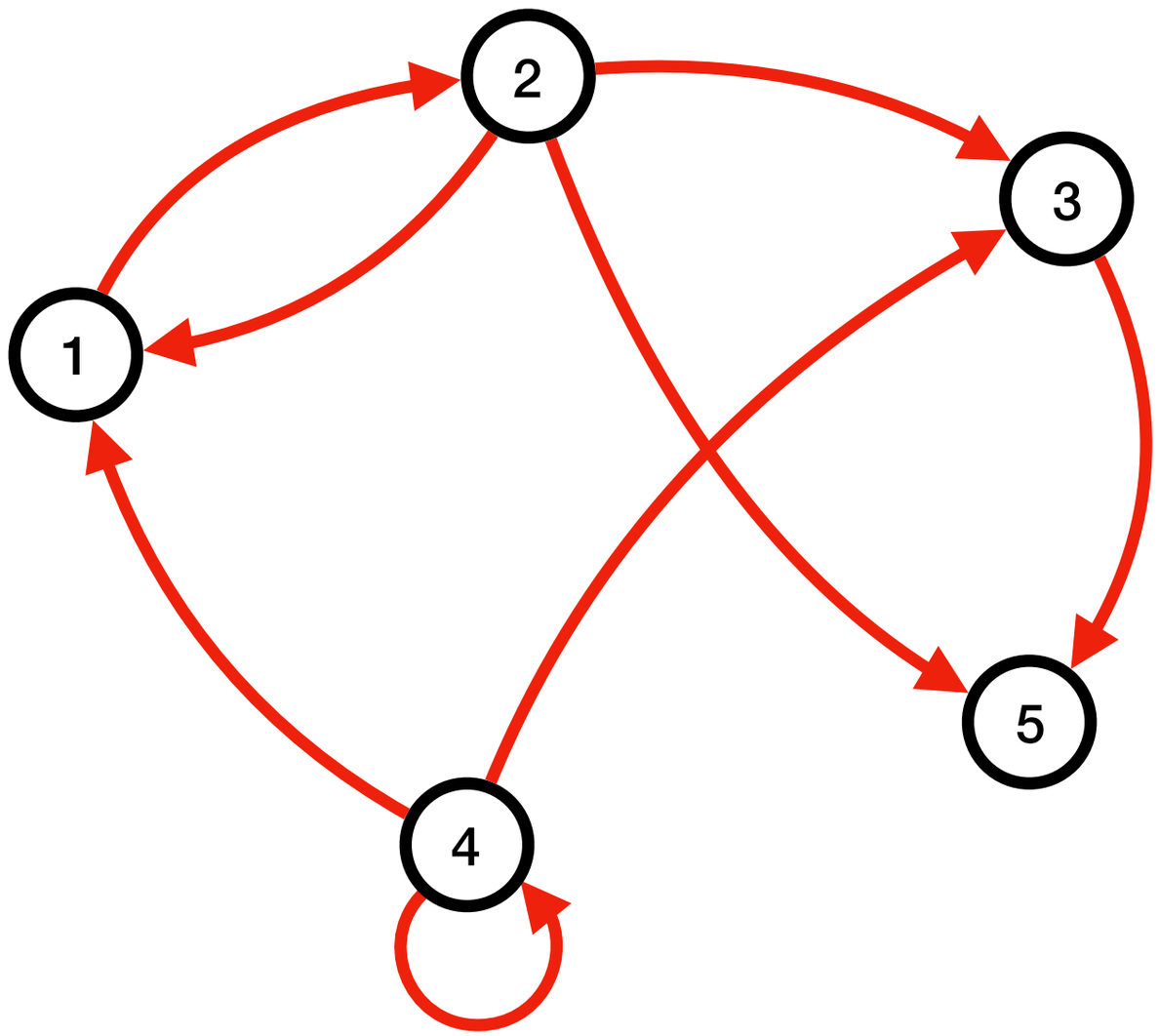
Introduction à l’informatique CM7

Antonio E. Porreca
https://aeporreca.org/introinfo

Graphes

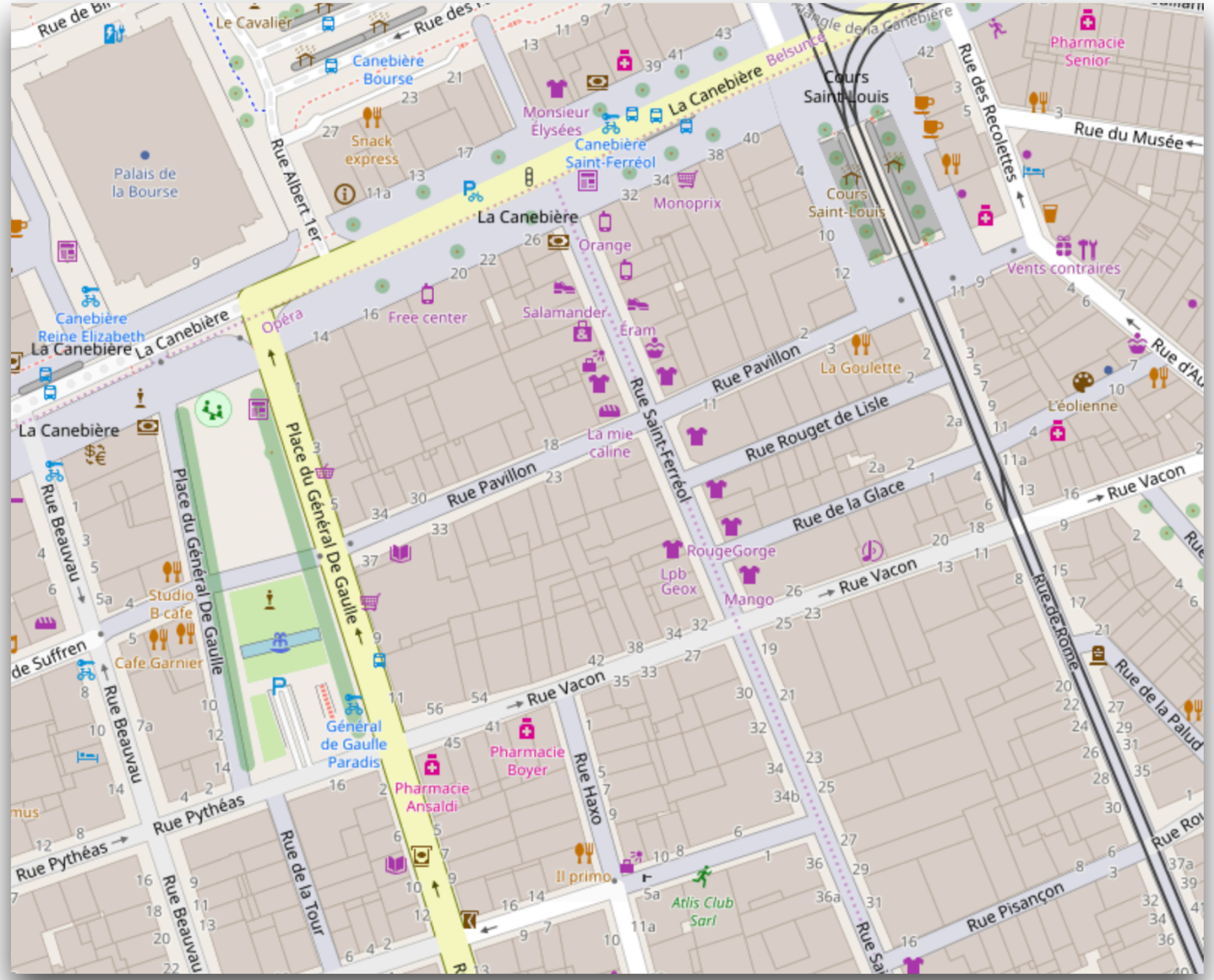
Graphes (orientés)

sommets (nœuds, points)



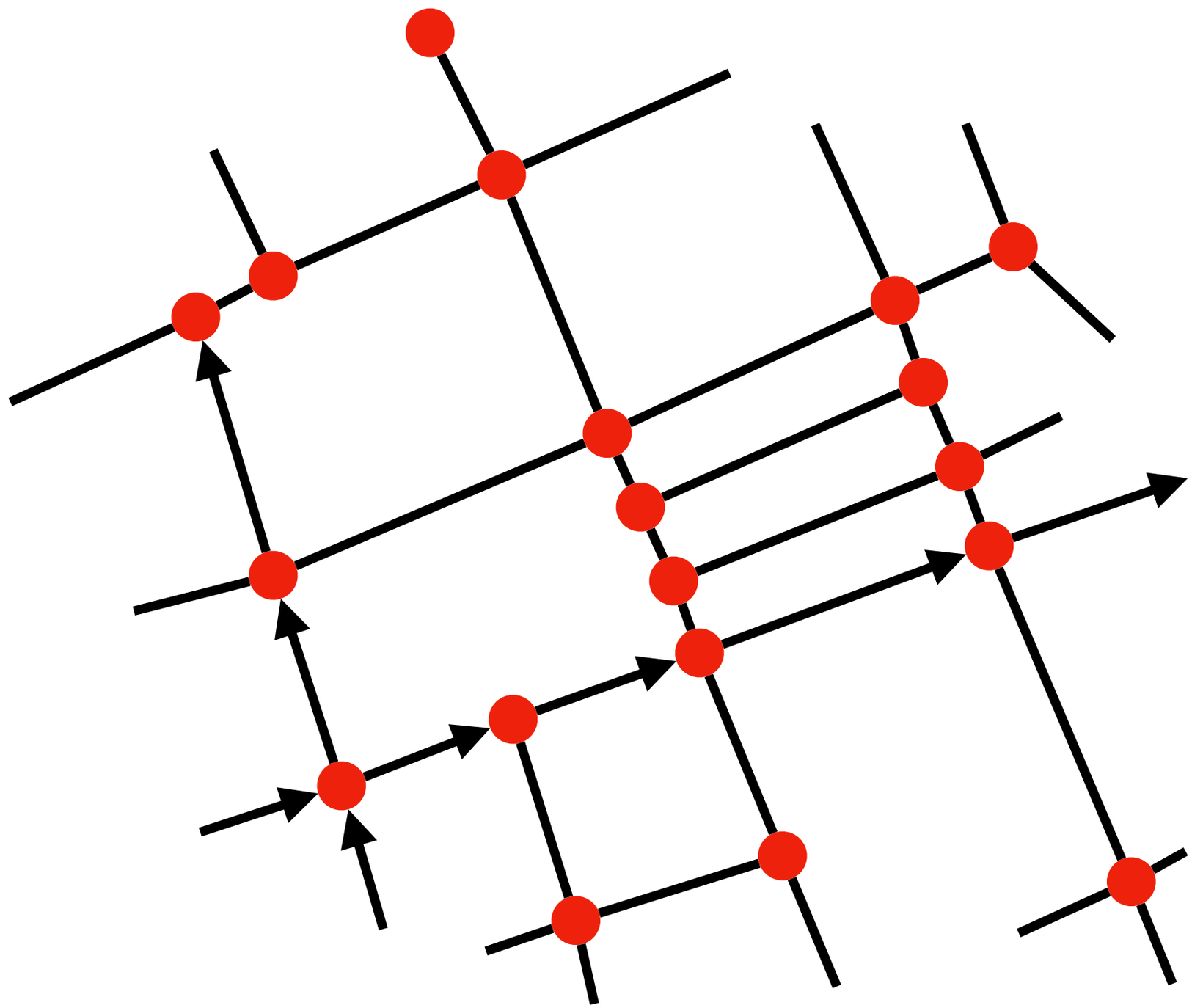
arcs

Plan d’une ville

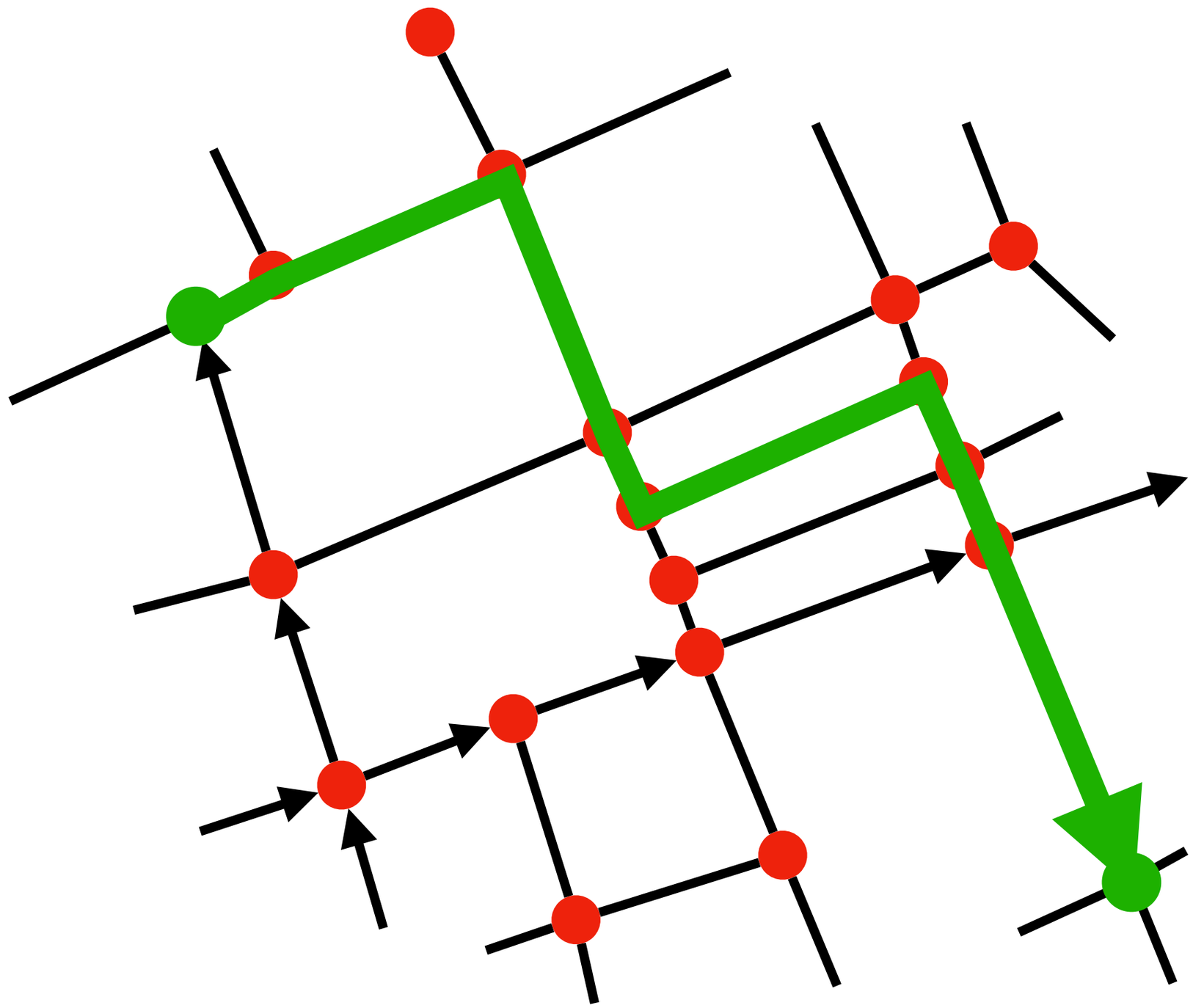


Plan d’une ville

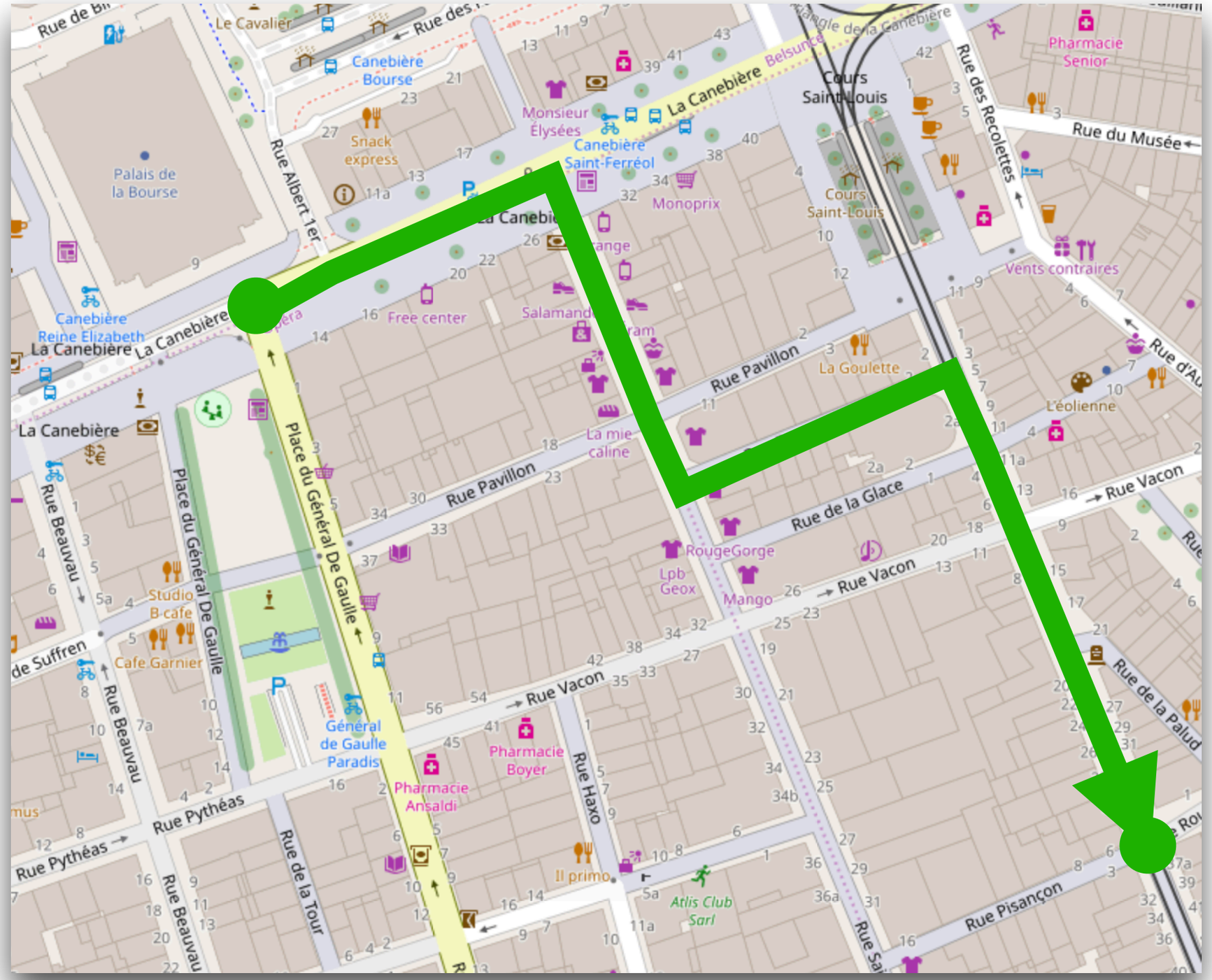
Plan d’une ville



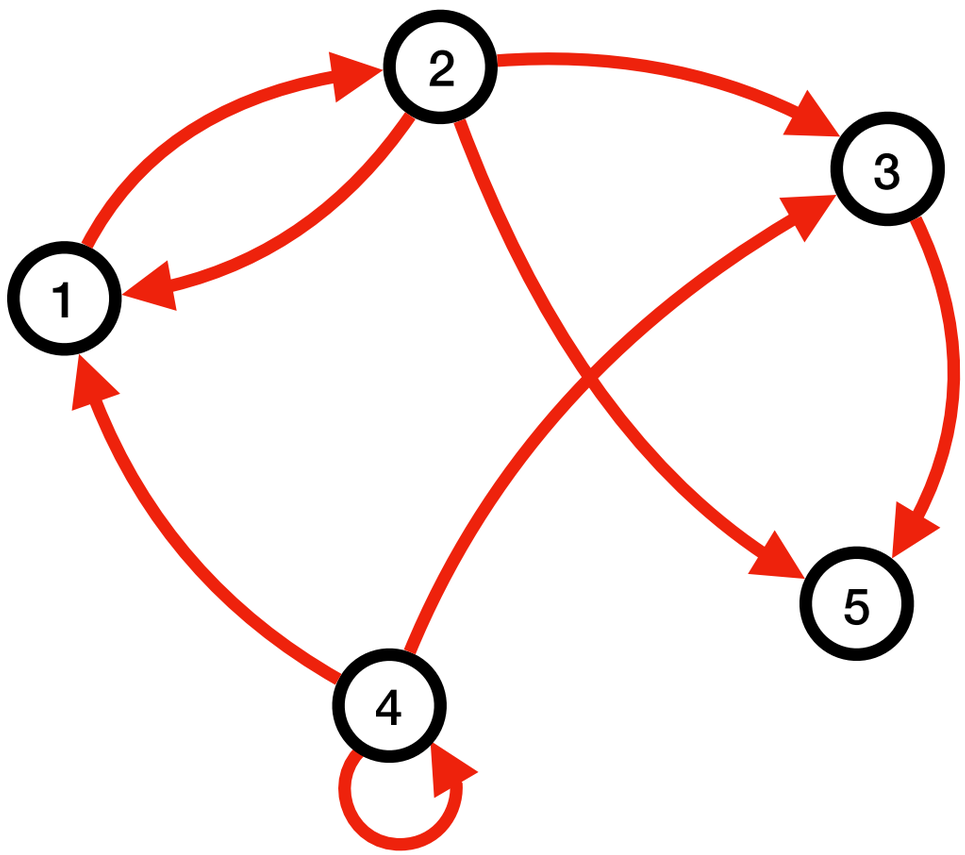
Plan d’une ville



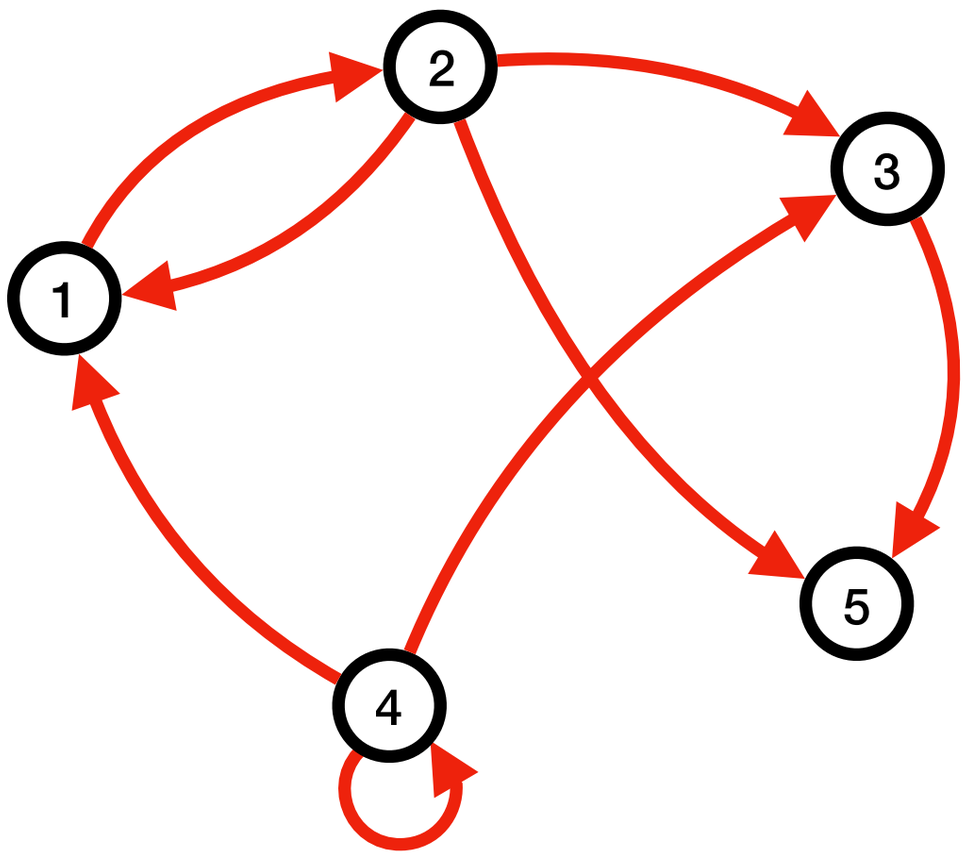
Plan d’une ville



Matrices d’adjacence

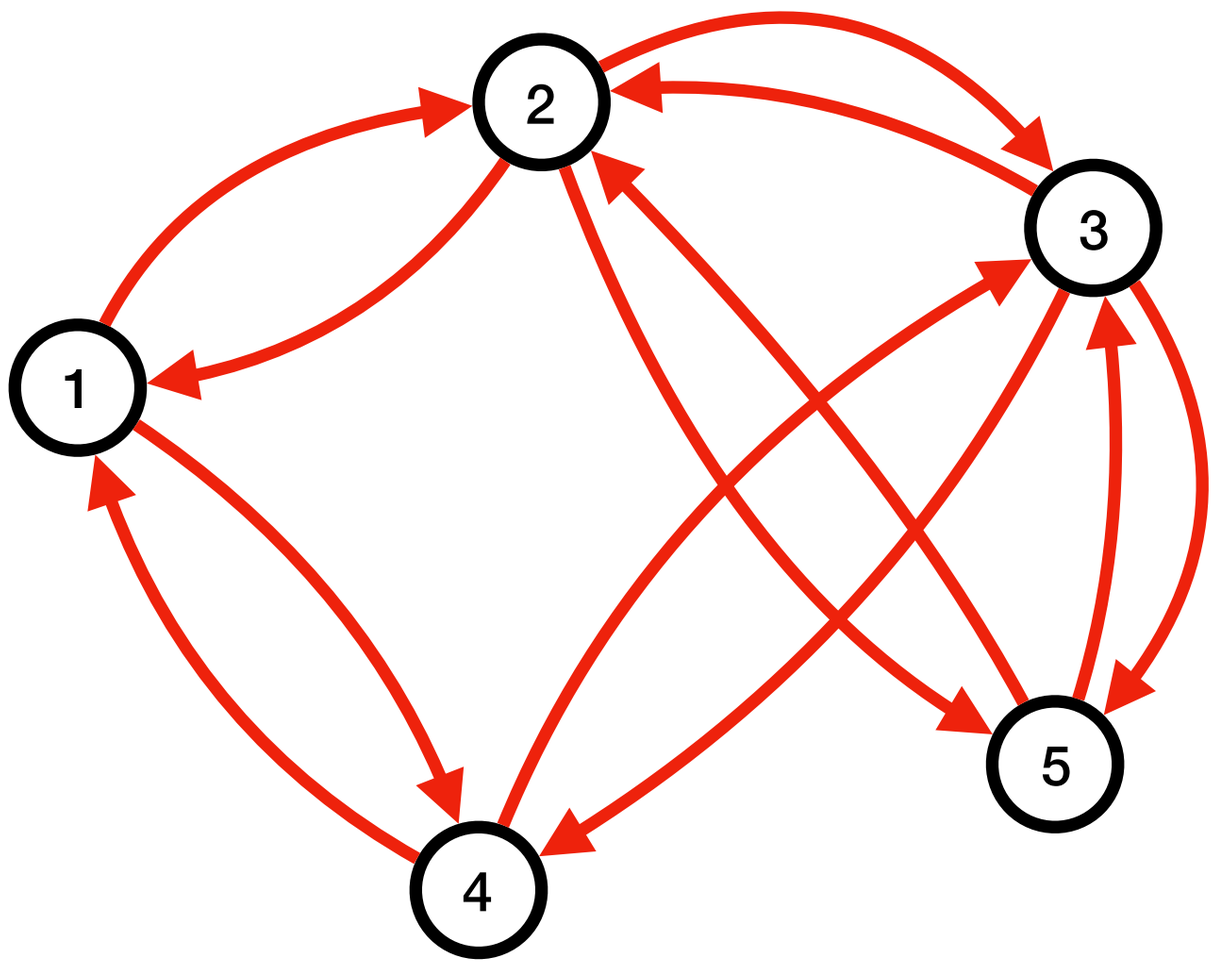


Matrices d'adjacence

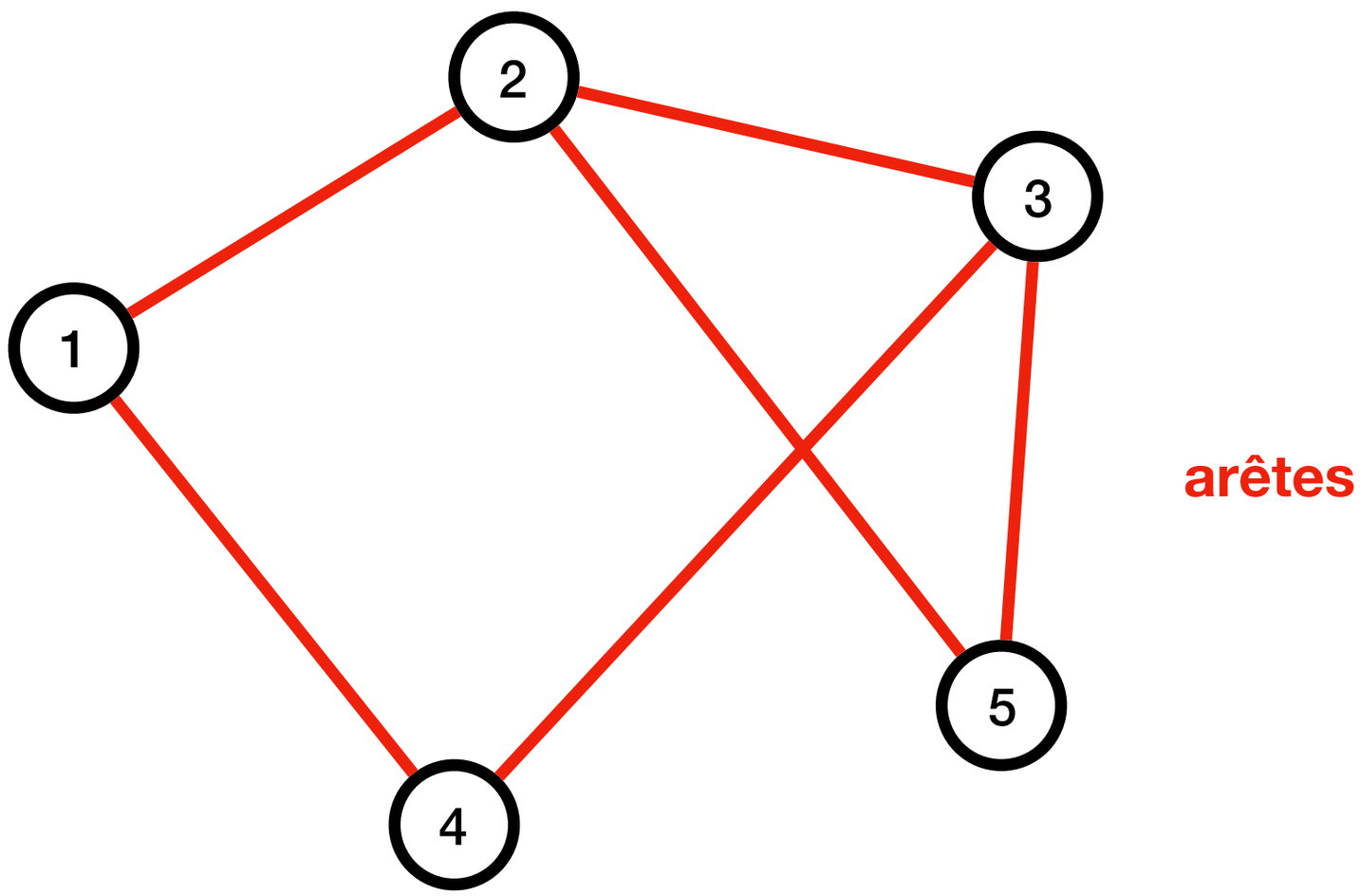


	1	2	3	4	5
1	0	1	0	0	0
2	1	0	1	0	1
3	0	0	0	0	1
4	1	0	1	1	0
5	0	0	0	0	0

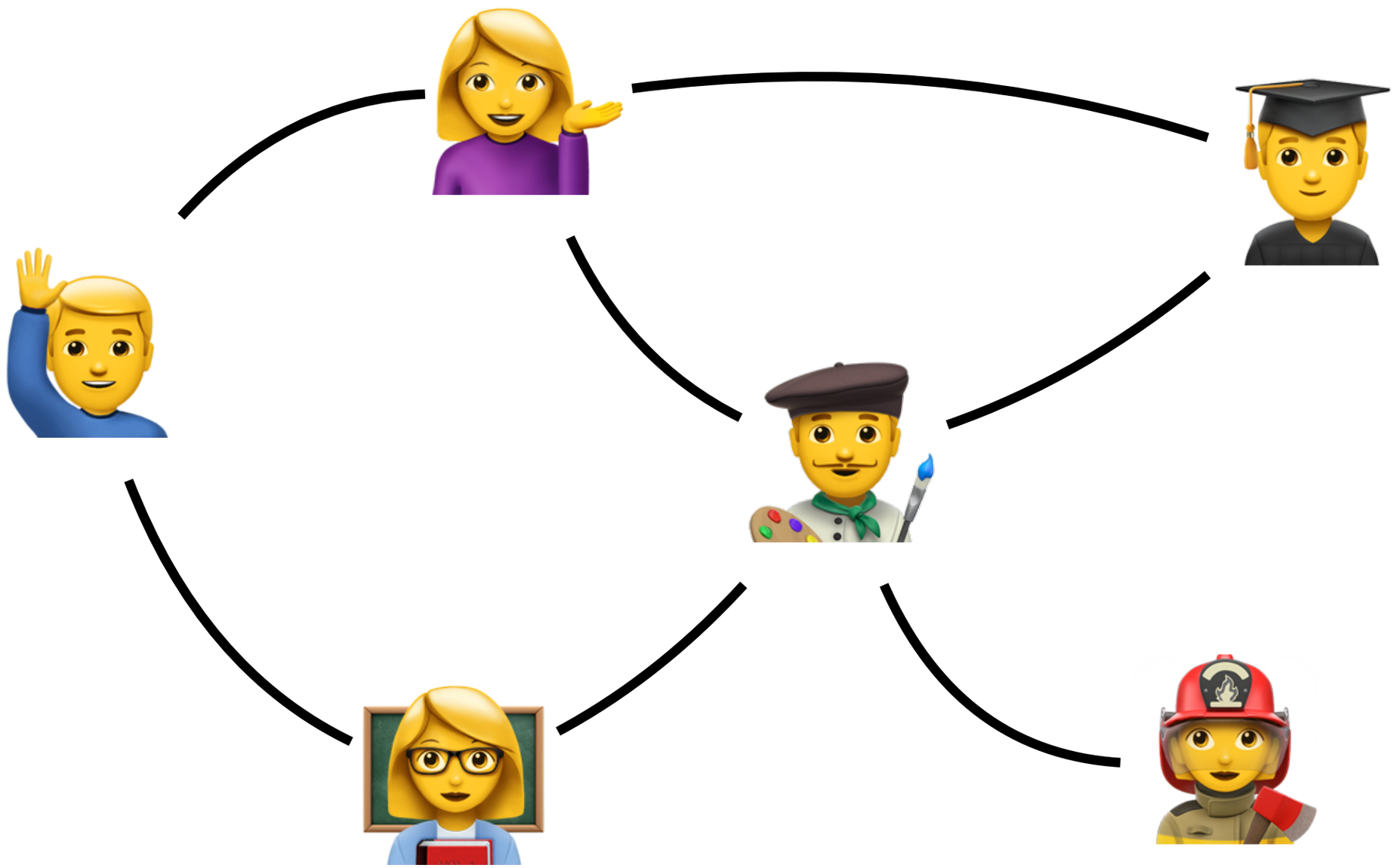
Graphes non orientés



Graphes non orientés



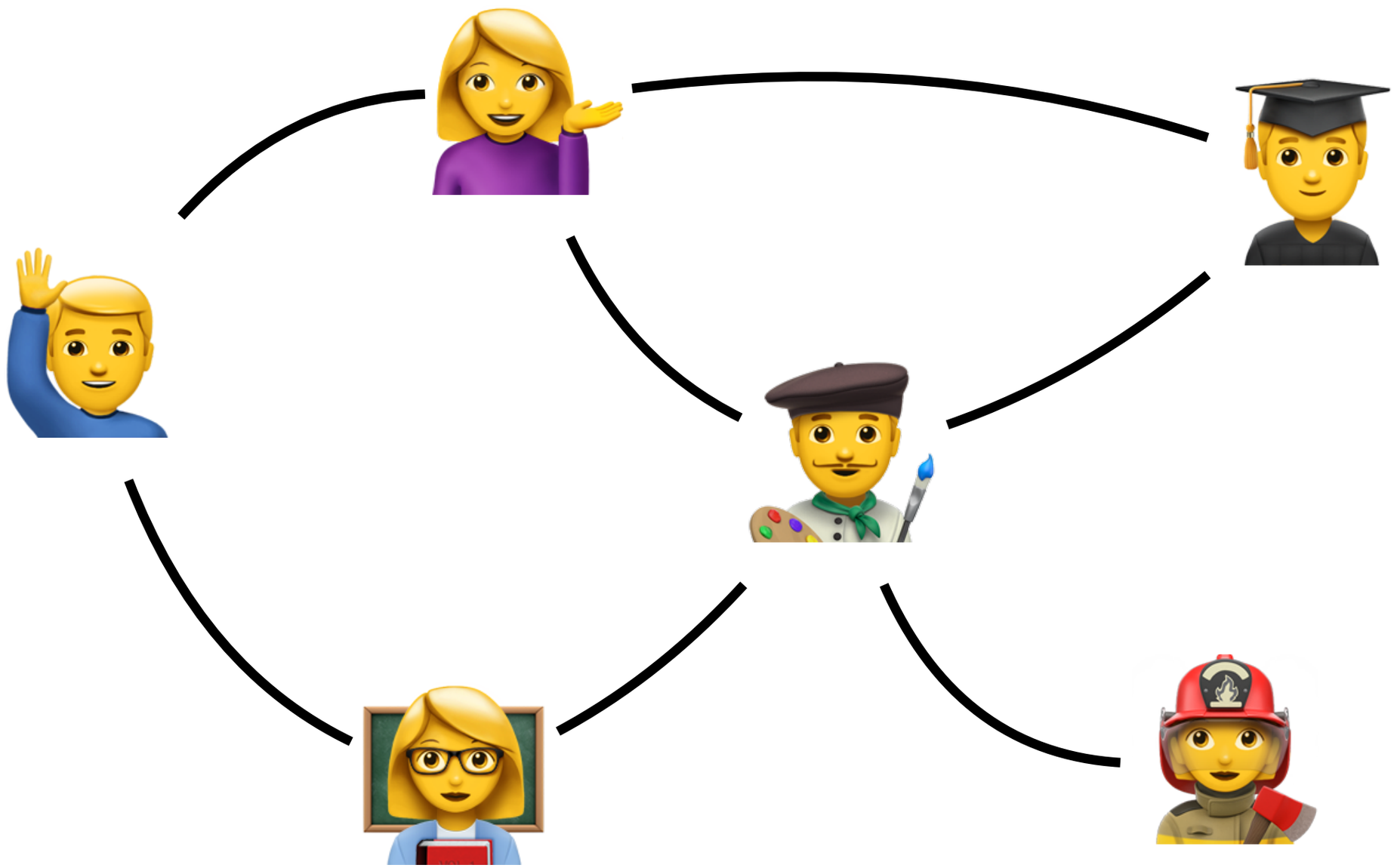
Réseau social (symétrique)



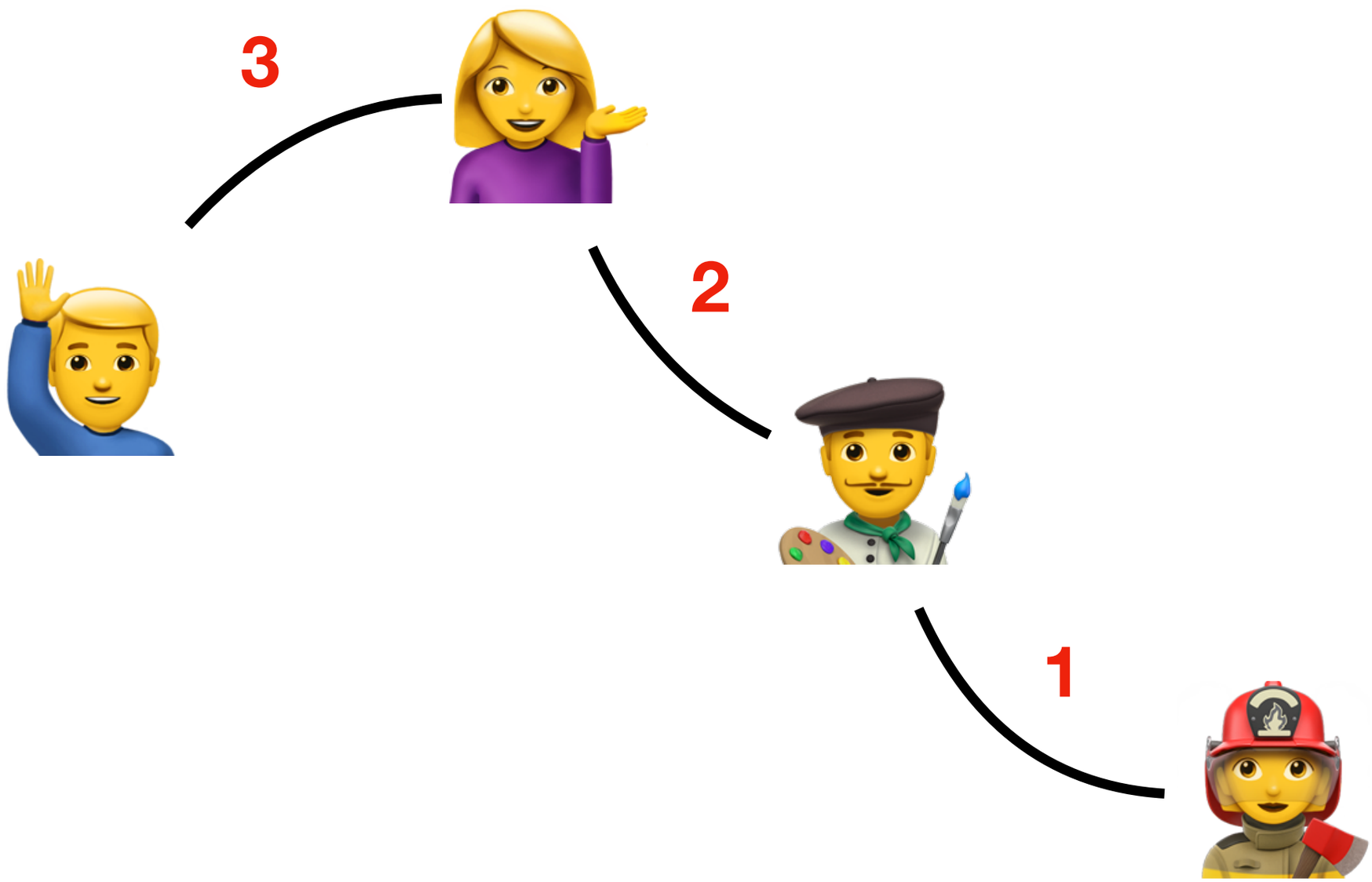
Each person in the world (at least among the 1.59 billion people active on Facebook) is connected to every other person by an average of three and a half other people.

