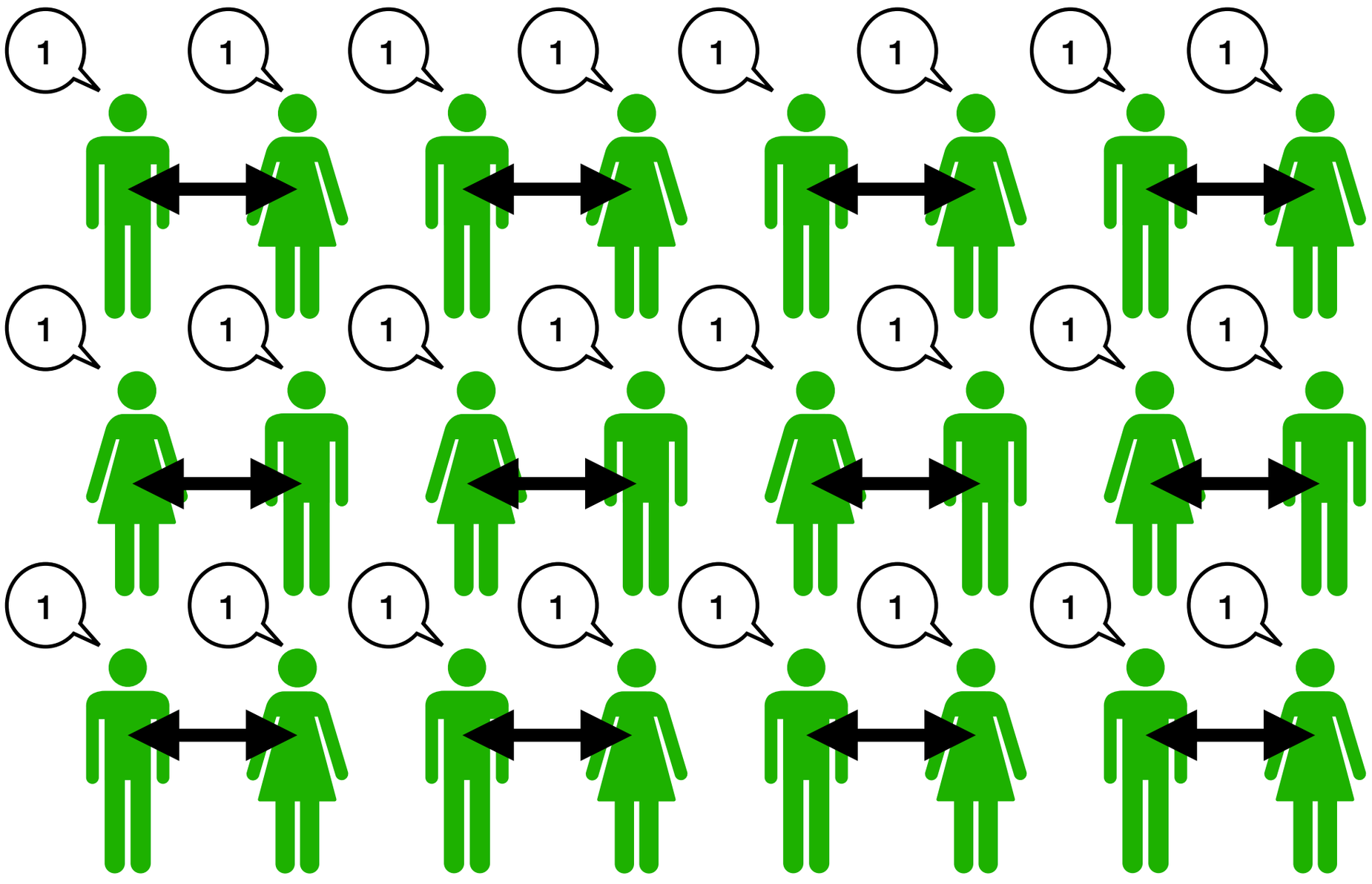

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