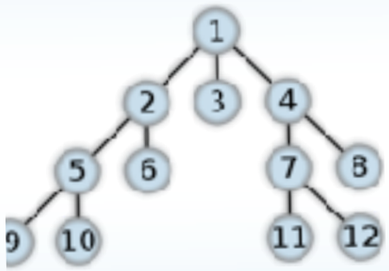


Kapitel 3.9: Eigenschaften von DFS und BFS

Algorithmen und Datenstrukturen
WS 2017/18

Prof. Dr. Sándor Fekete

Algorithmus 3.7

INPUT: Graph G = (V,E), Knoten s

OUTPUT: Knotenmenge $Y \subseteq V$, die von s aus erreichbar ist,

Kantenmenge $T \subseteq E$, die die Erreichbarkeit sicherstellt

1. Sei R:={s}, Y:={s}, T:=∅
2. WHILE (R≠∅) DO {
   - 2.1. wähle Element $v \in R$
   - 2.2. IF (es gibt kein $w \in V \setminus Y$ mit $e=\{v,w\} \in E$) THEN
     - 2.2.1. R:=R\{v}
   - 2.3. ELSE {
     - 2.3.1. wähle ein $w \in V \setminus R$ mit $e=\{v,w\} \in E$;
     - 2.3.2. setze R := R u {w}, Y := Y u {w}, T := T u {e};