https://research.fb.com/three-and-a-half-degrees-of-separation/

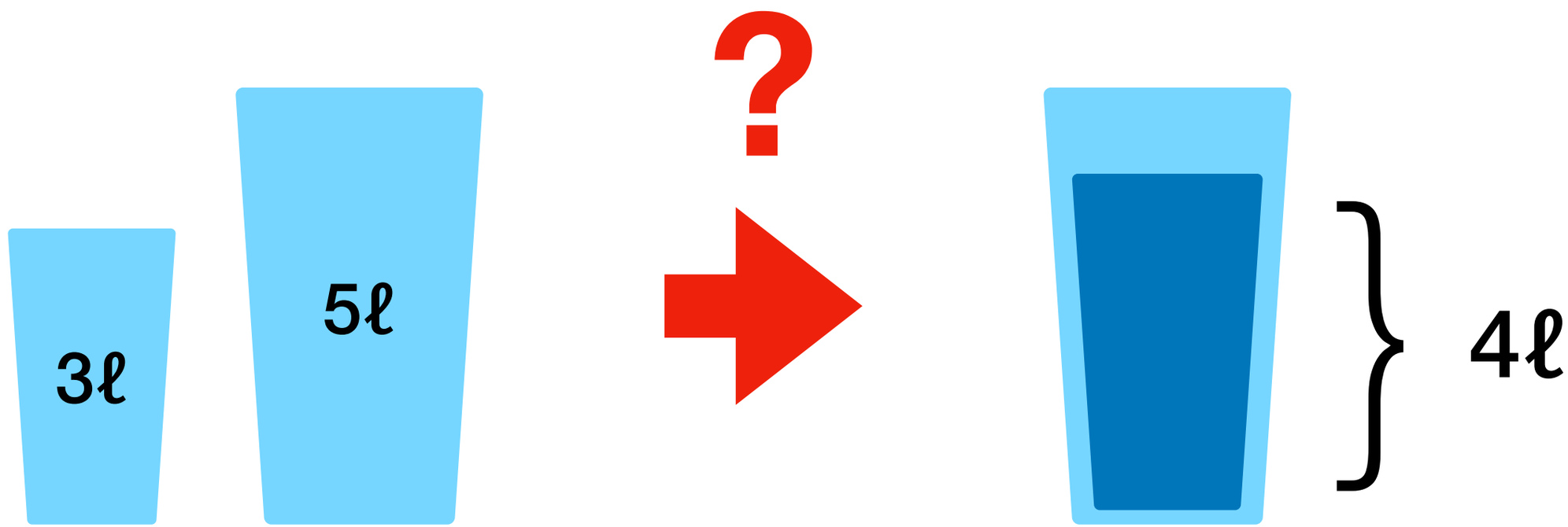
Diamètre d’un graphe



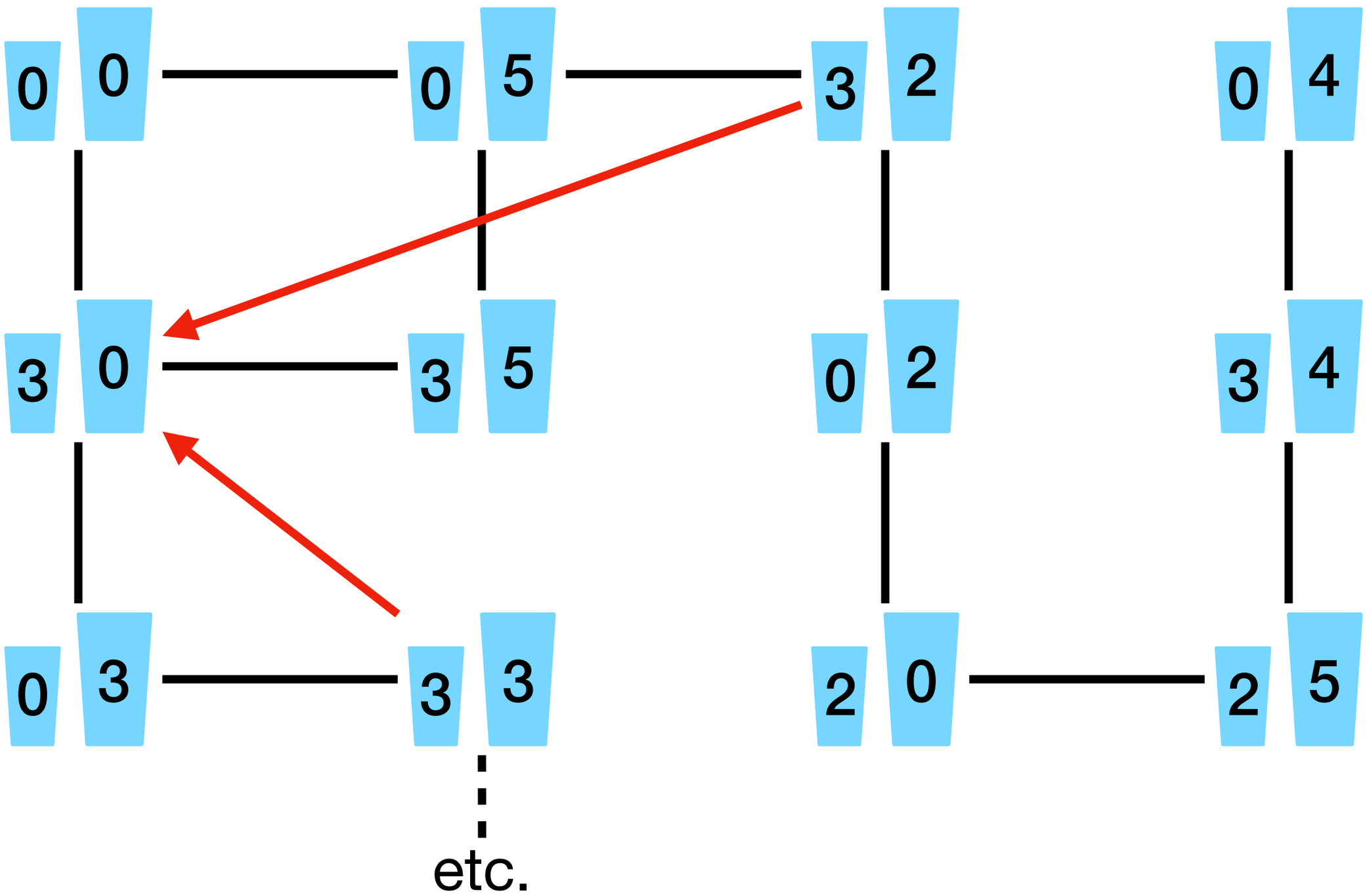
Diamètre d’un graphe



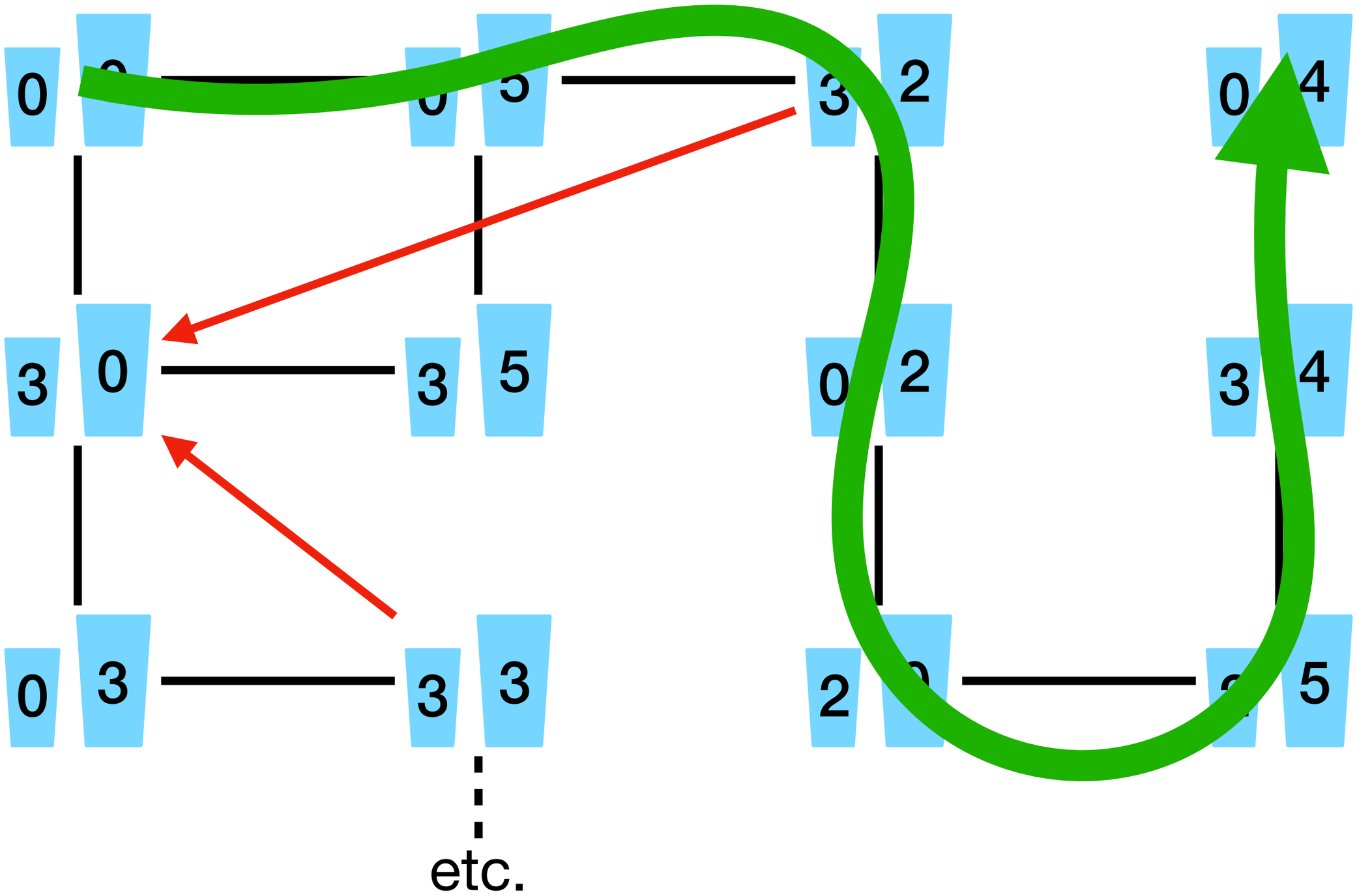
Enigme des récipients



Graphe des configurations

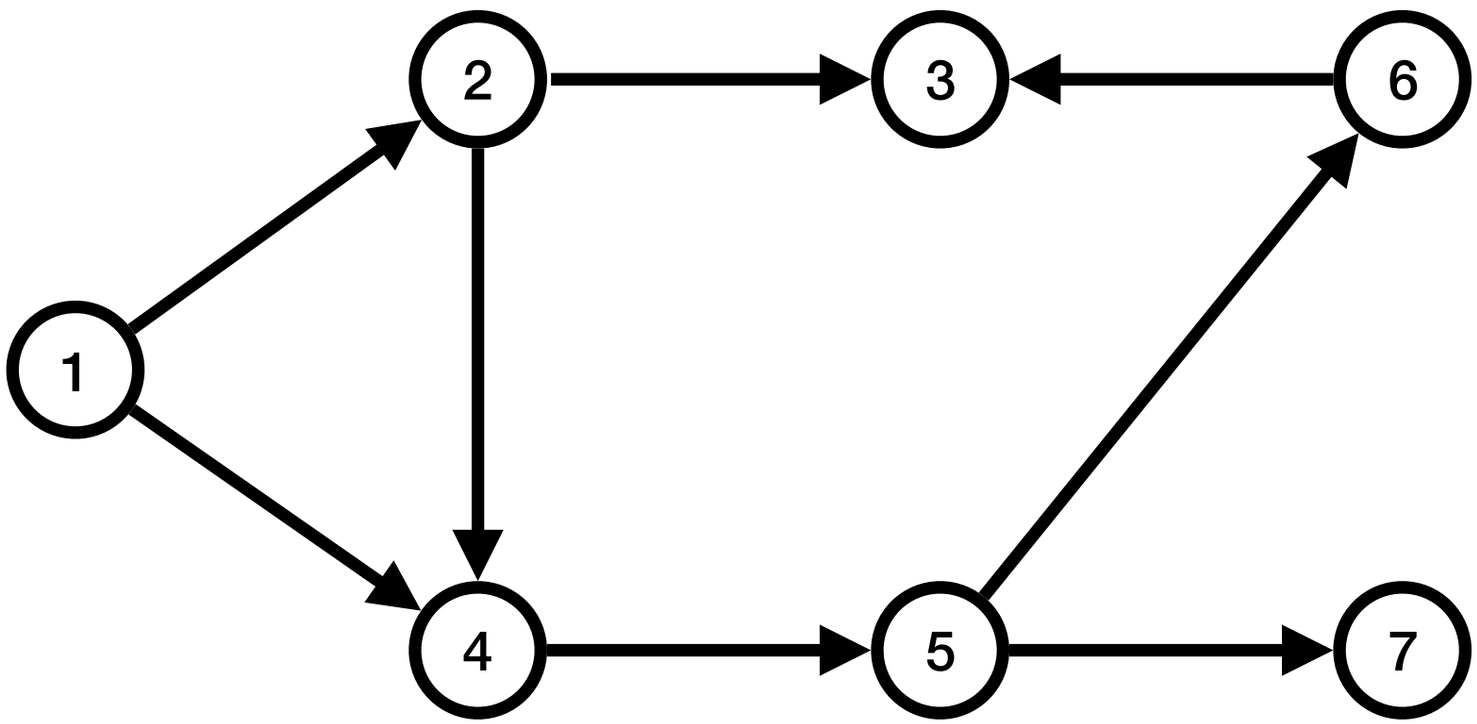


Graphe des configurations

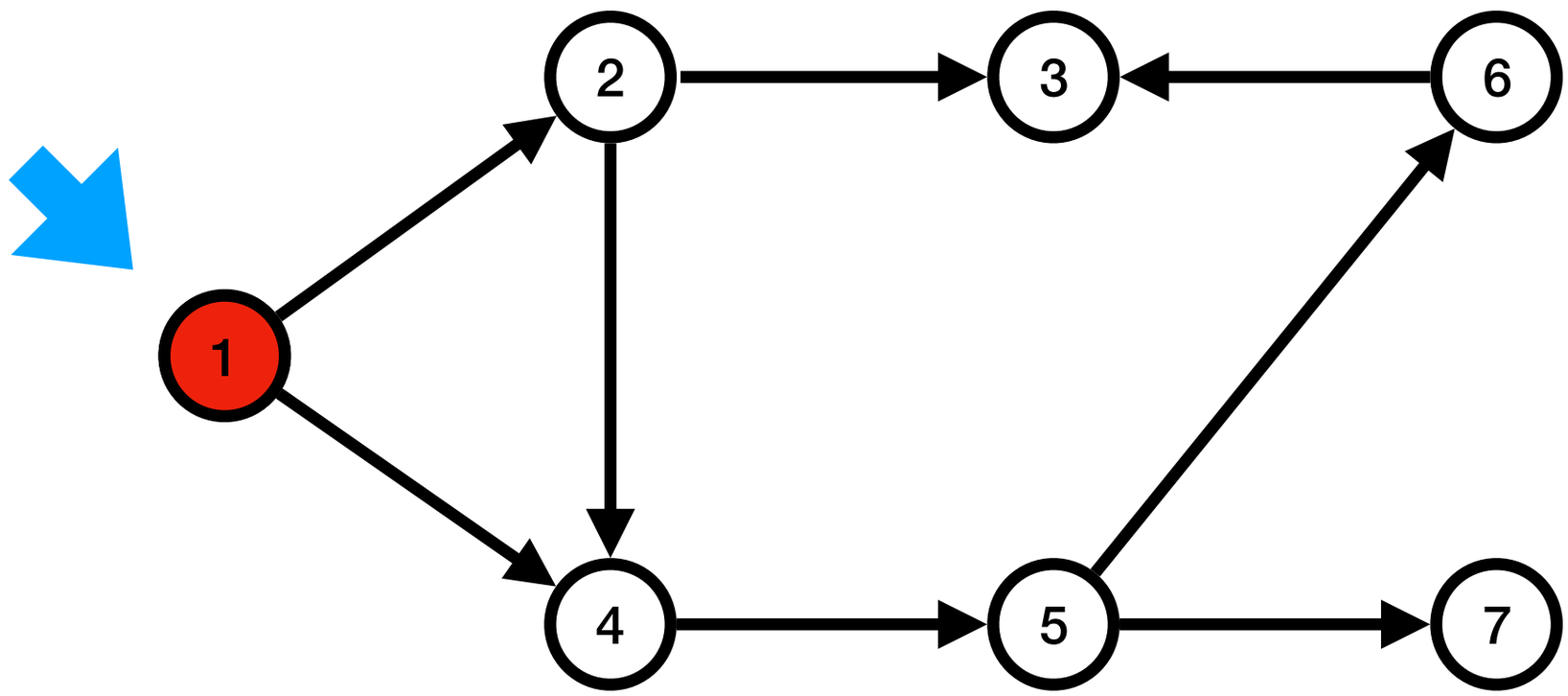


Parcours de graphes

Parcours en largeur



Parcours en largeur



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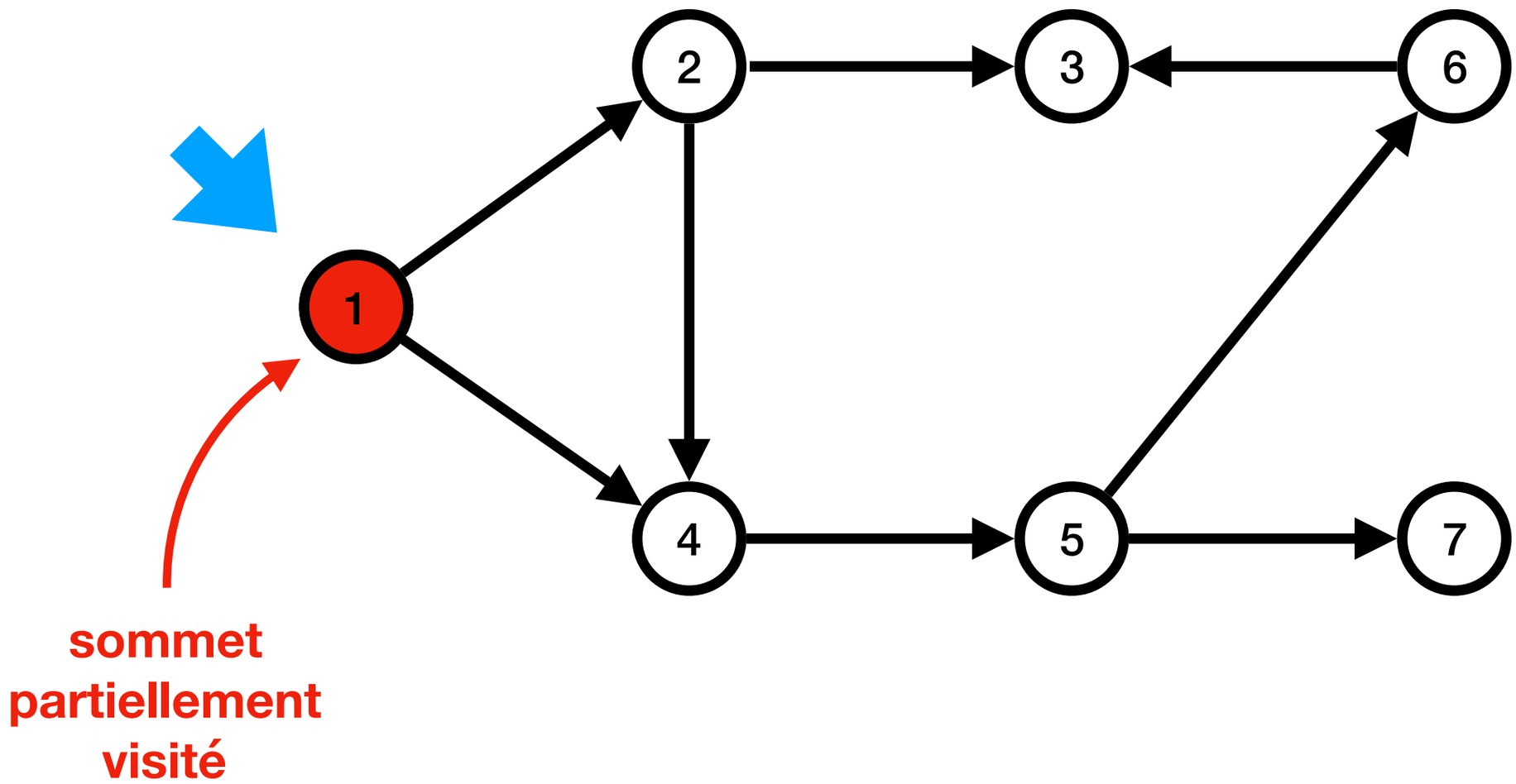
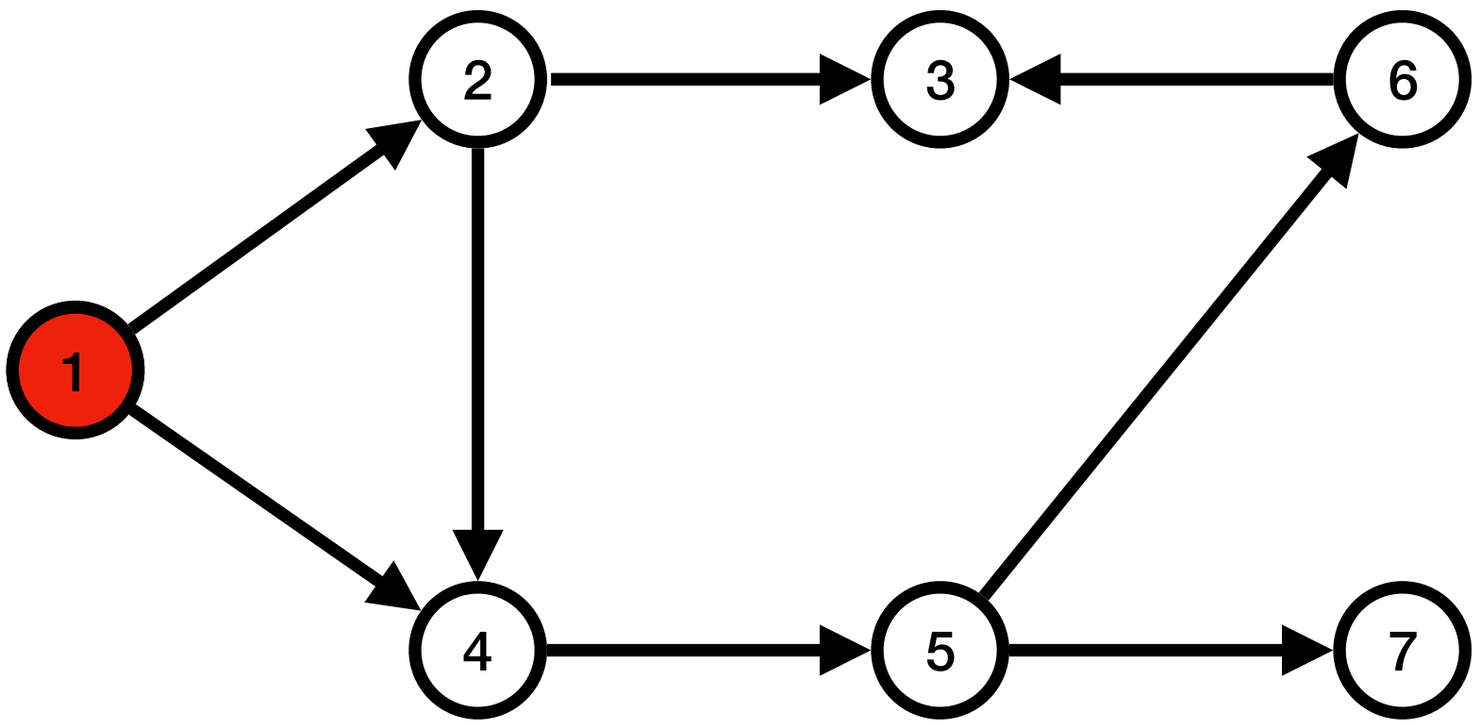
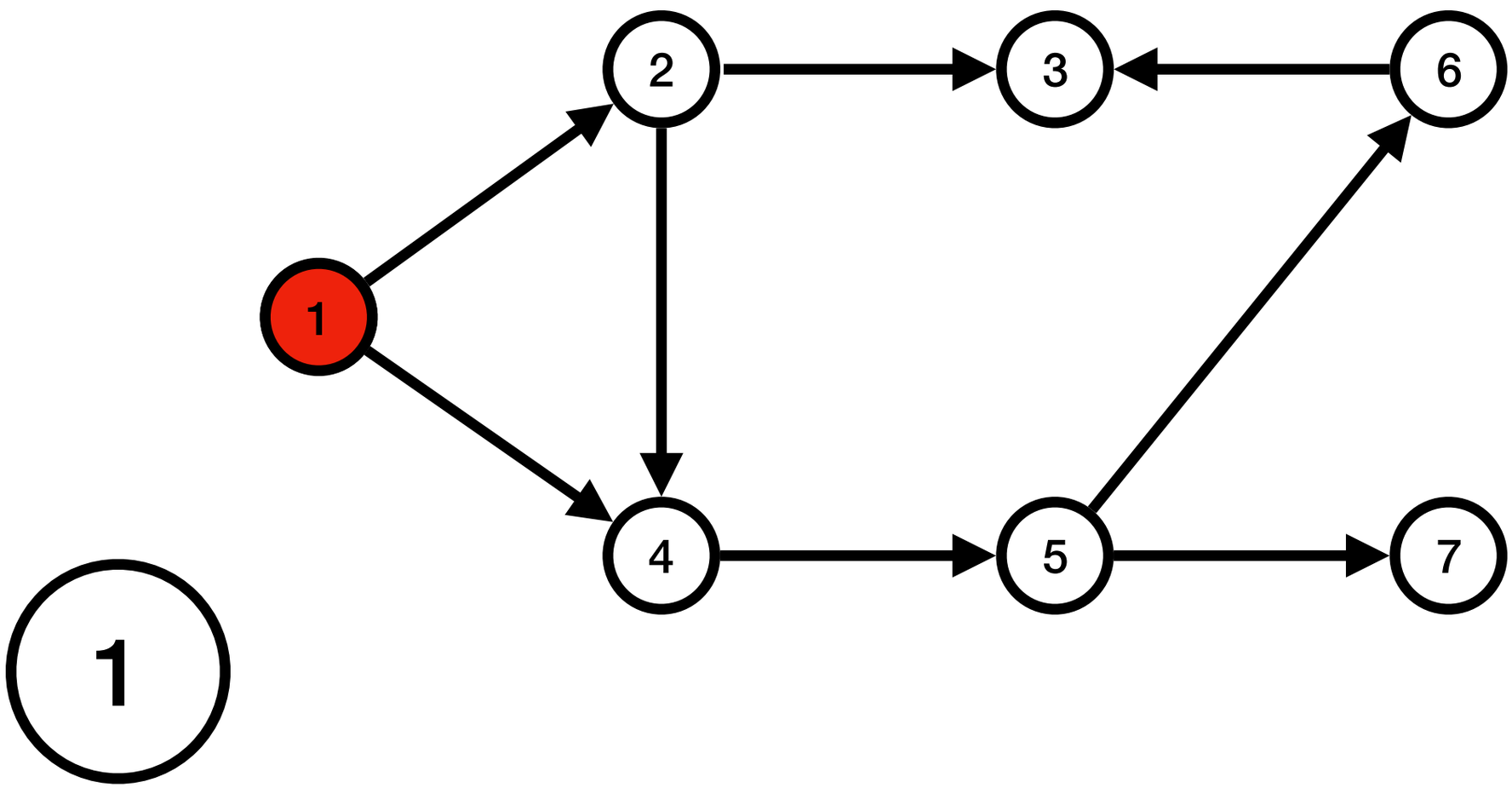


Parcours en largeur



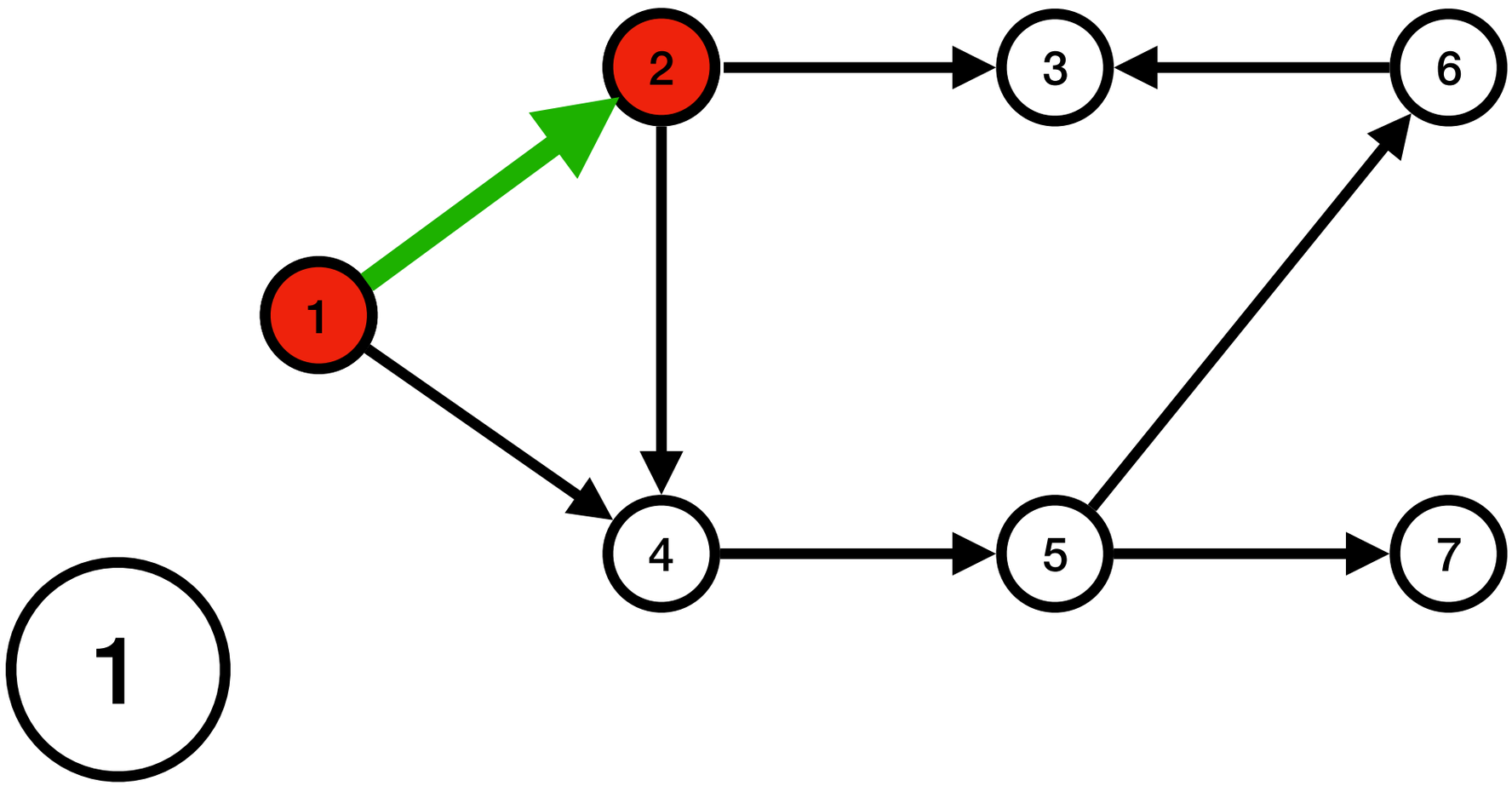
File → 1

Parcours en largeur



File →

Parcours en largeur



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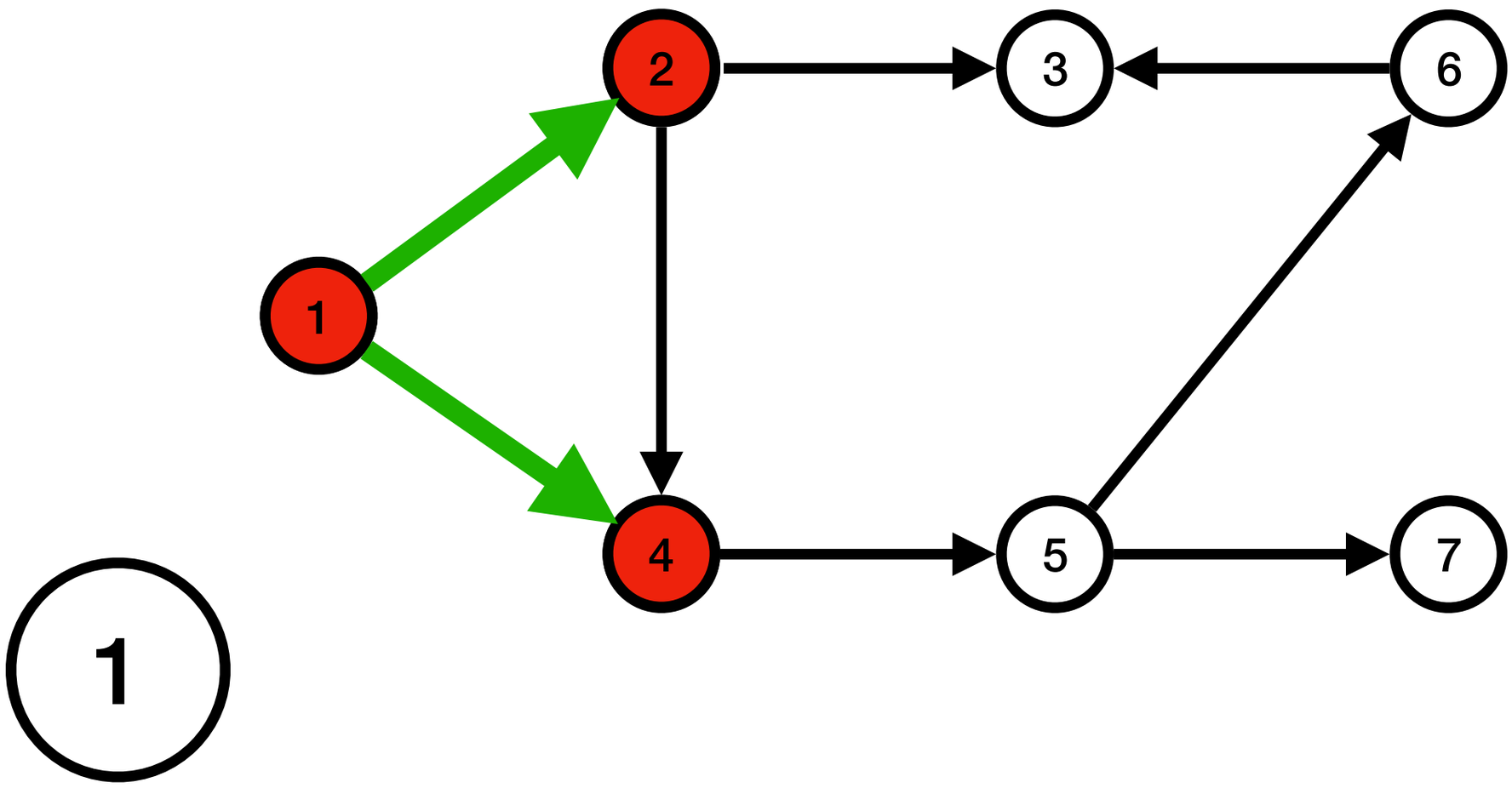
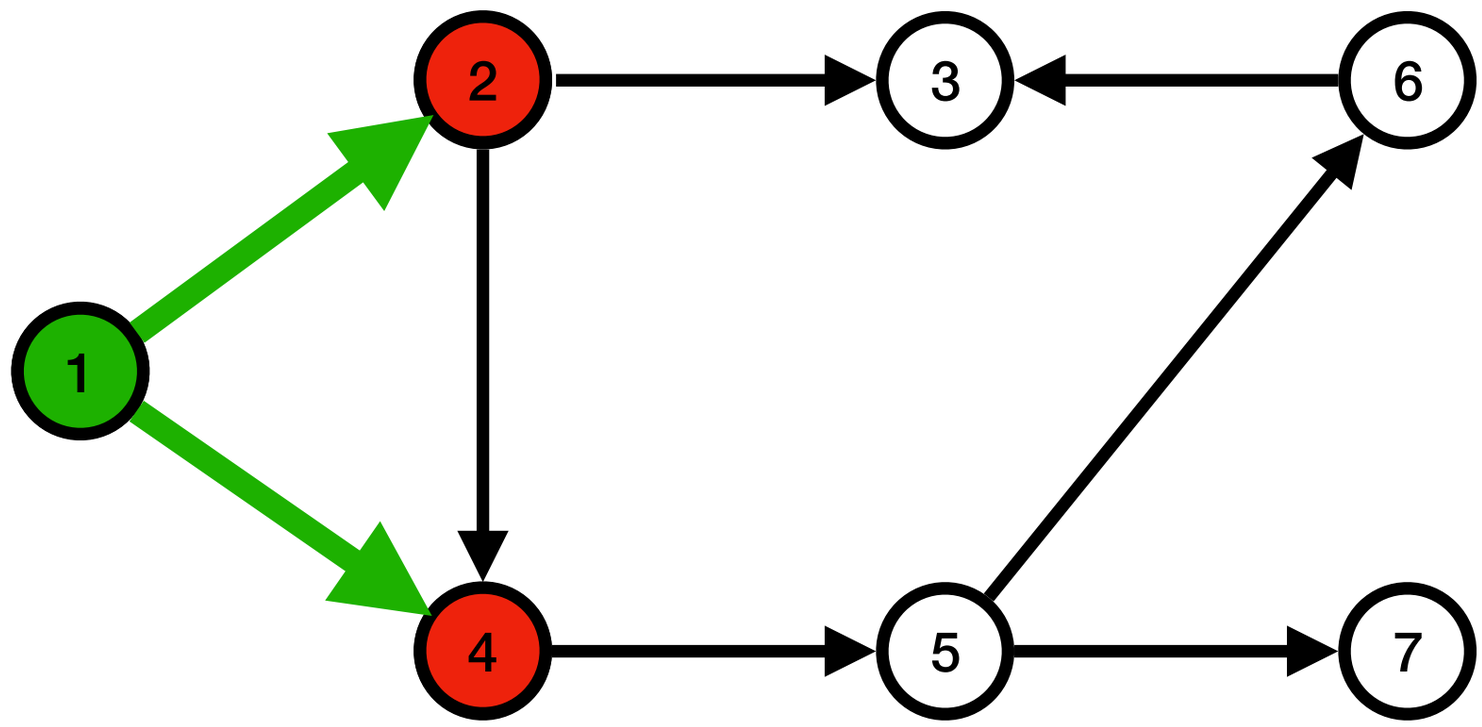
Parcours en largeur



File → 2 4

Parcours en largeur



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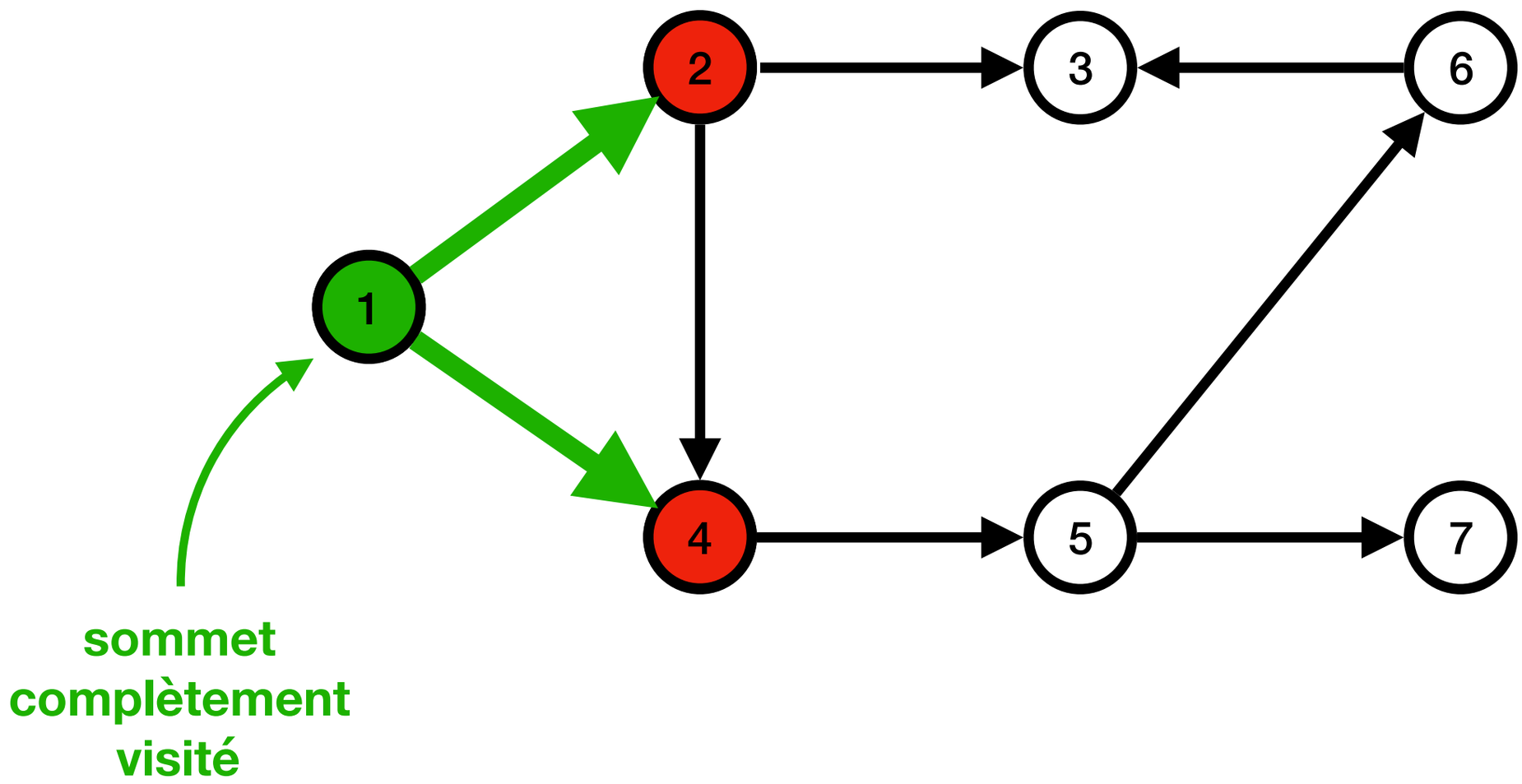

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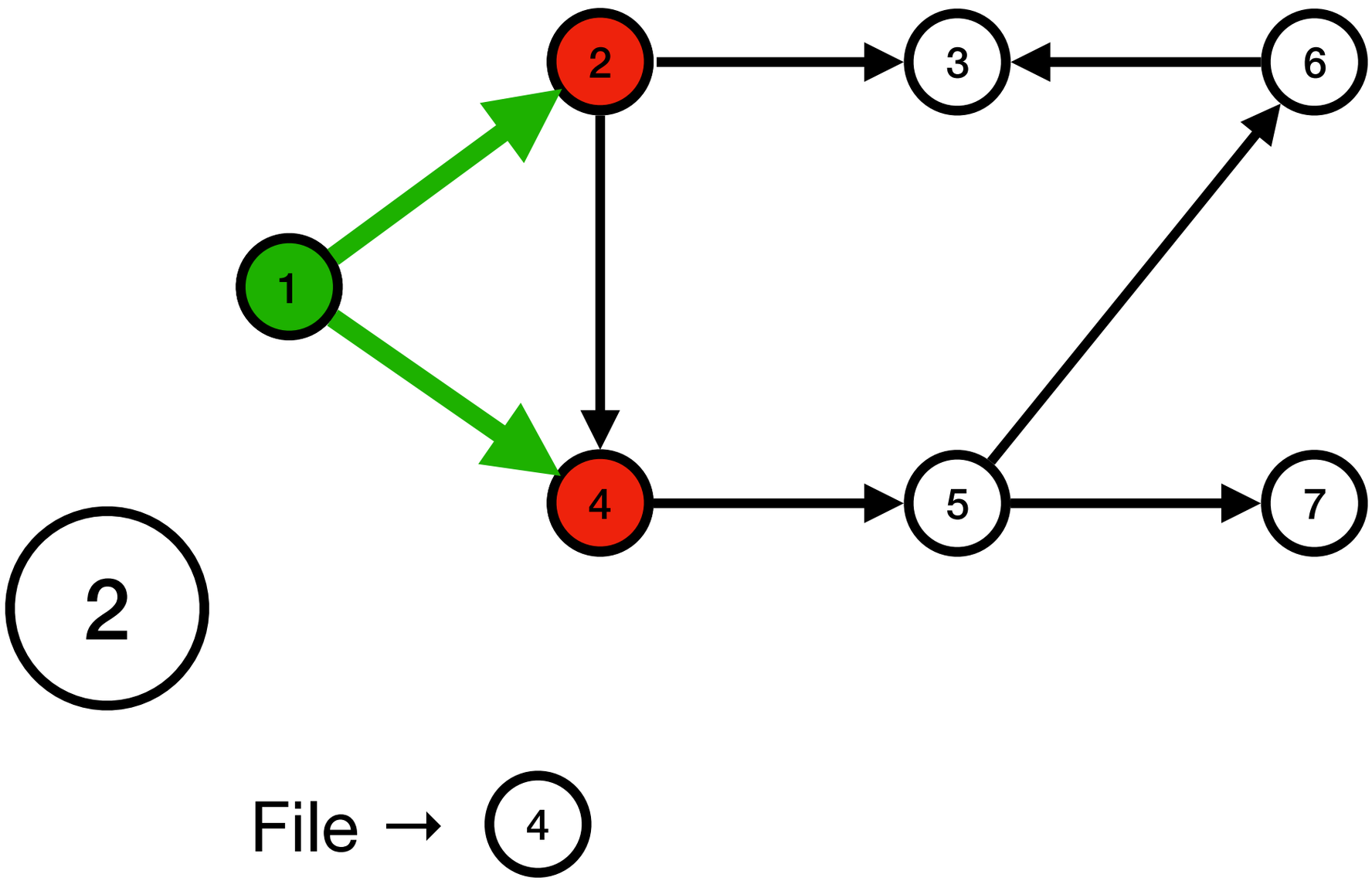

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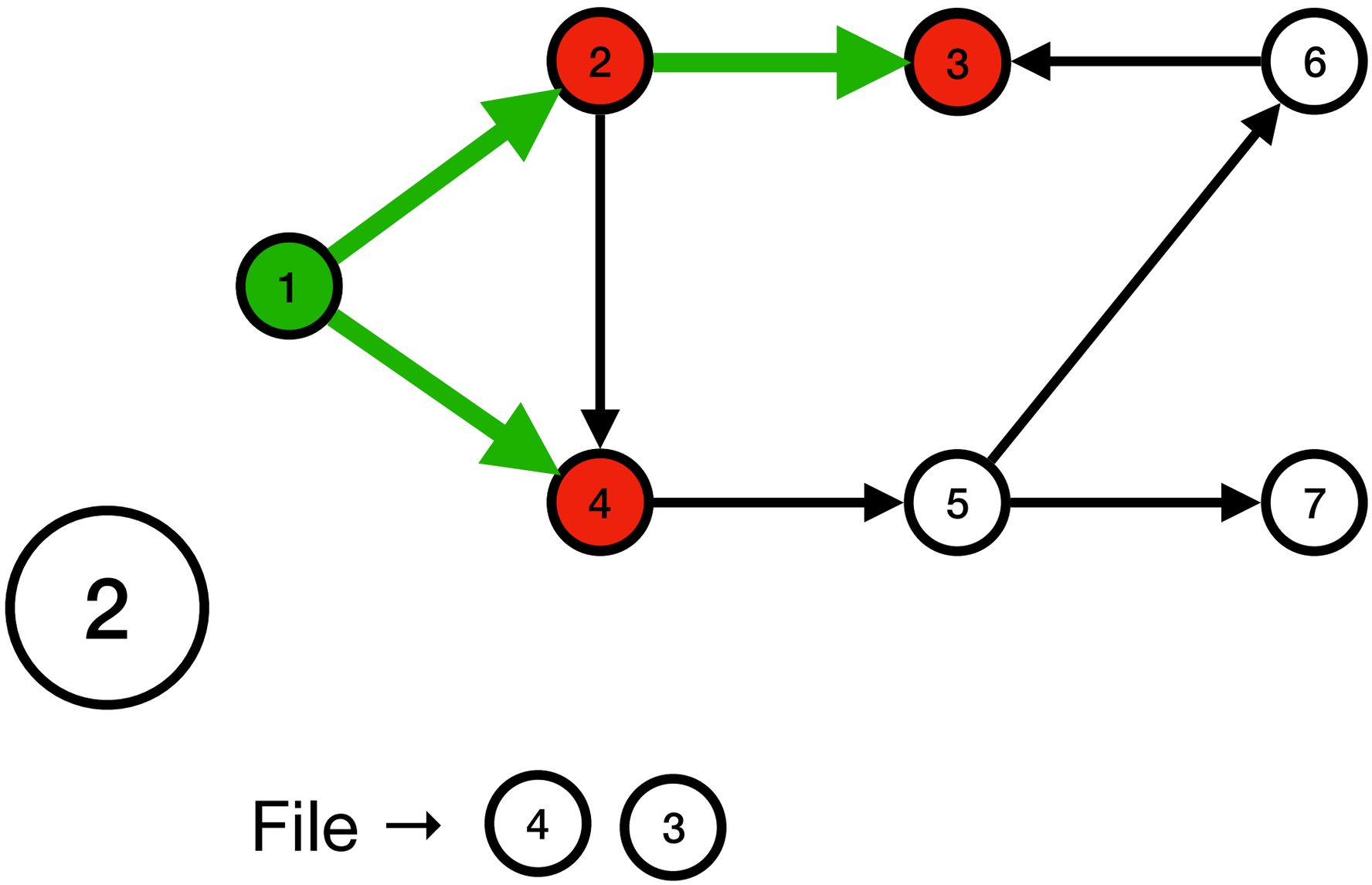

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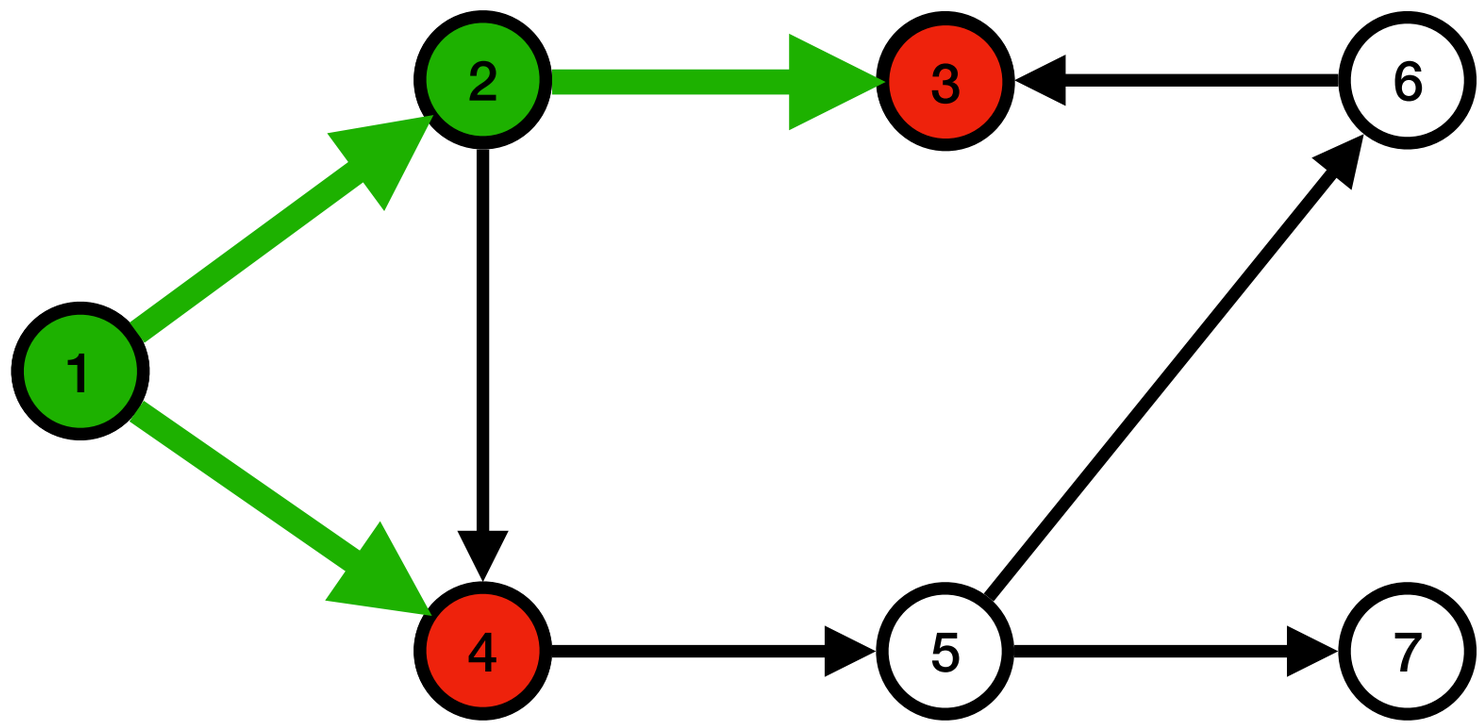
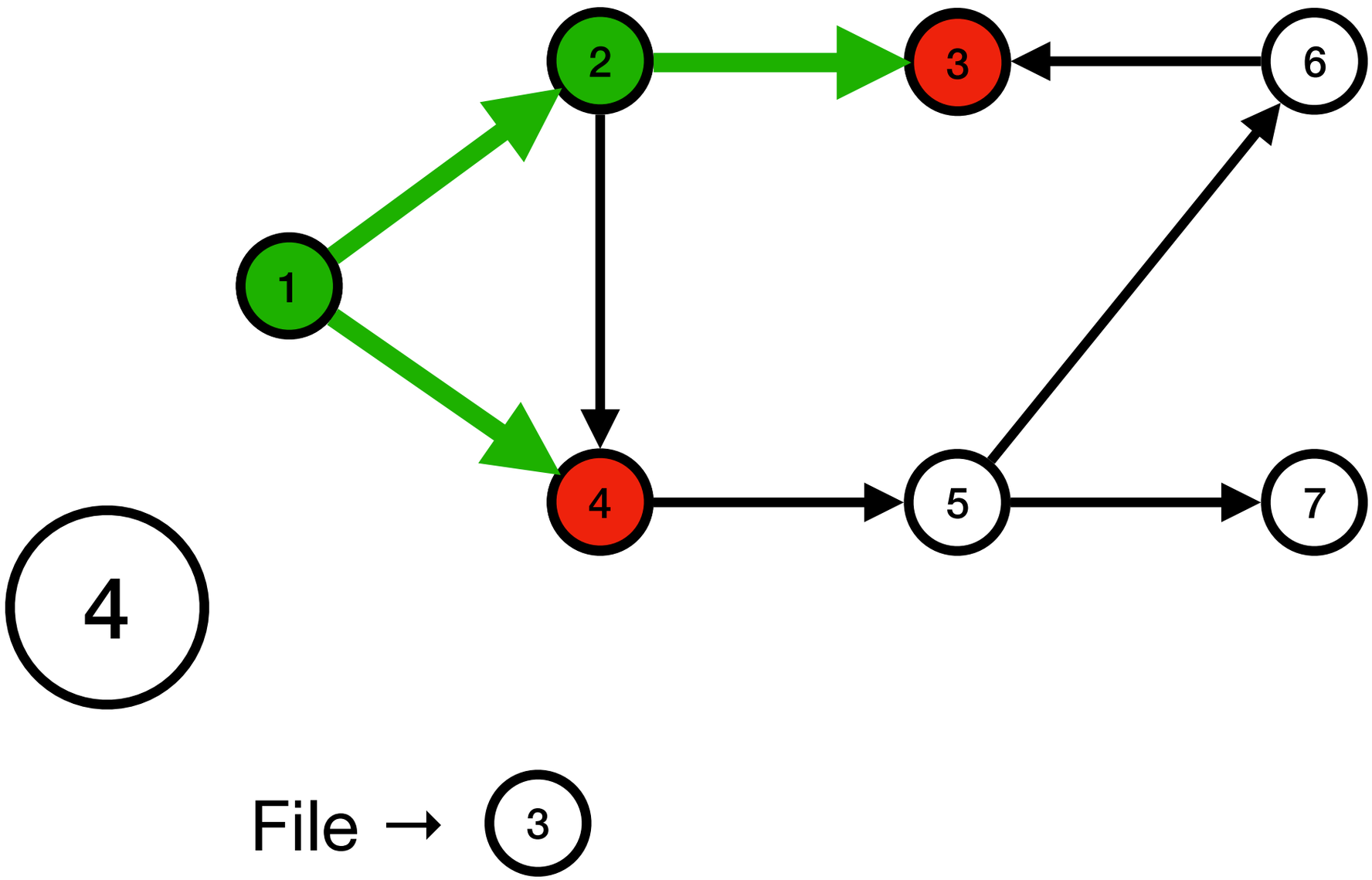