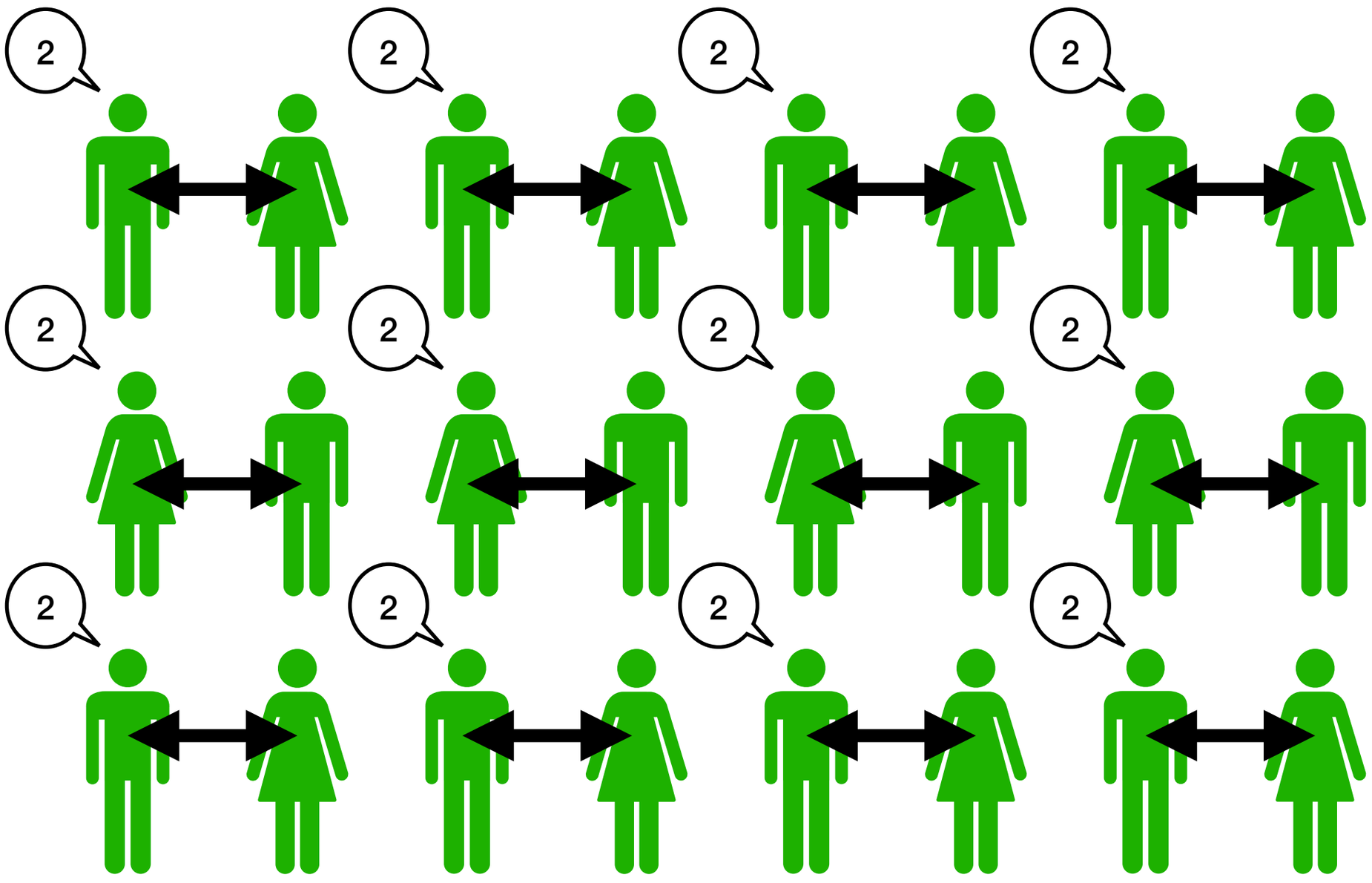

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