     }

}

Auf die Schnelle mit der Welle

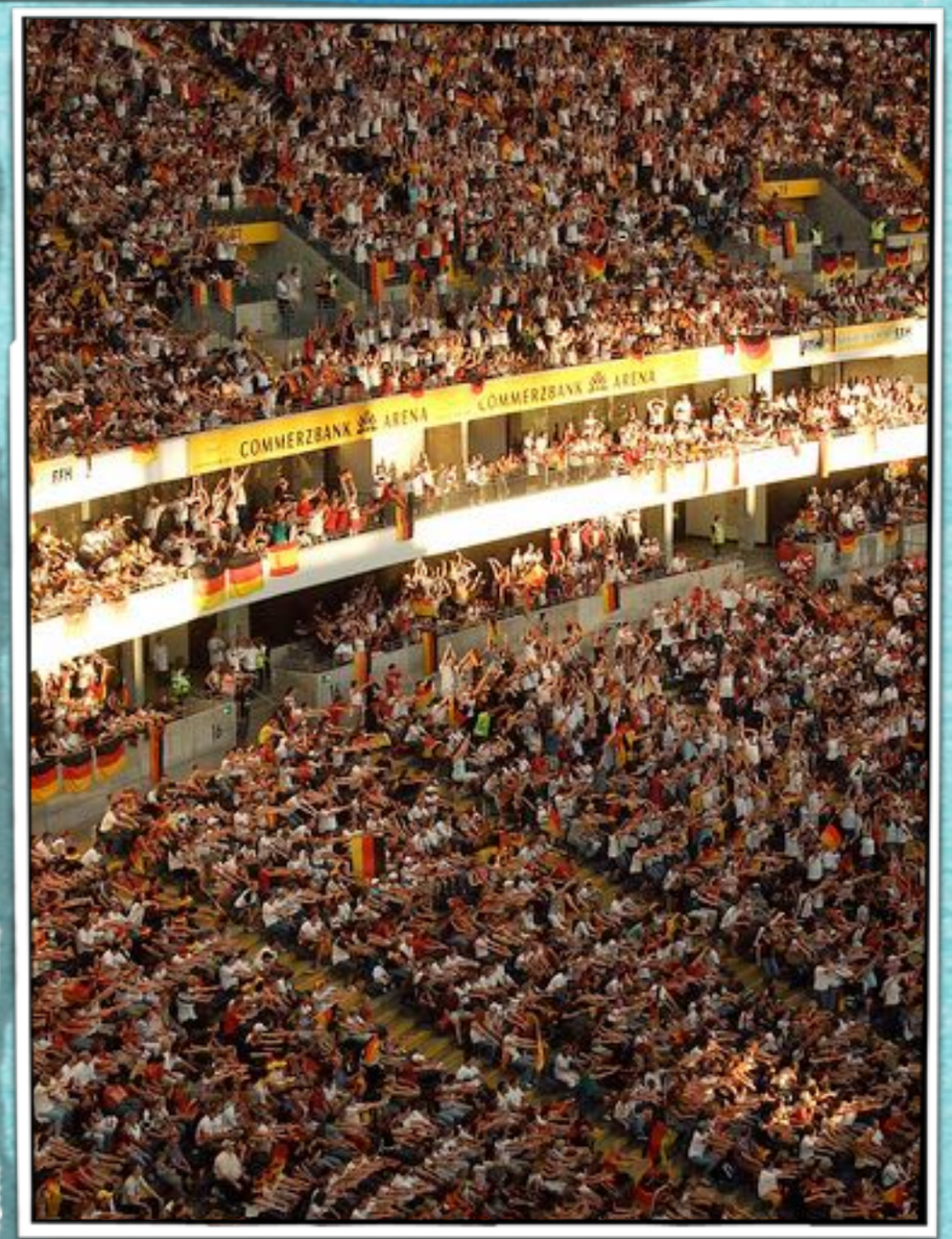
A. LOS bei „NULL“

B. Bis „ANGEKOMMEN!“:

- Solange du noch nicht aufgestanden warst:
  - Wenn ein oder mehrere direkte Nachbarn aufstehen:
    1. Einen dieser Nachbarn merken
    2. In der nächsten Runde:
       2.1. aufstehen
       2.2. Zahl merken
    3. In der übernächsten Runde hinsetzen

C. Nach „ANGEKOMMEN!“:

- Auf gemerkten Nachbarn zeigen



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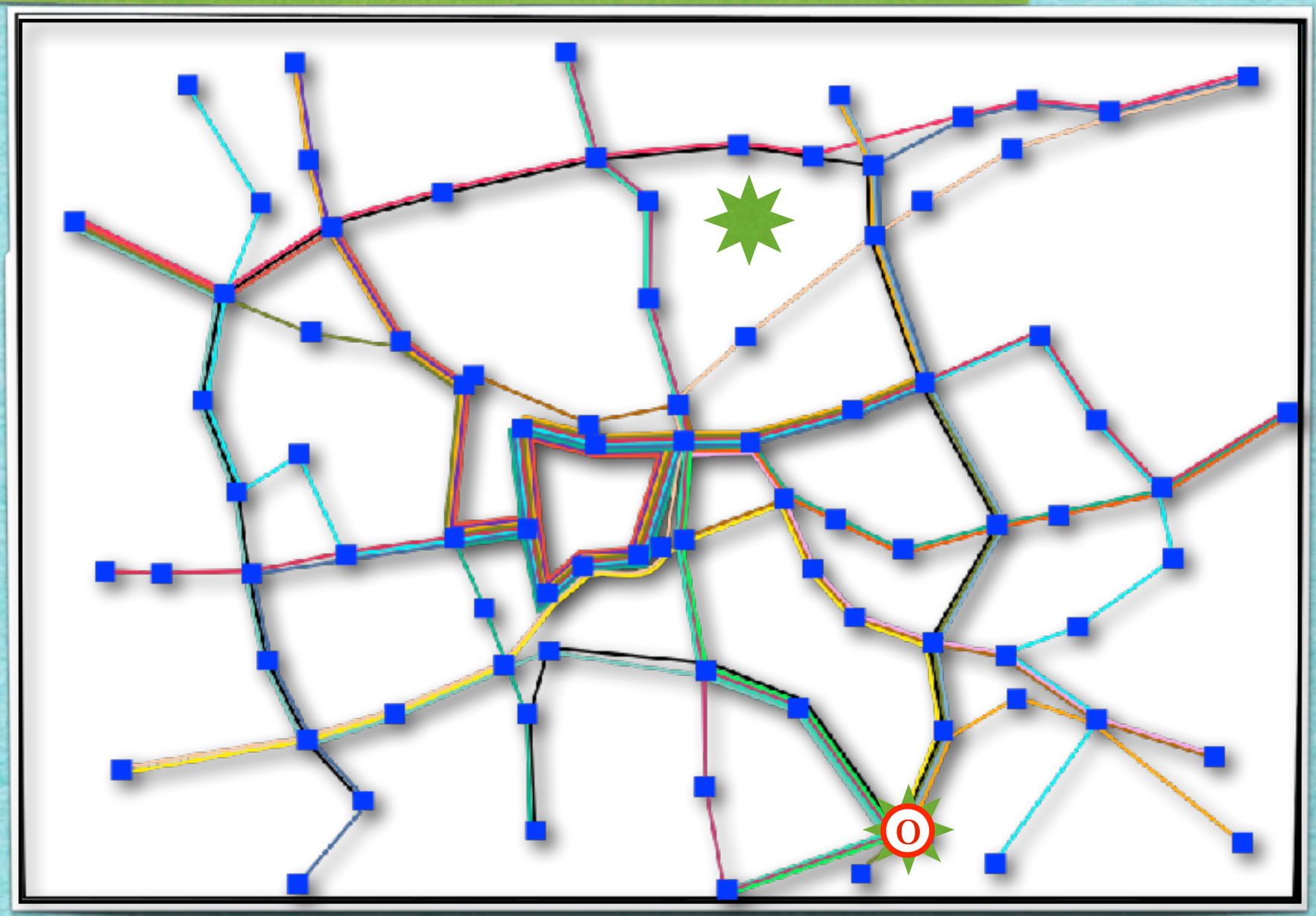