File → 4 3

Parcours en largeur



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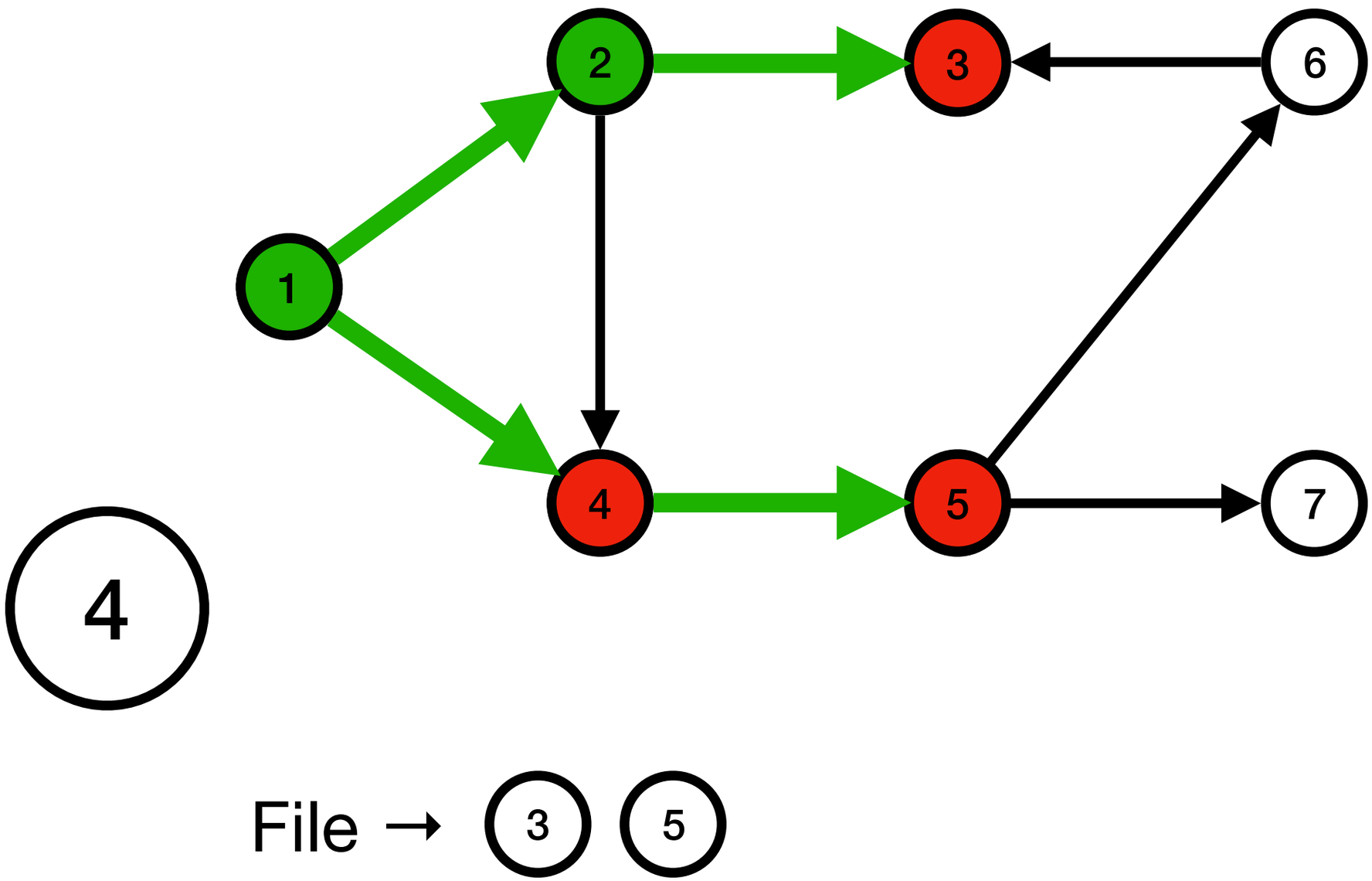

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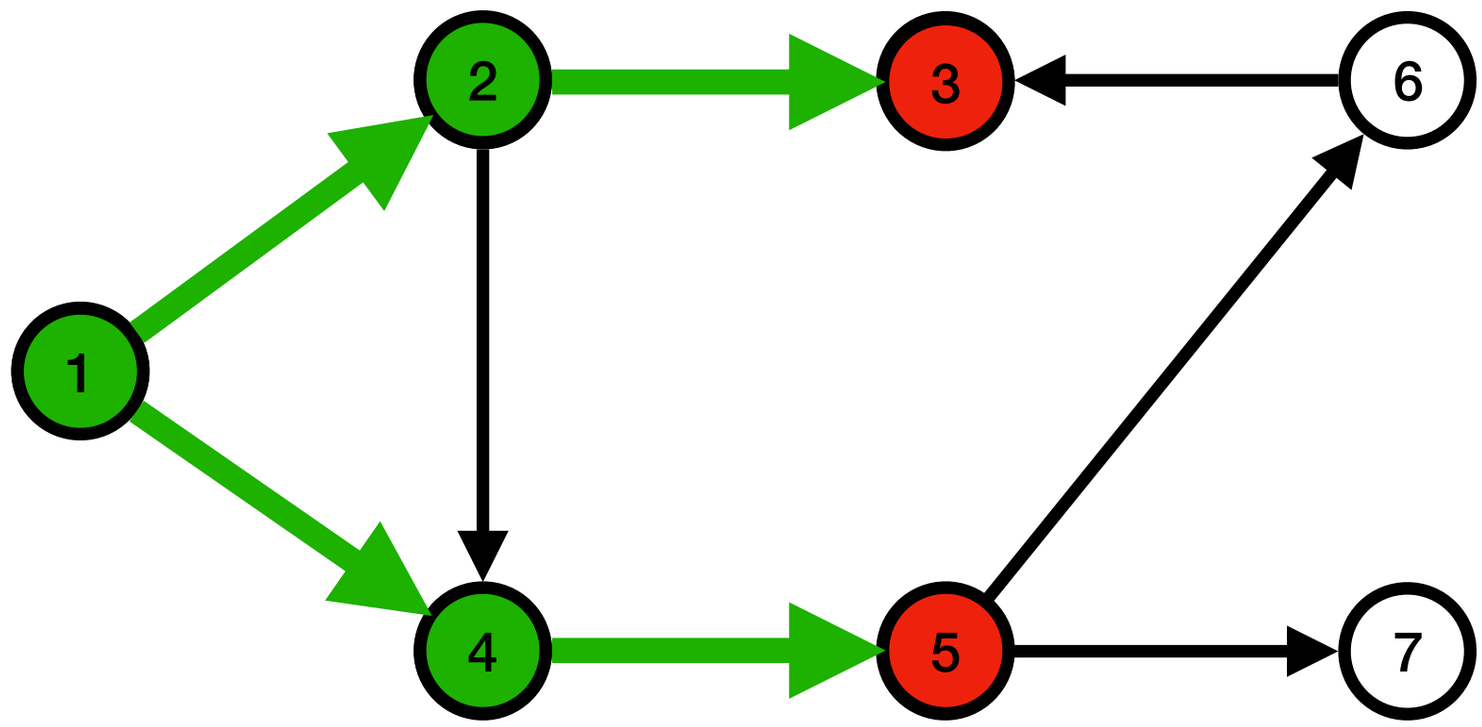

File → 3 5

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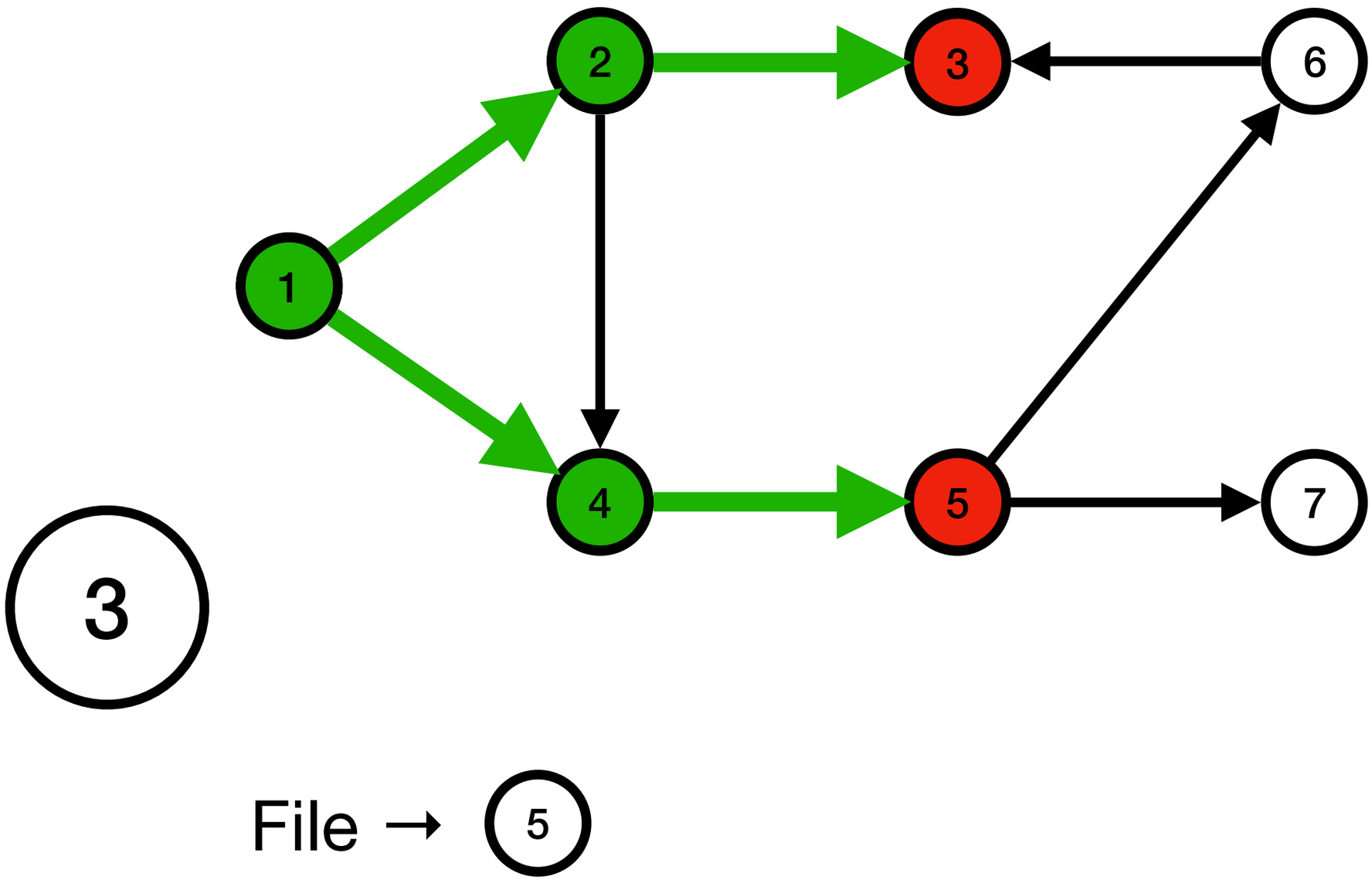

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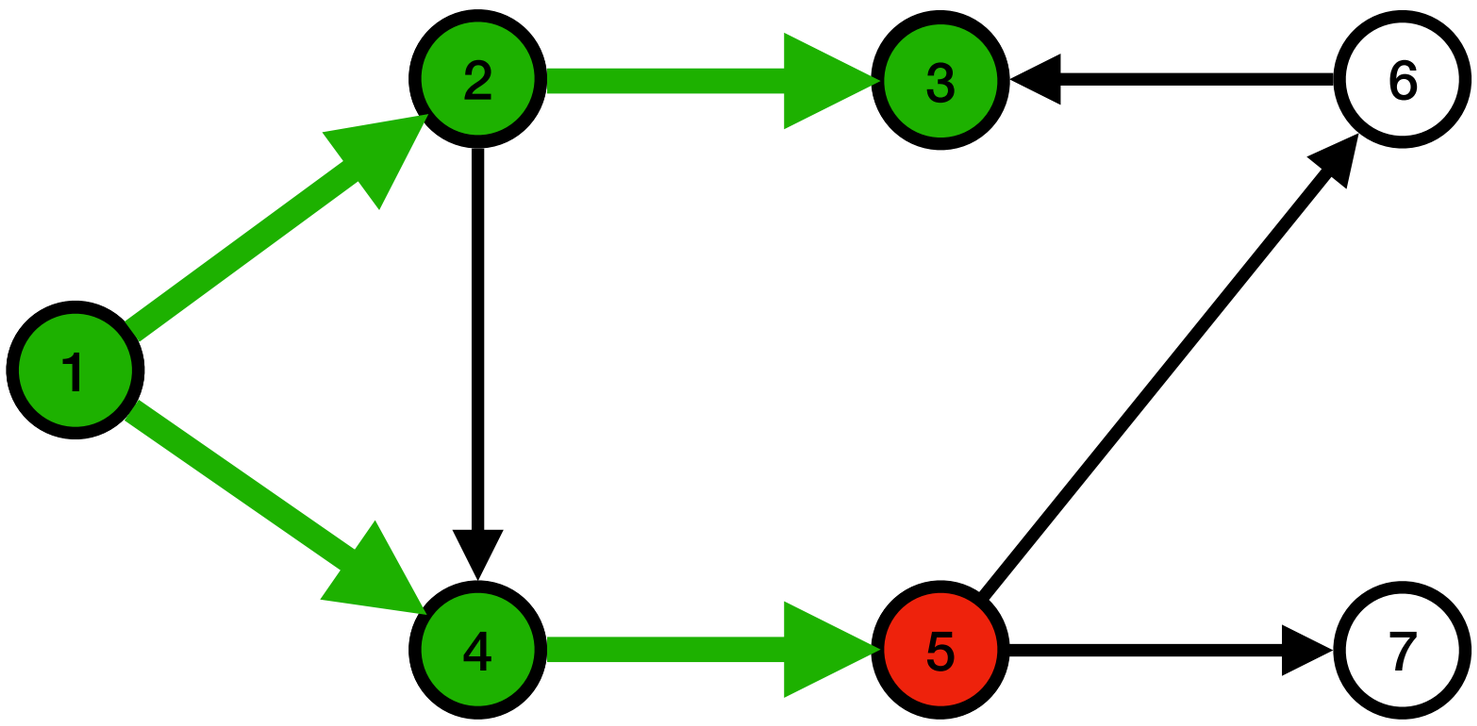
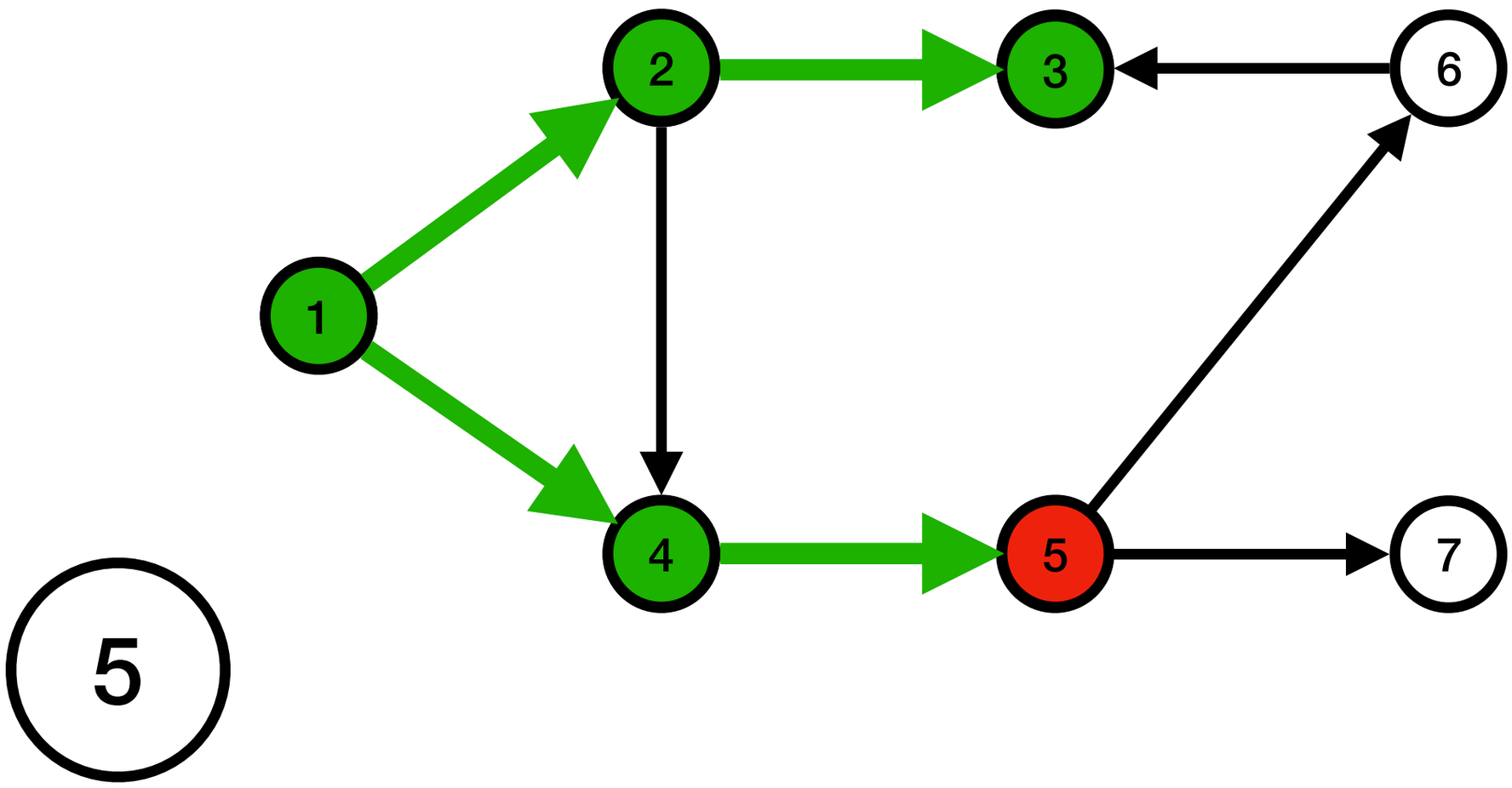


File → 5

Parcours en largeur



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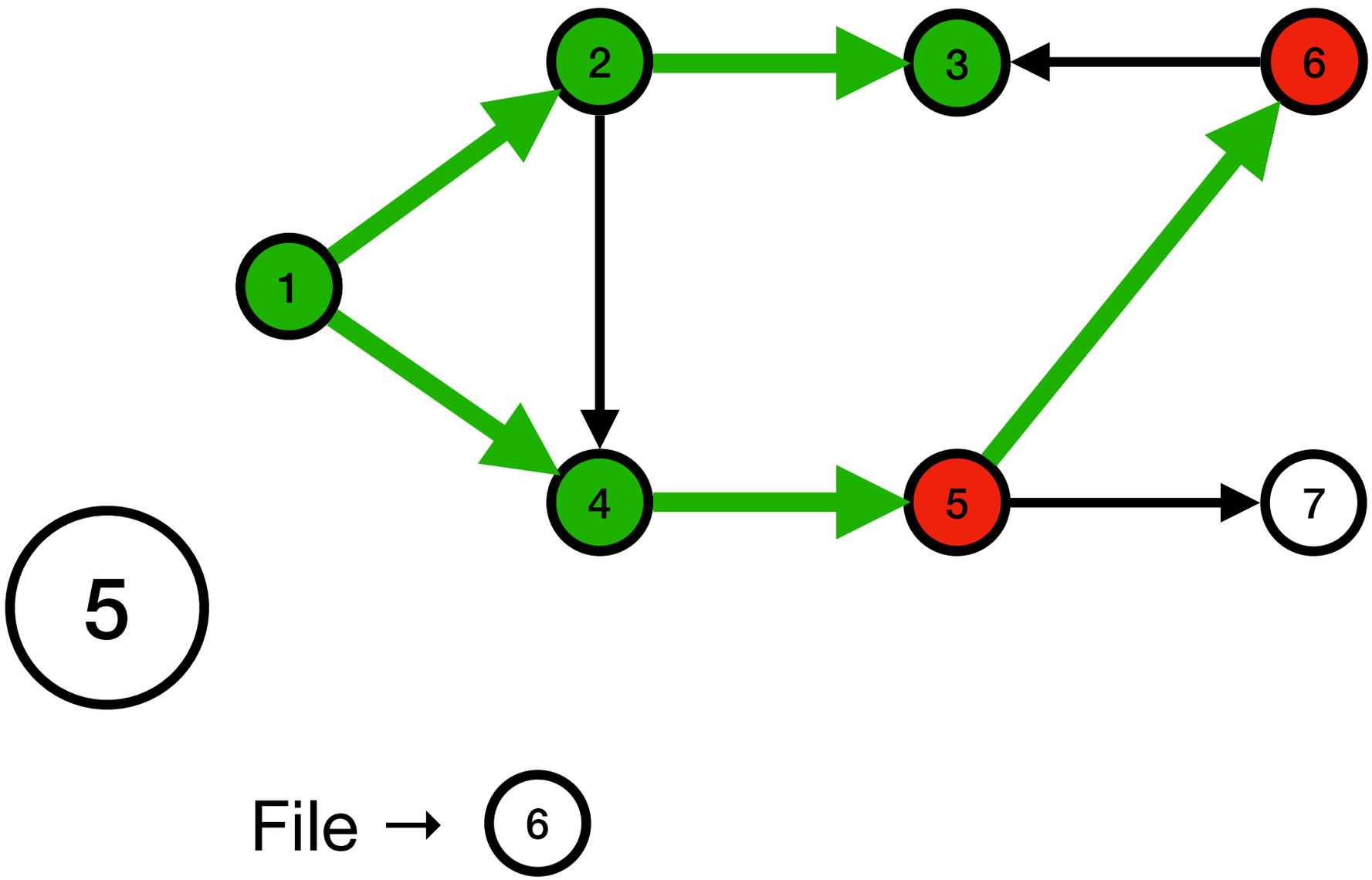

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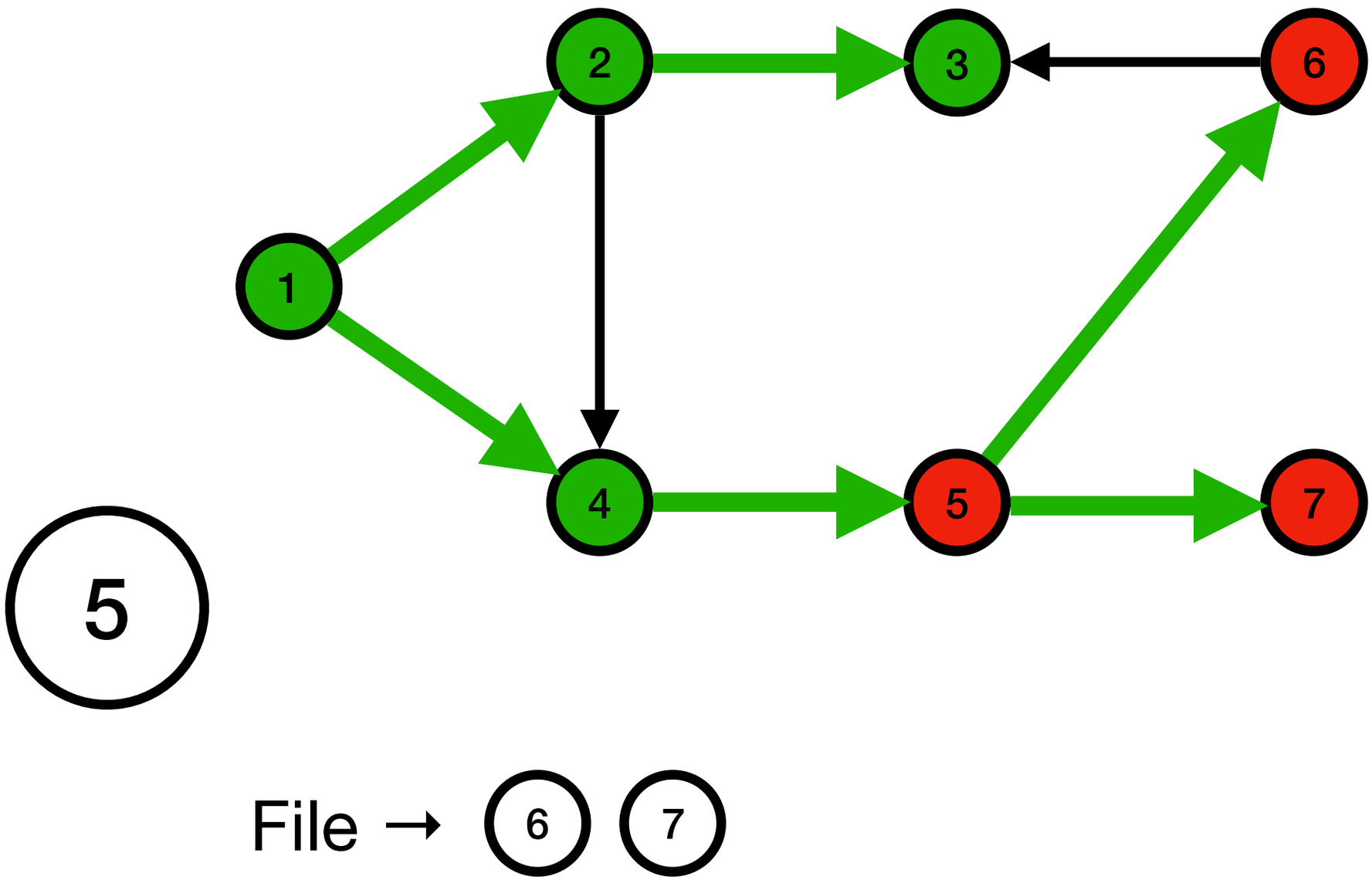

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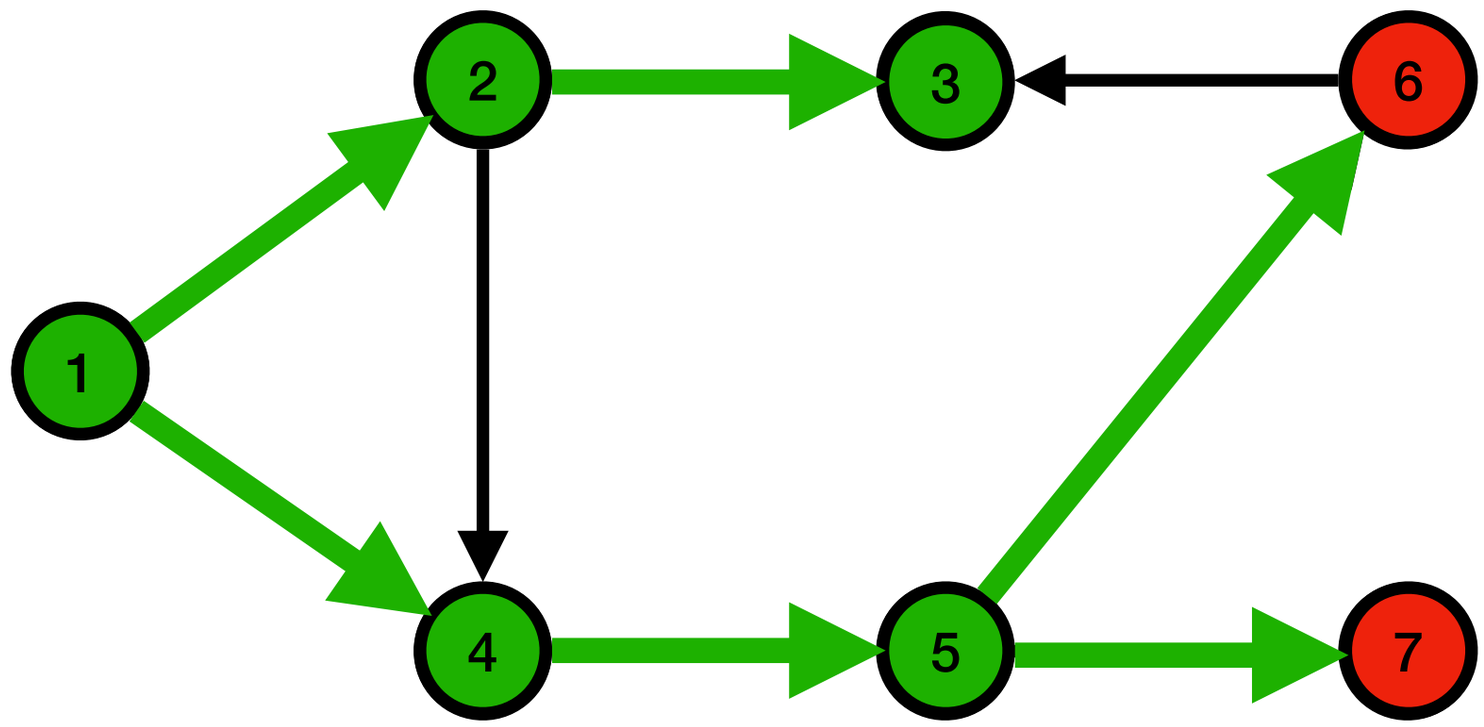
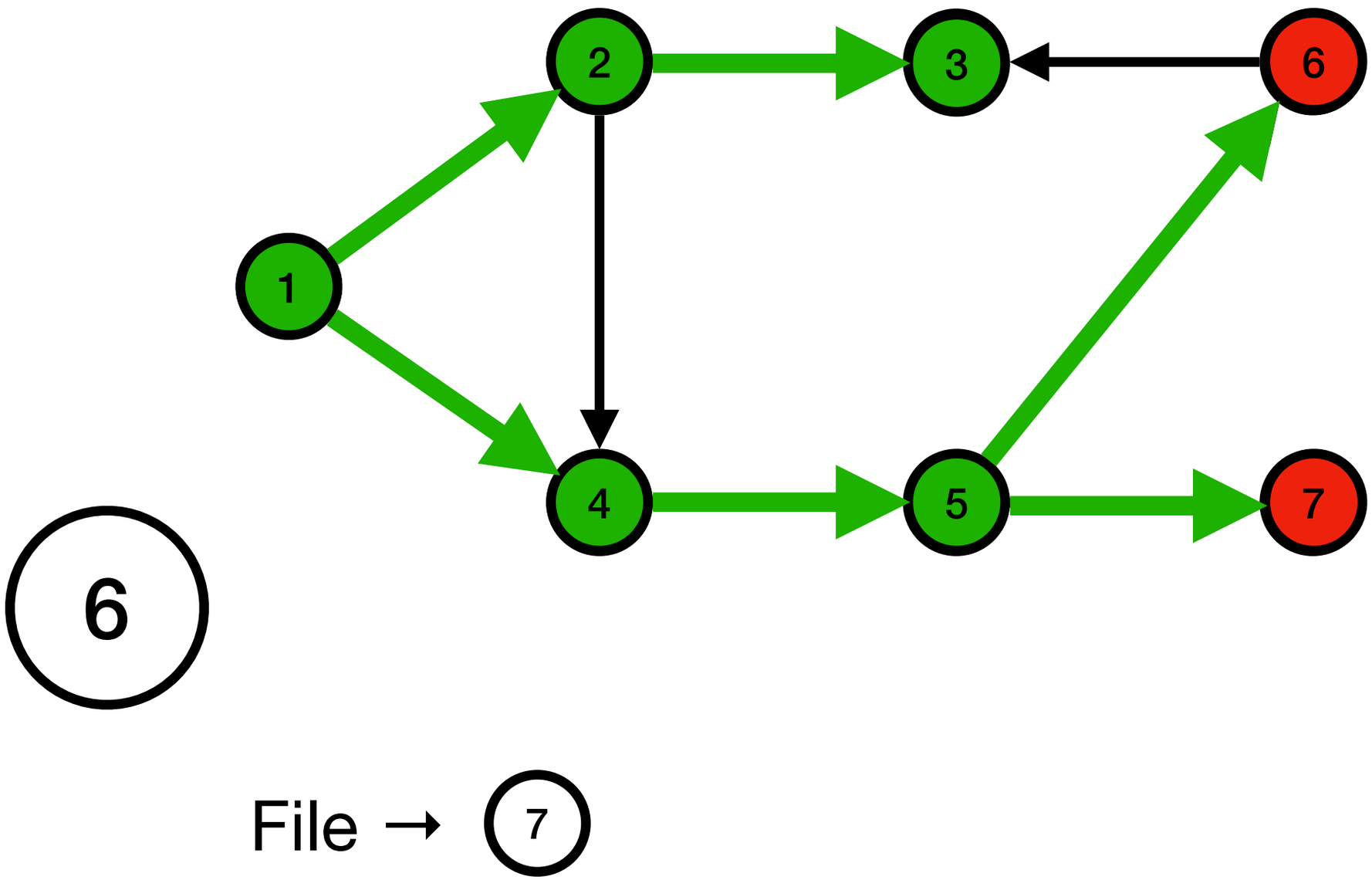


File → 6 7

Parcours en largeur



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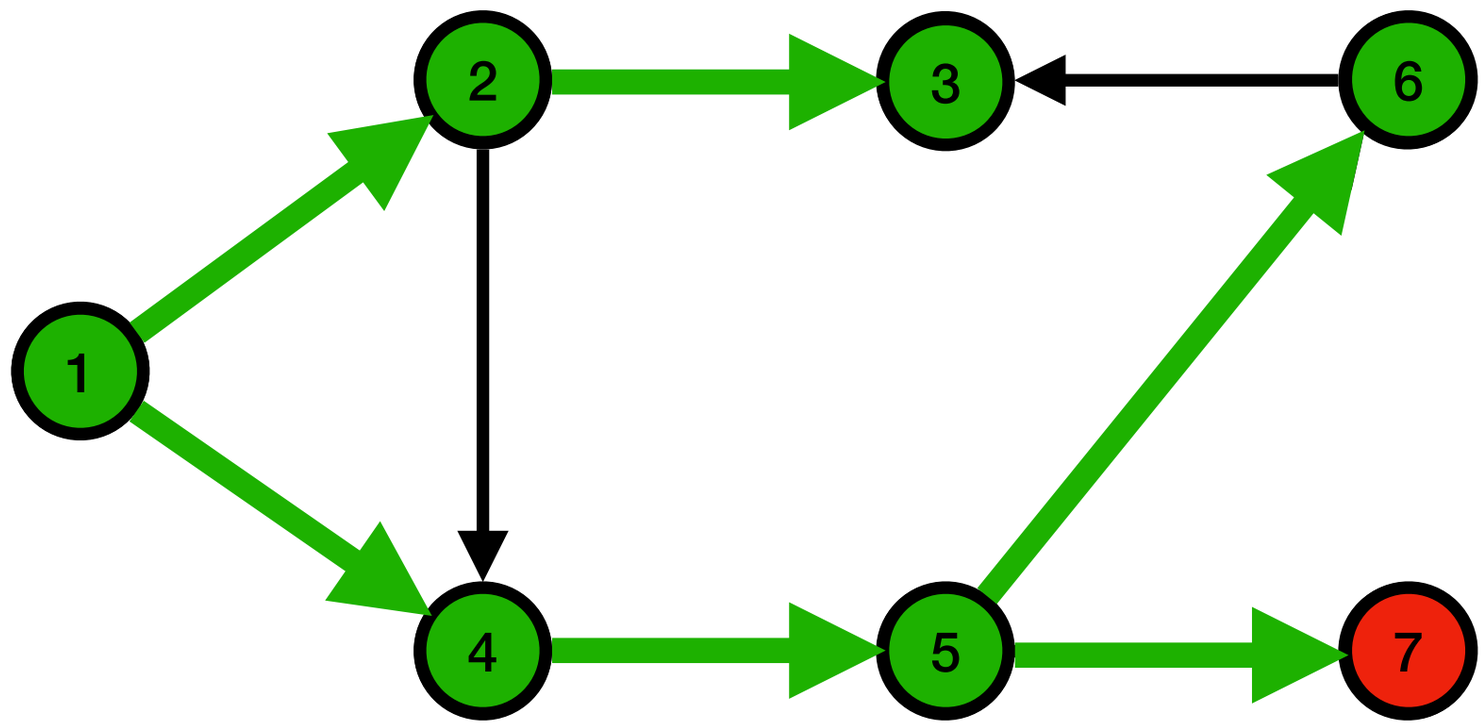
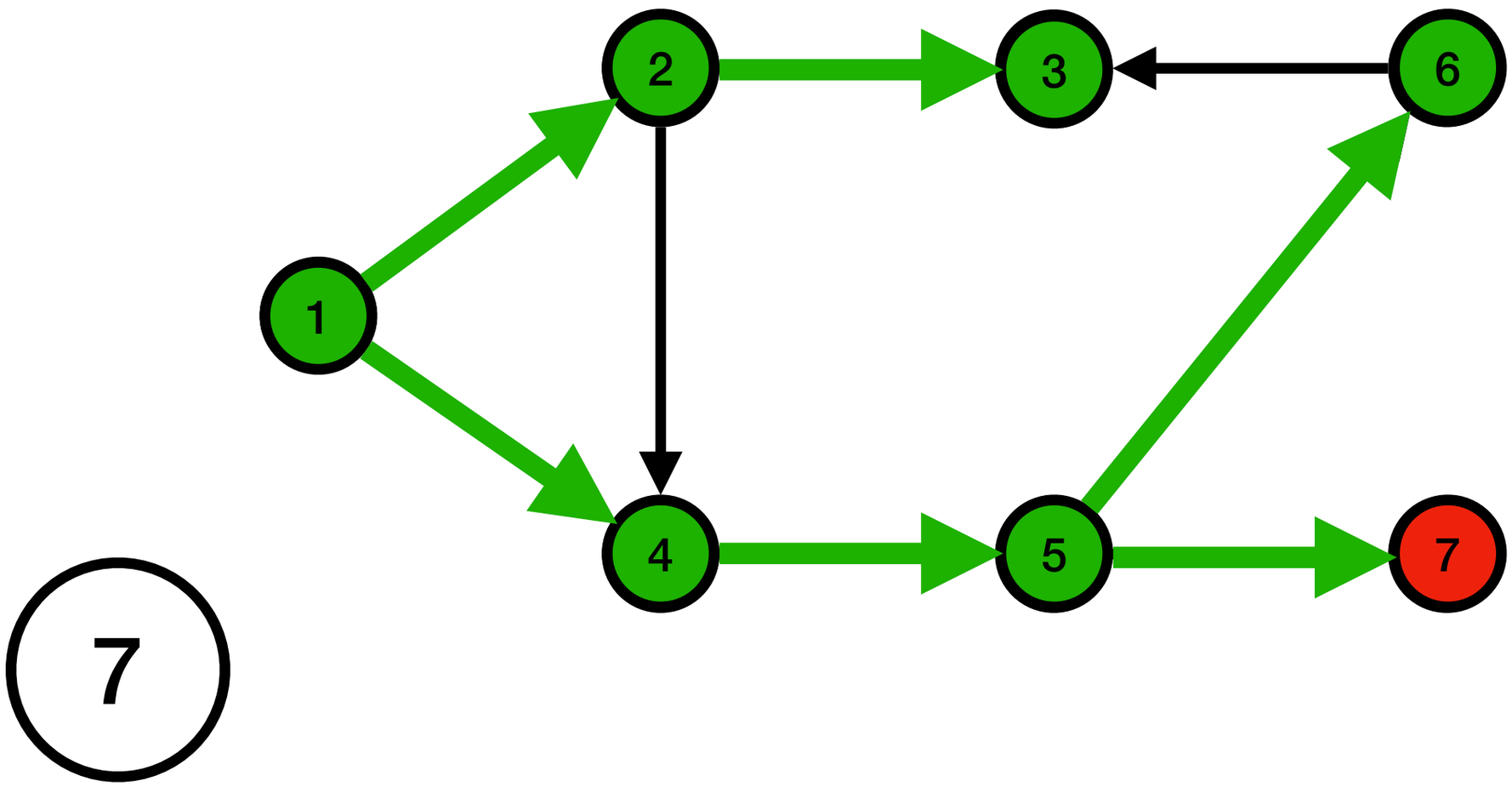


File → 7

Parcours en largeur



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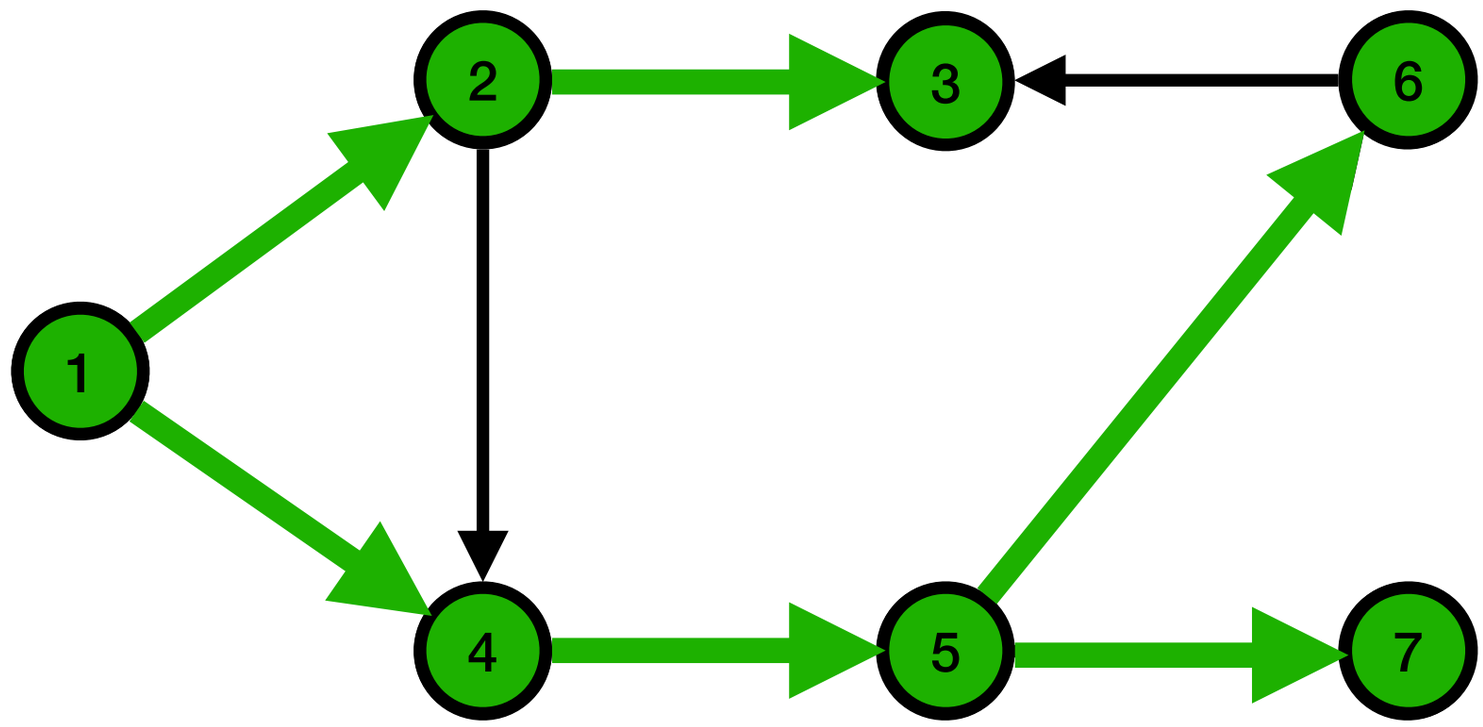

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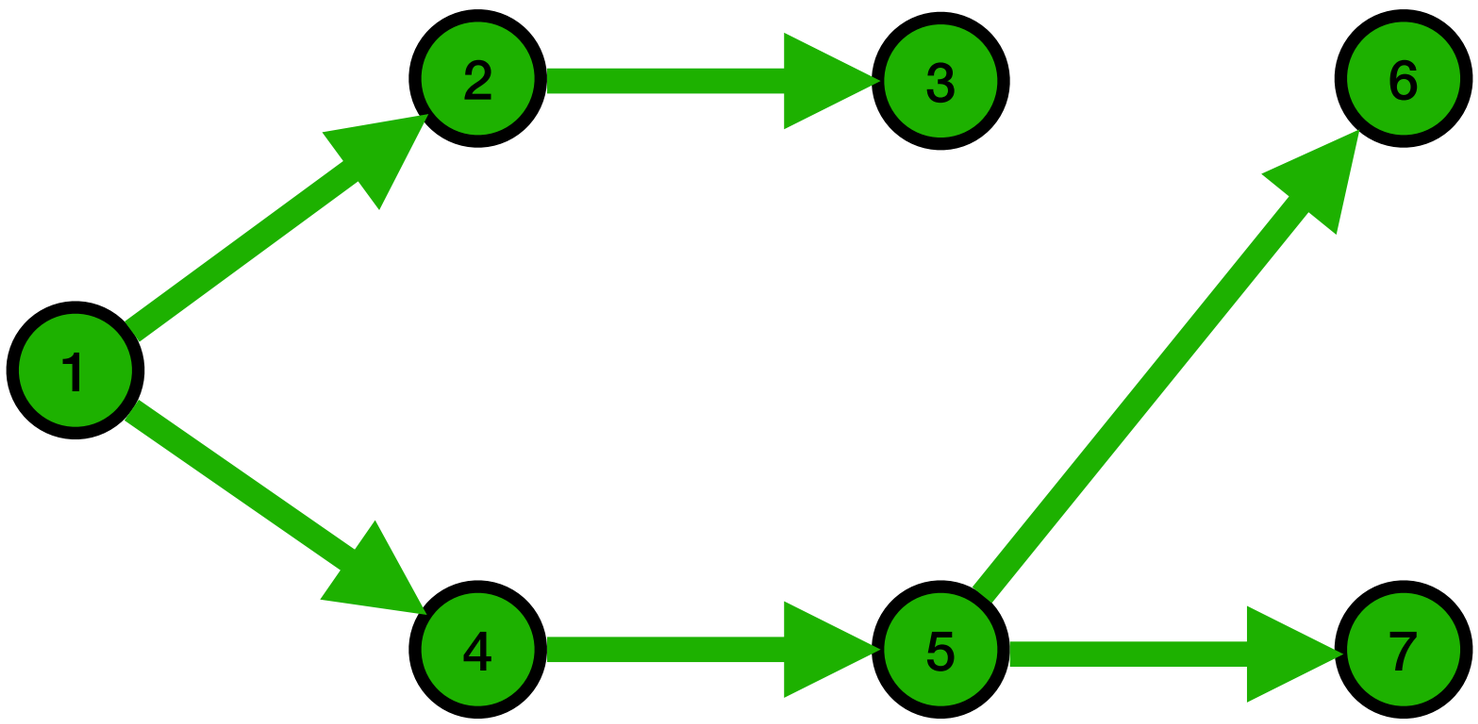
Parcours en largeur



Structure de données « file »

$$F \coloneqq \varnothing$$

Structure de données « file »

$$F := \varnothing$$

$$F \rightarrow$$

Structure de données « file »

enfiler(F, 1)

F →

Structure de données « file »

enfiler(F, 1)

F → 1

Structure de données « file »

enfiler(F, 2)

F → 1 2

Structure de données « file »

x ≔ défiler(F)

F → 2

Structure de données « file »

enfiler(F, 3)

F → 2 3

Structure de données « file »

enfiler(F, 4)

F → 2 3 4

Structure de données « file »

enfiler(F, 5)

F → 2 3 4 5

Structure de données « file »

x ≔ défiler(F)

F → 3 4 5

Structure de données « file »

x ≔ défiler(F)

F → 4 5

Structure de données « file »

x ≔ défiler(F)

F → 5

Structure de données « file »

x ≔ défiler(F)