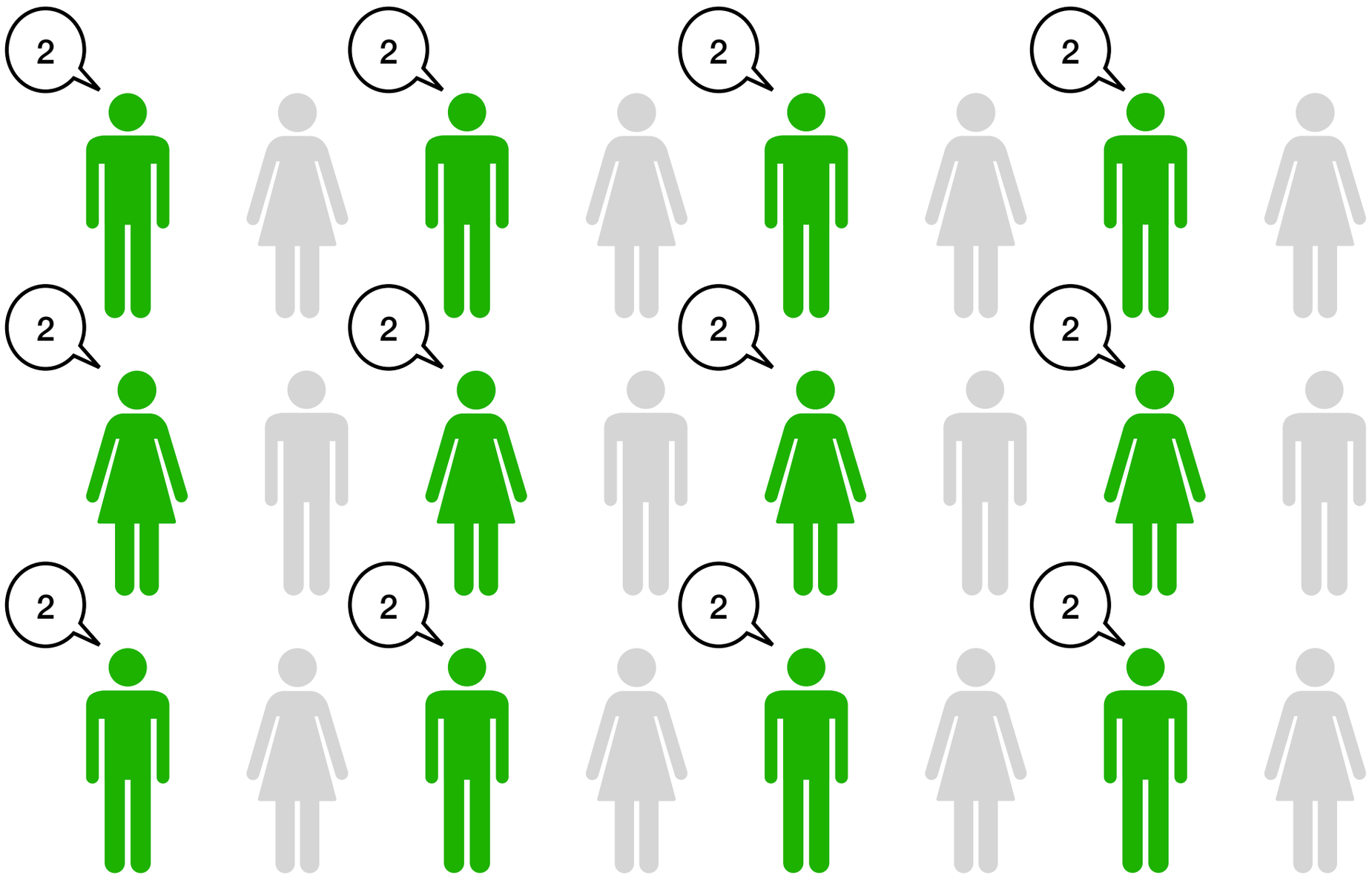

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