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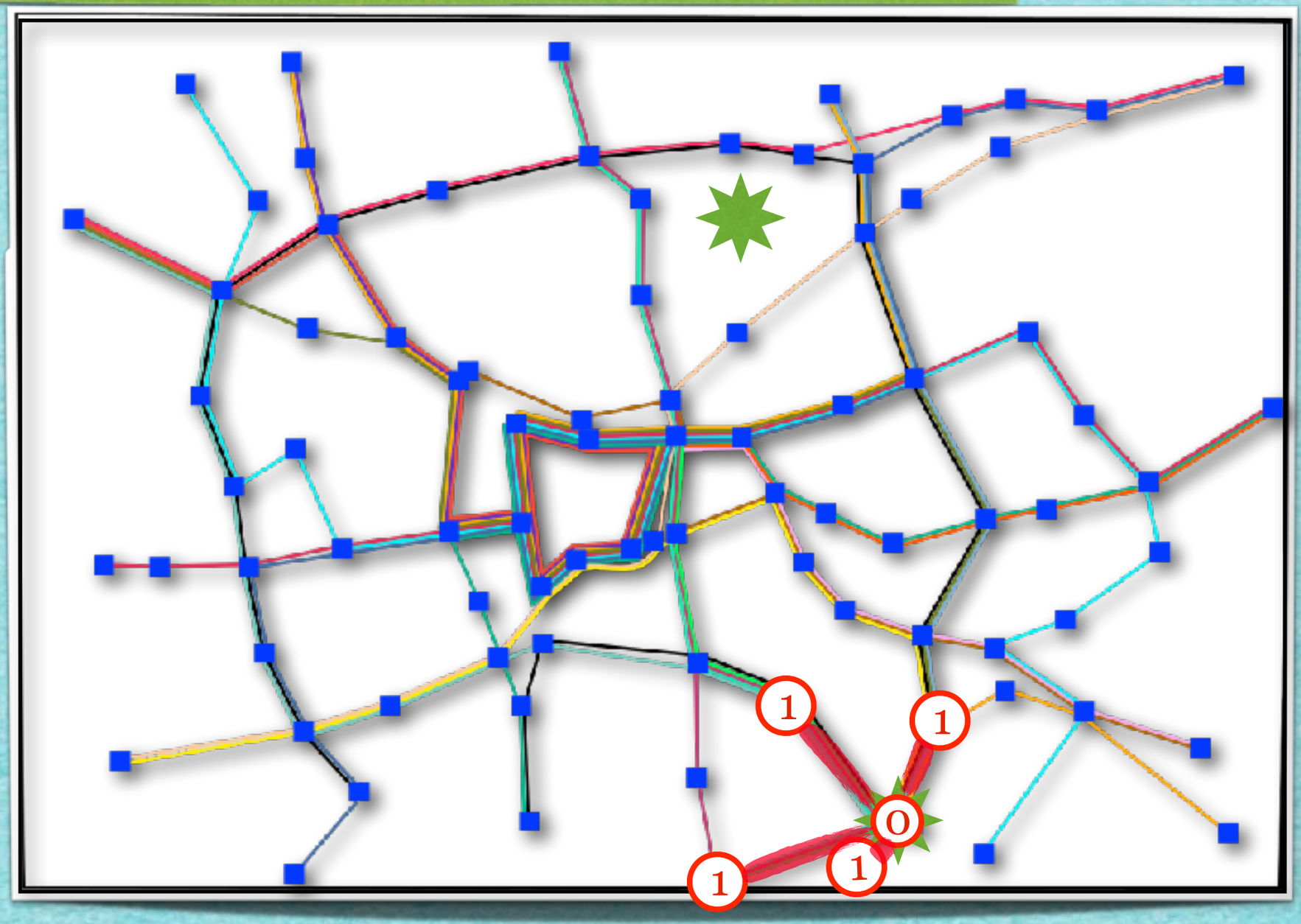