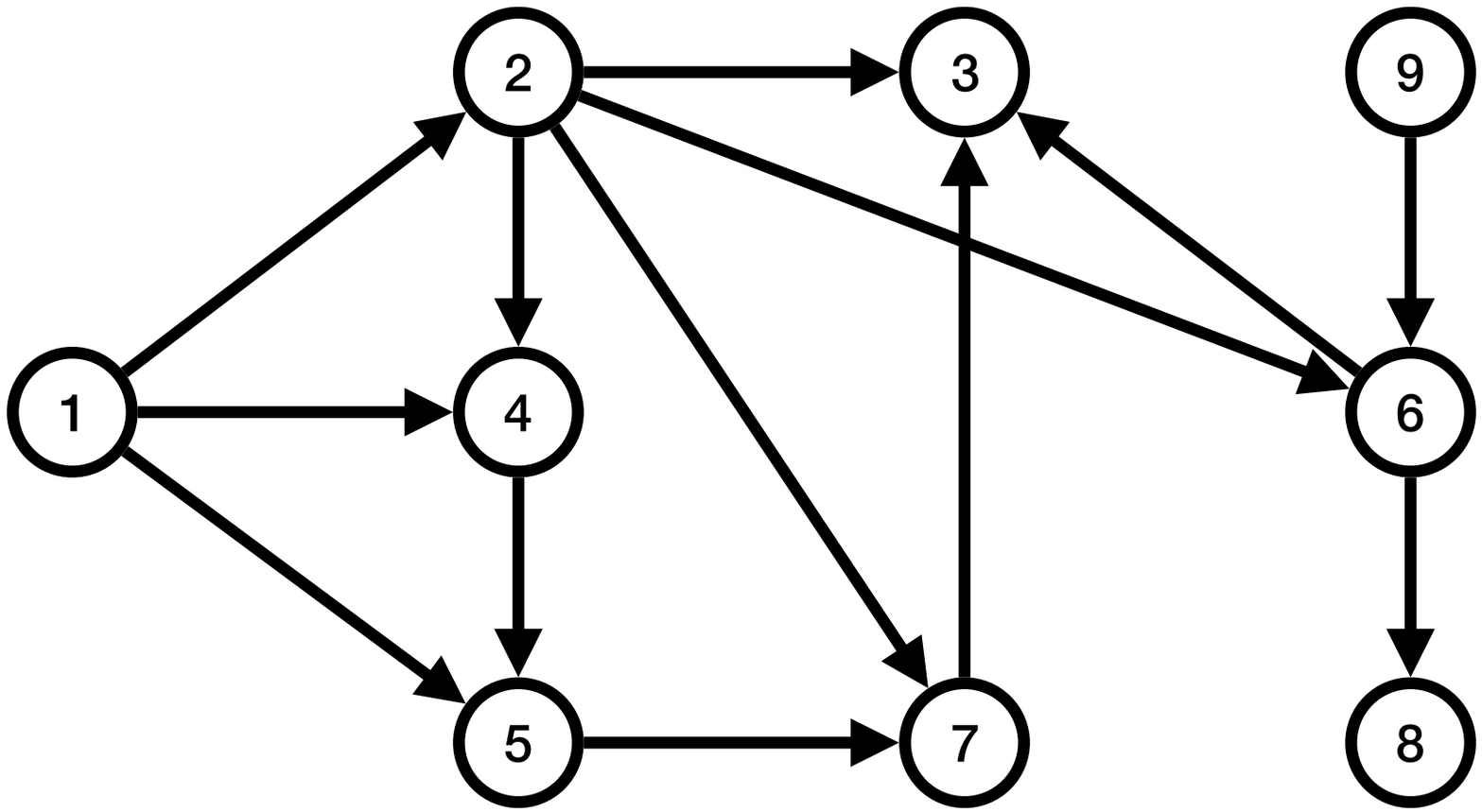
F →

Structure de données « file »

F →

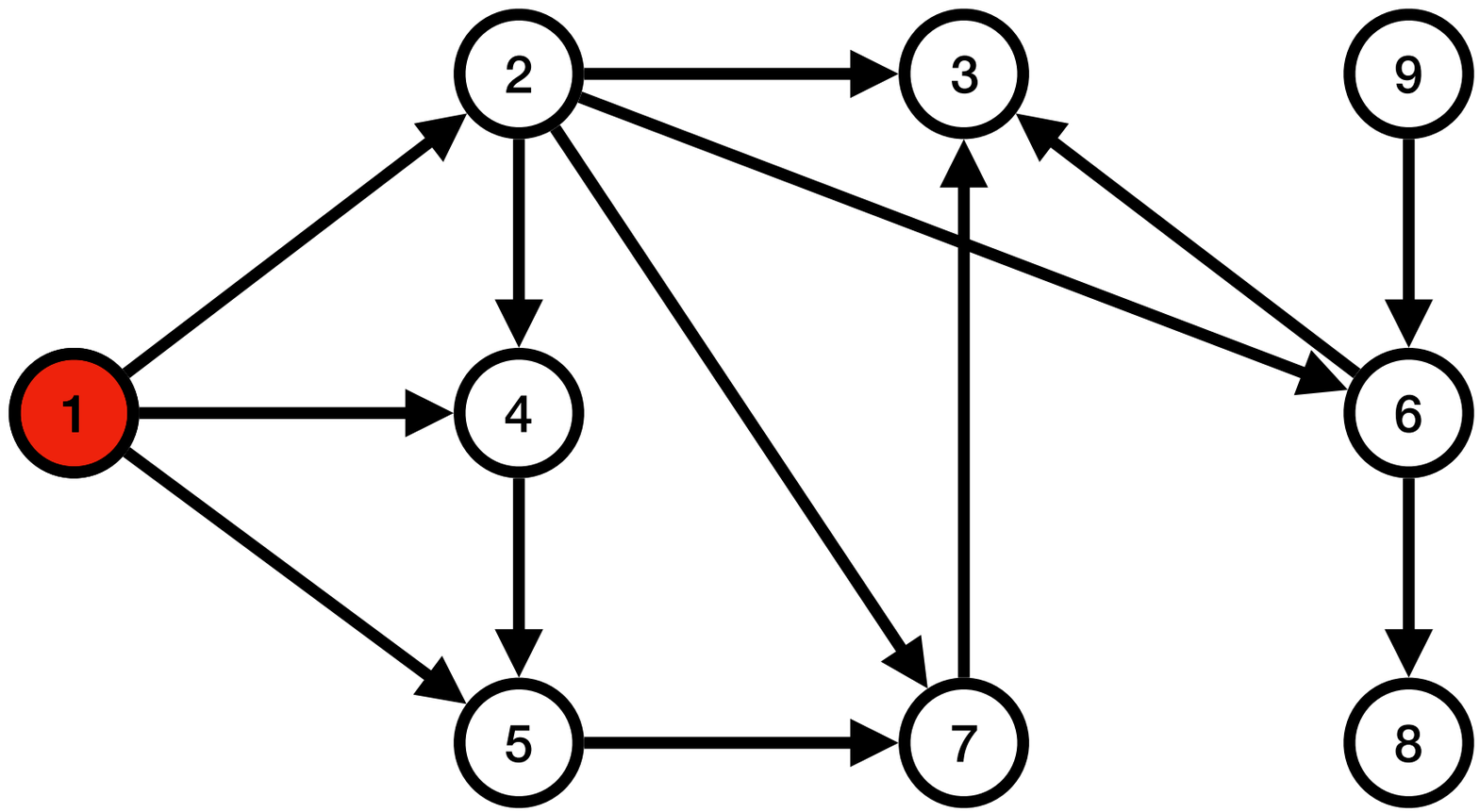
```
fonction parcours-en-largeur(G, s)
    n ≔ |G|                 (nombre de sommets)
    pour v ≔ 0 jusqu'à n – 1 faire
        couleur[v] ≔ blanc
    fin pour
    H ≔ graphe(n)           (graphe vide)
    F ≔ ∅                   (file vide)
    couleur[s] ≔ rouge
    enfiler(F, s)
    tant que F ≠ ∅ faire
        u ≔ défiler(F)
        pour v ≔ 0 jusqu'à n – 1 faire
            si G[u, v] = 1 et couleur[v] = blanc alors
                couleur[v] ≔ rouge
                H[u, v] ≔ 1
                enfiler(F, v)
            fin si
        couleur[u] ≔ vert
        fin pour
    fin tant que
    retourner H             (graphe des chemins minimaux)
fin fonction
```

Un autre exemple



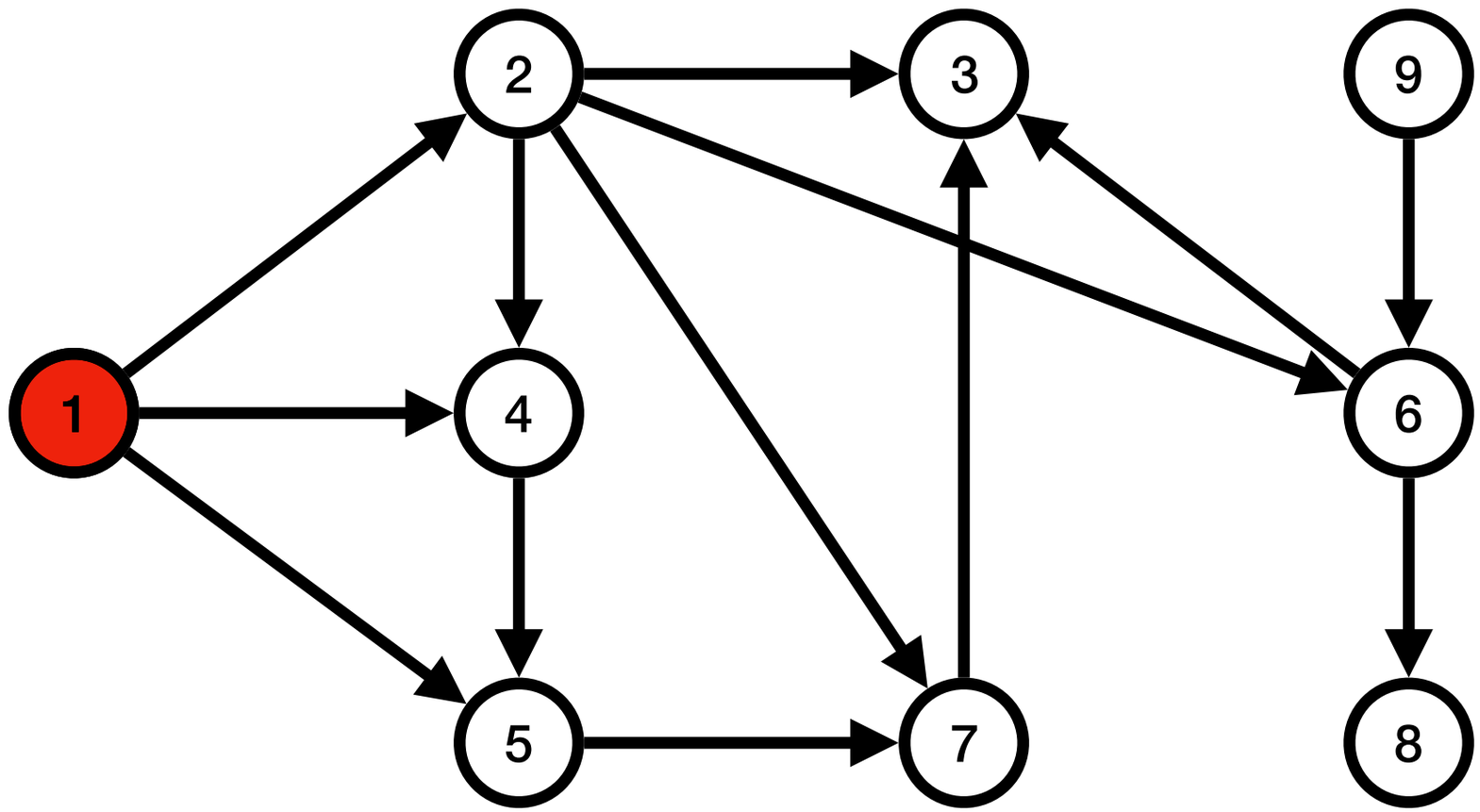
File →

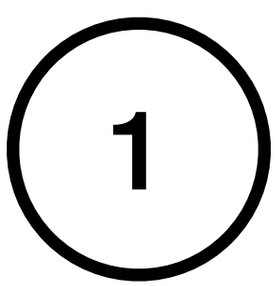
Un autre exemple



File → 1

Un autre exemple





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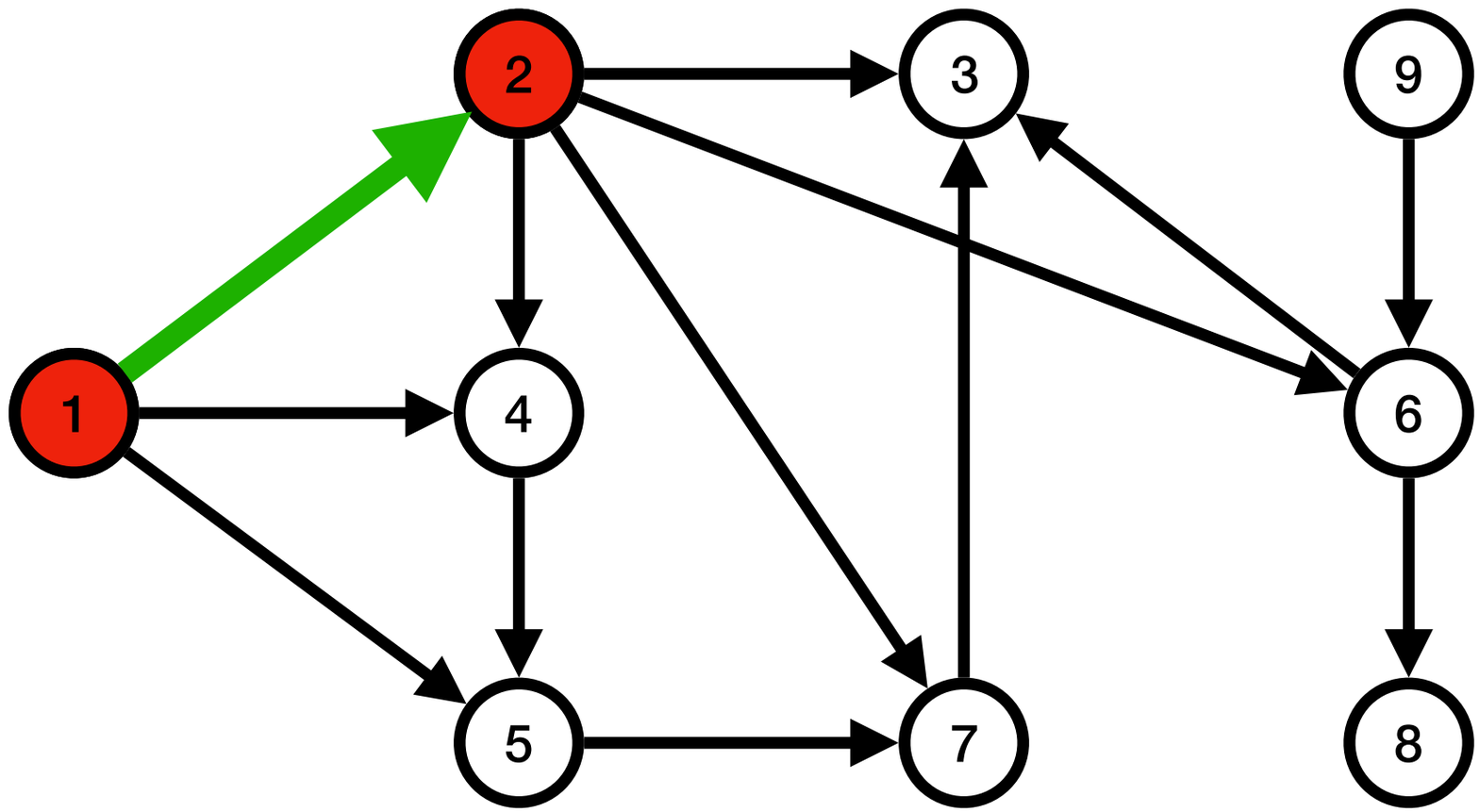
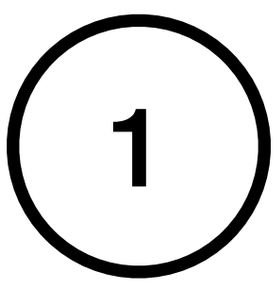
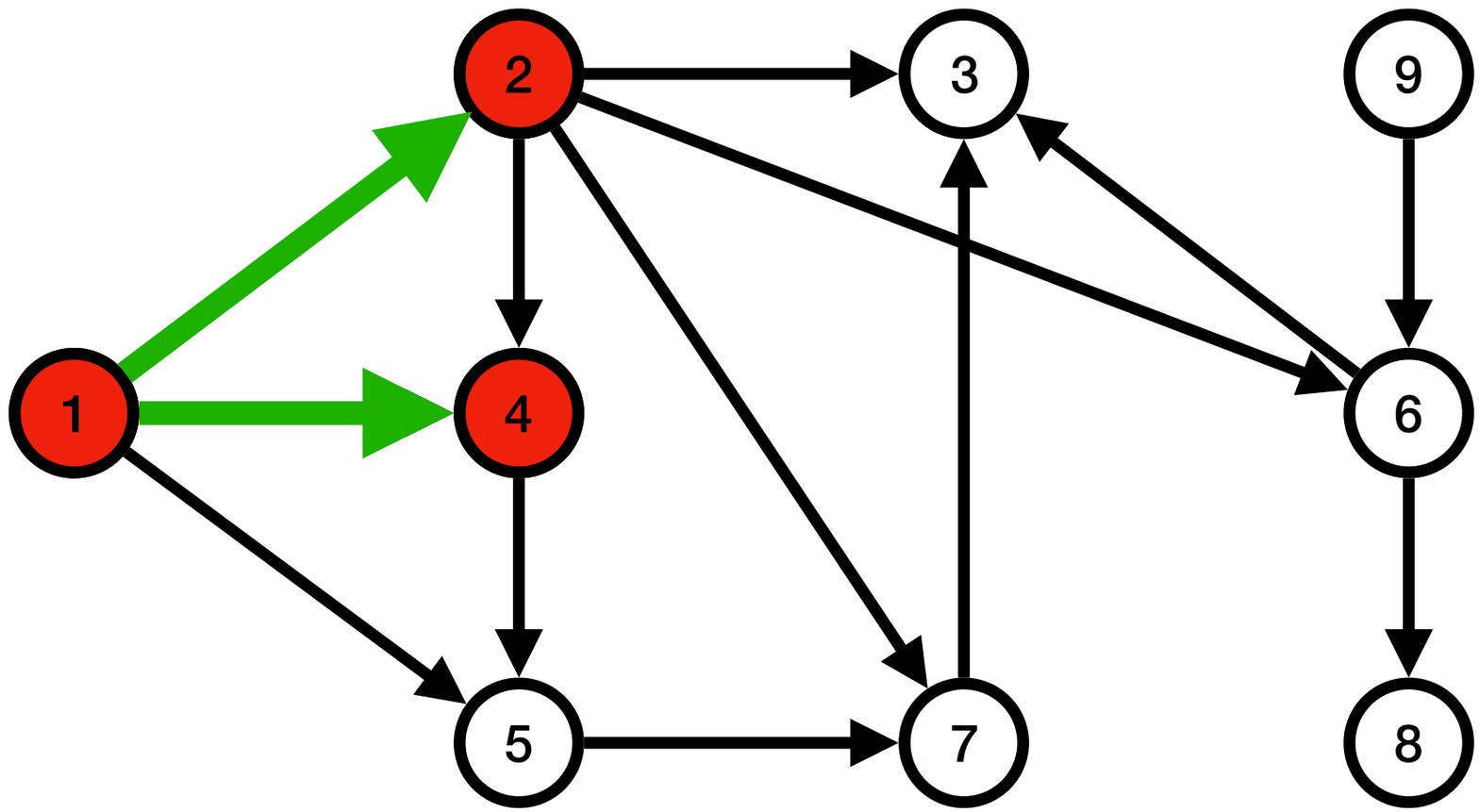
Un autre exemple

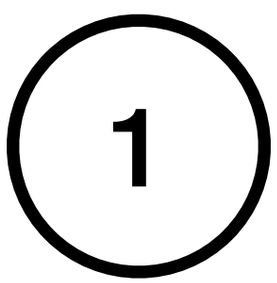


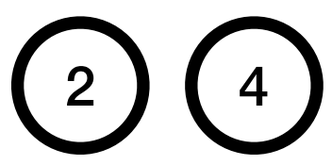


File → 

Un autre exemple





File → 

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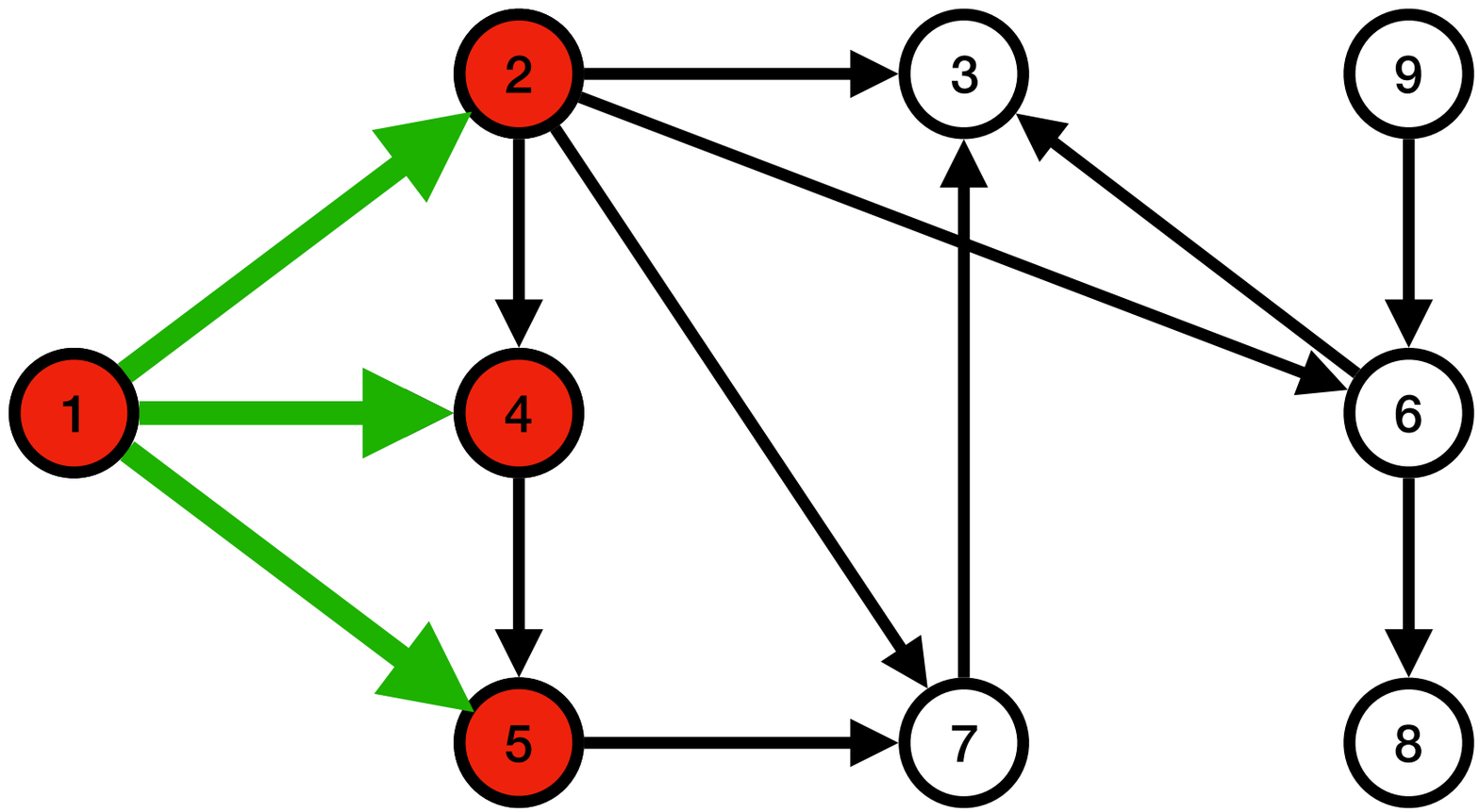

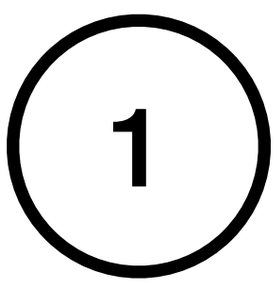

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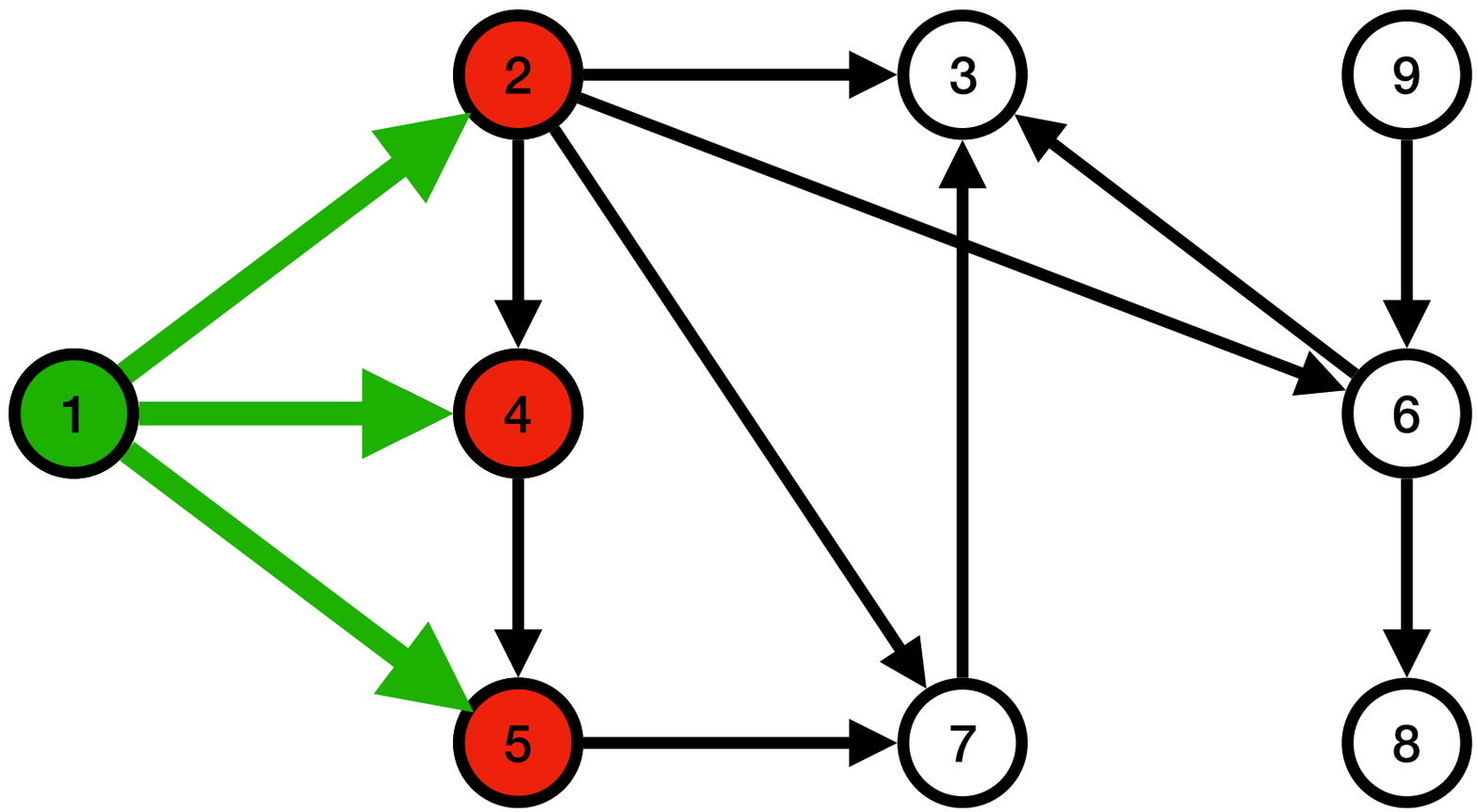
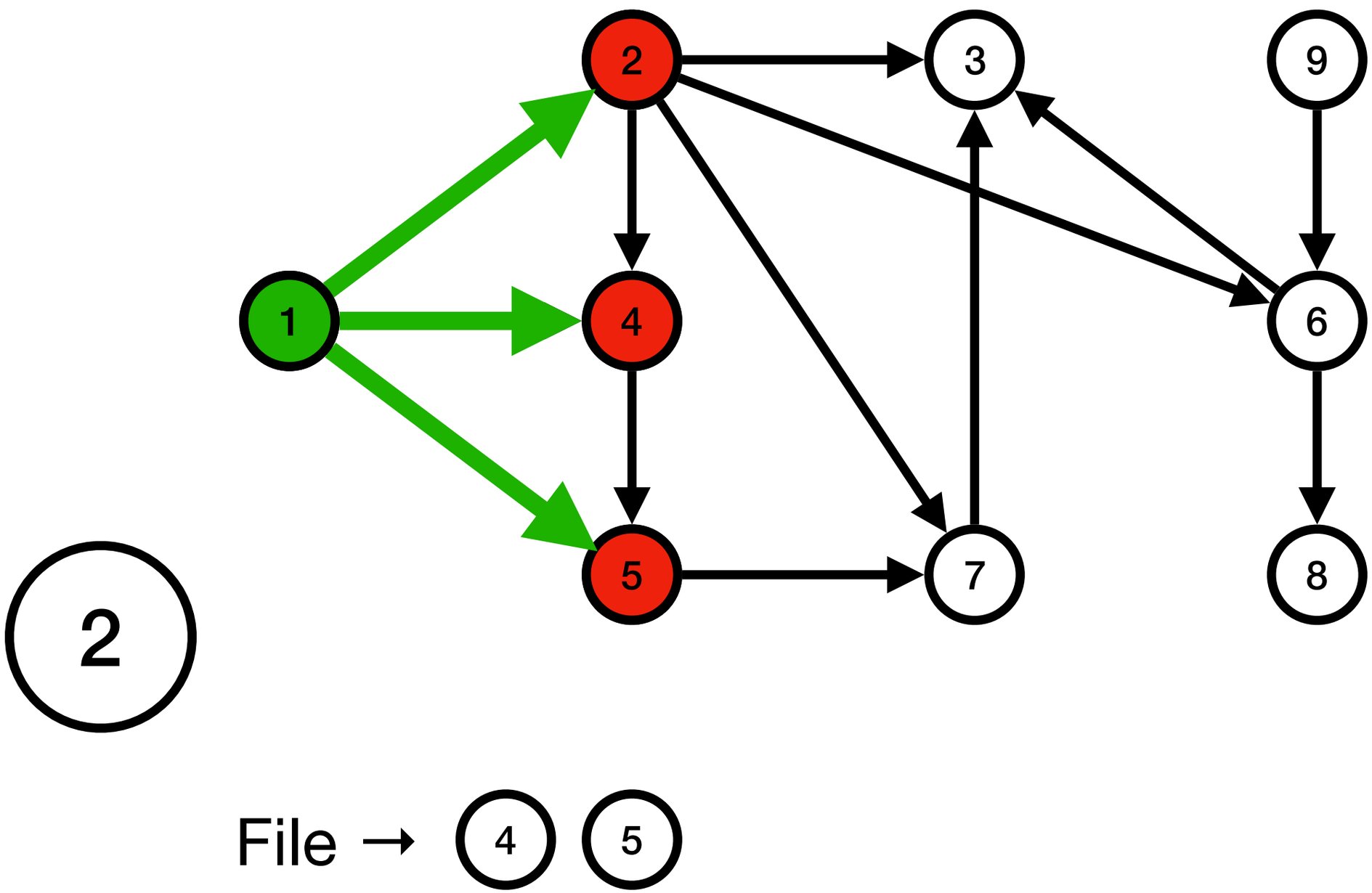
Un autre exemple

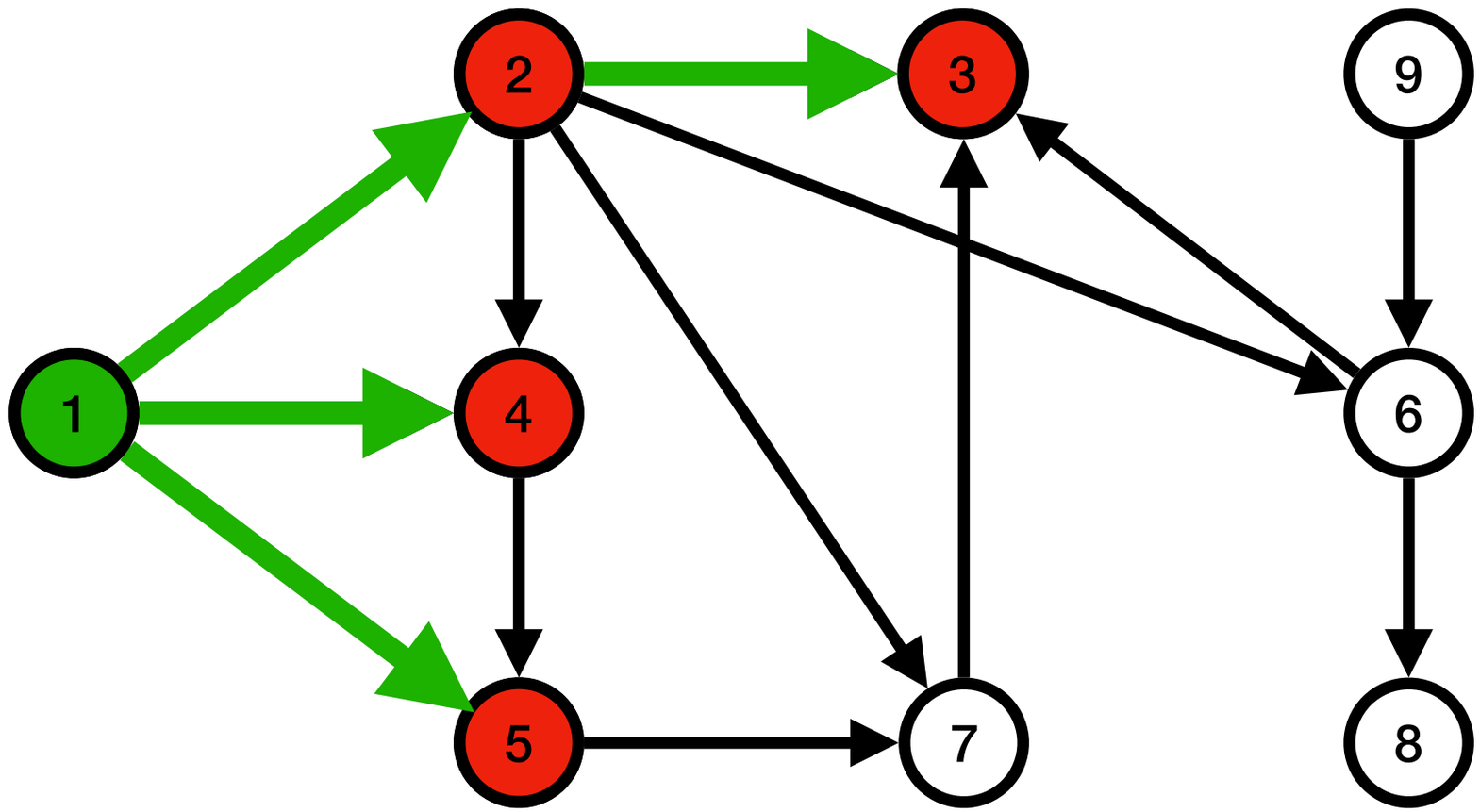


File → 2 4 5

Un autre exemple



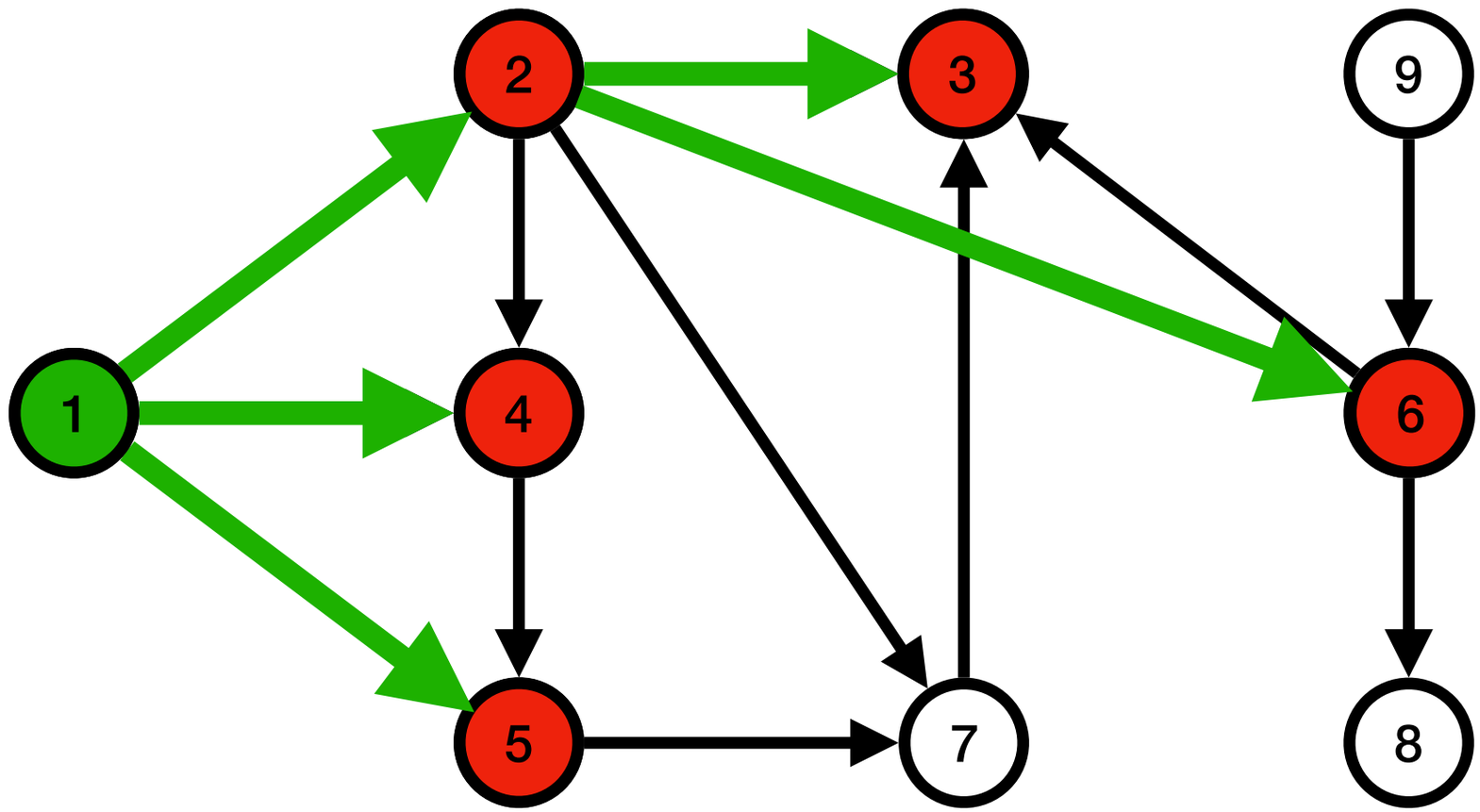
Un autre exemple



2

File → 4 5 3

Un autre exemple



2

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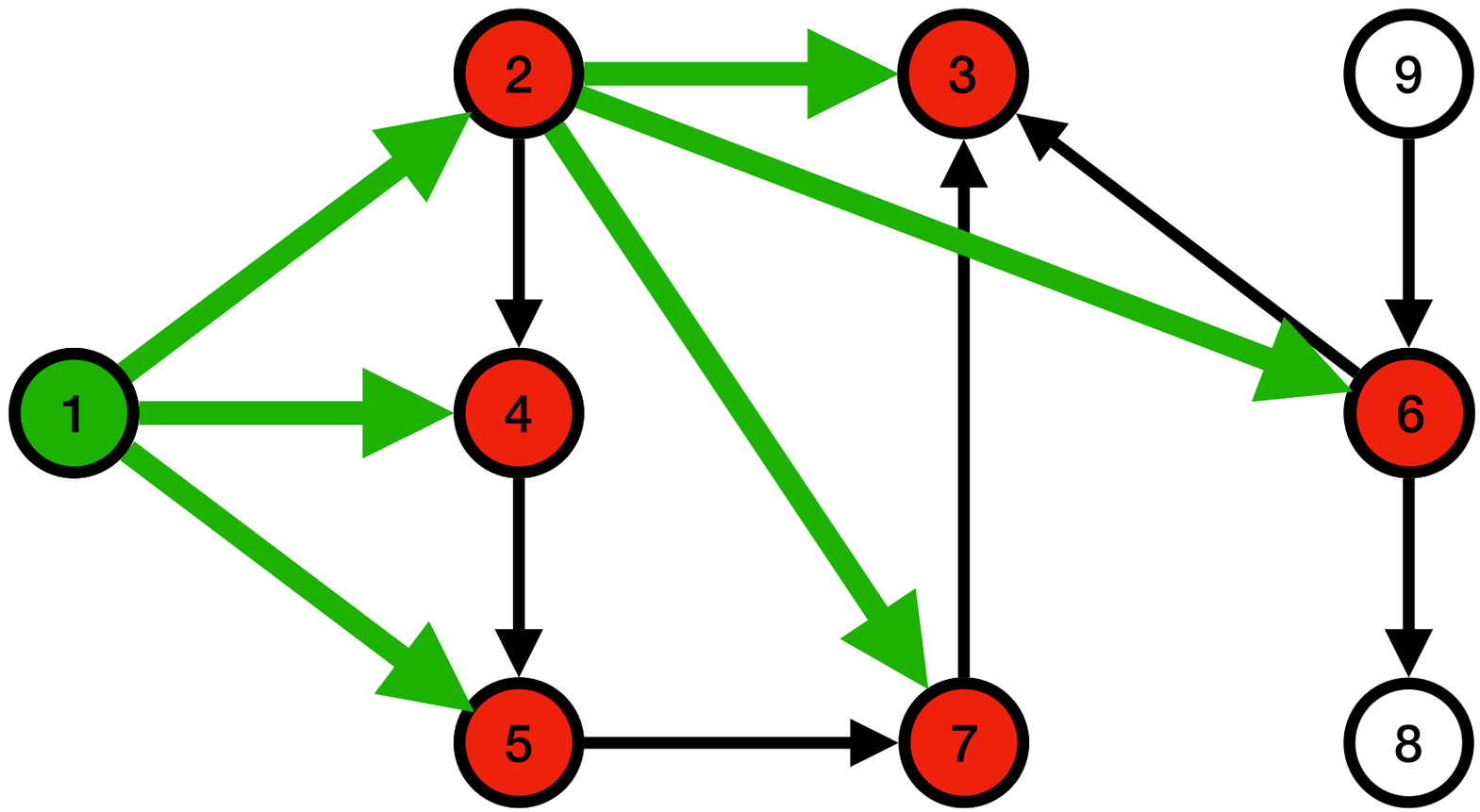
Un autre exemple



2

File → 4 5 3 6 7

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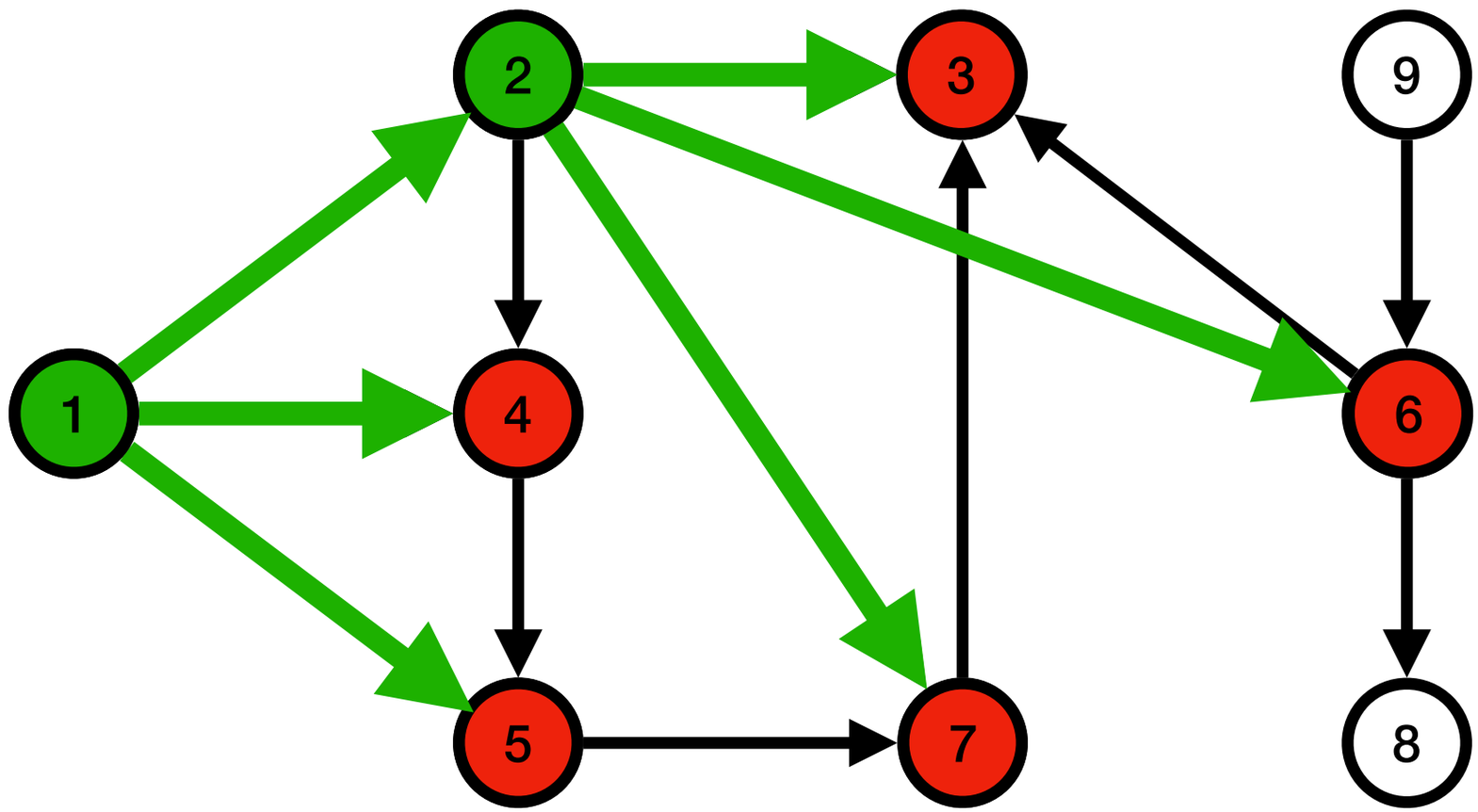

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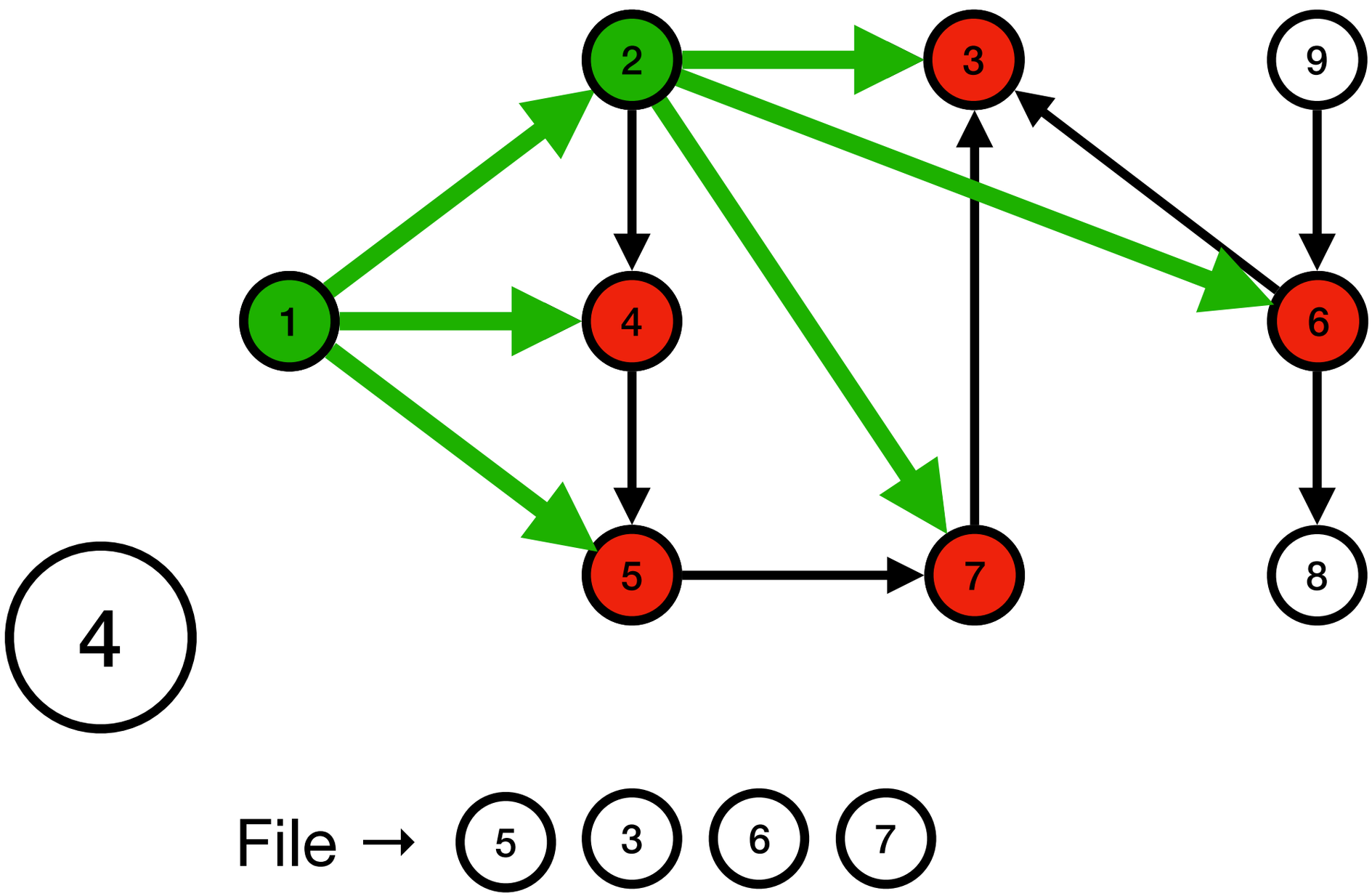