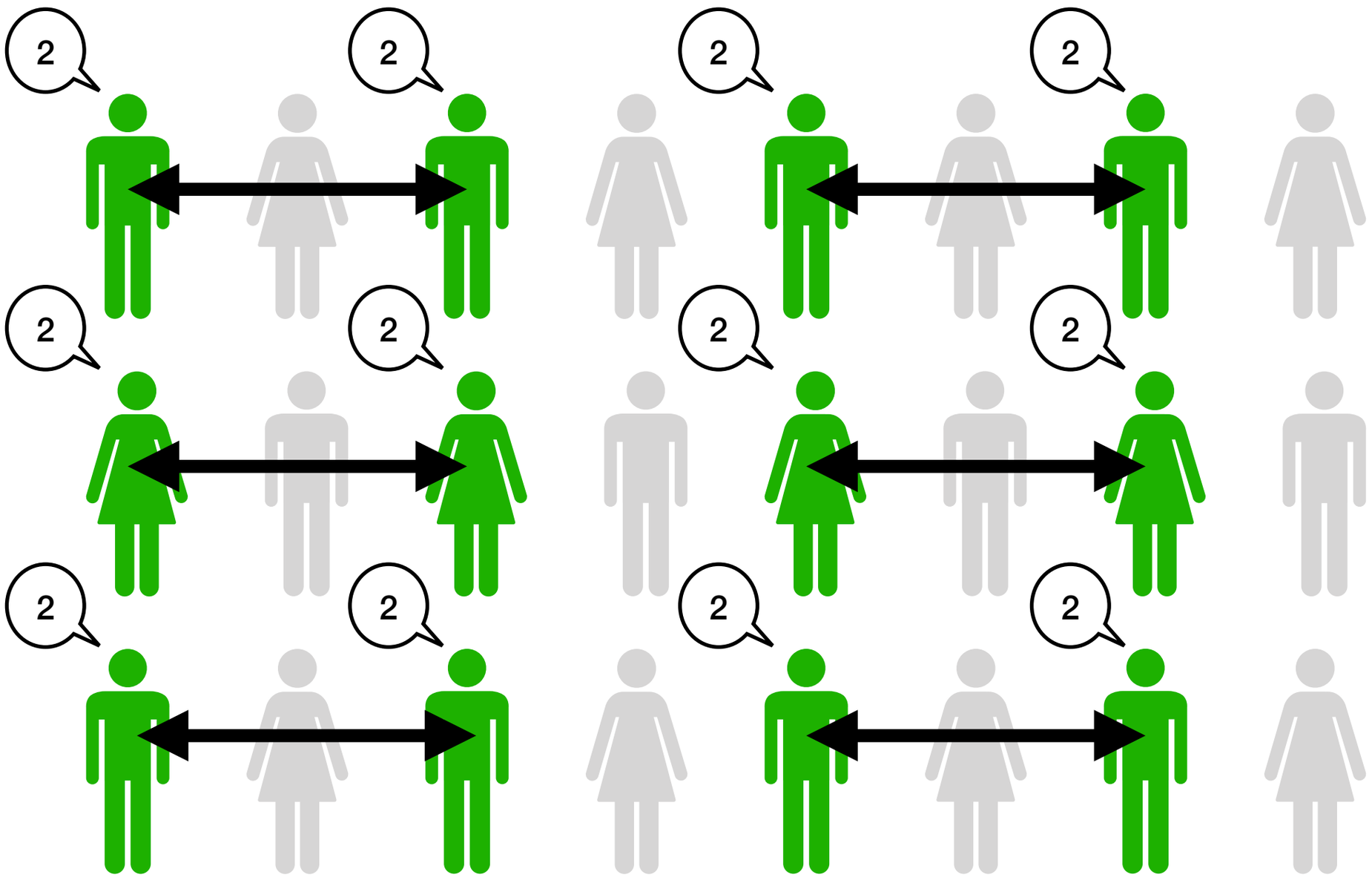

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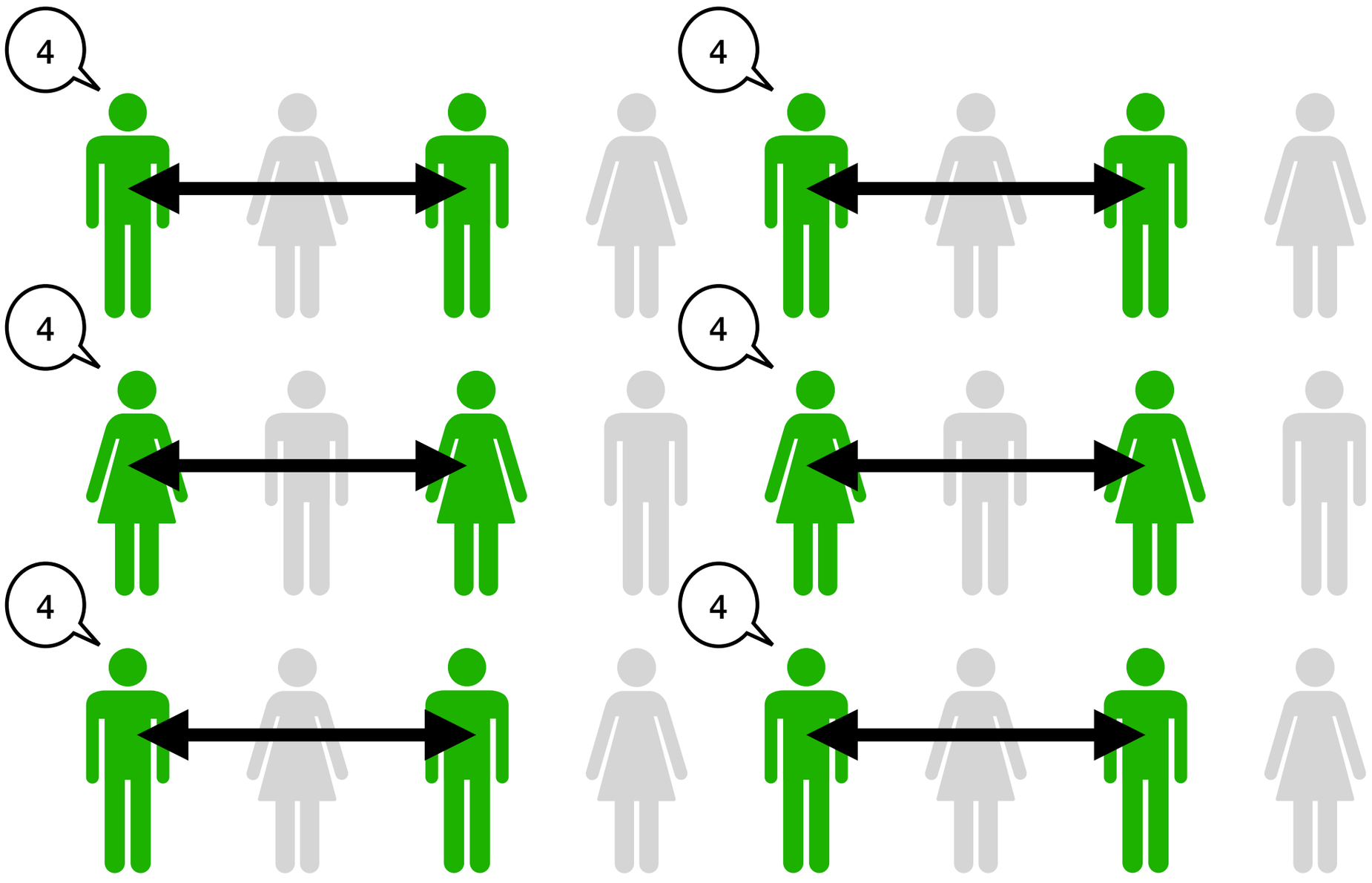

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