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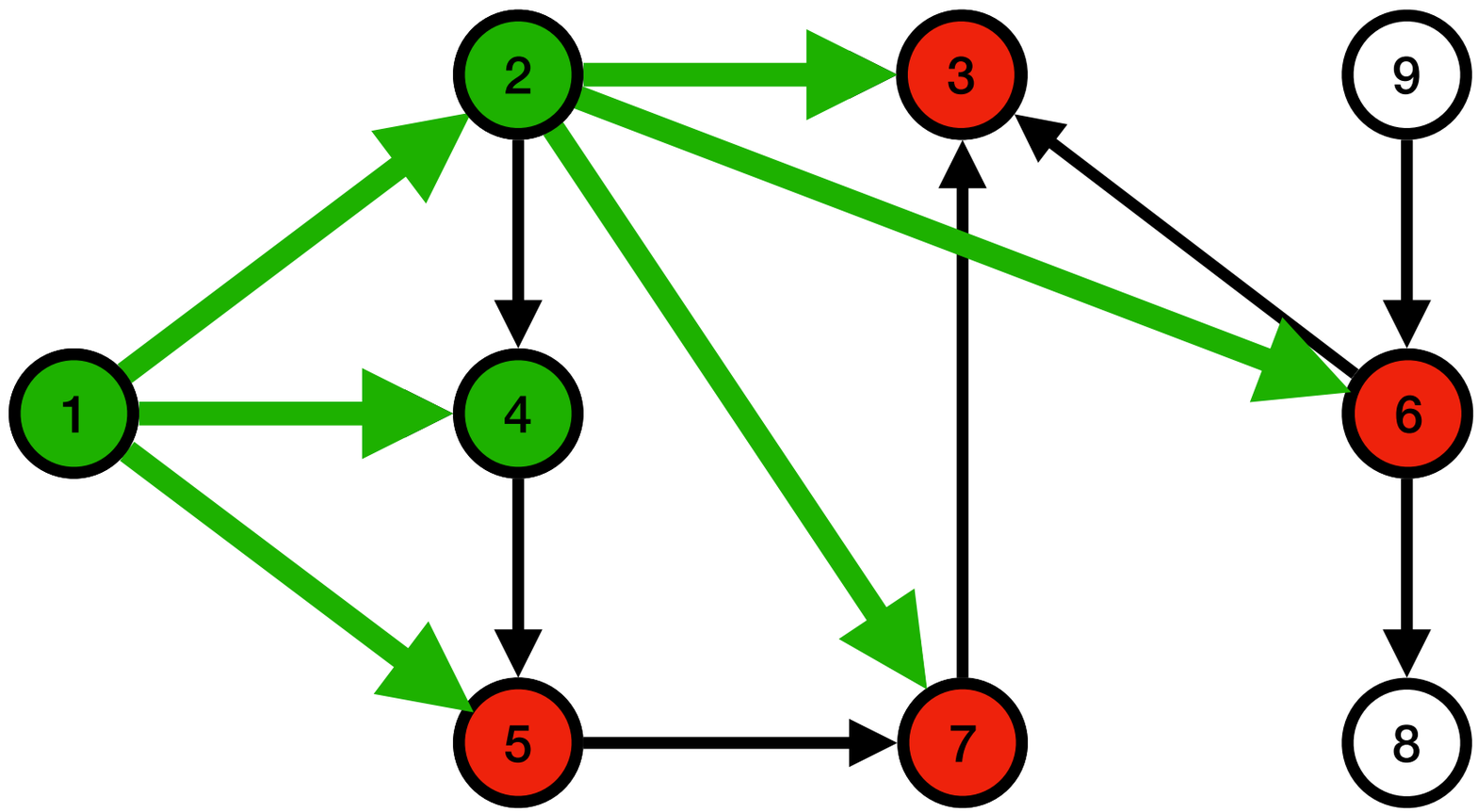

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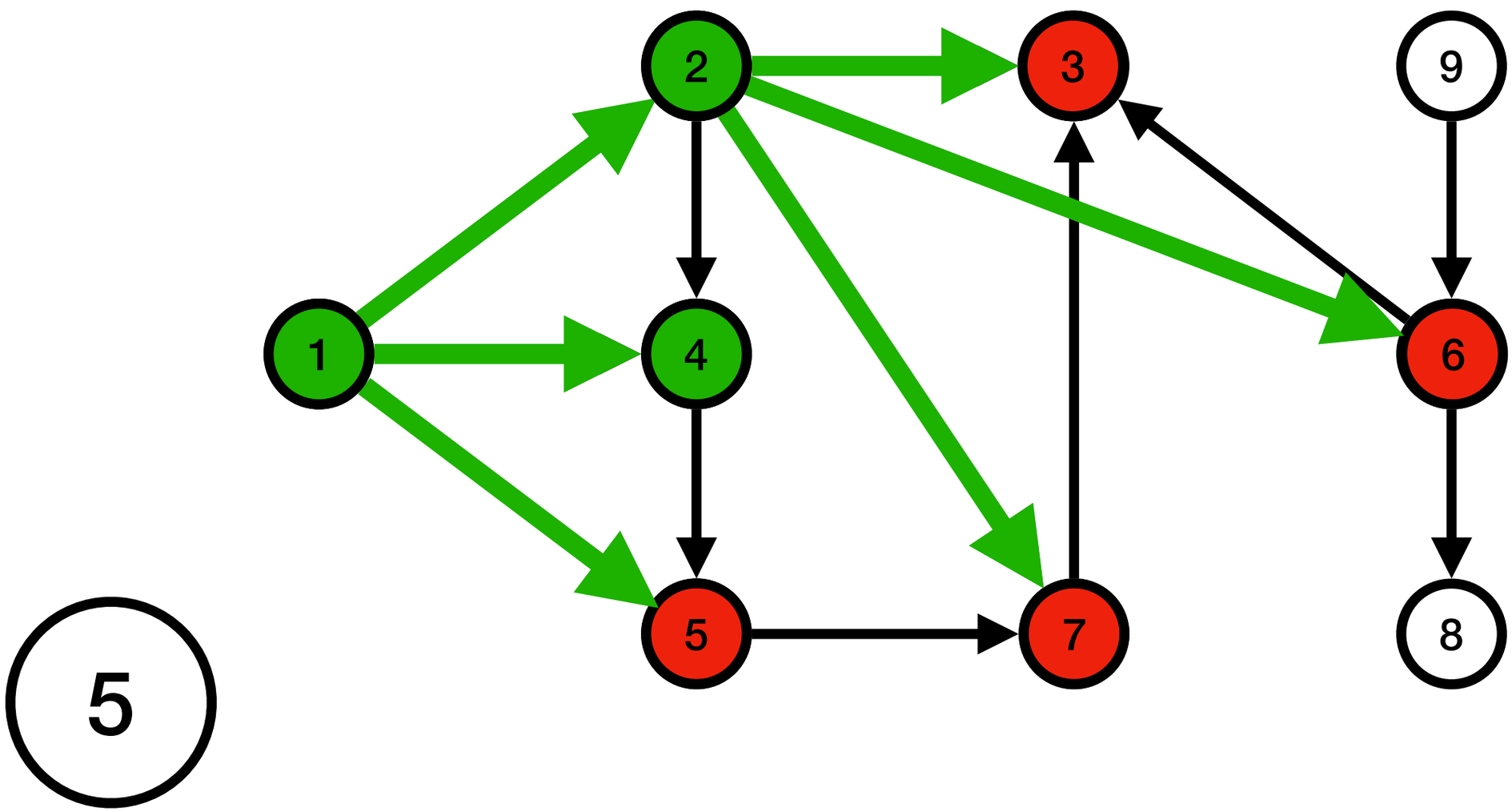
Un autre exemple



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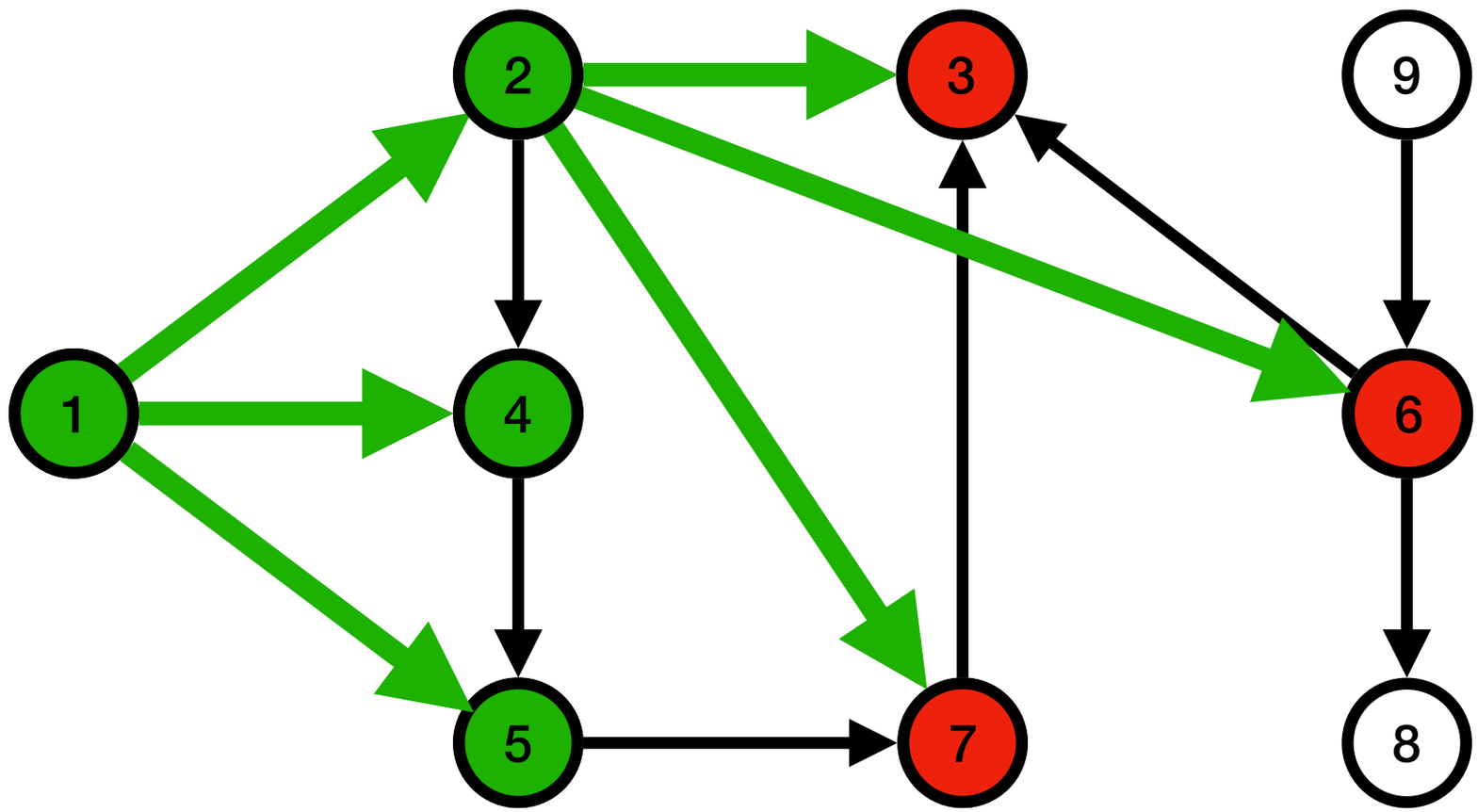

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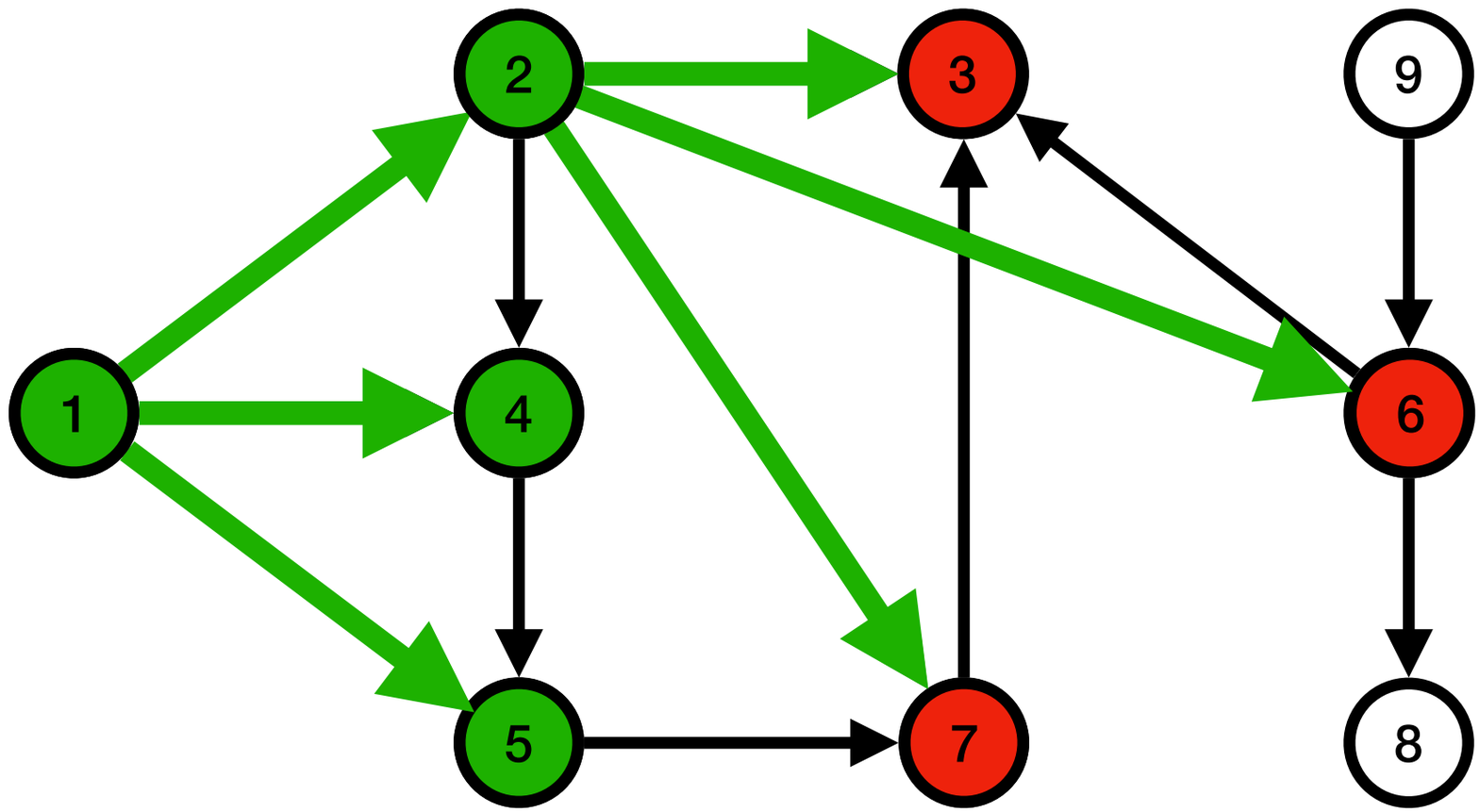

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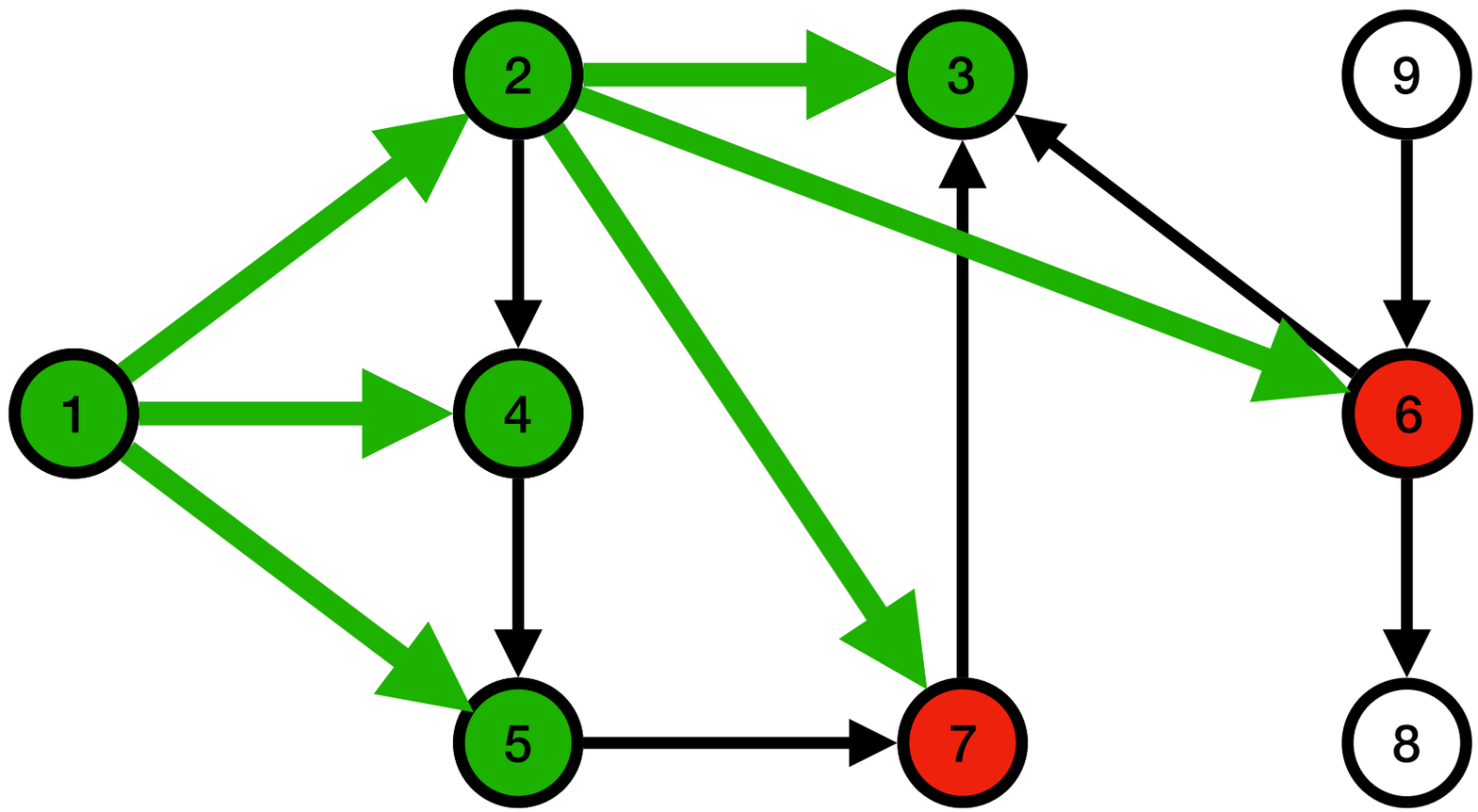

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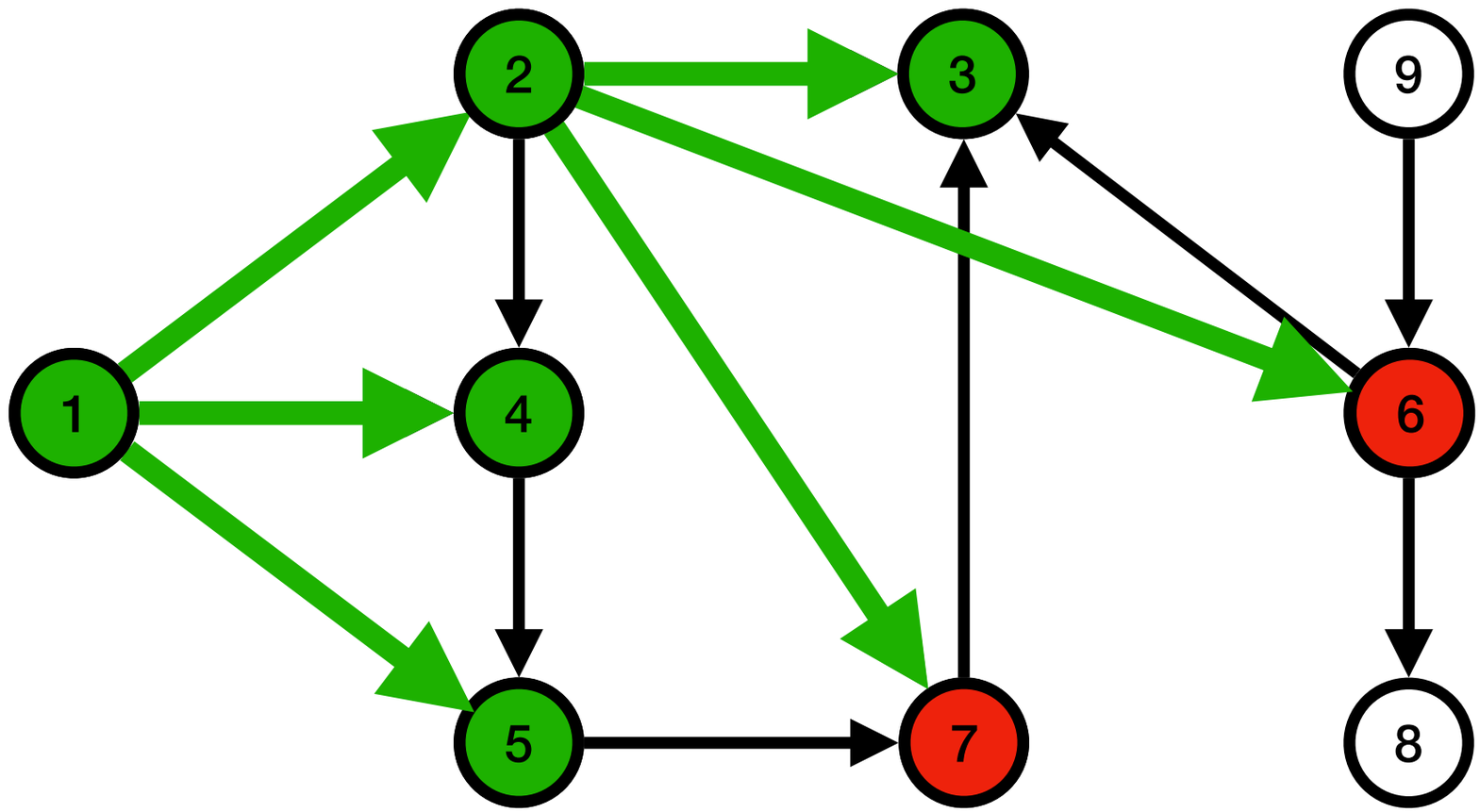

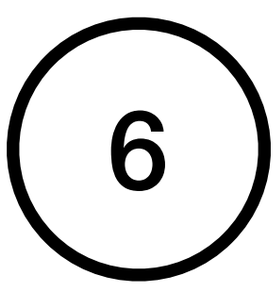

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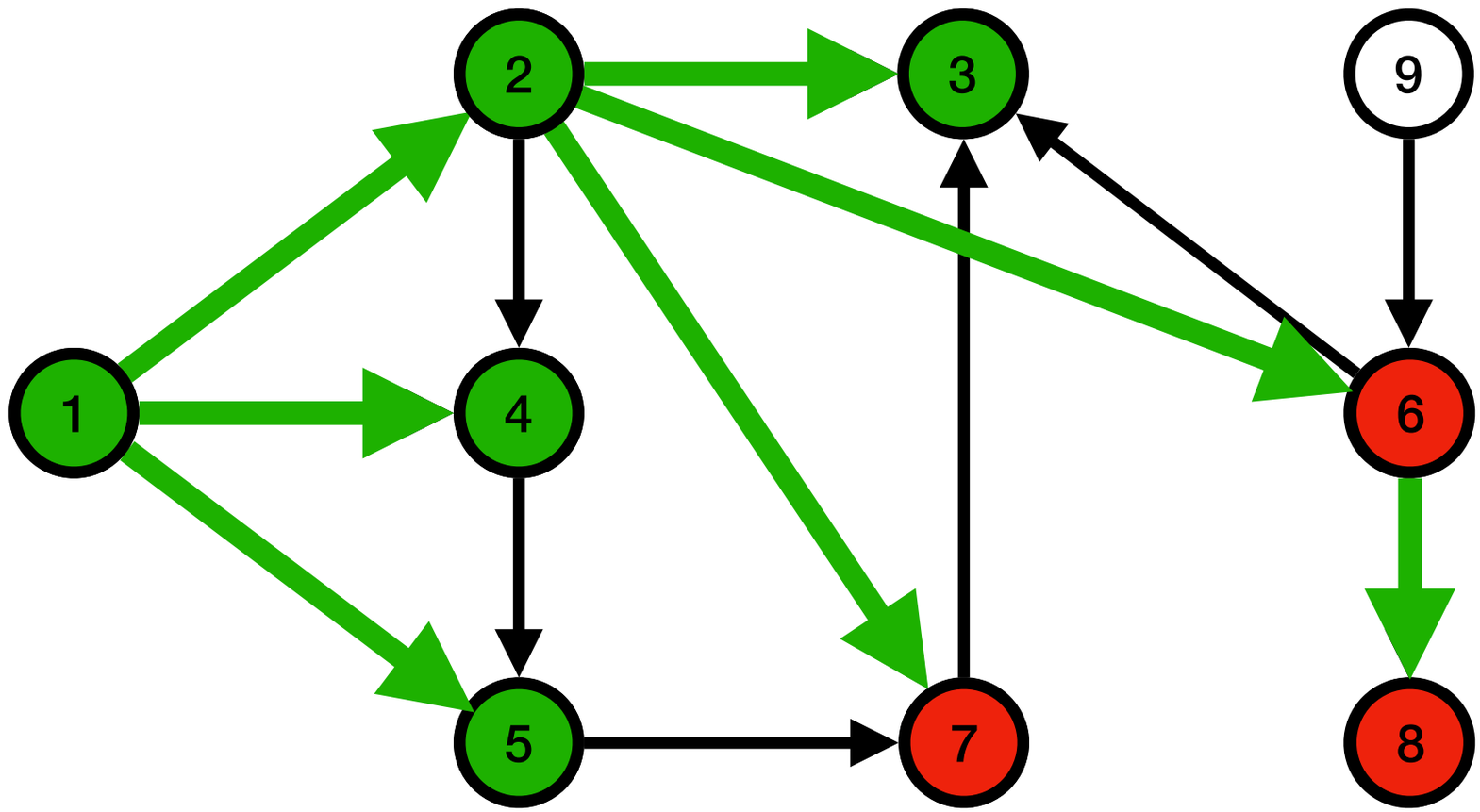
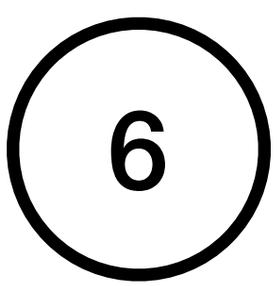
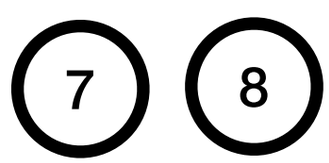




File → 

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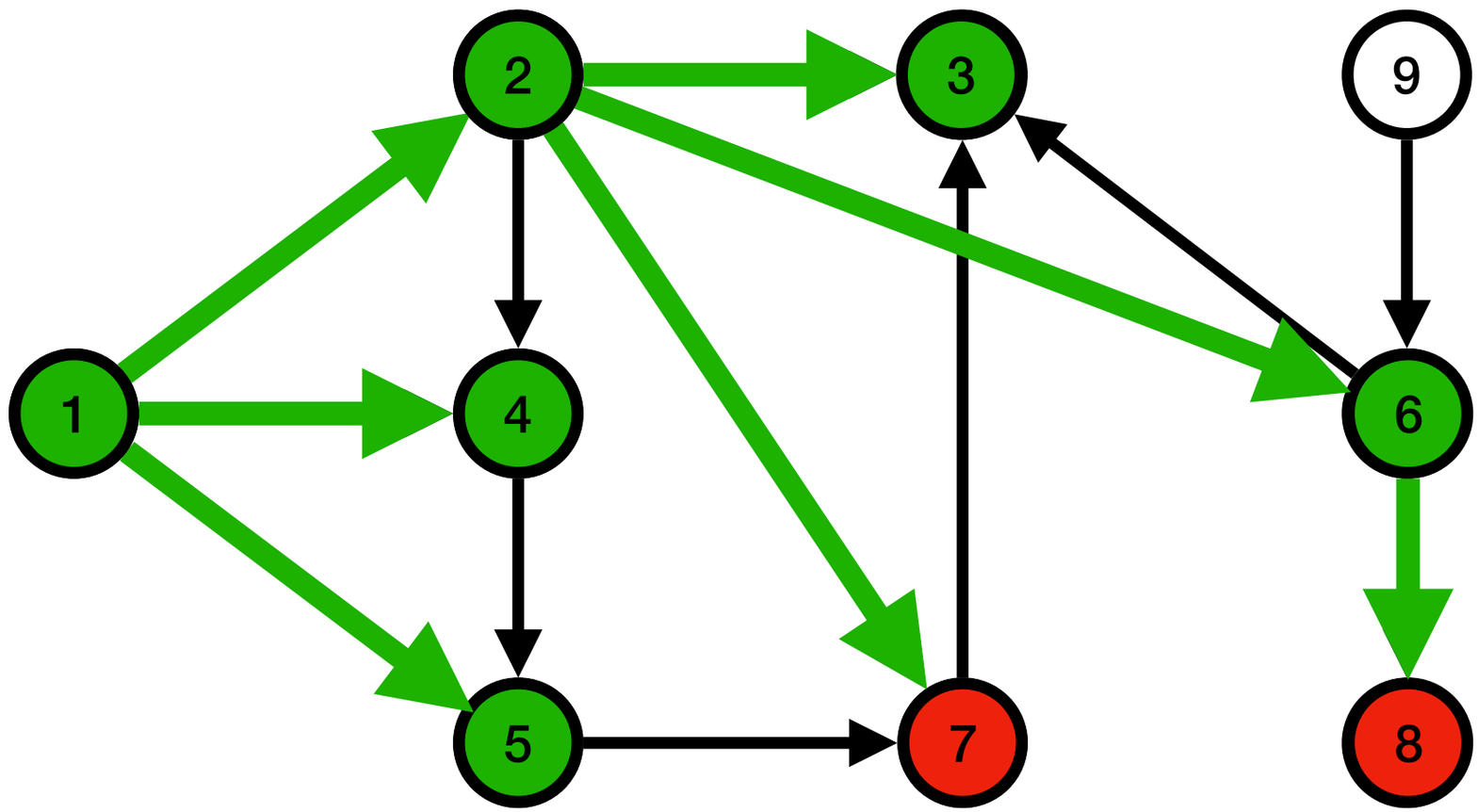

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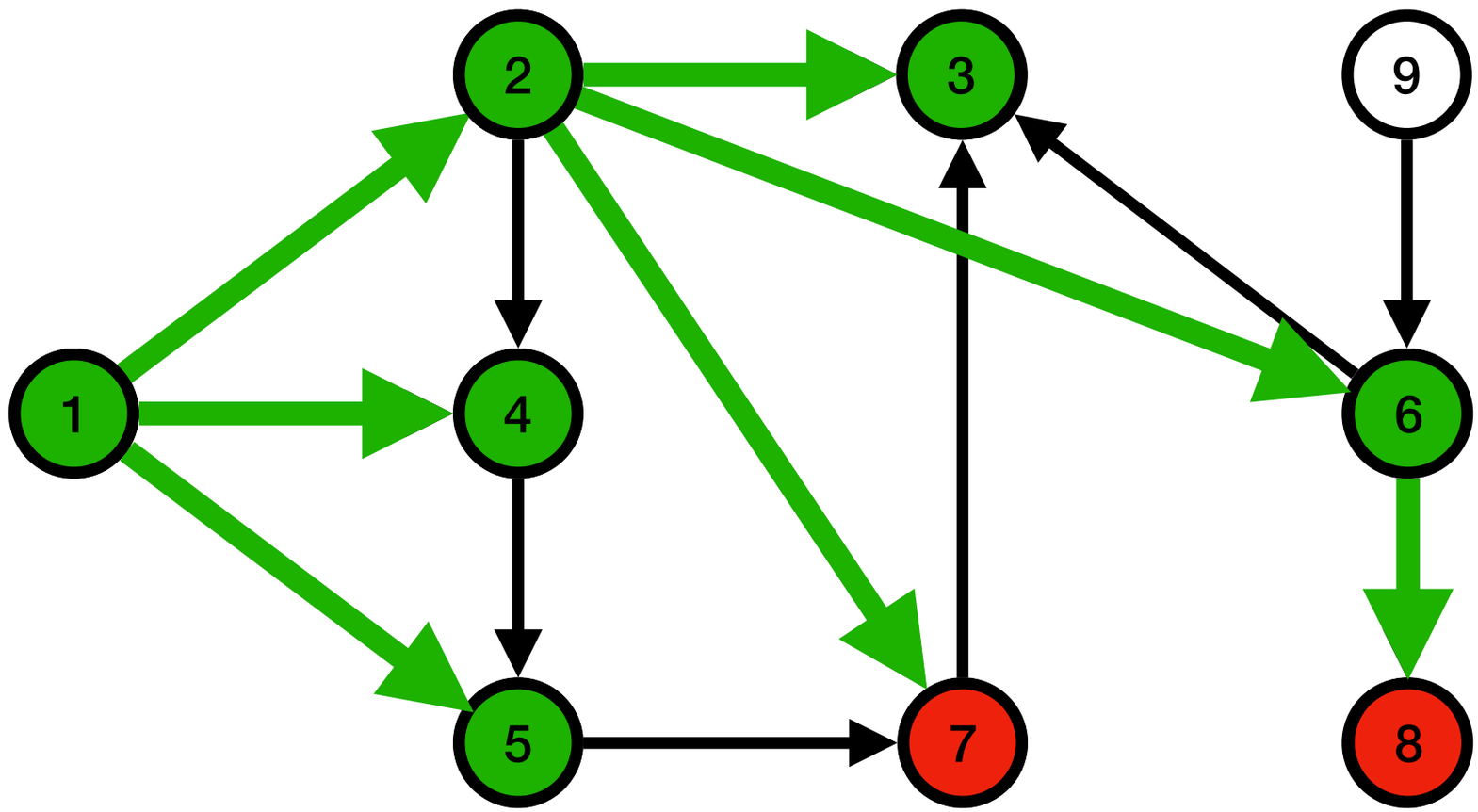
Un autre exemple



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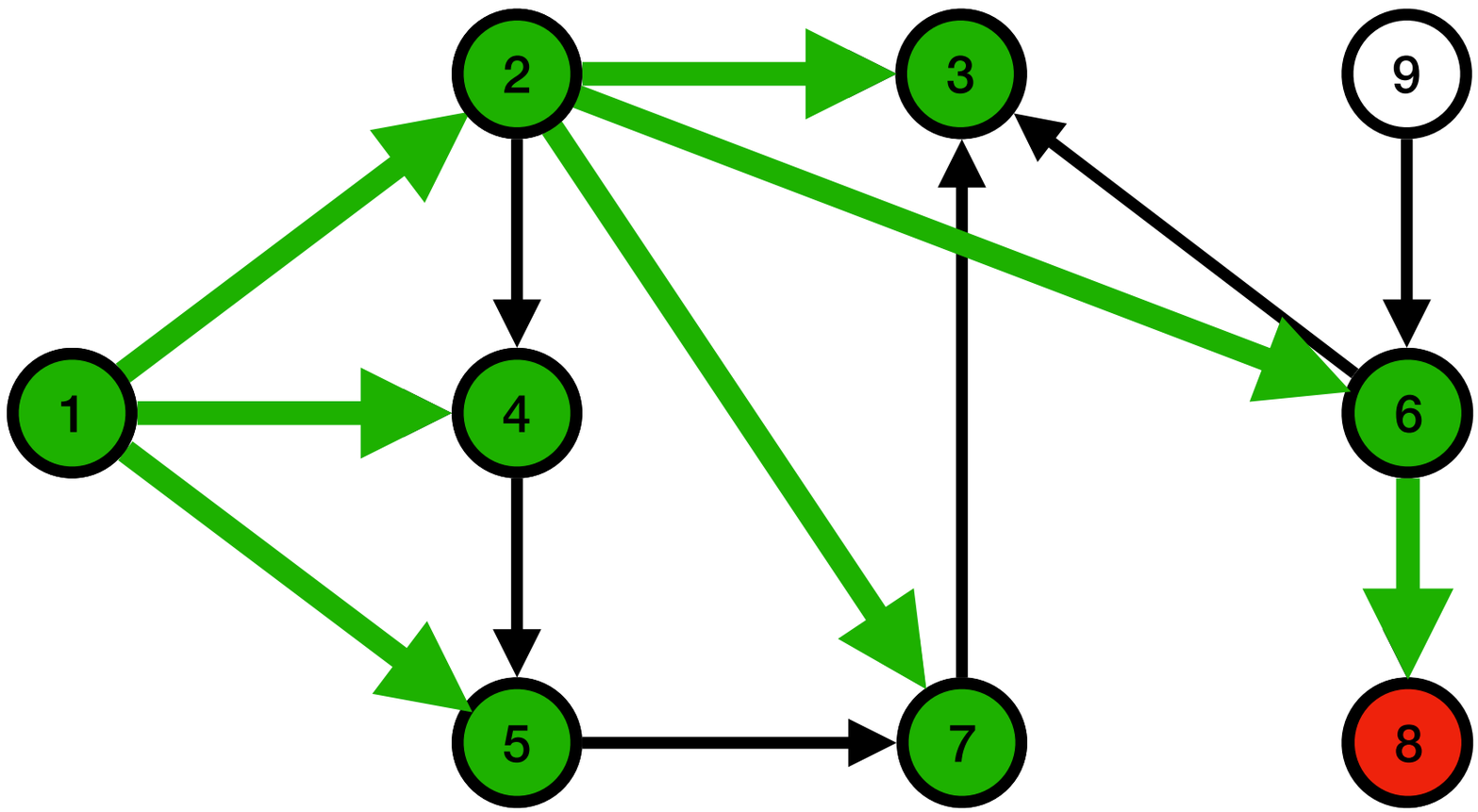
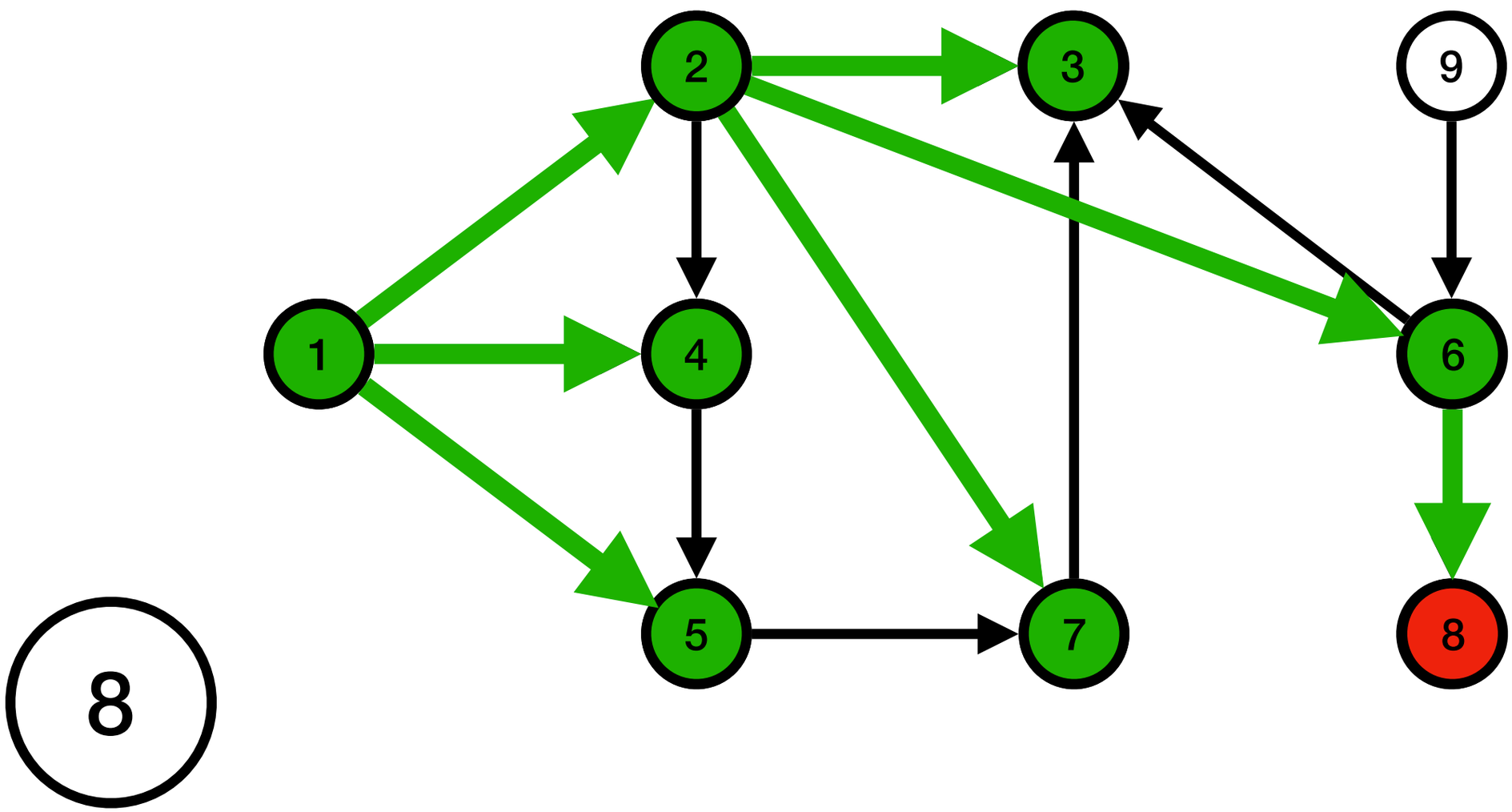


File → 8

Un autre exemple



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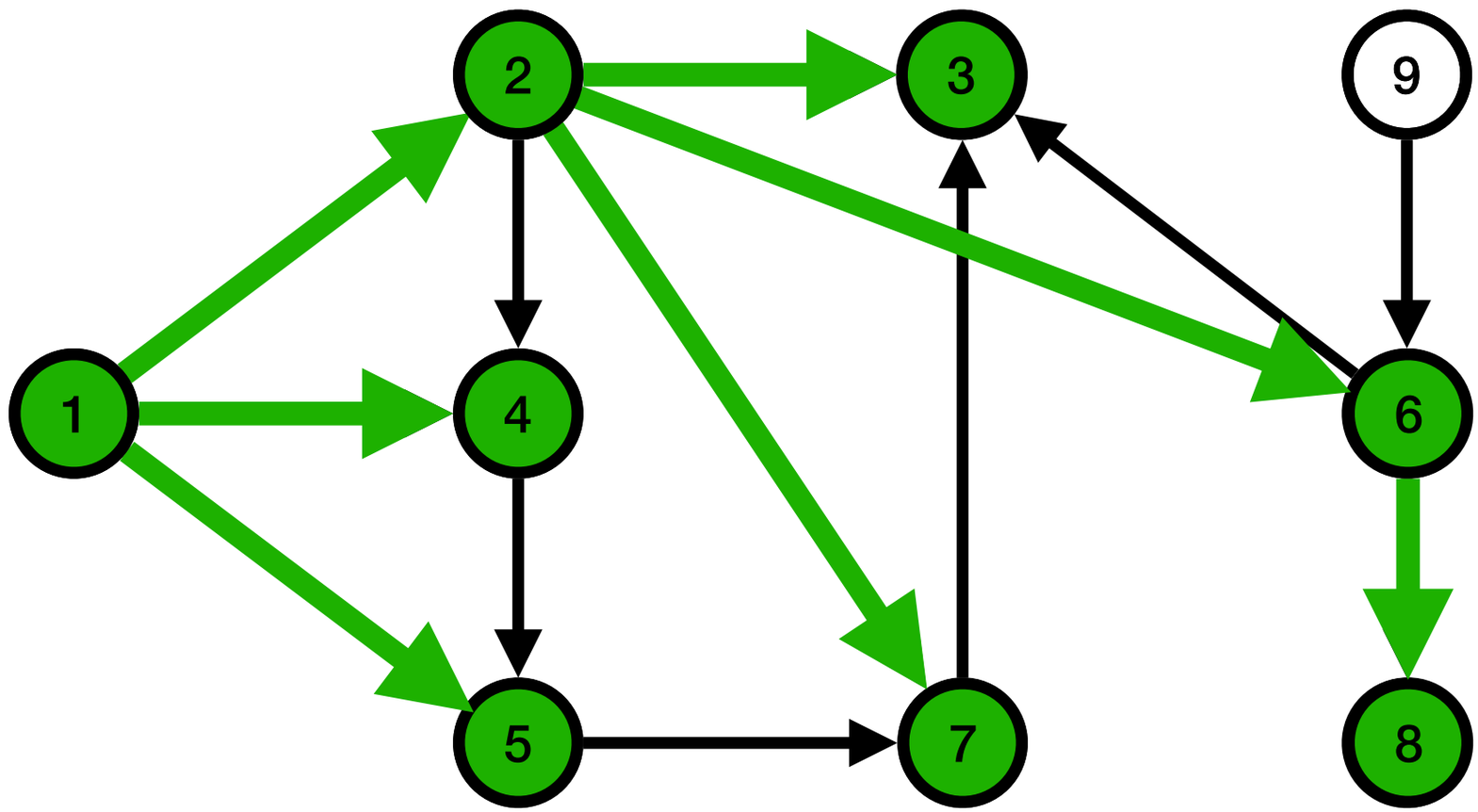

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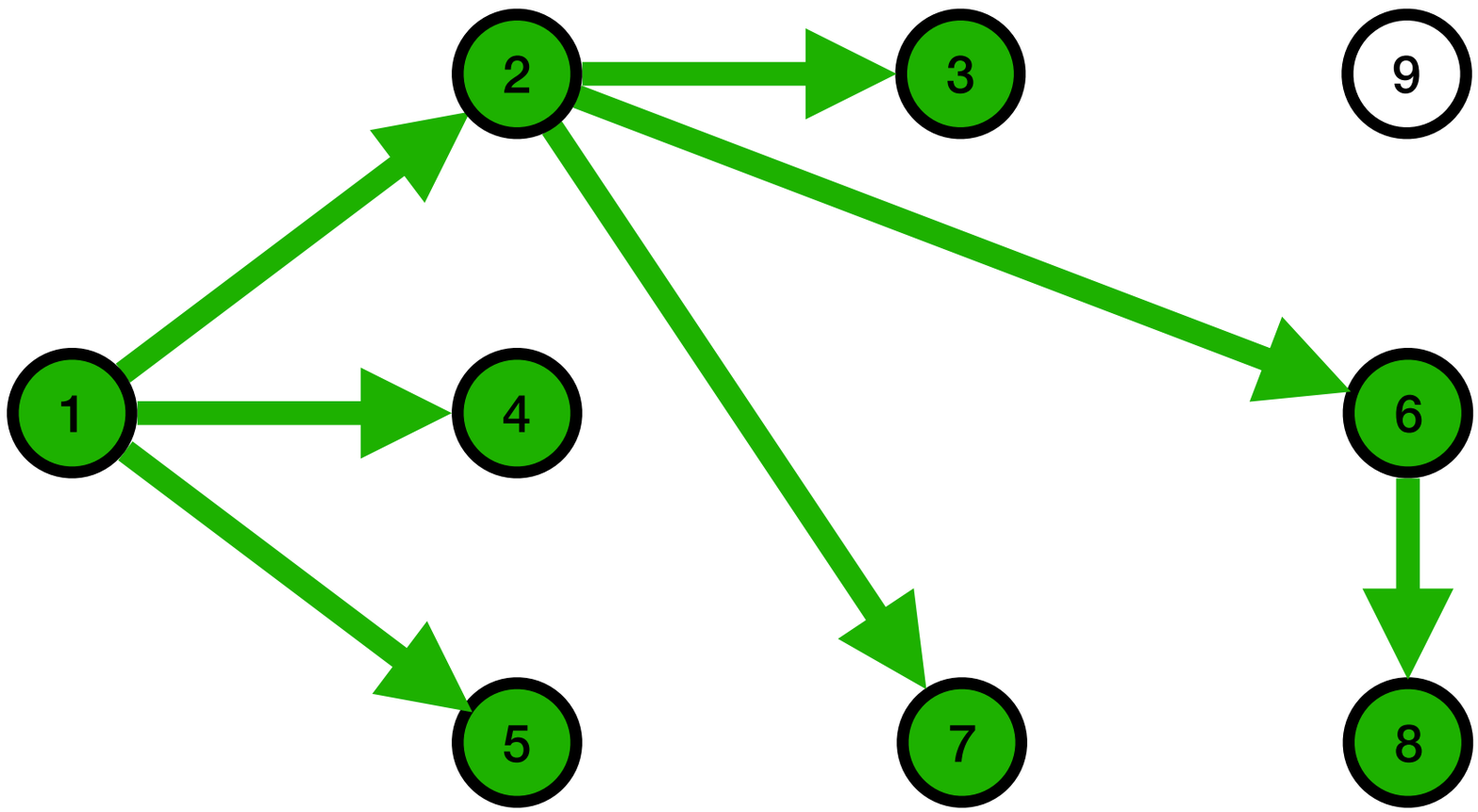