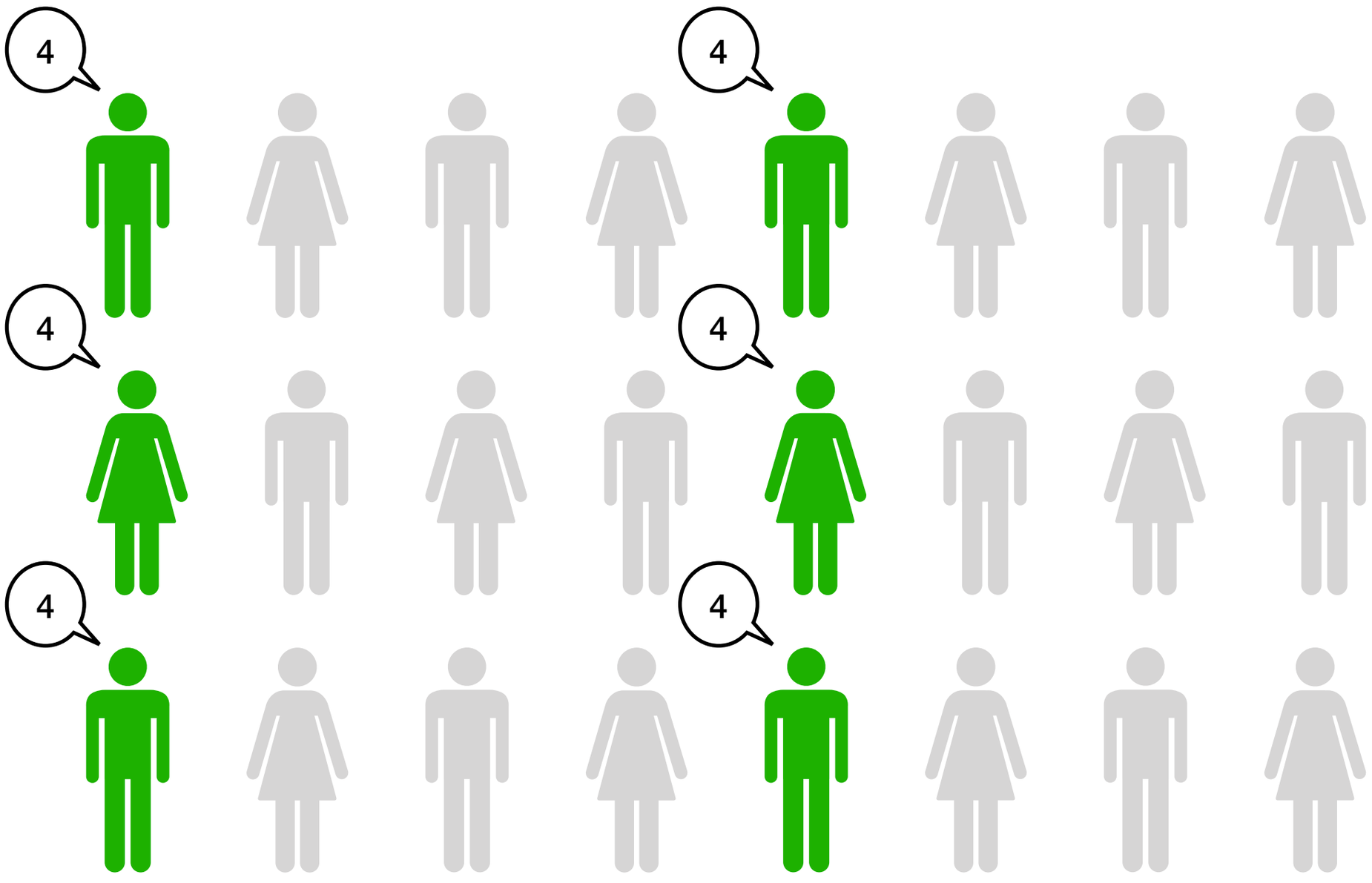

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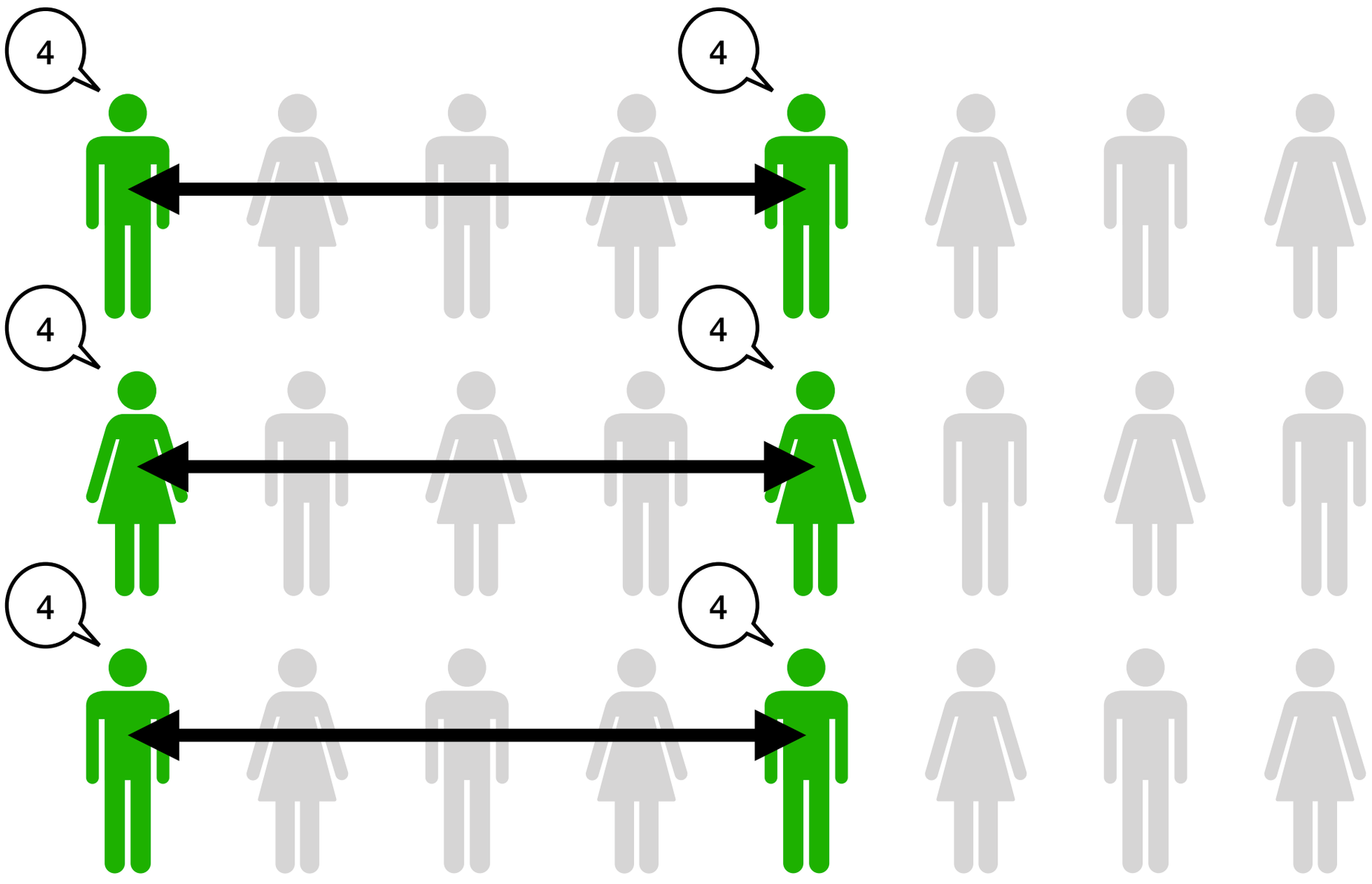

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