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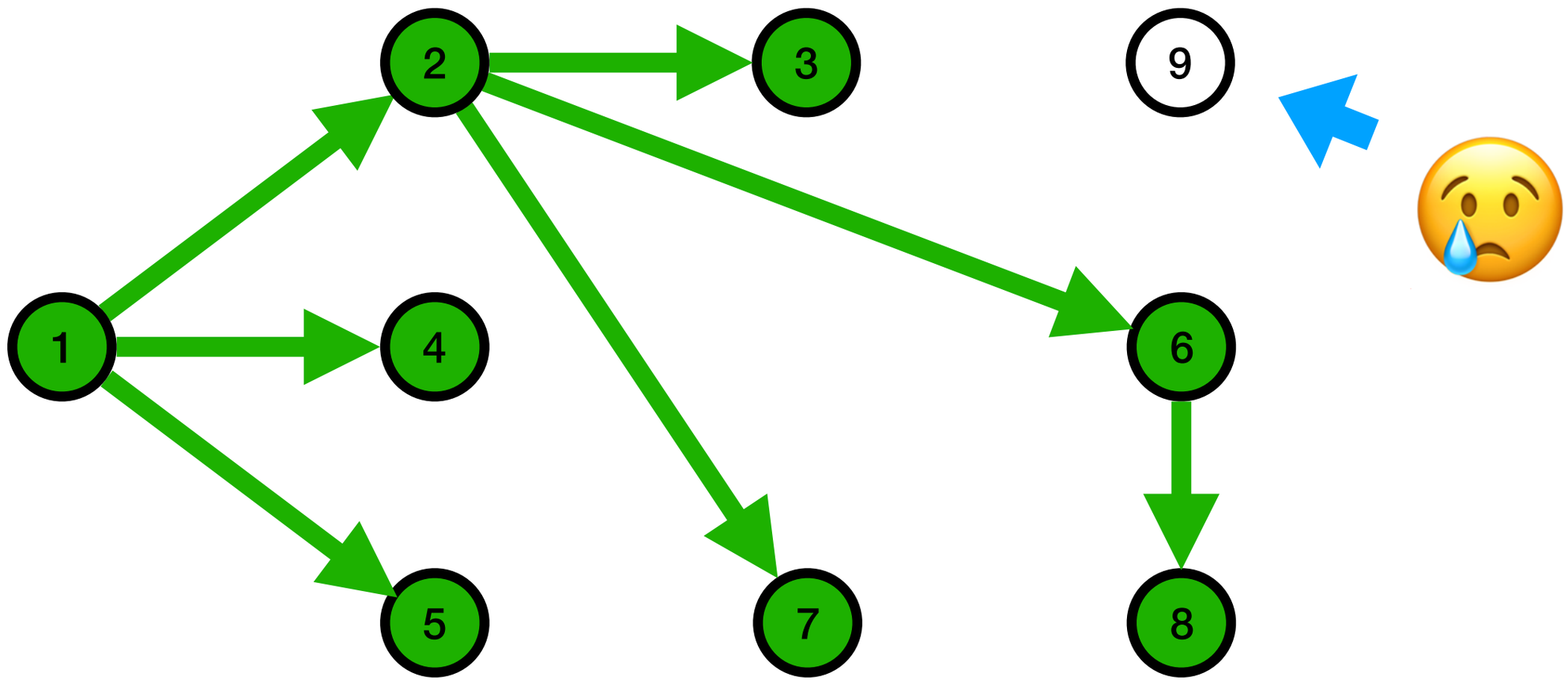
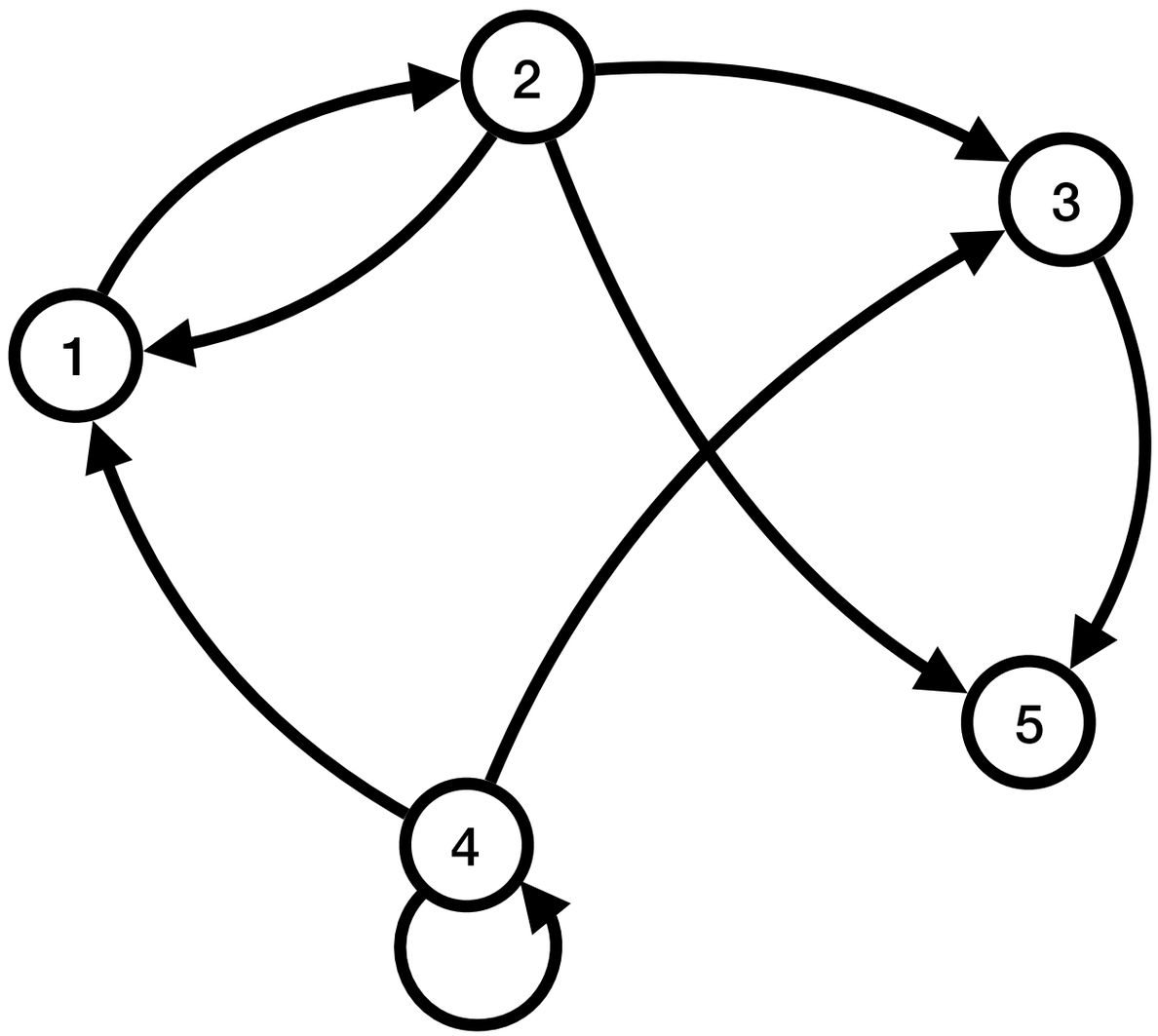
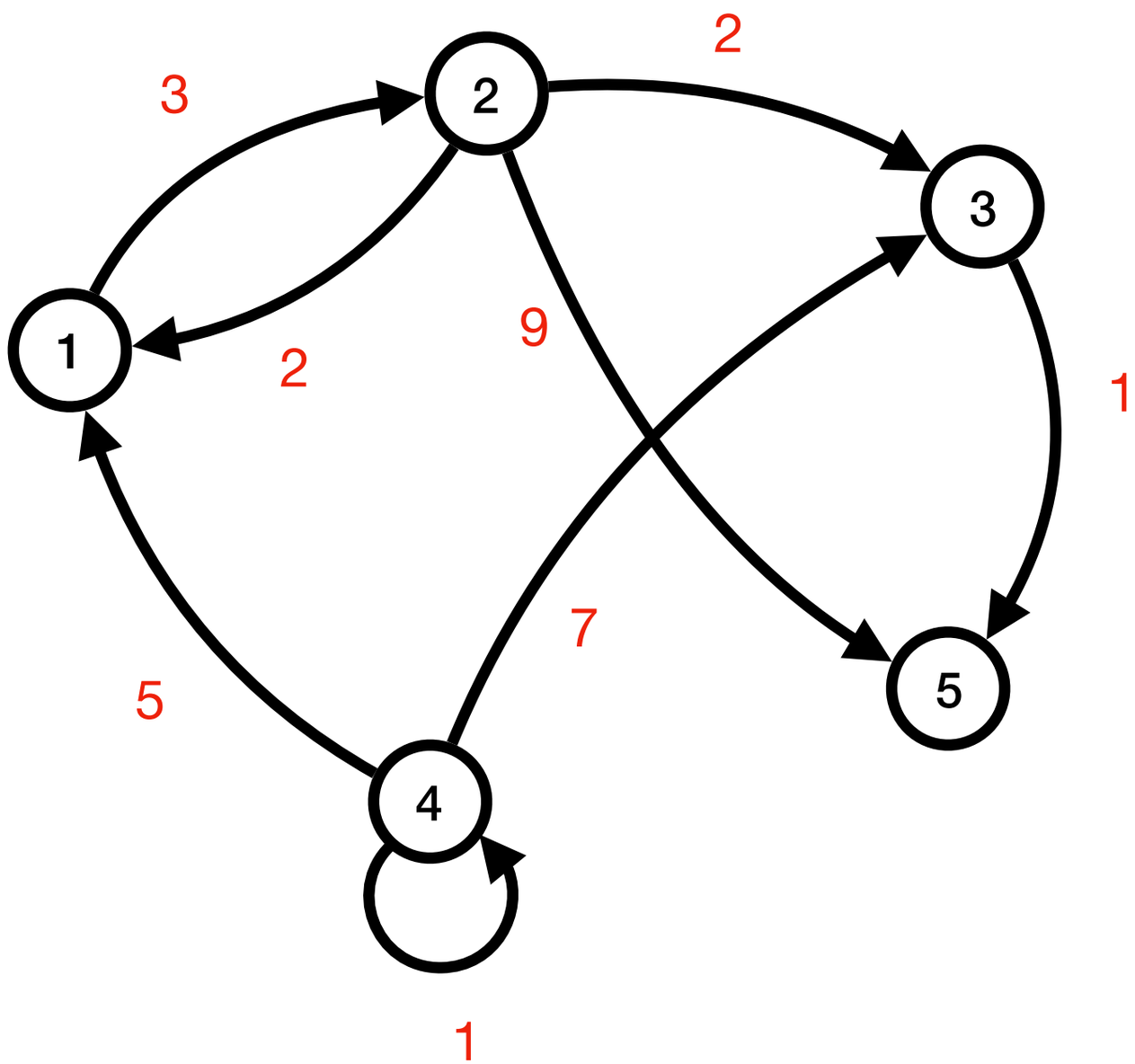


Le plus court chemin

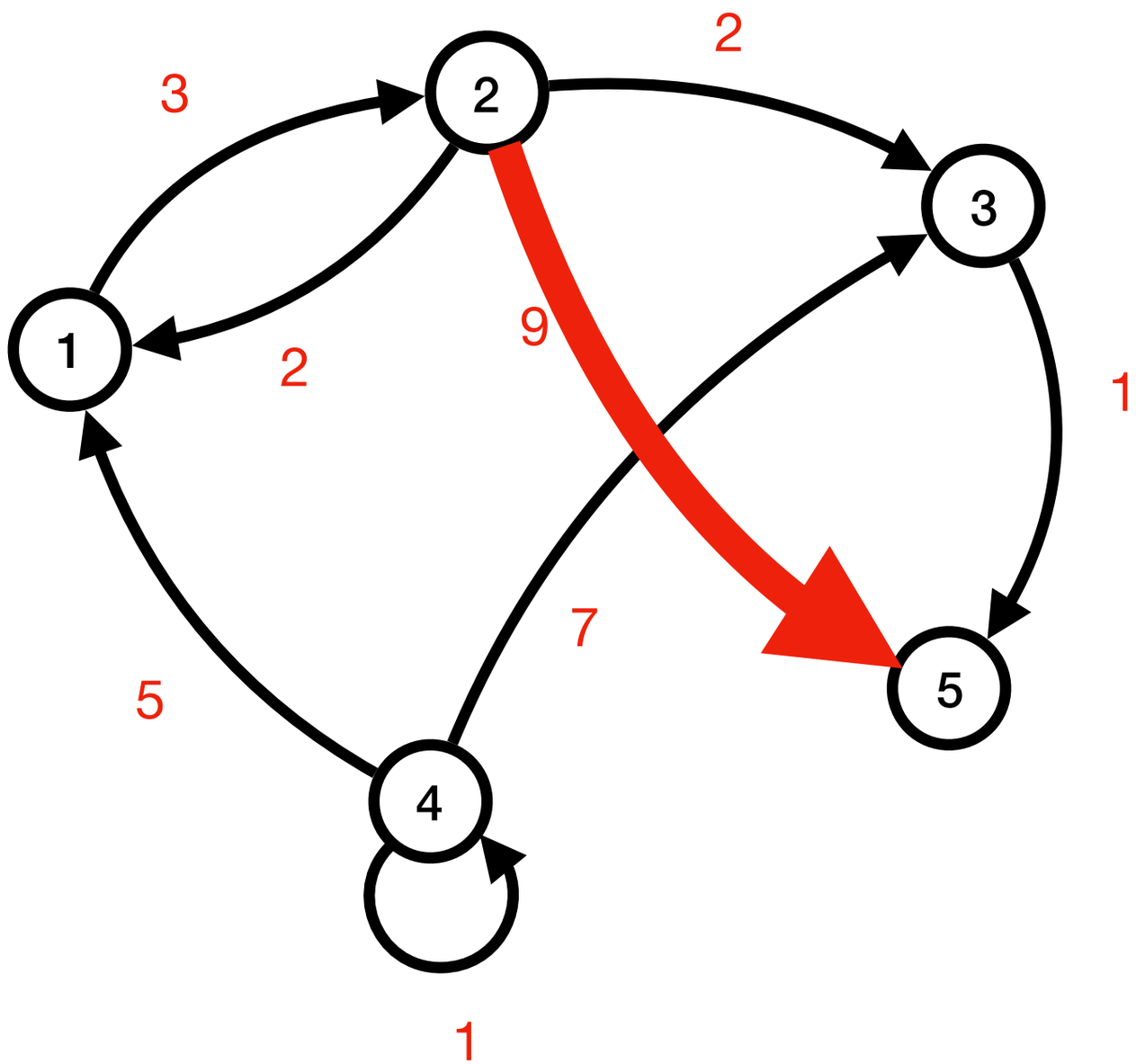
Graphes pondérés



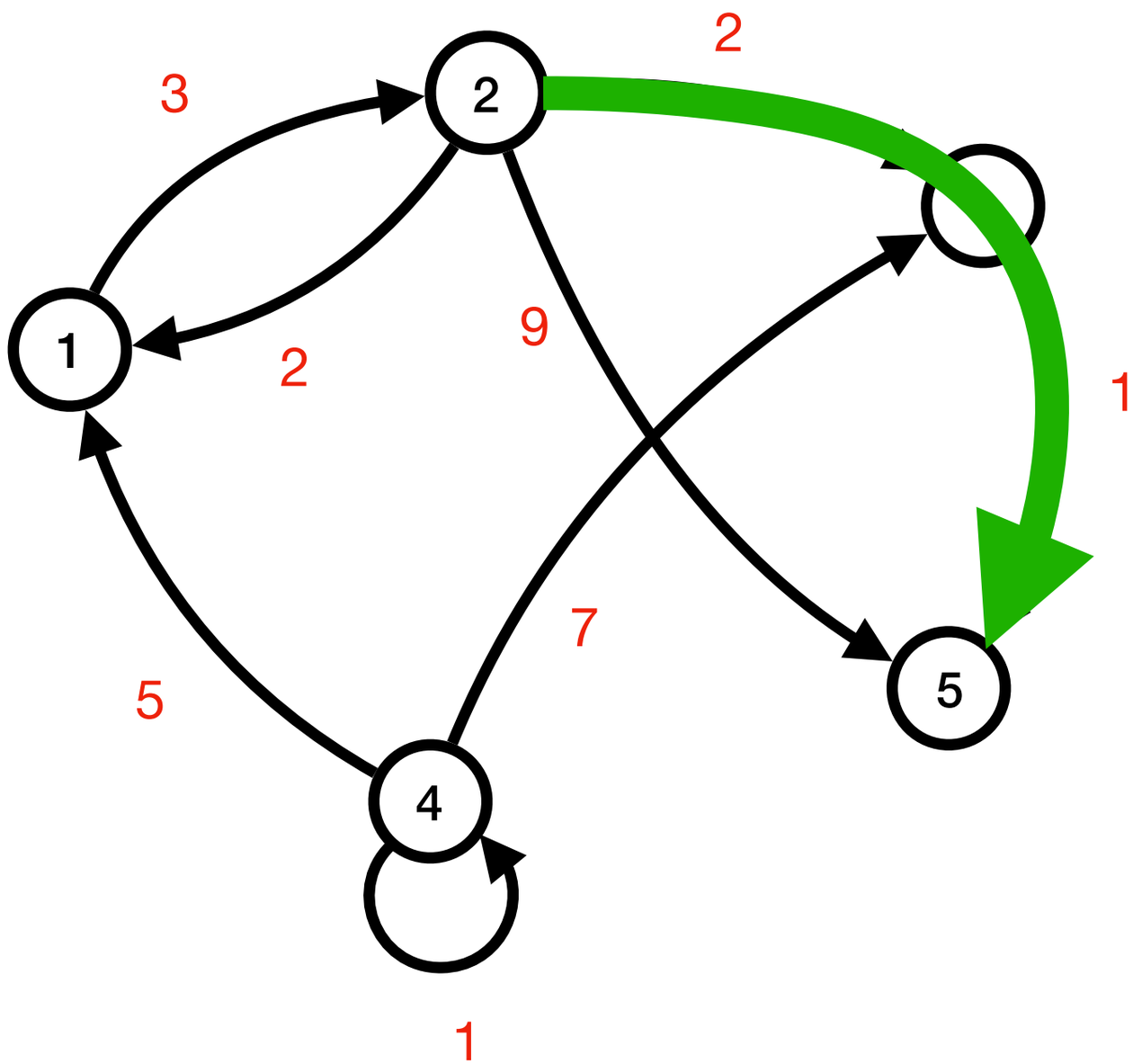
Graphes pondérés



Graphes pondérés

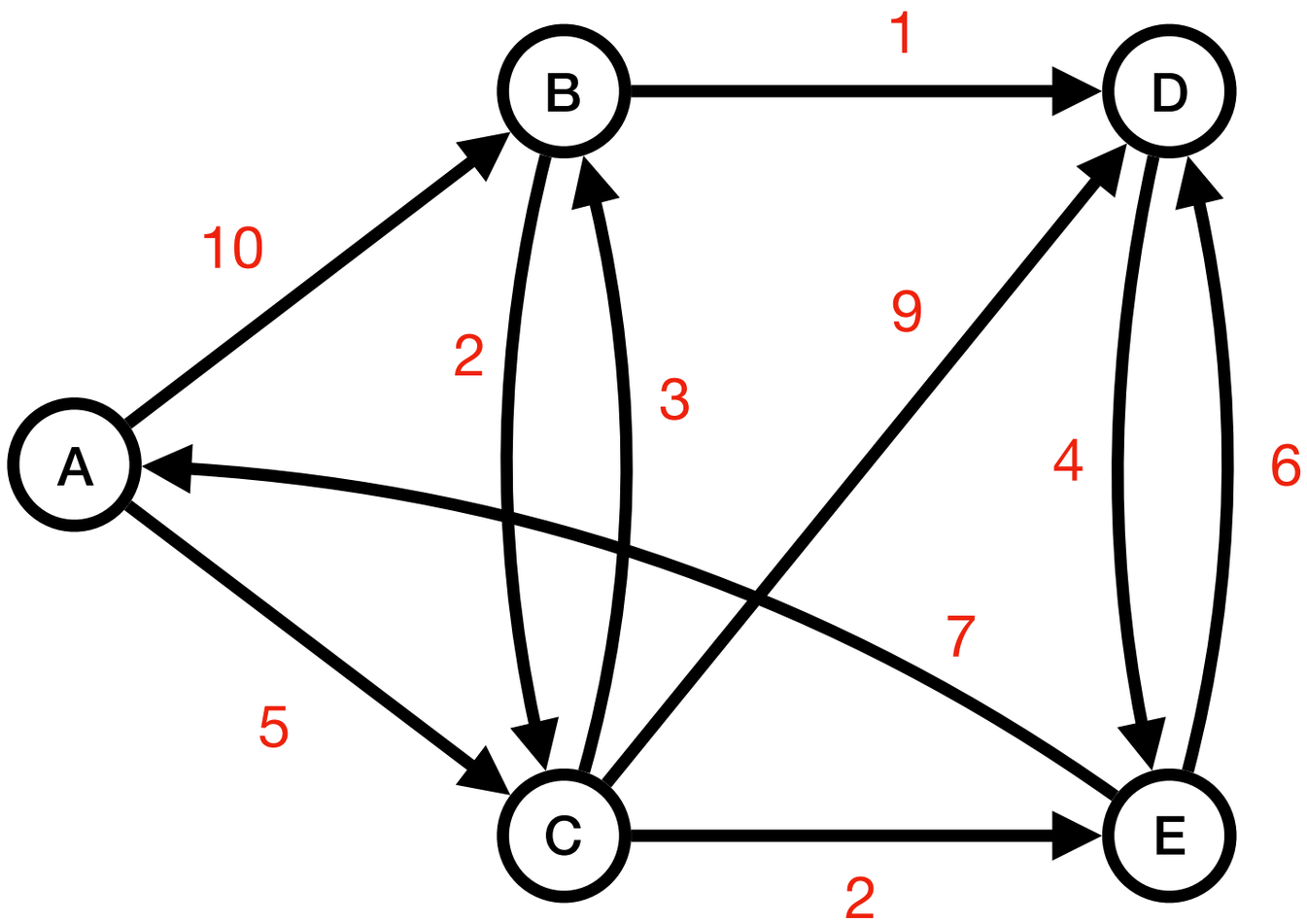


Graphes pondérés

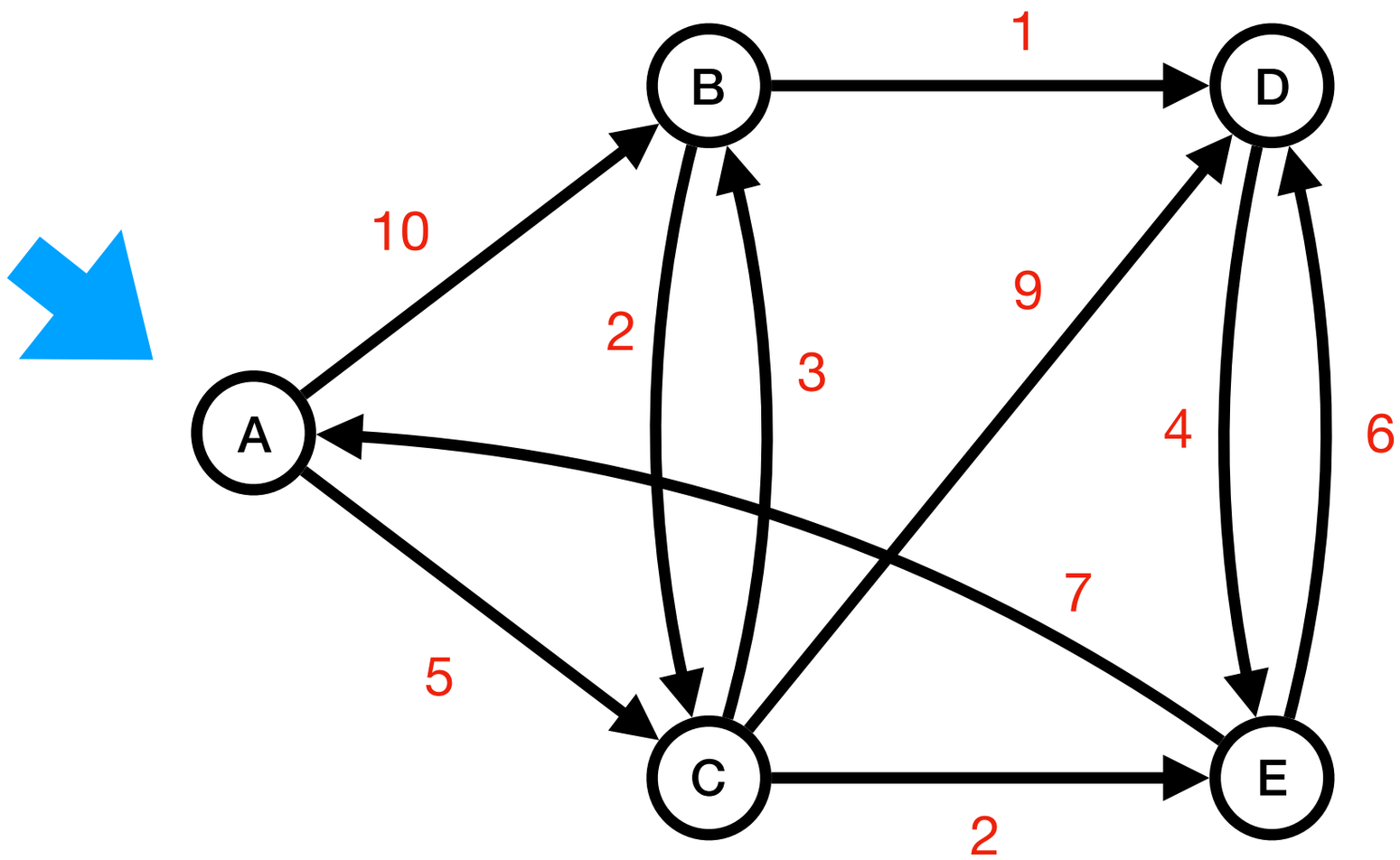


L’algorithme de parcours en largeur ne garantit pas d’obtenir un chemin minimal sur un graphe pondéré

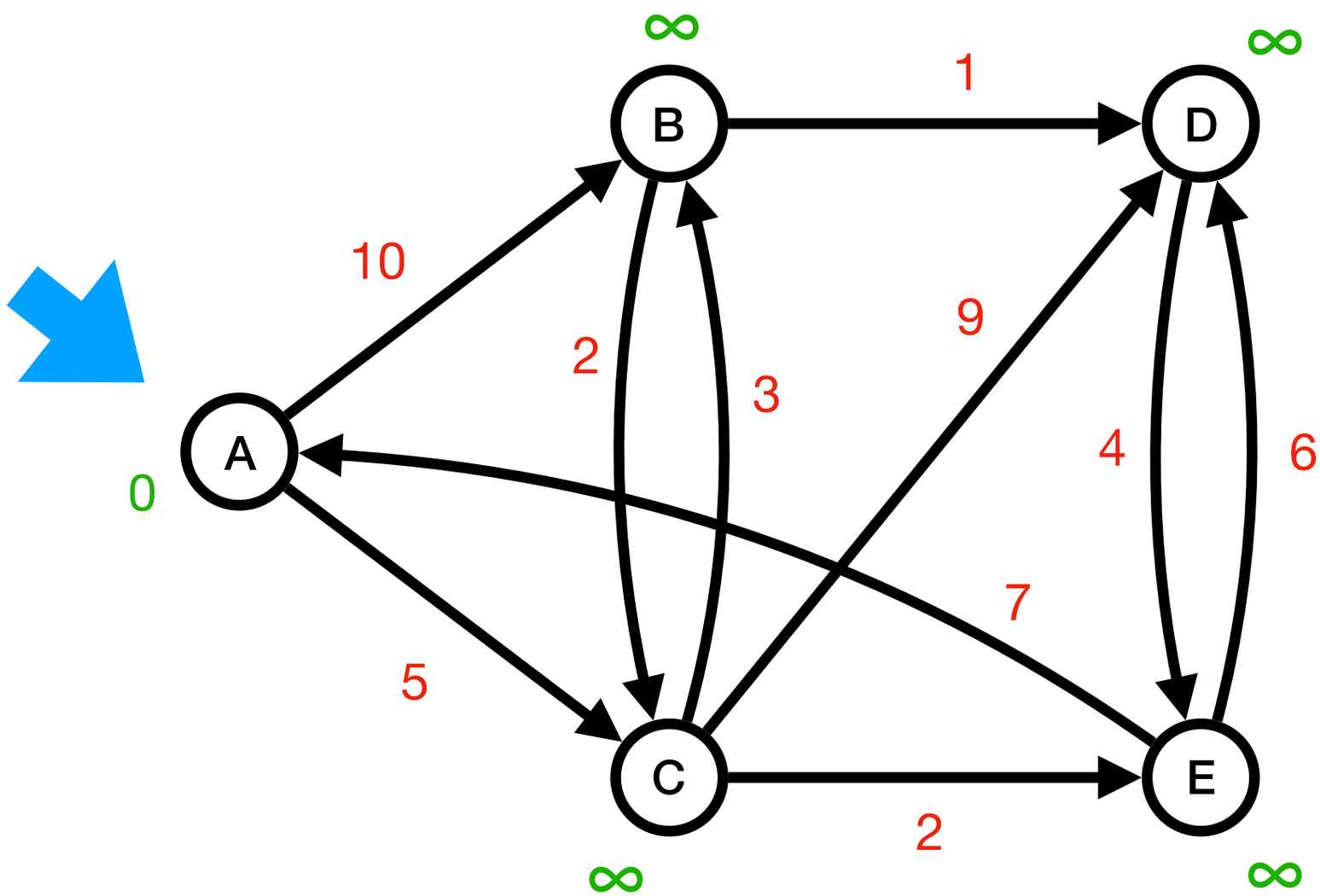
Algorithme de Dijkstra



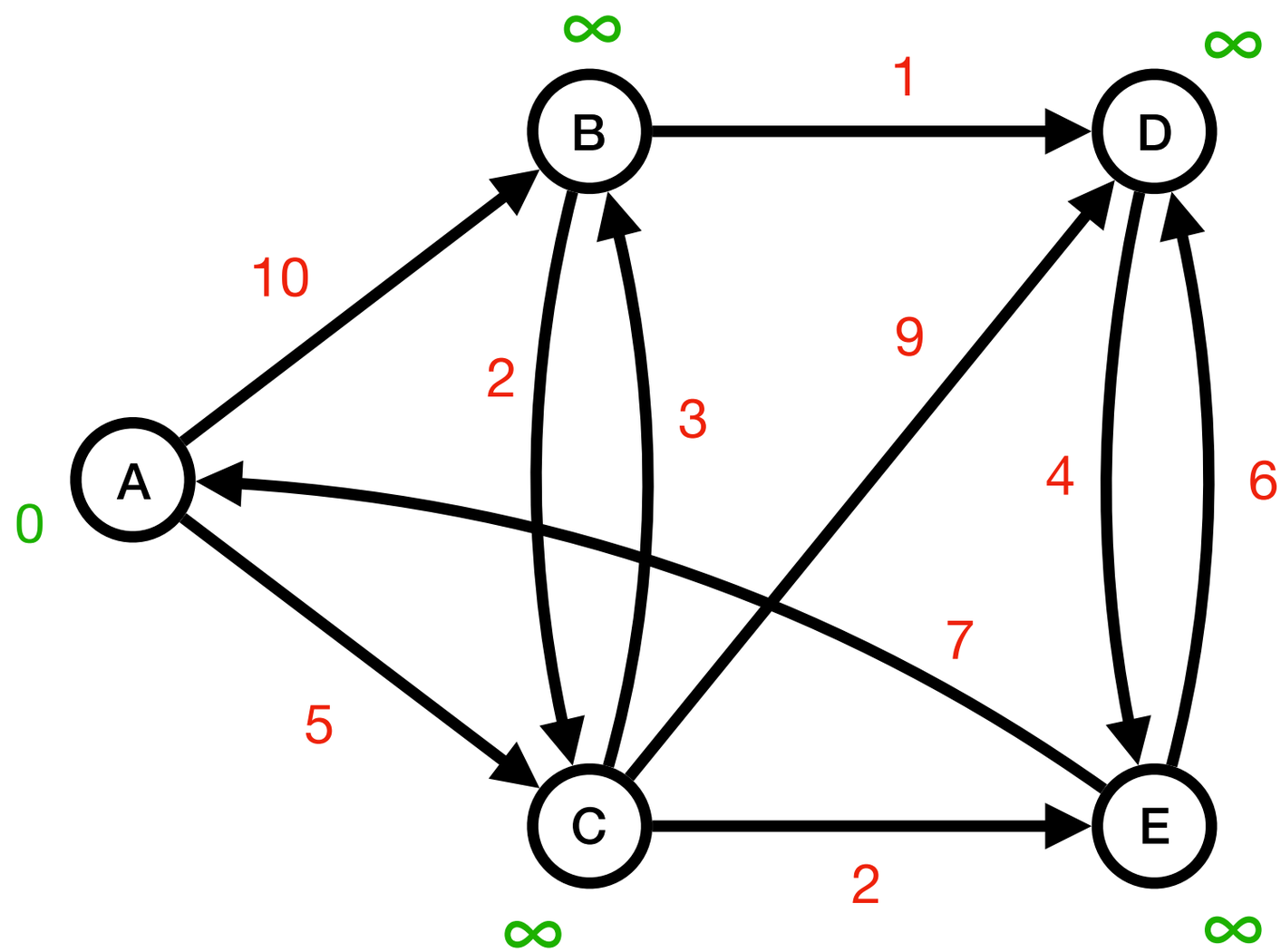
Algorithme de Dijkstra



Algorithme de Dijkstra



Algorithme de Dijkstra



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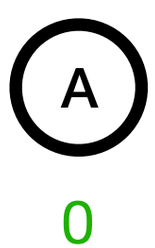
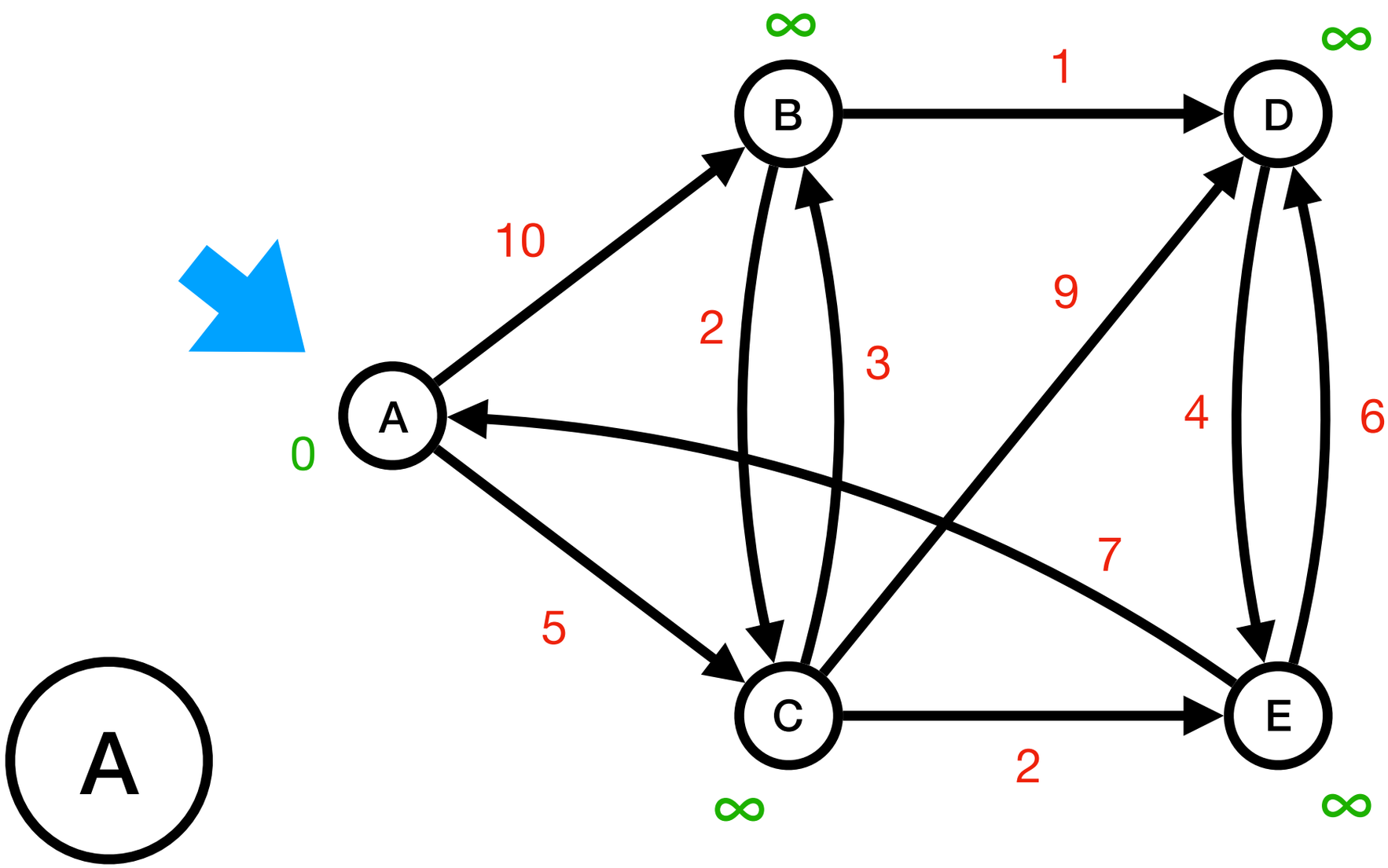
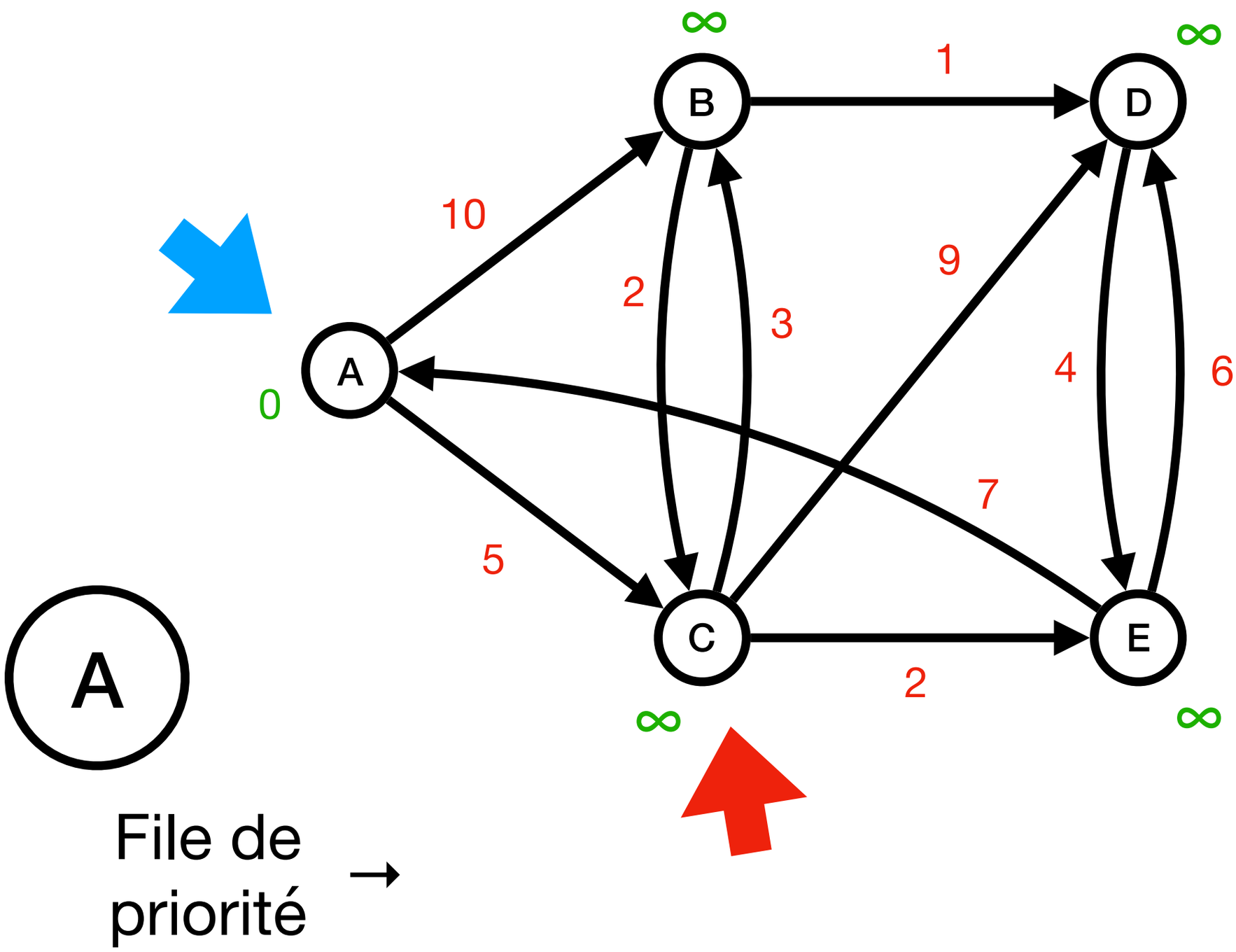