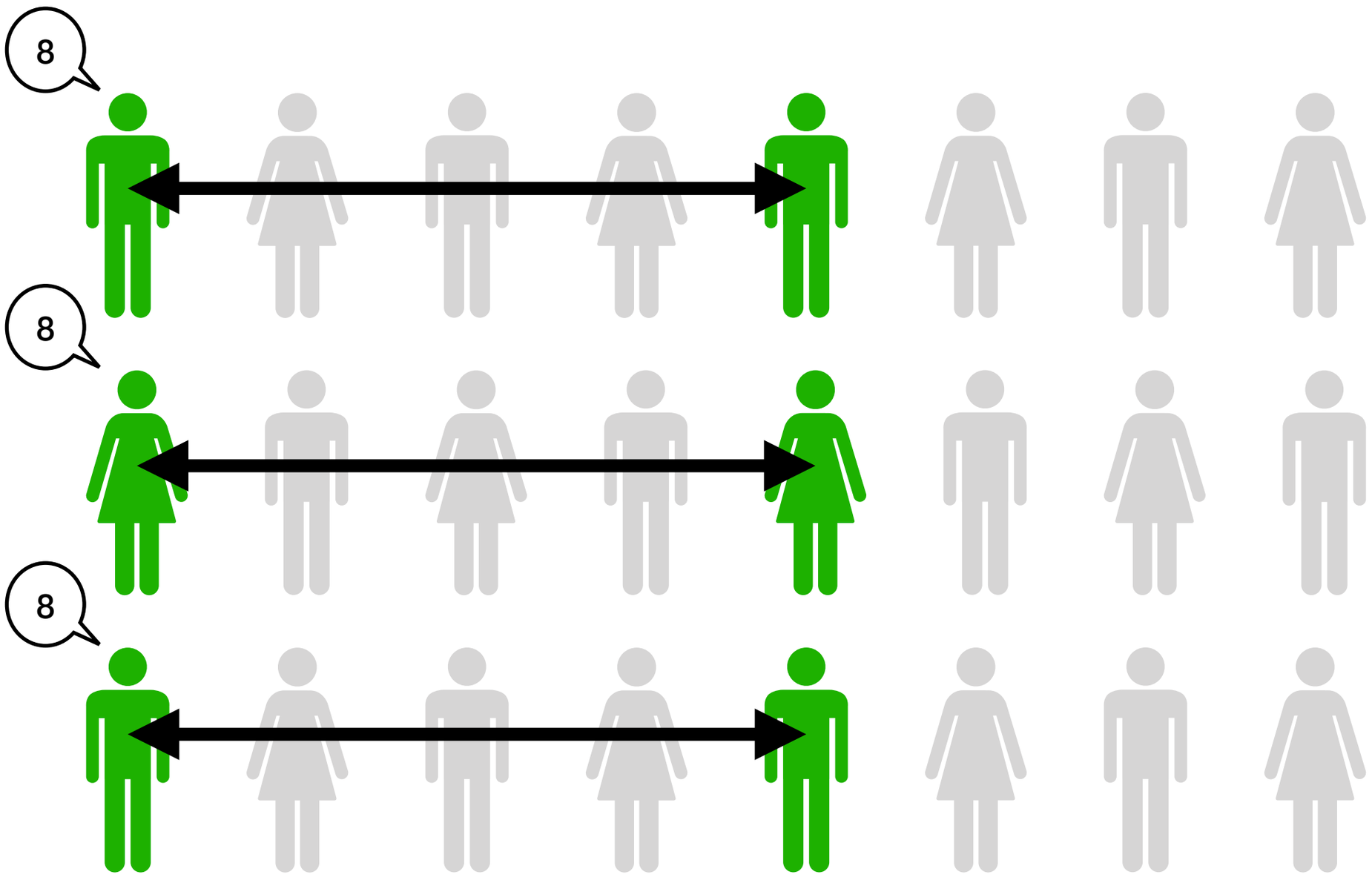

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