Algorithme de Dijkstra

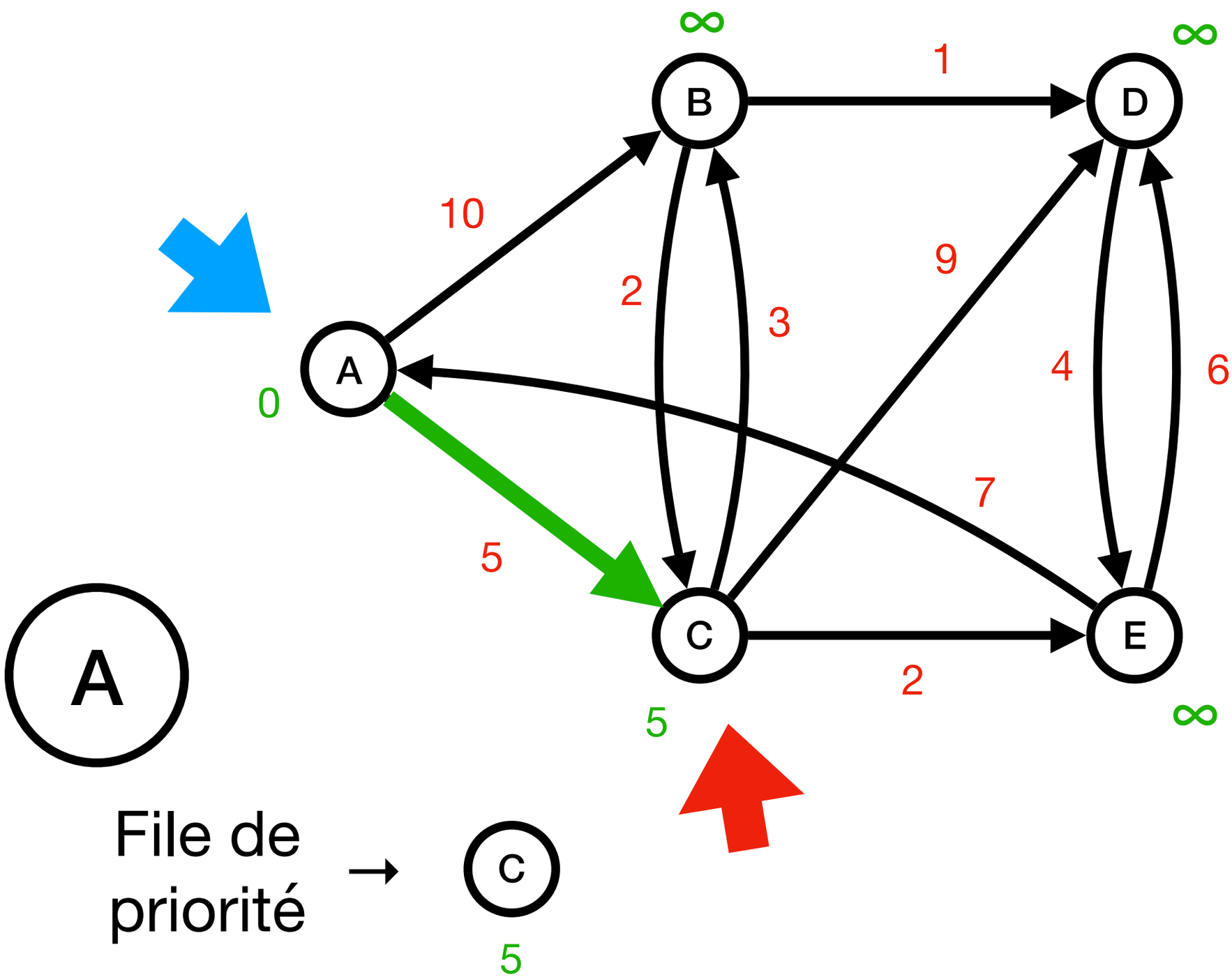


File de priorité →

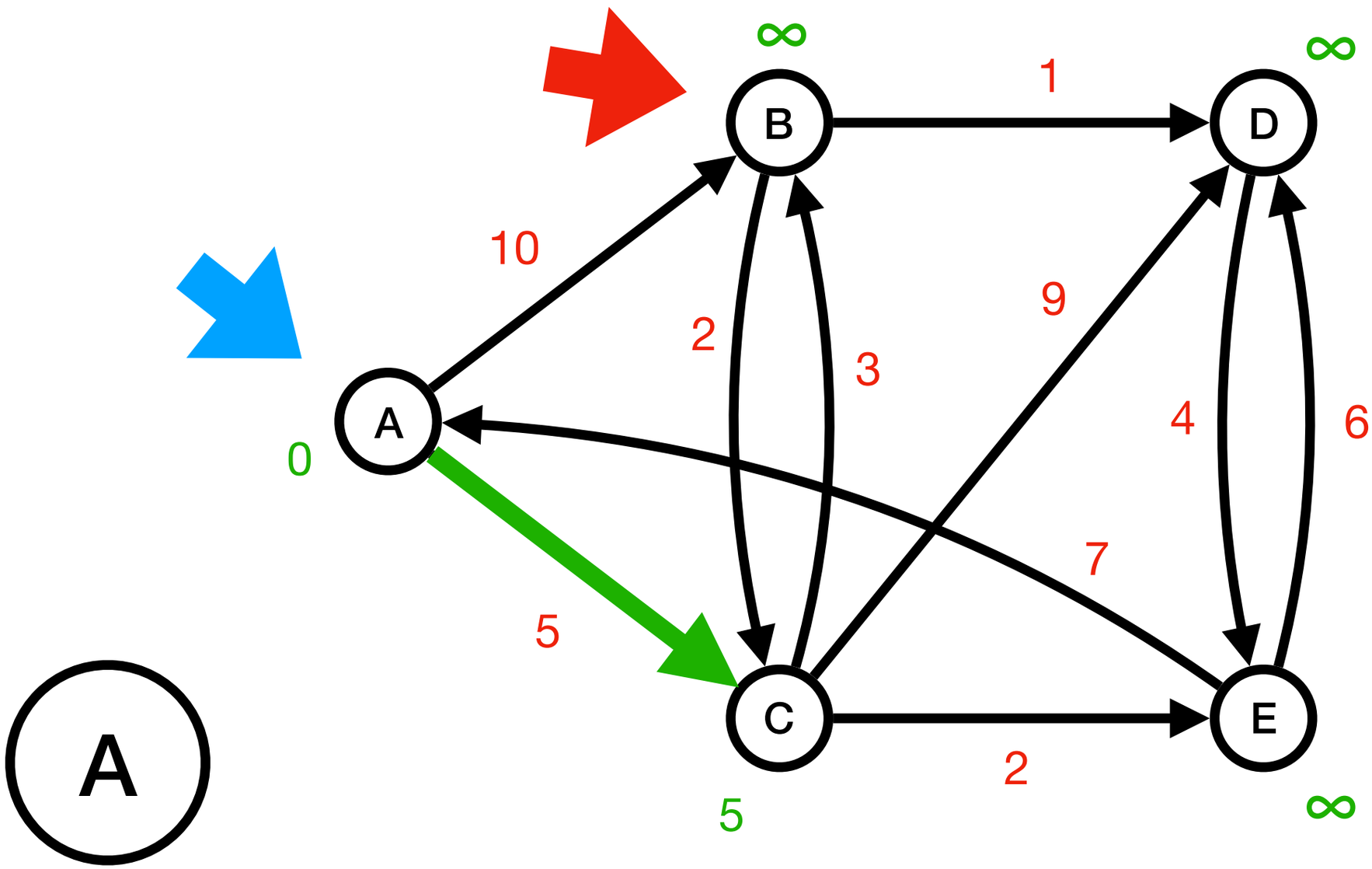
Algorithme de Dijkstra



Algorithme de Dijkstra



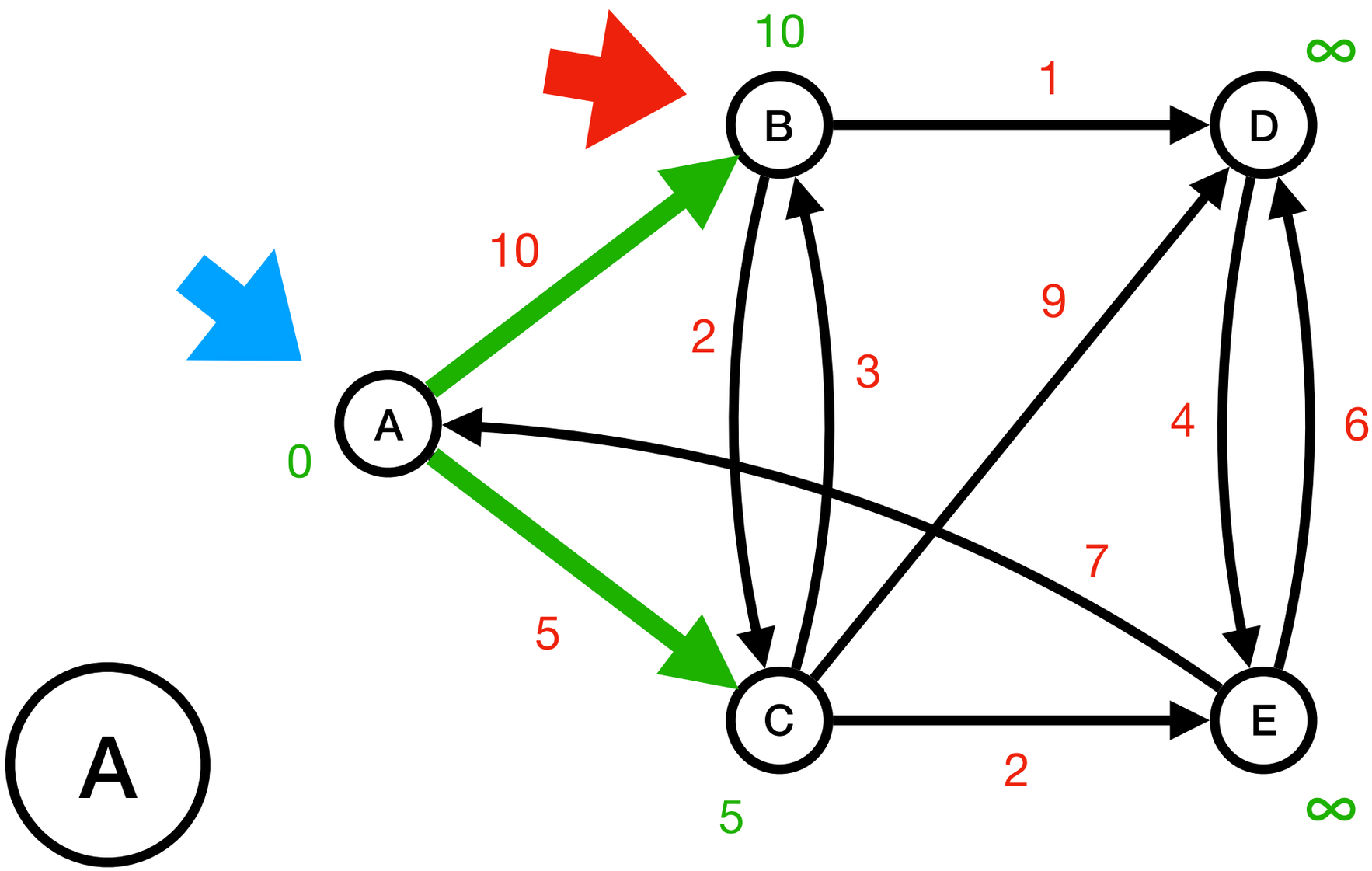
Algorithme de Dijkstra



File de priorité → C

5

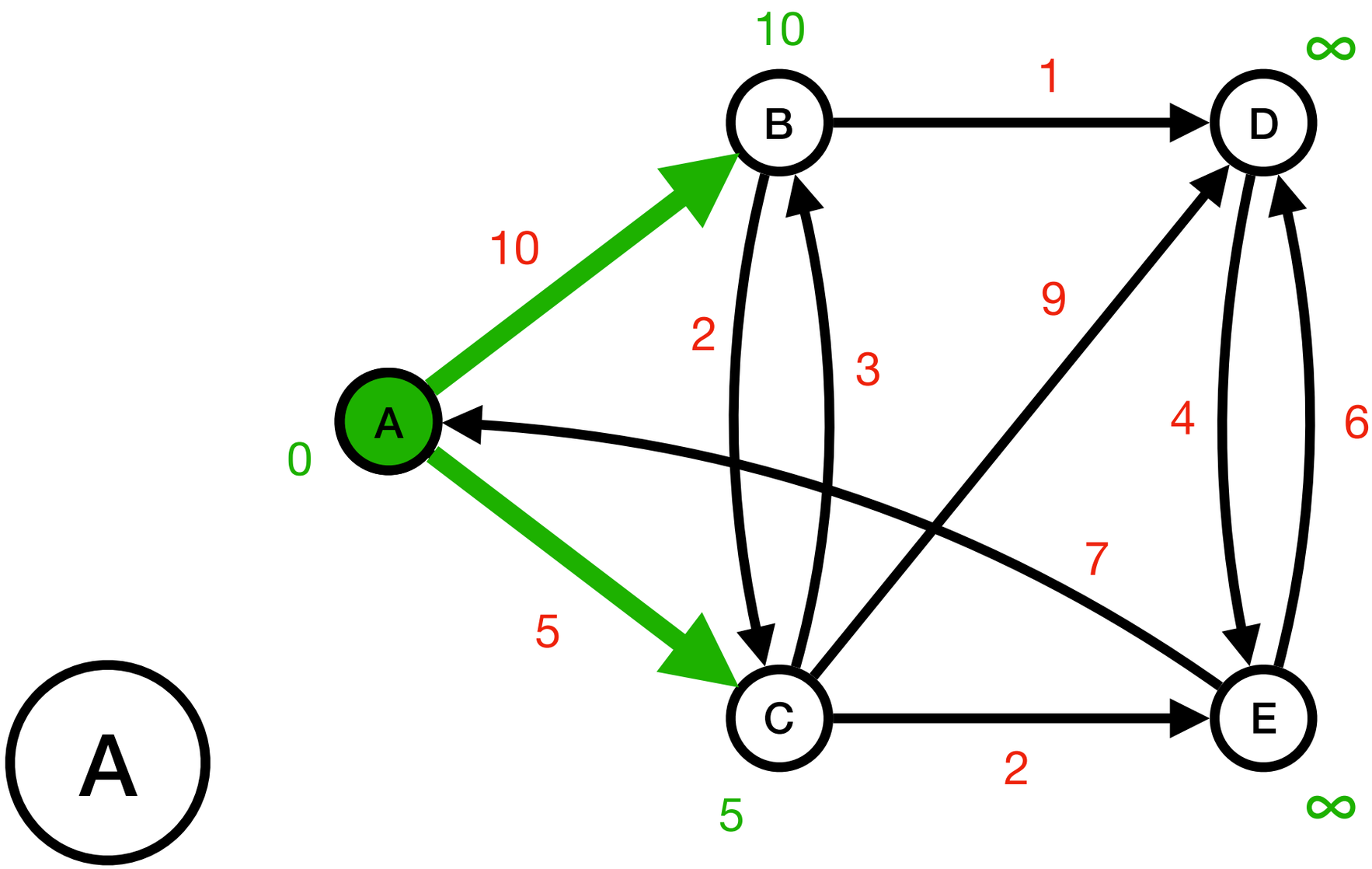
Algorithme de Dijkstra



File de priorité → C B

5 10

Algorithme de Dijkstra



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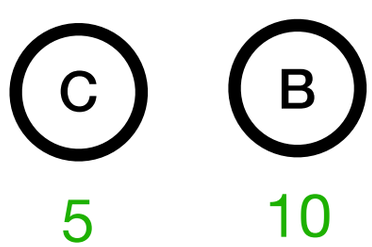
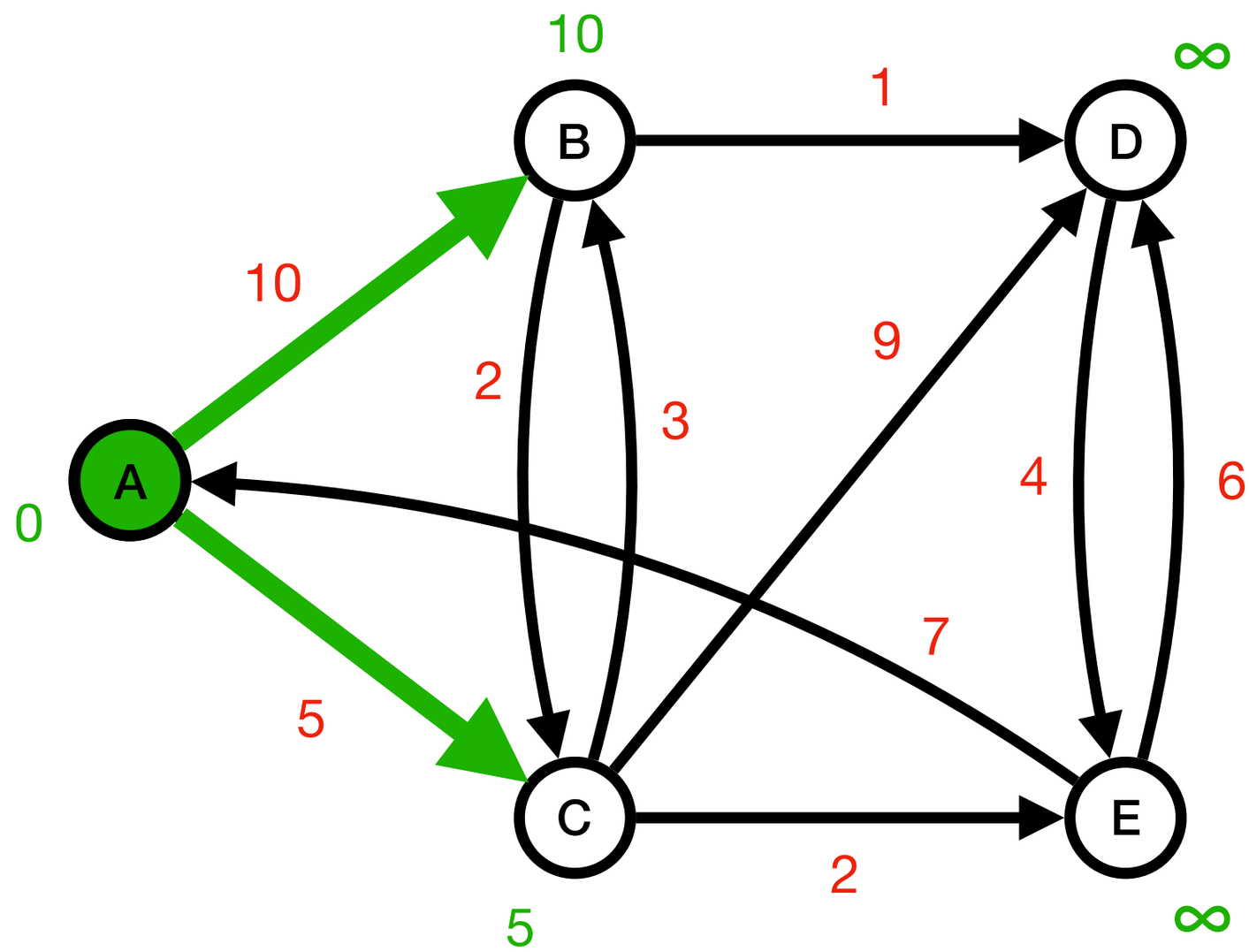


Algorithme de Dijkstra



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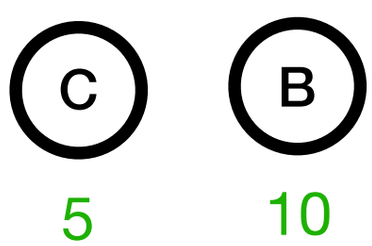
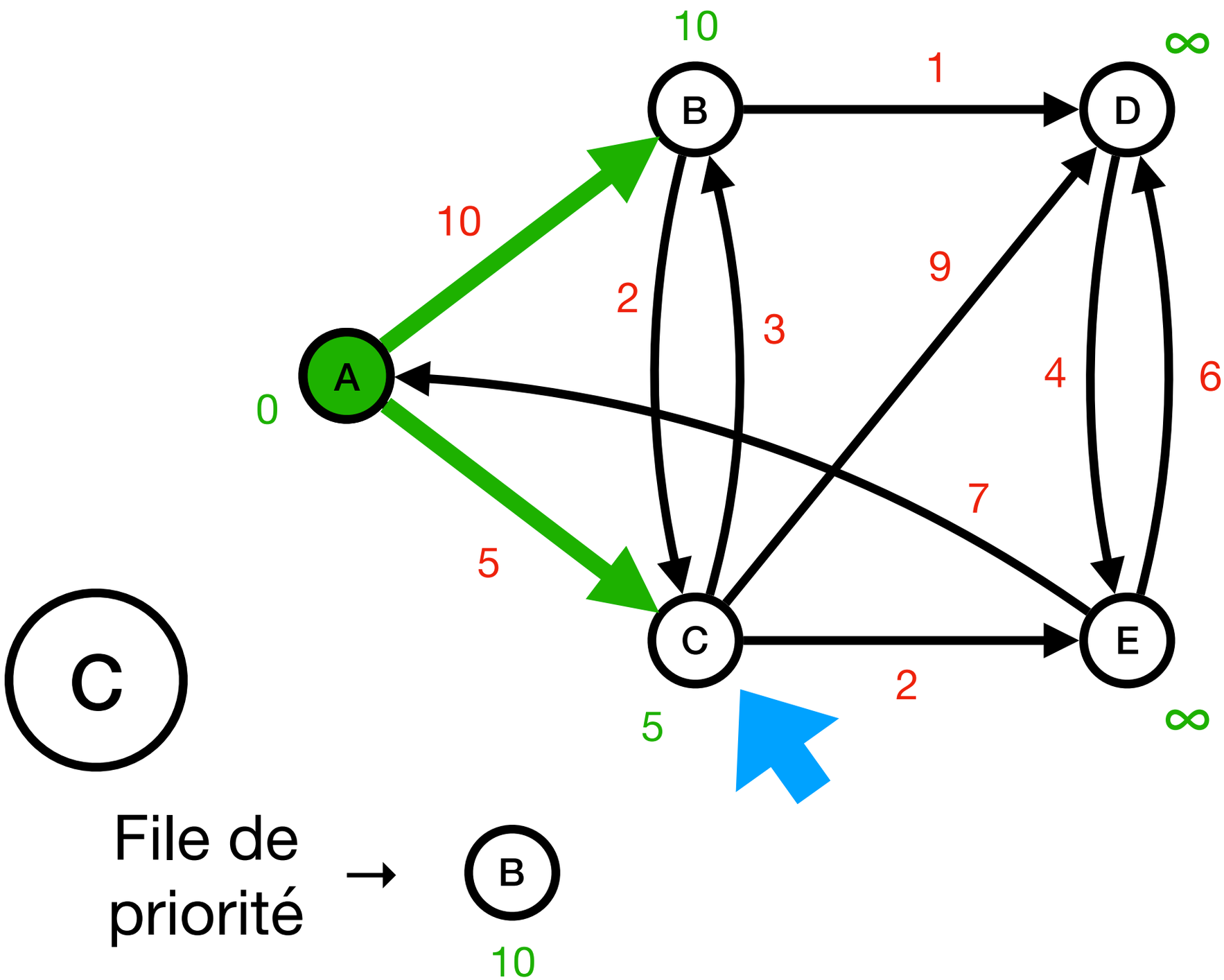
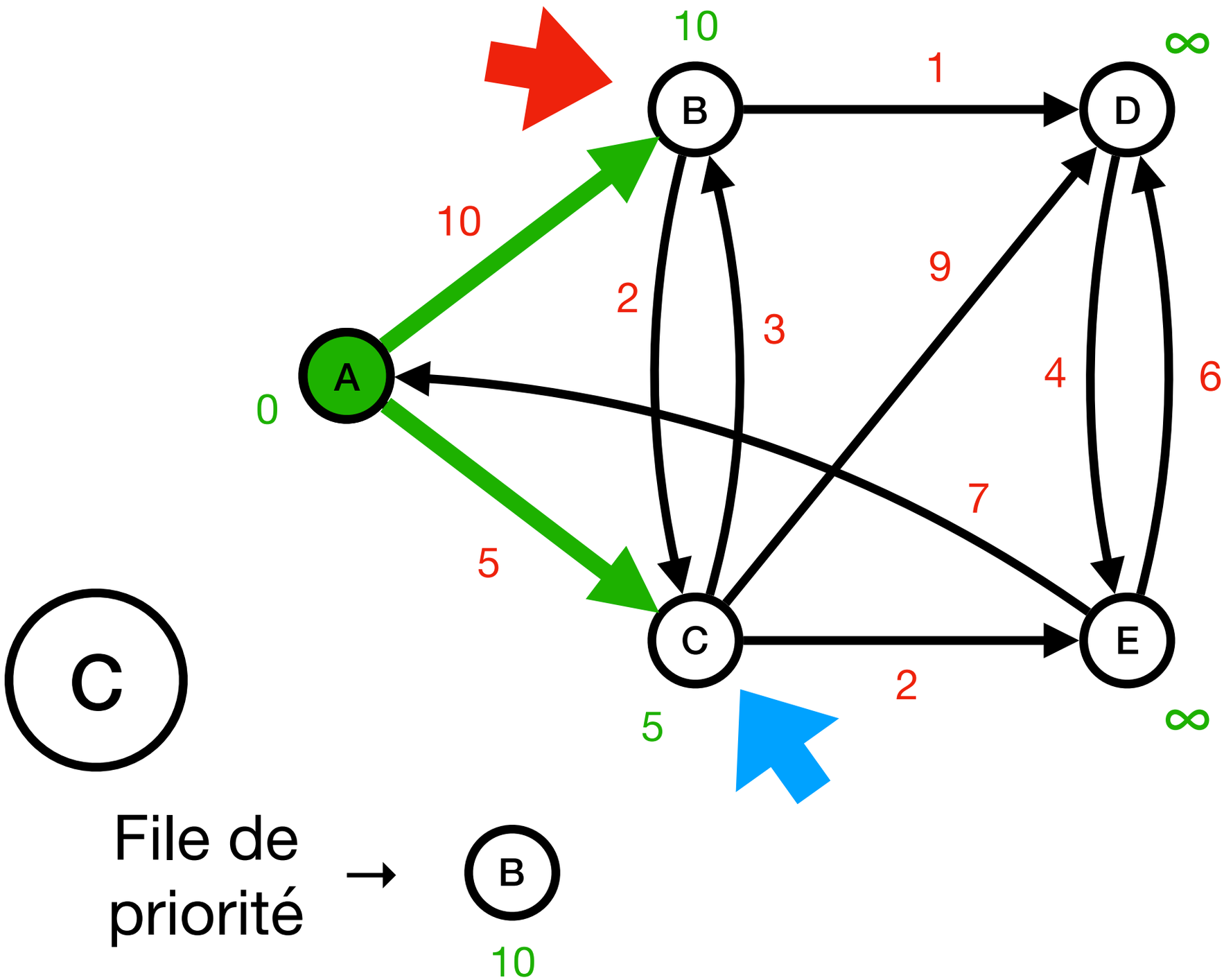


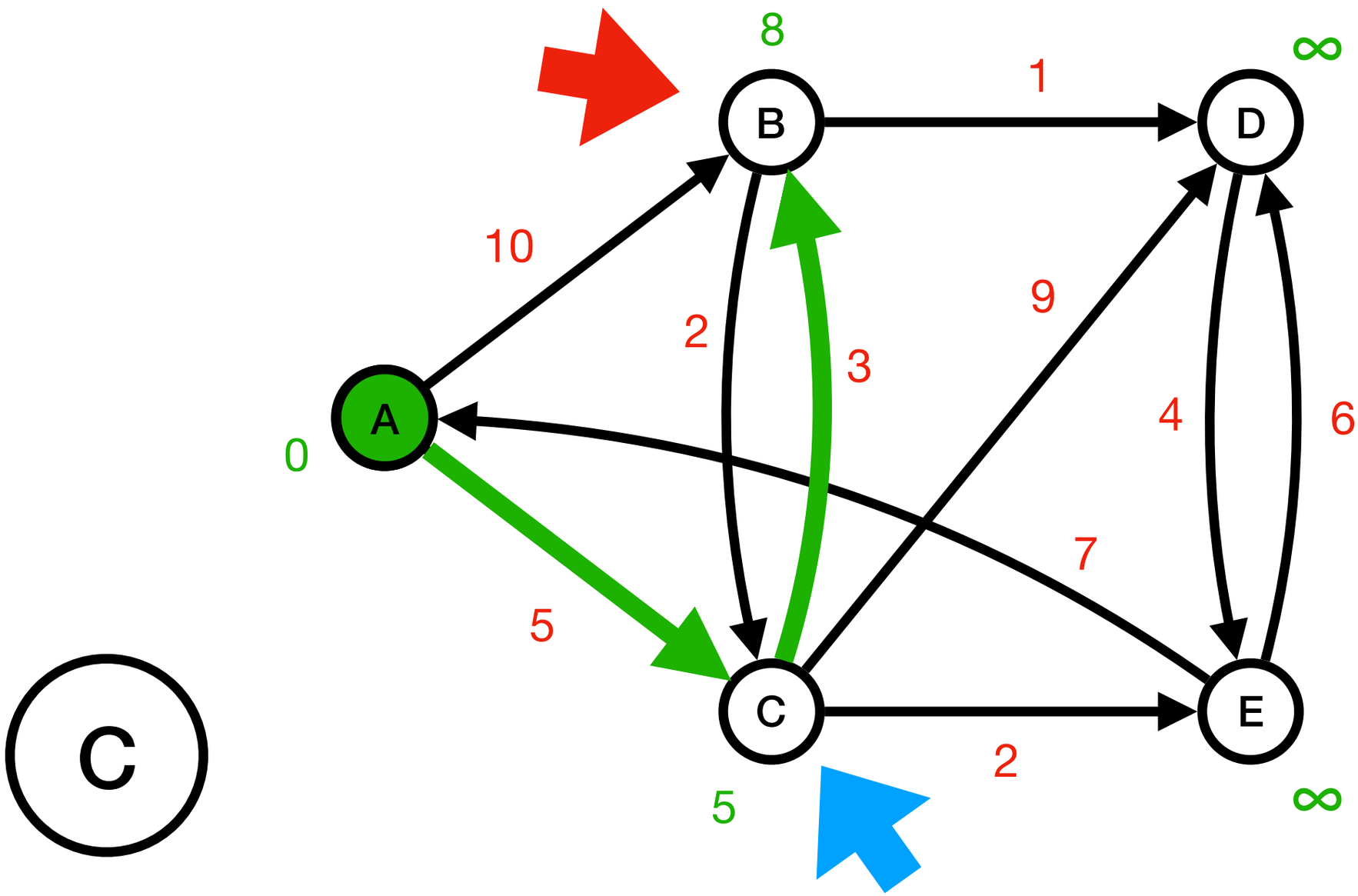
Algorithme de Dijkstra



Algorithme de Dijkstra



Algorithme de Dijkstra

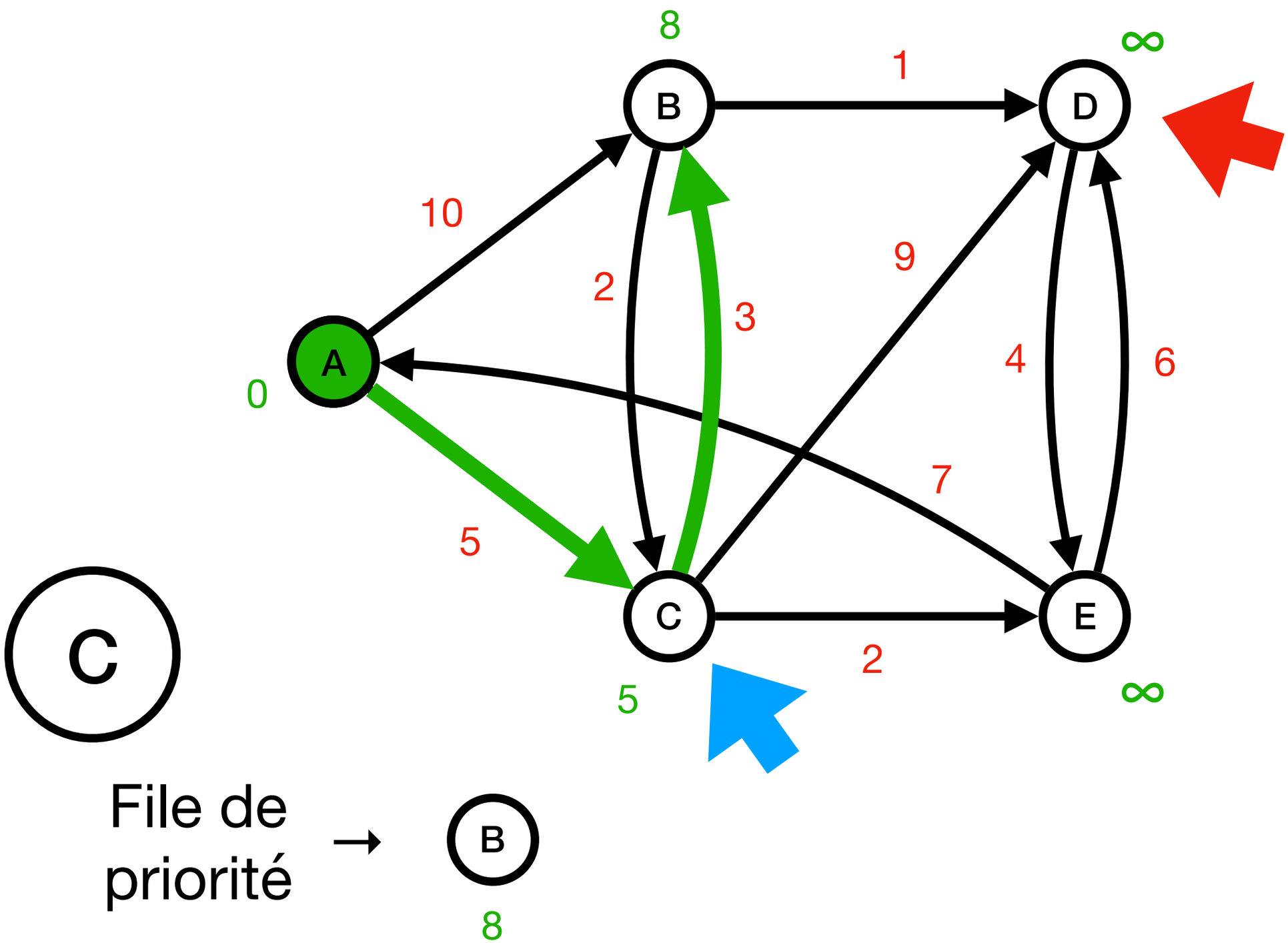


C

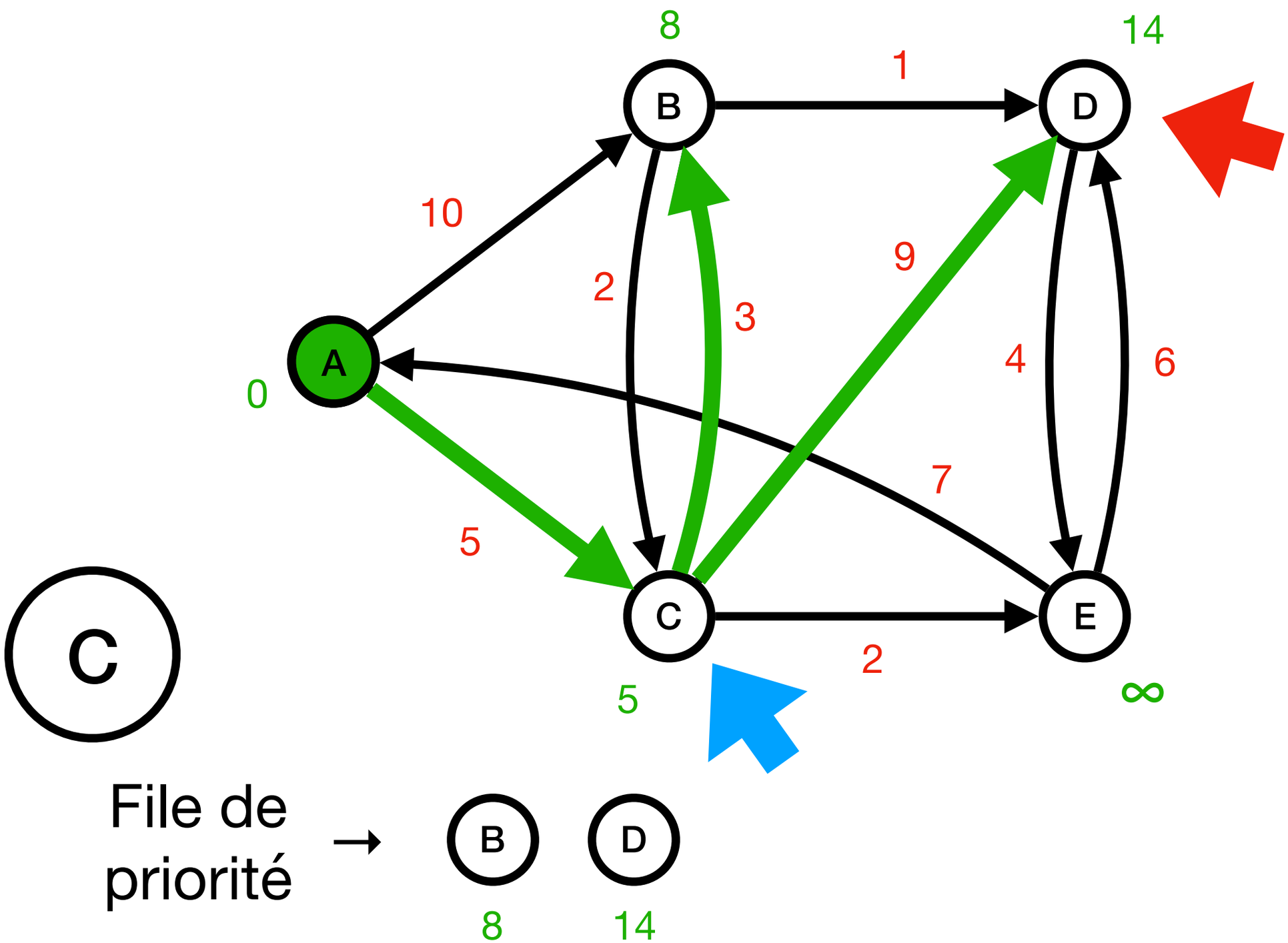
File de priorité → B

8

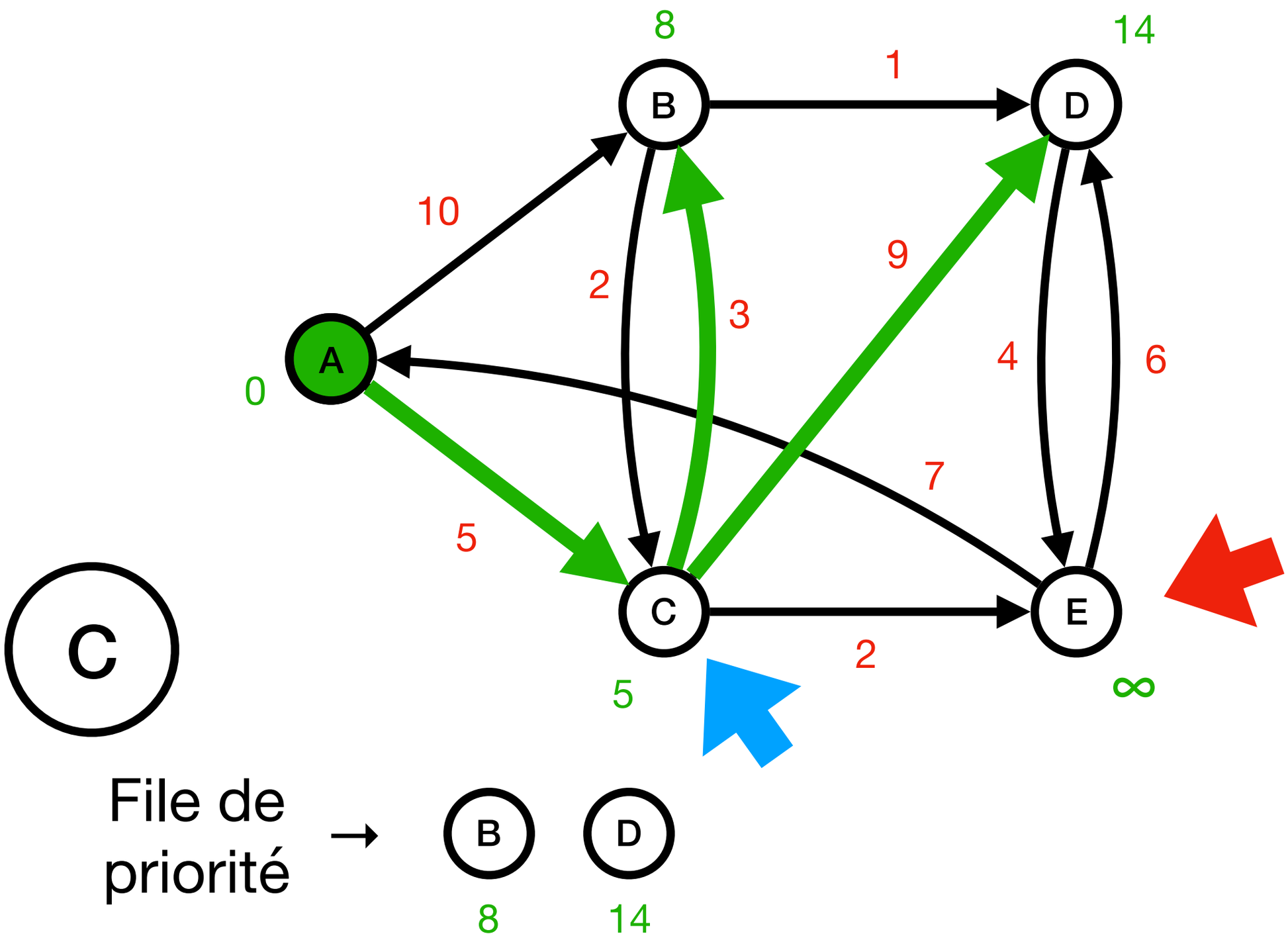
Algorithme de Dijkstra



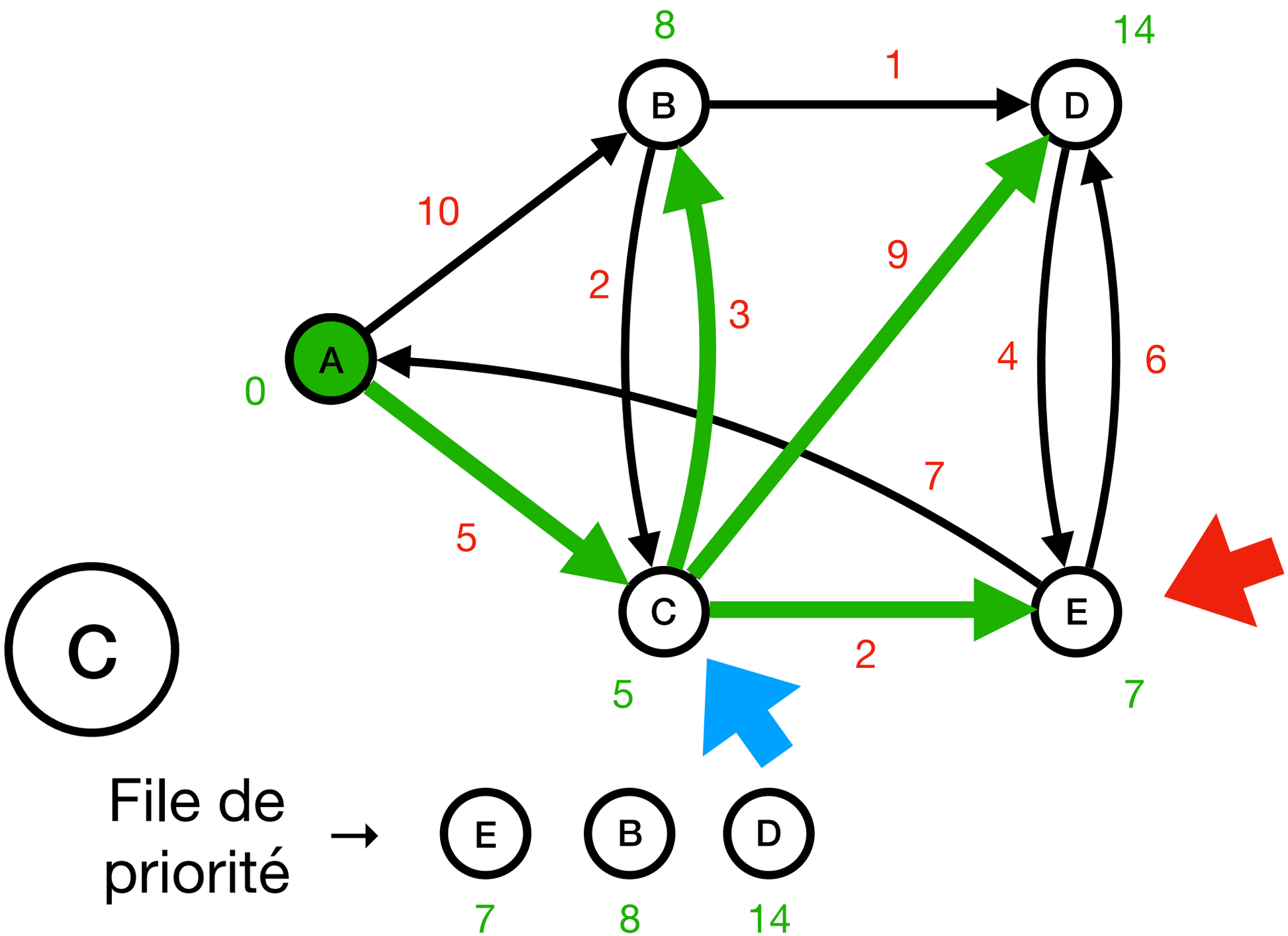
Algorithme de Dijkstra



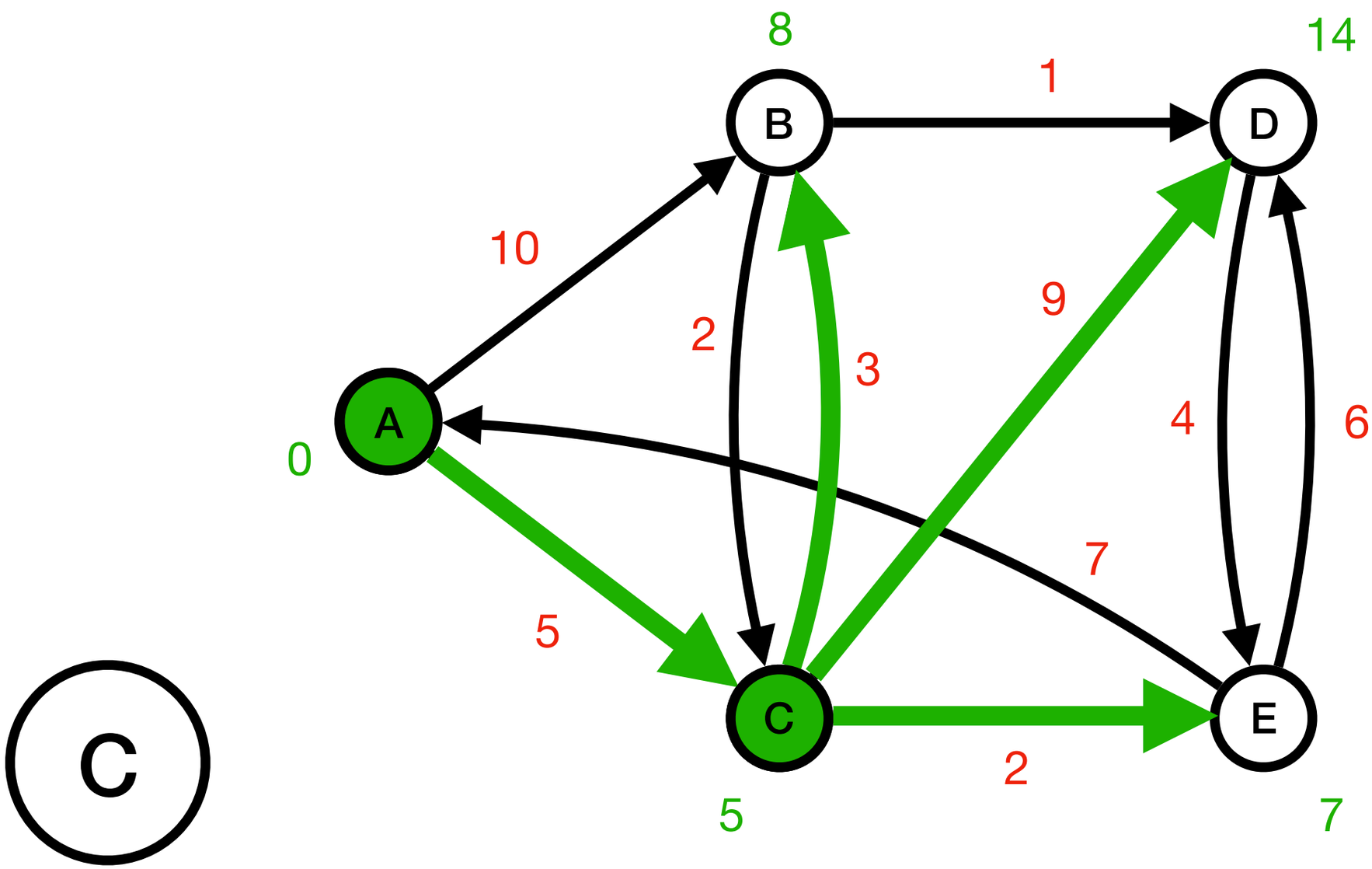
Algorithme de Dijkstra



Algorithme de Dijkstra



Algorithme de Dijkstra



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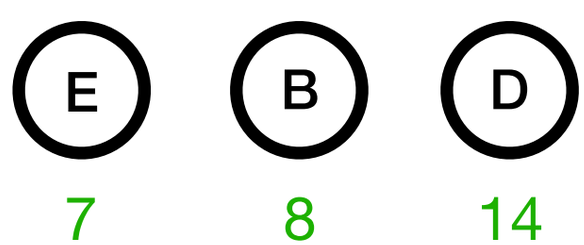
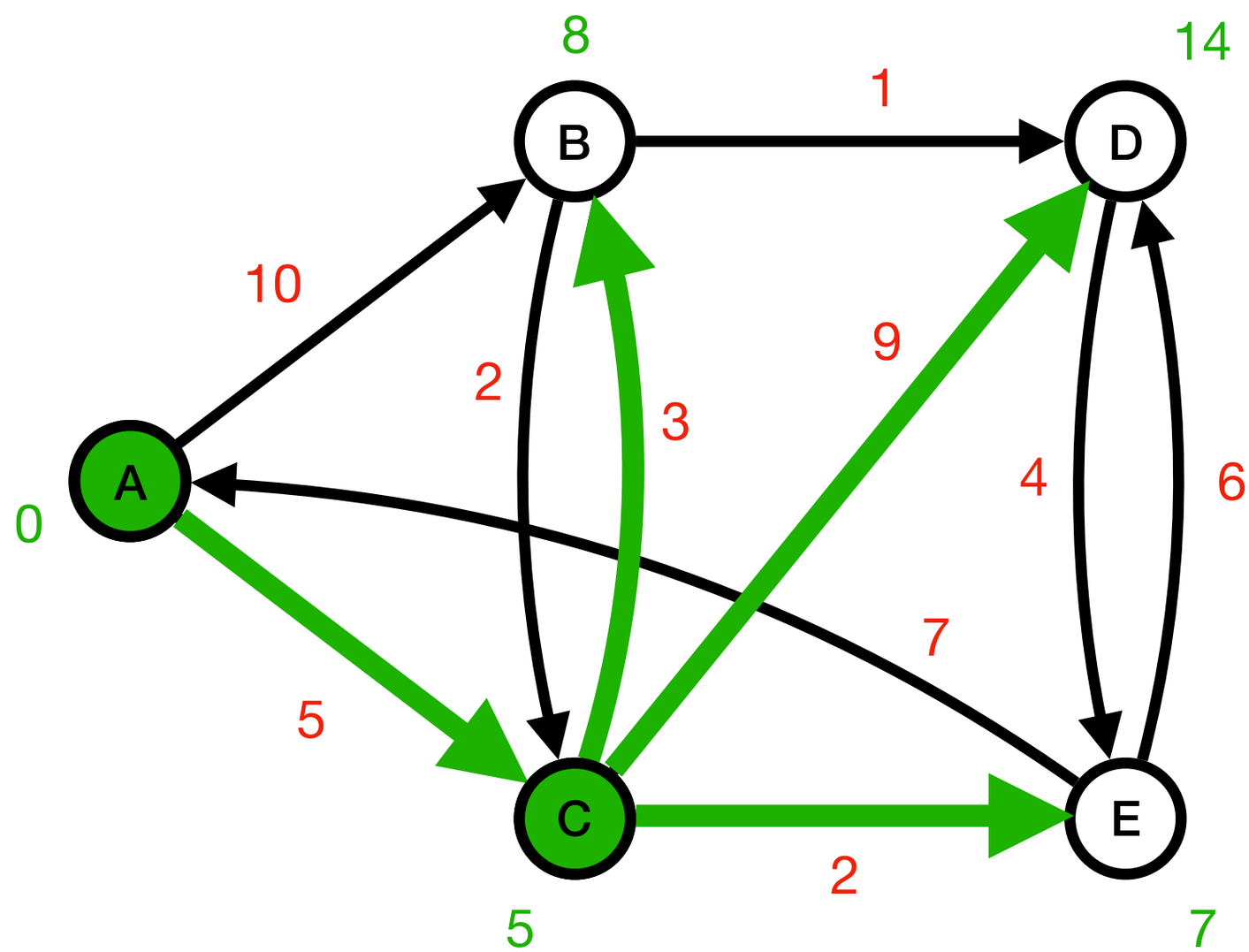


Algorithme de Dijkstra



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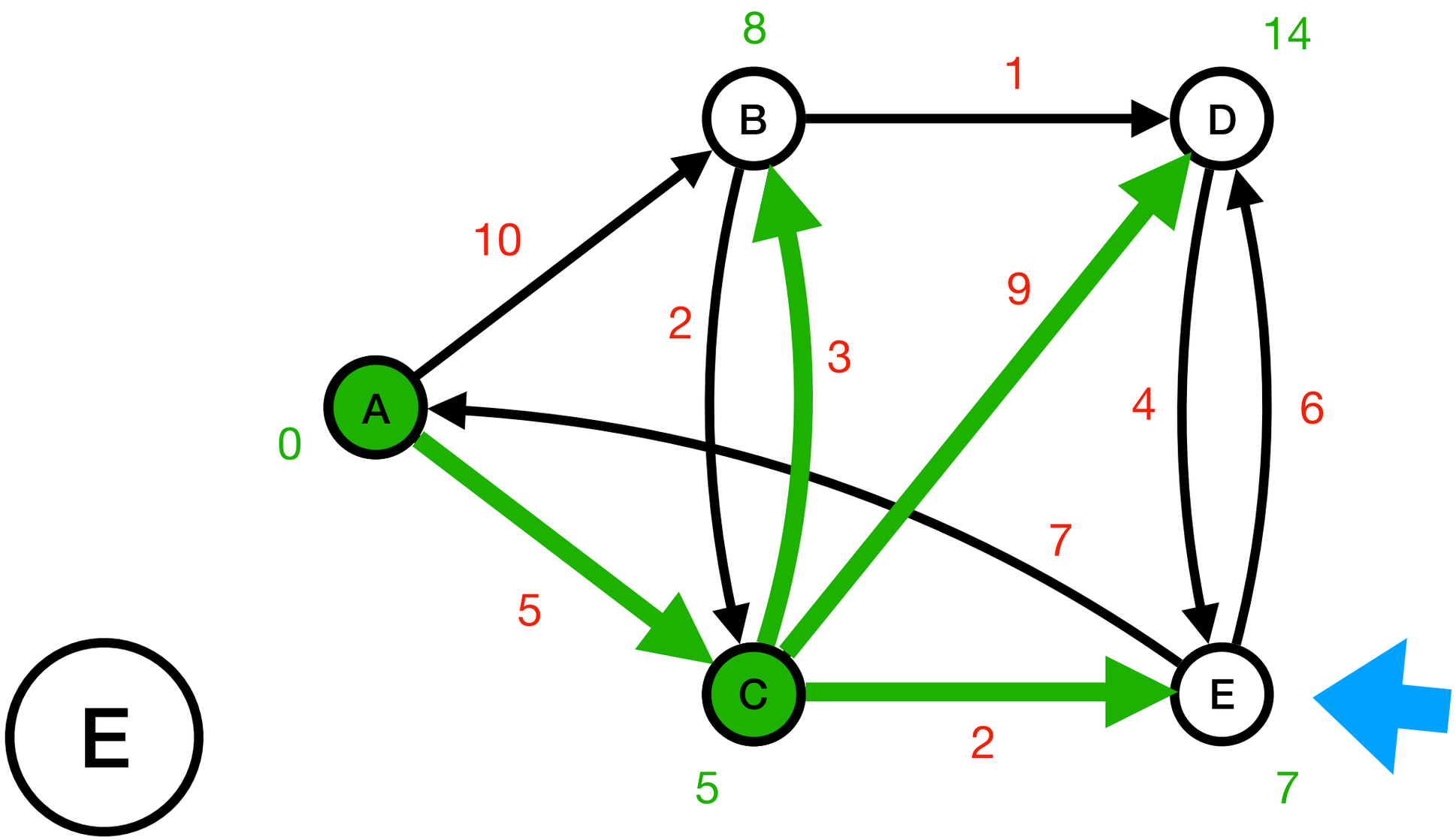
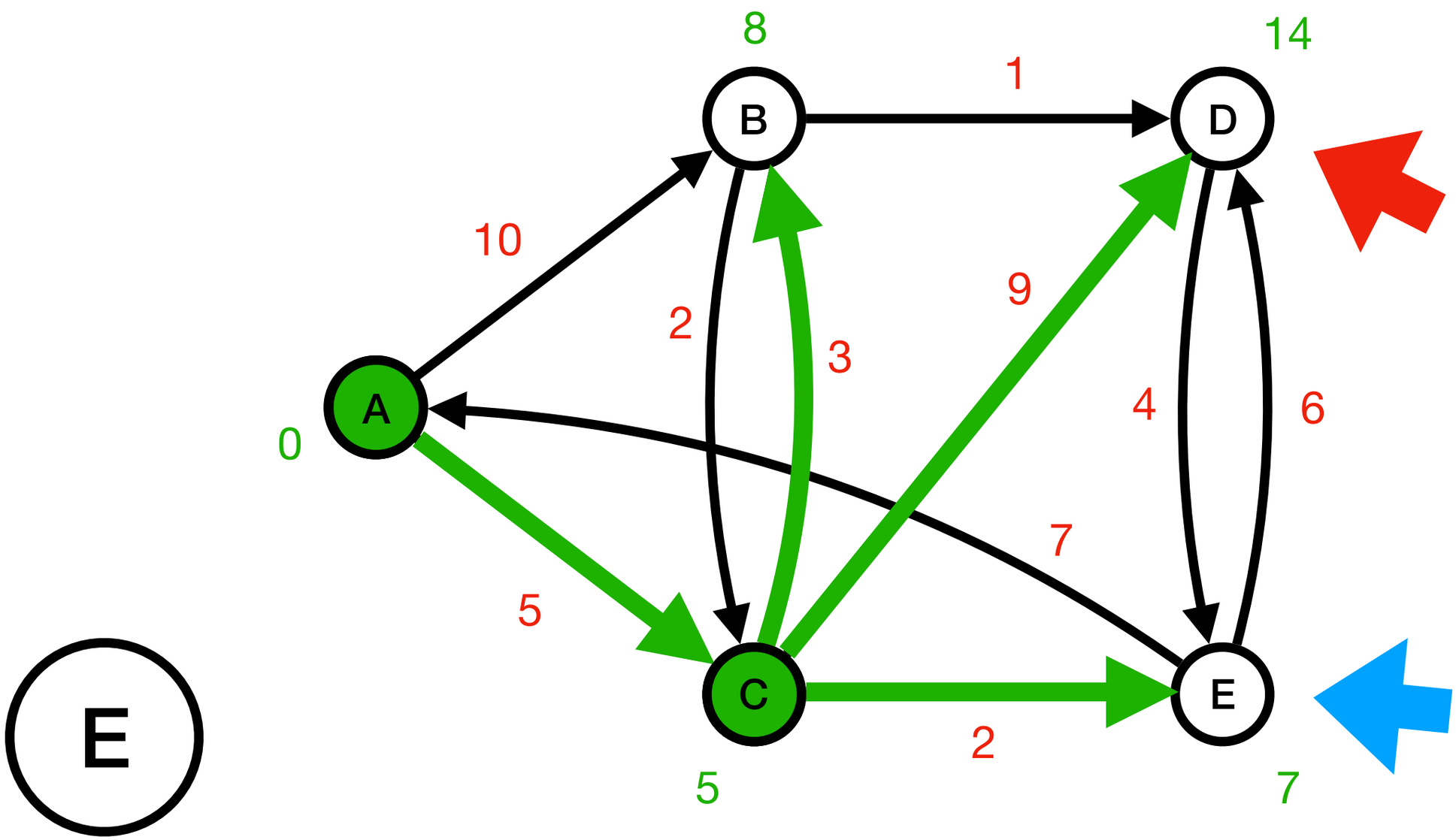
Algorithme de Dijkstra



File de priorité → B D

8 14

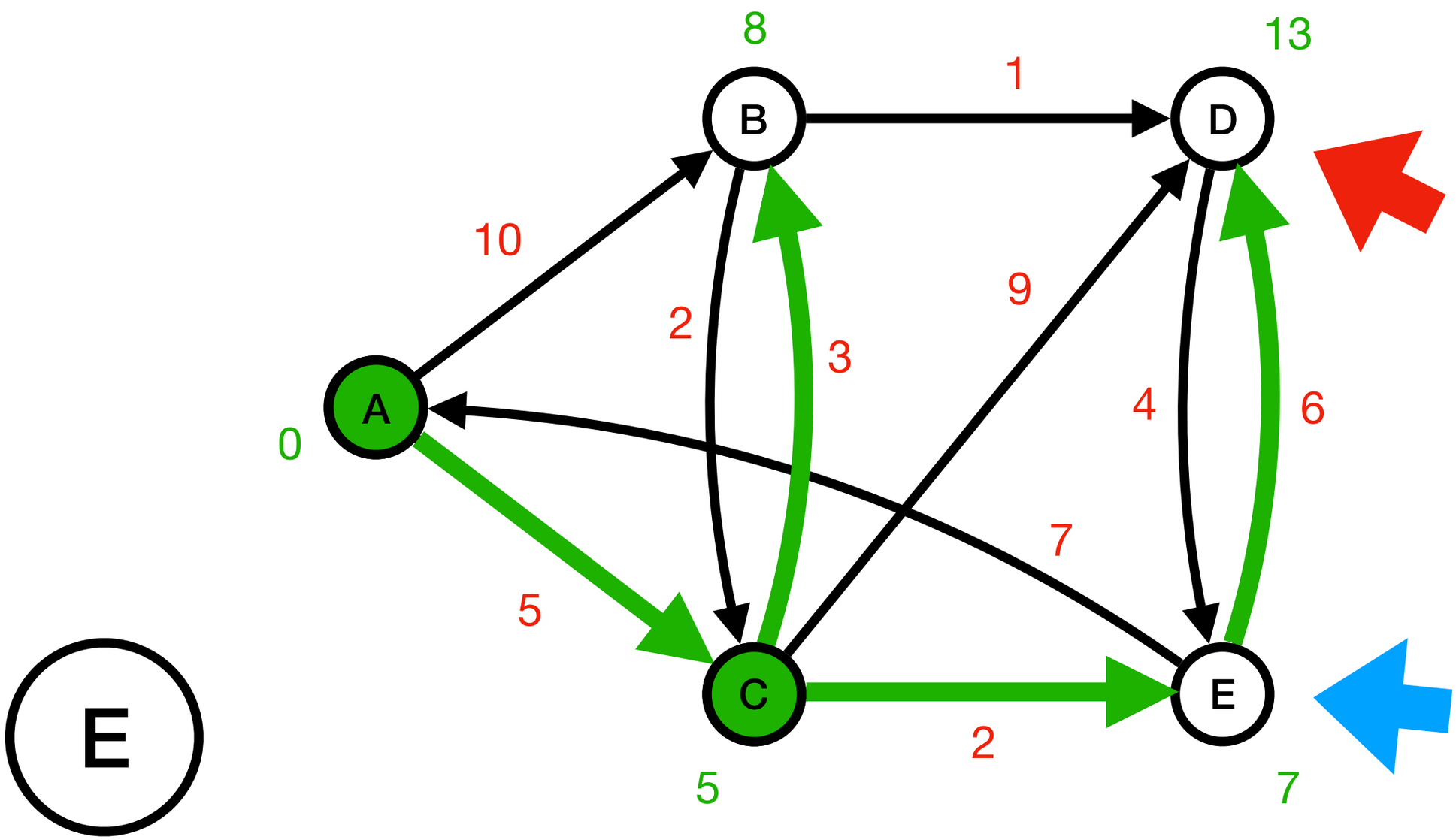
Algorithme de Dijkstra



File de priorité → B D

8 14

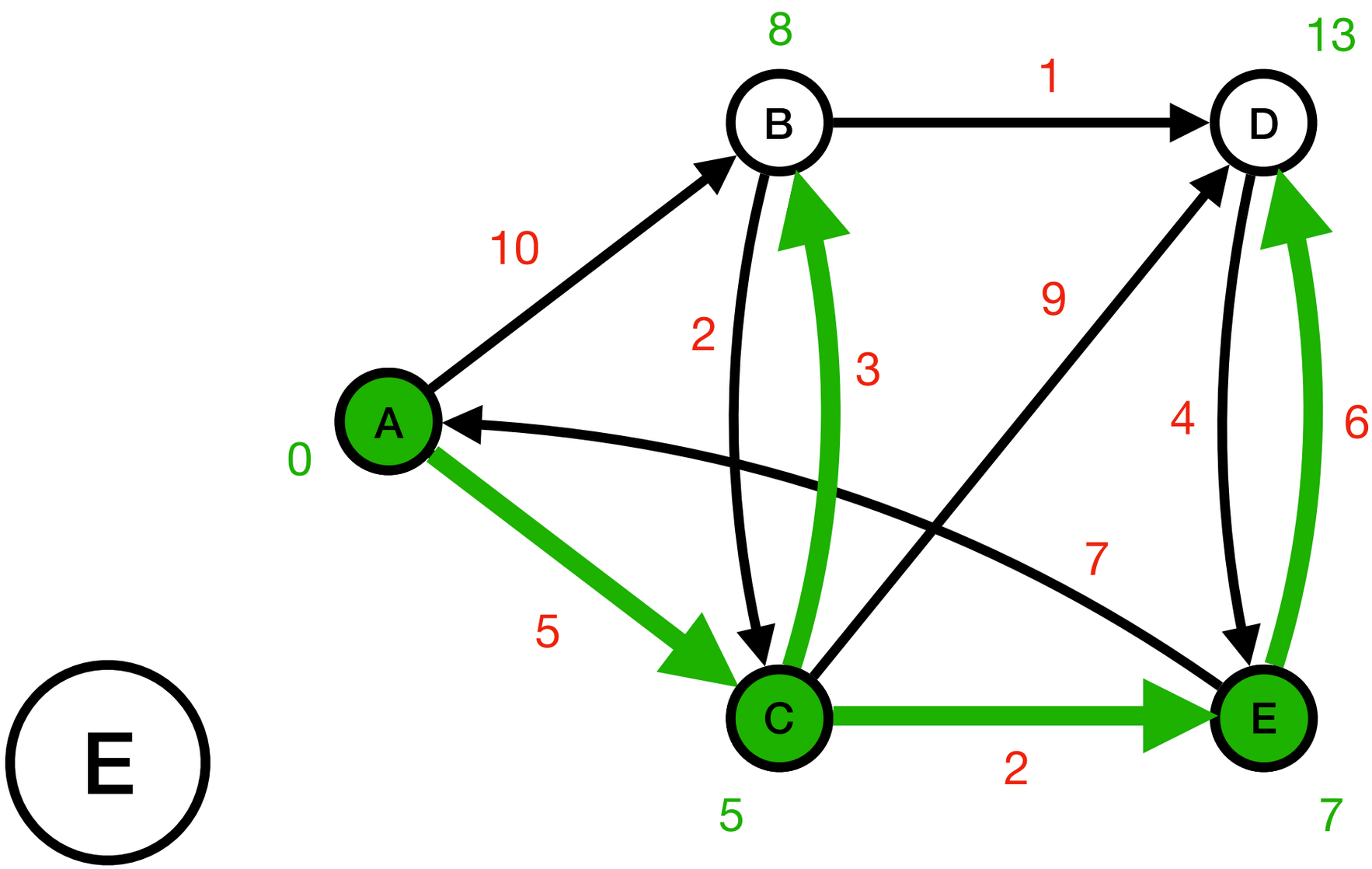
Algorithme de Dijkstra



File de priorité → B D

8 13

Algorithme de Dijkstra

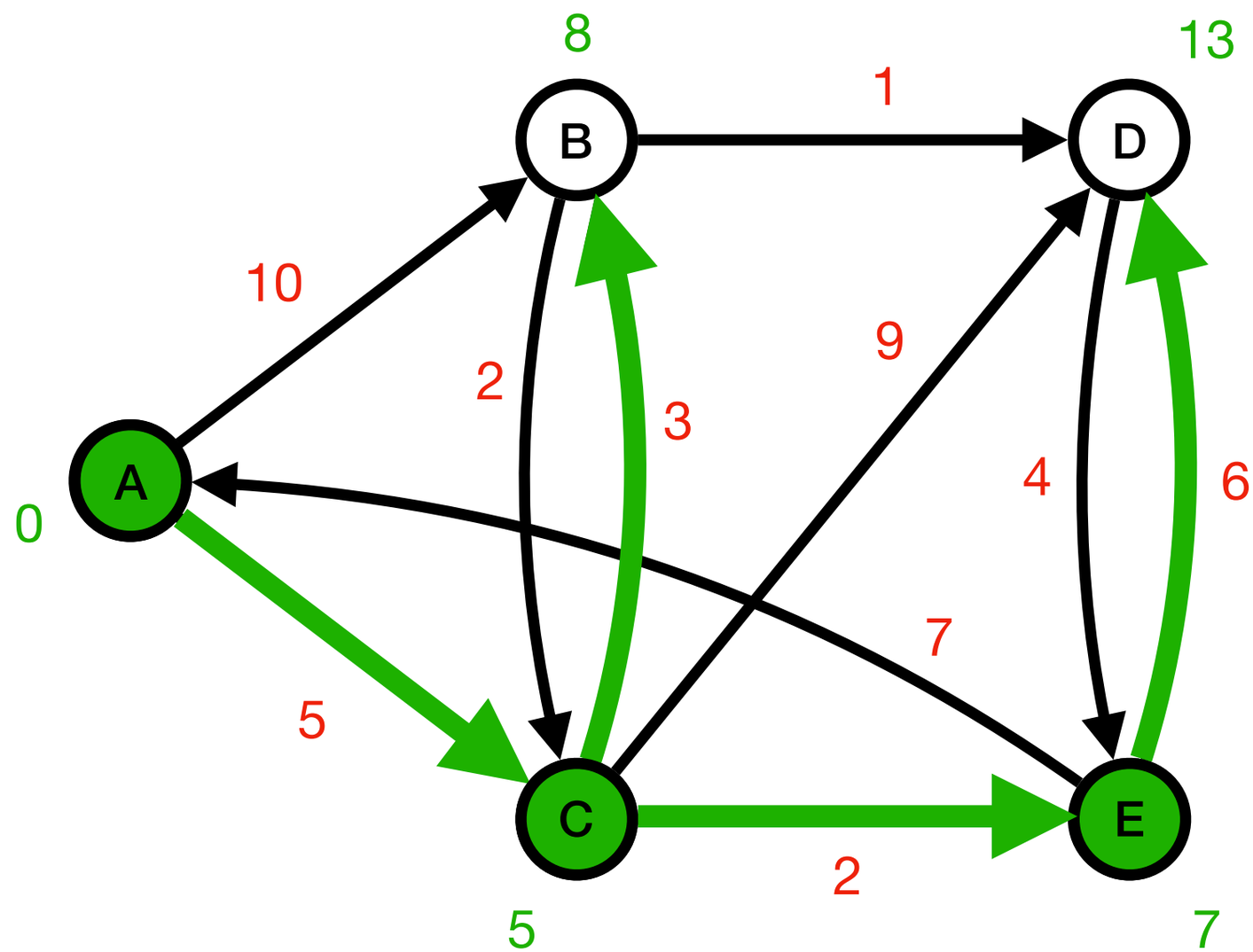


E

File de priorité → B D

8 13

Algorithme de Dijkstra



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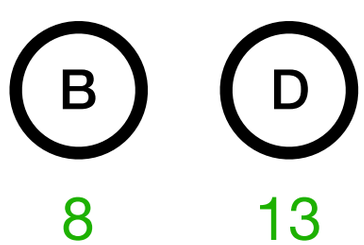
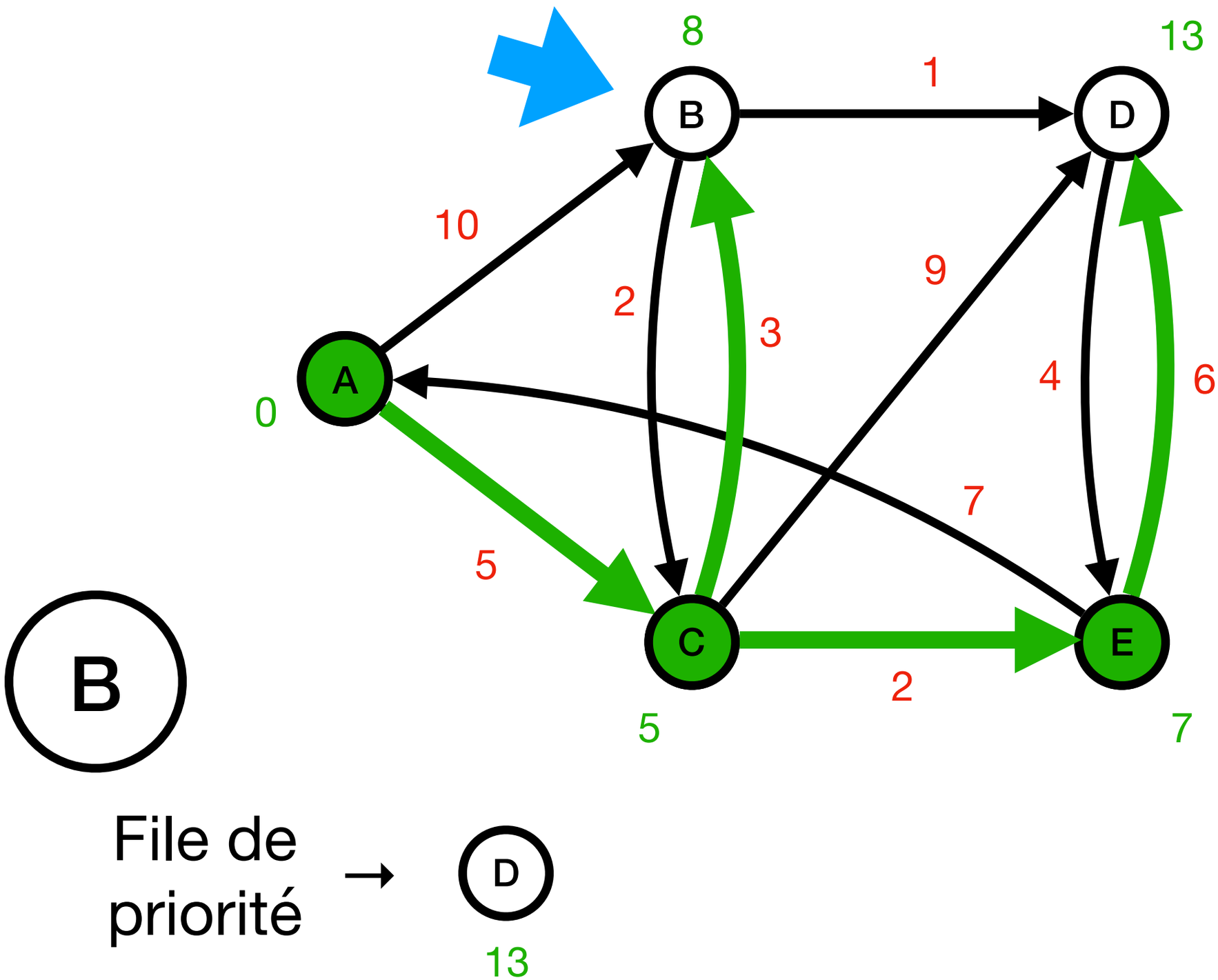
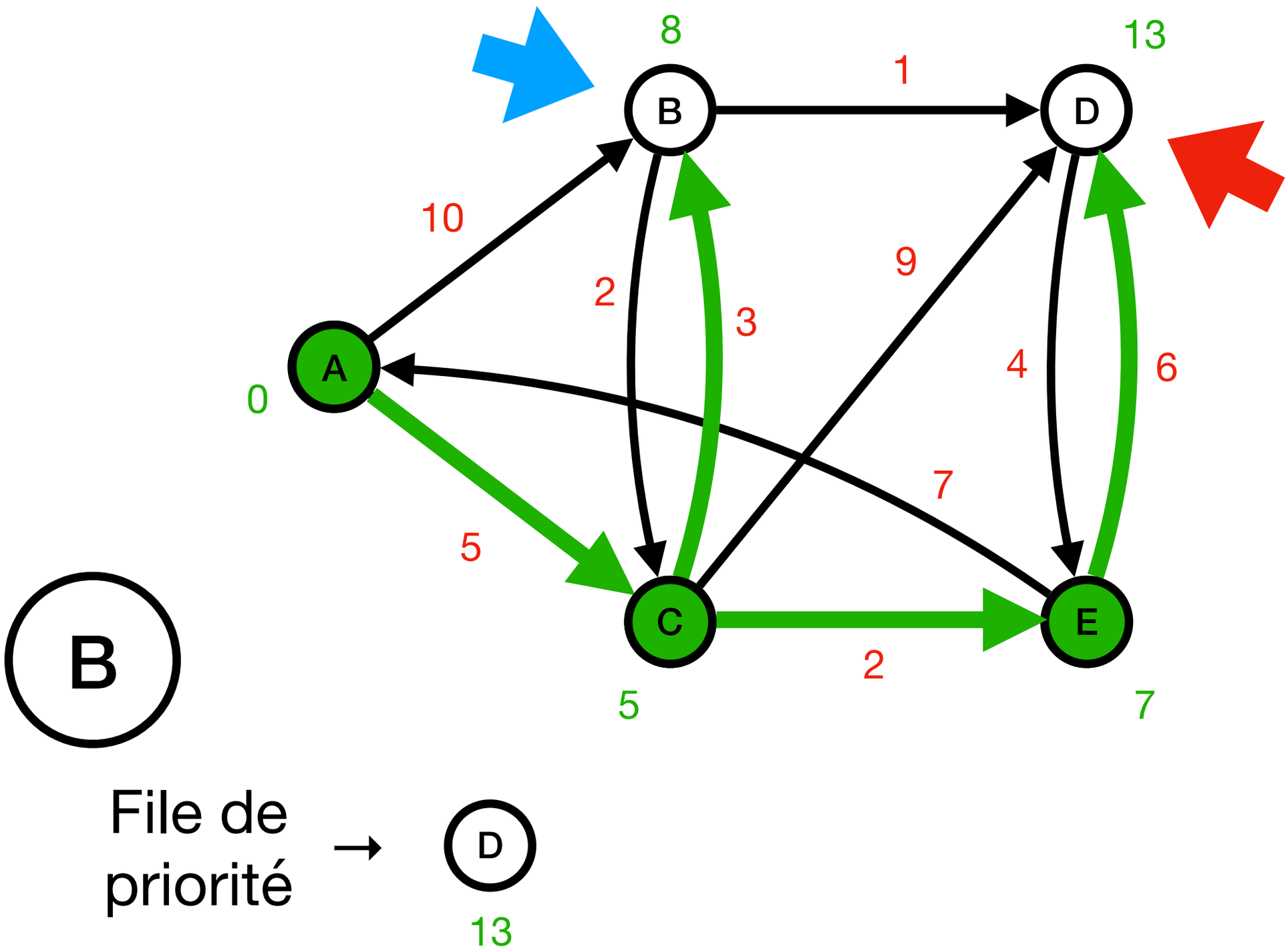


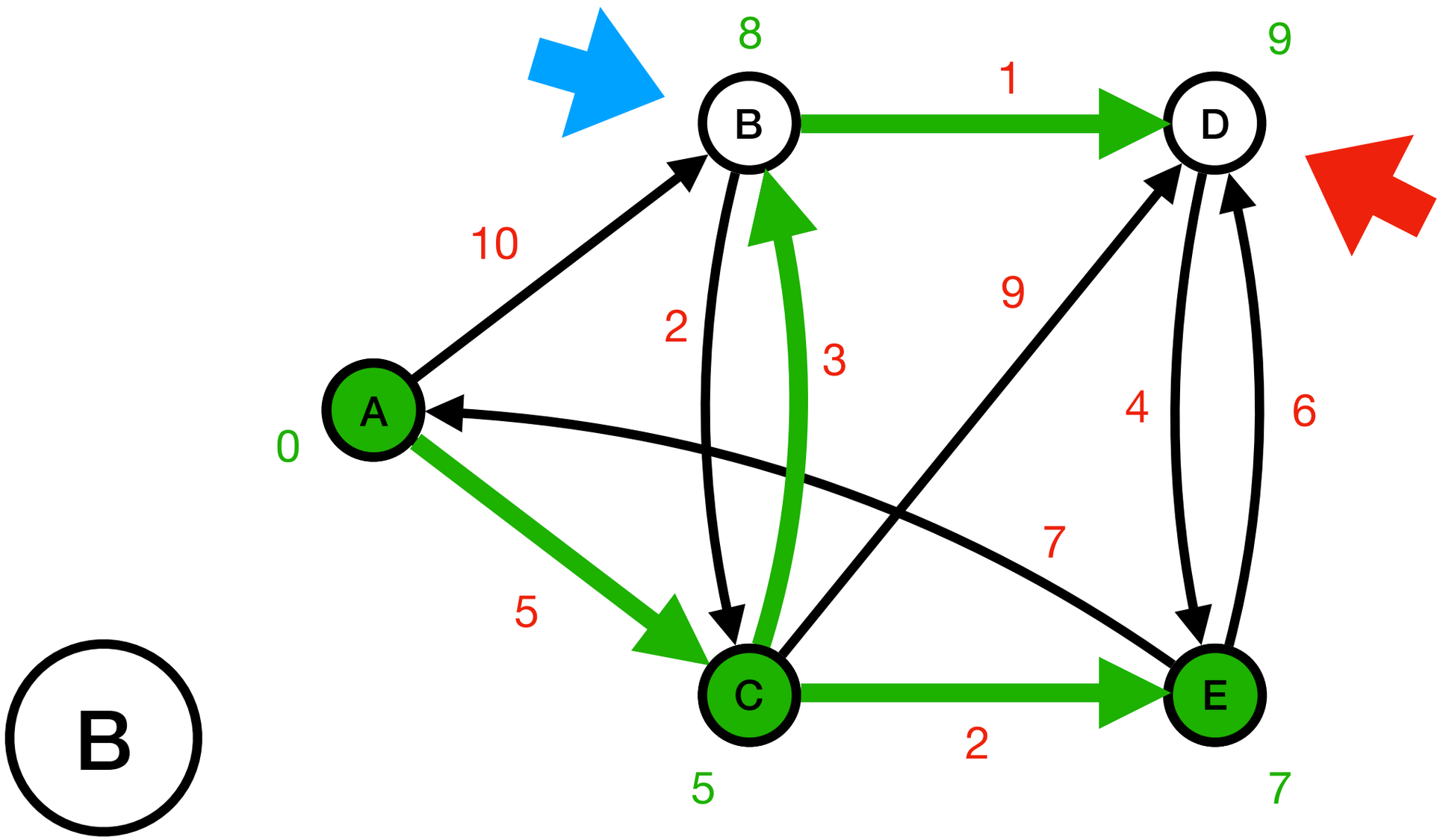
Algorithme de Dijkstra

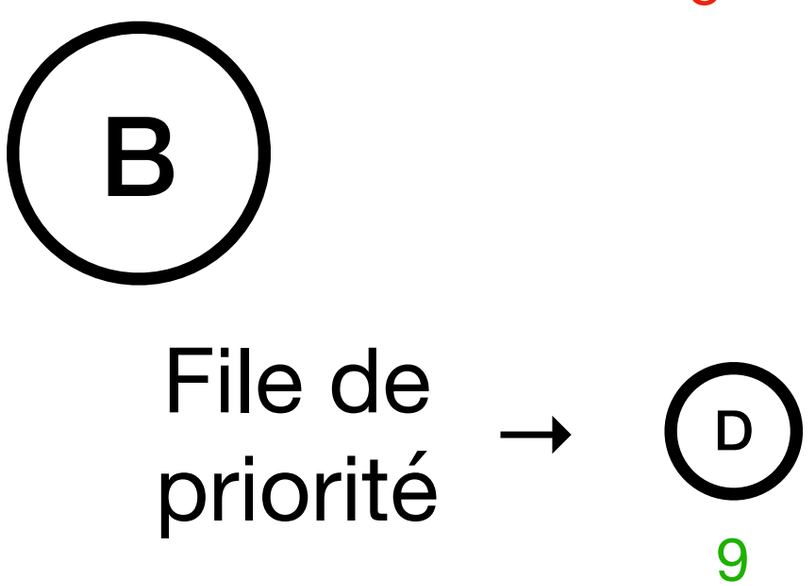


Algorithme de Dijkstra



Algorithme de Dijkstra





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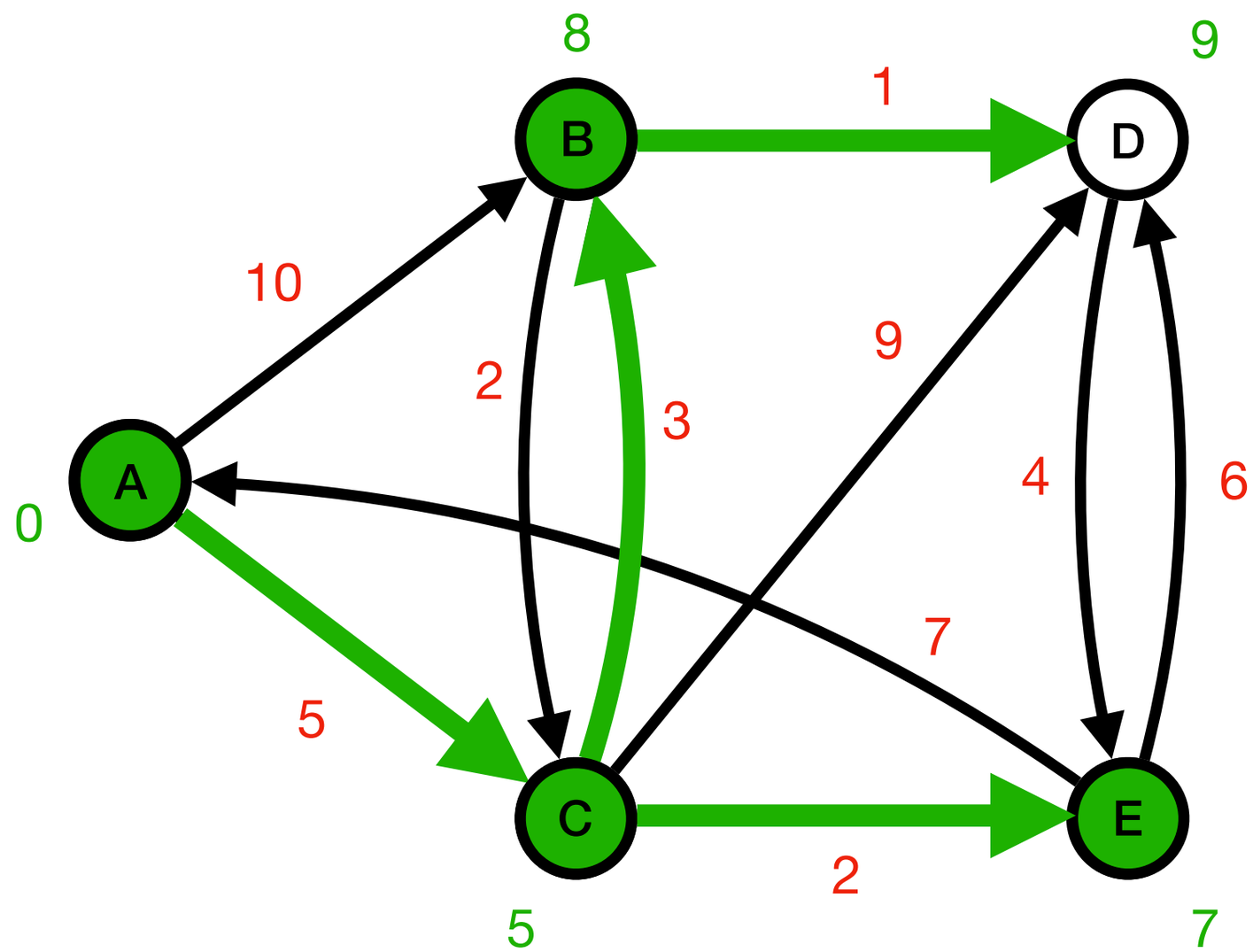

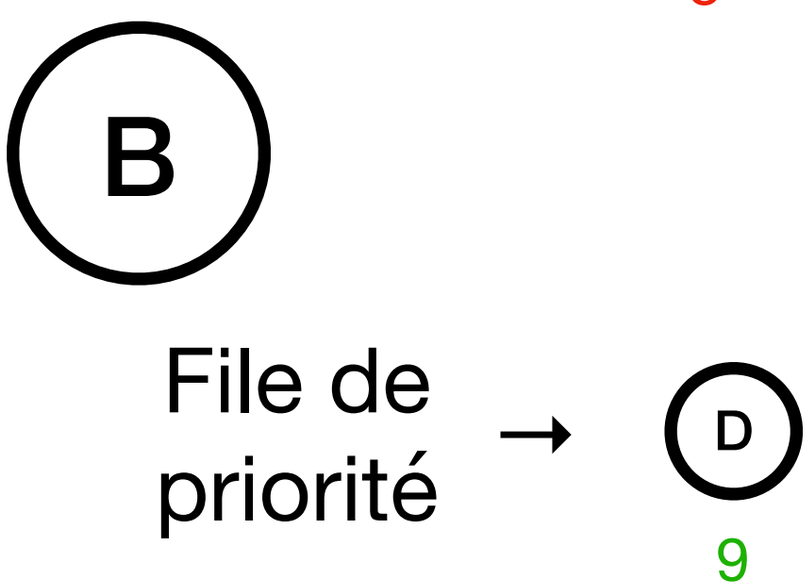

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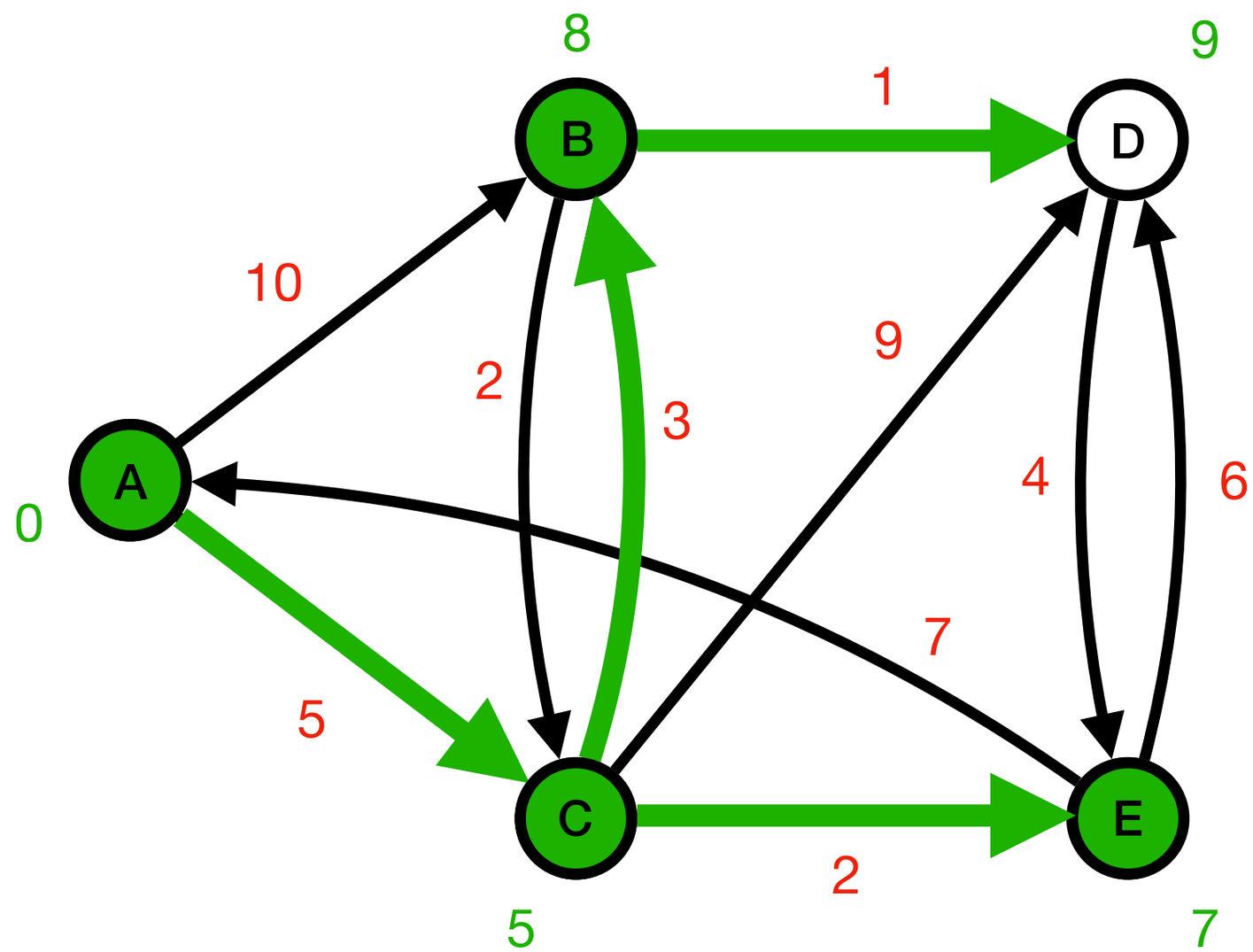

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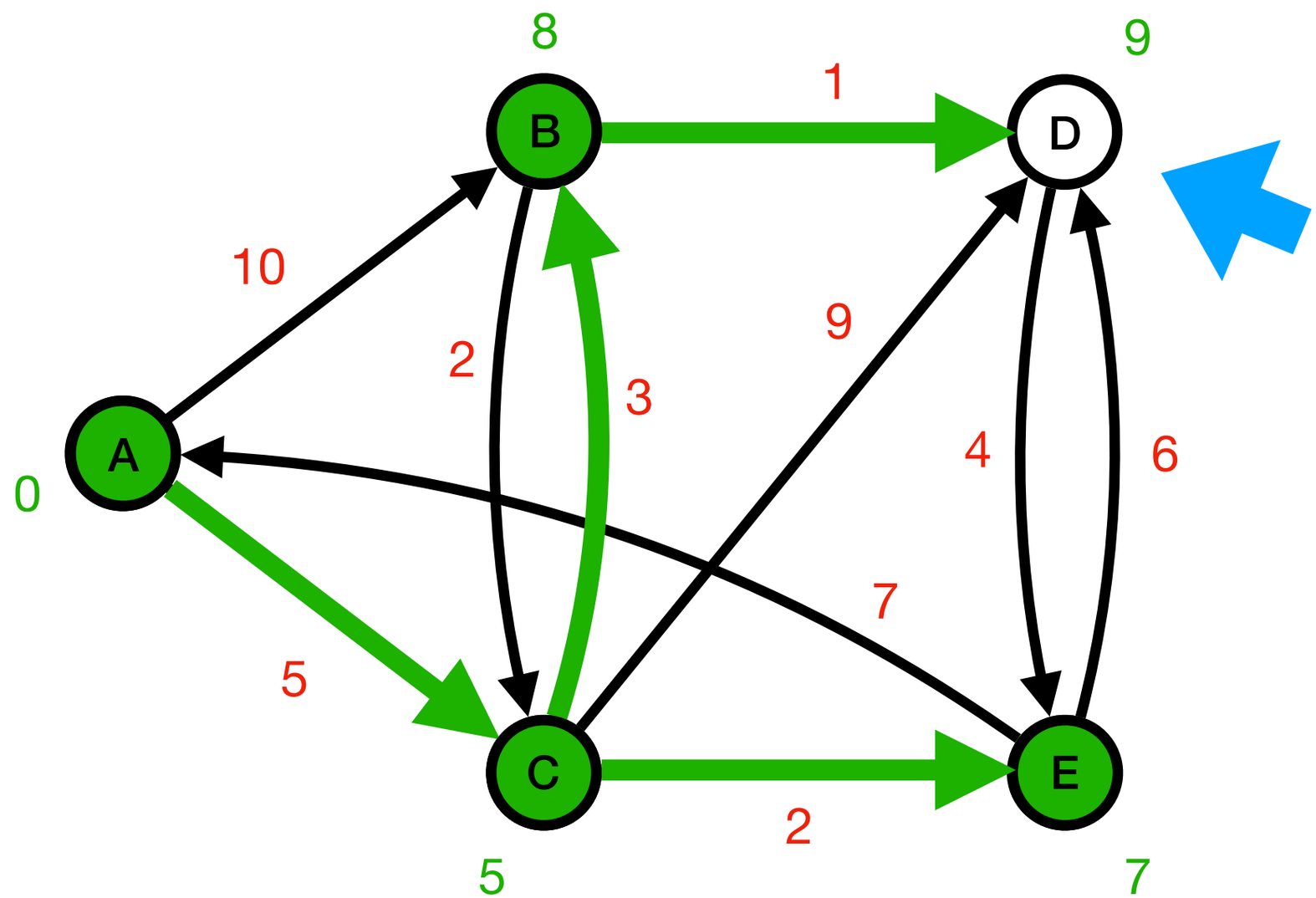
Algorithme de Dijkstra



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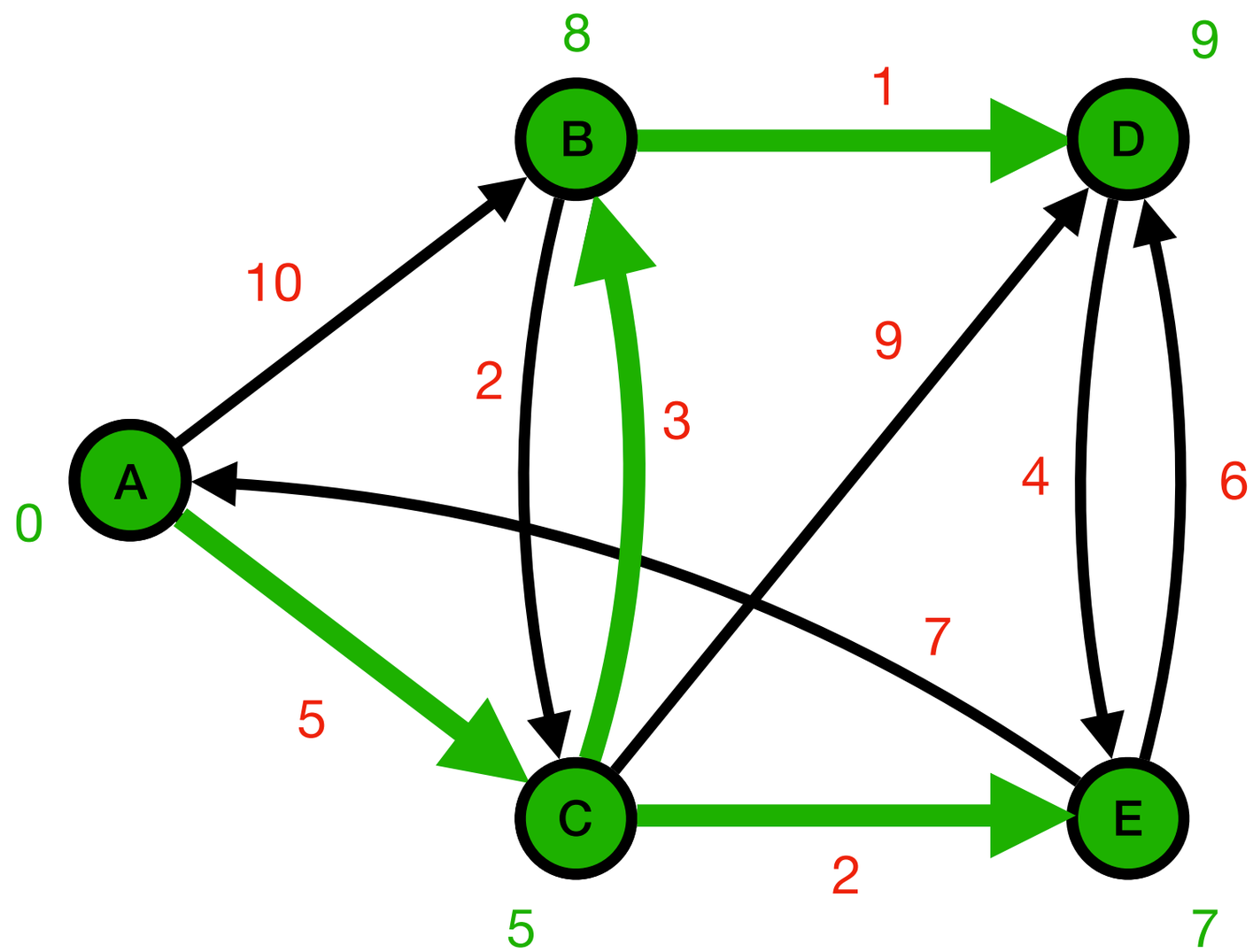
Algorithme de Dijkstra



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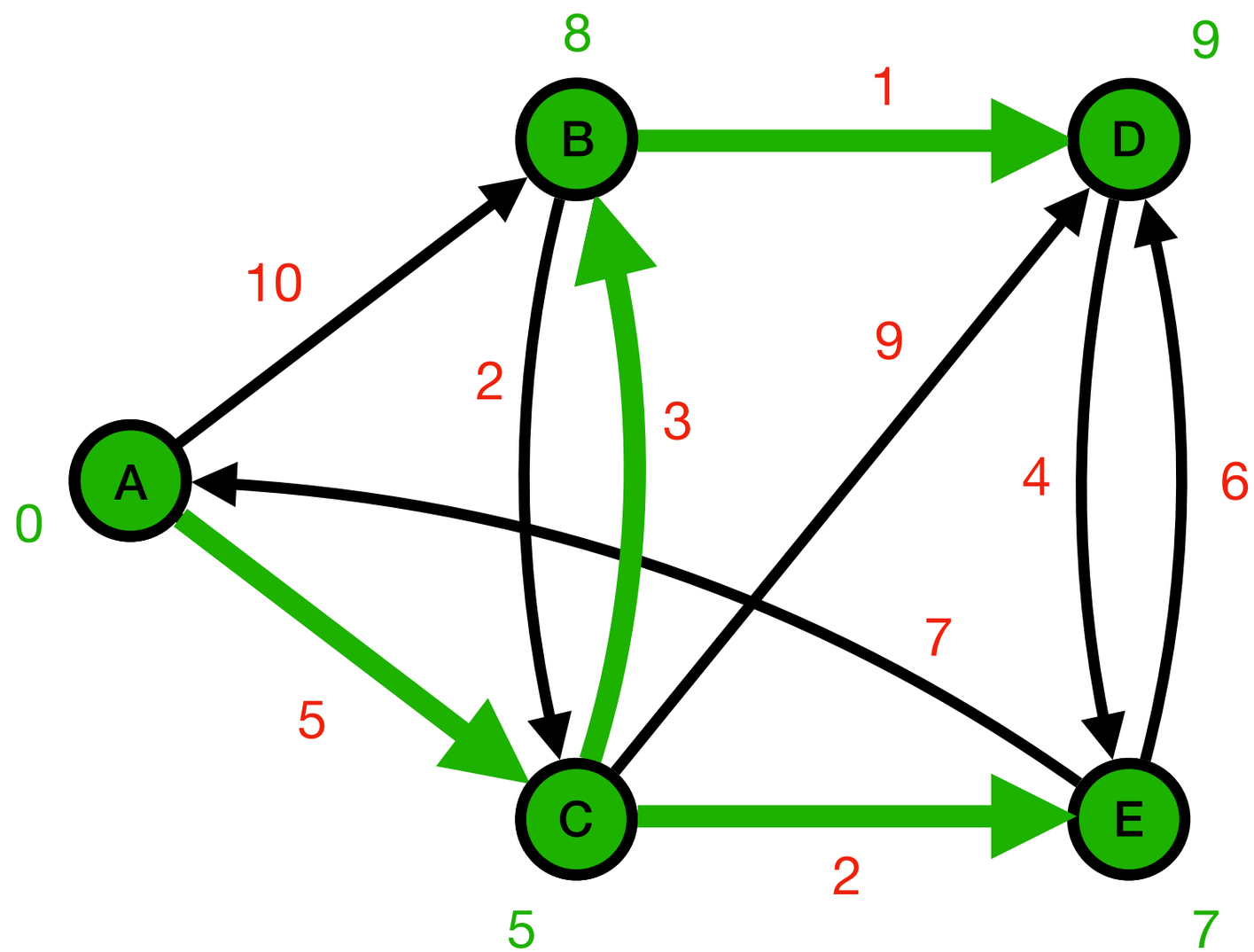

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Algorithme de Dijkstra