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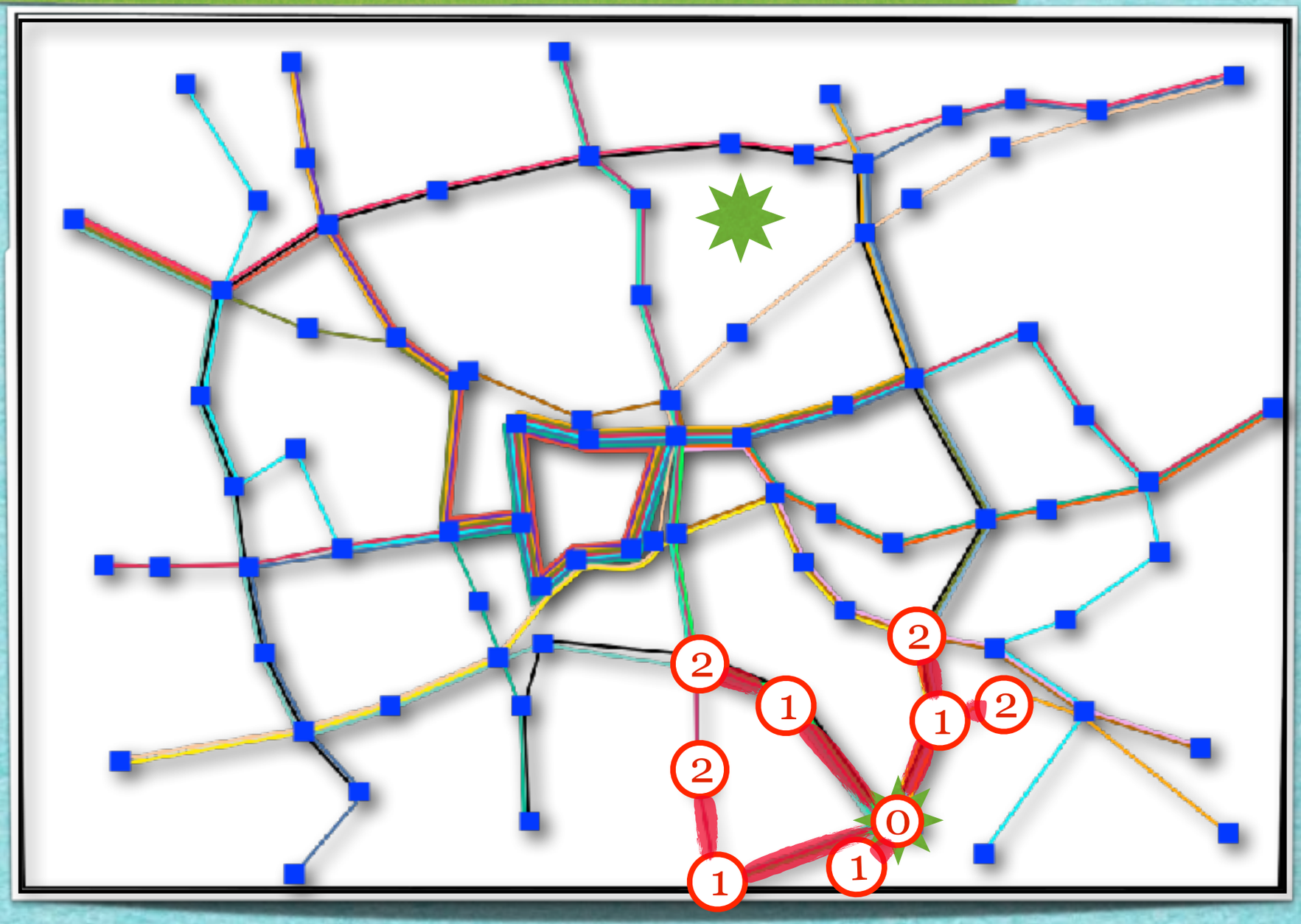

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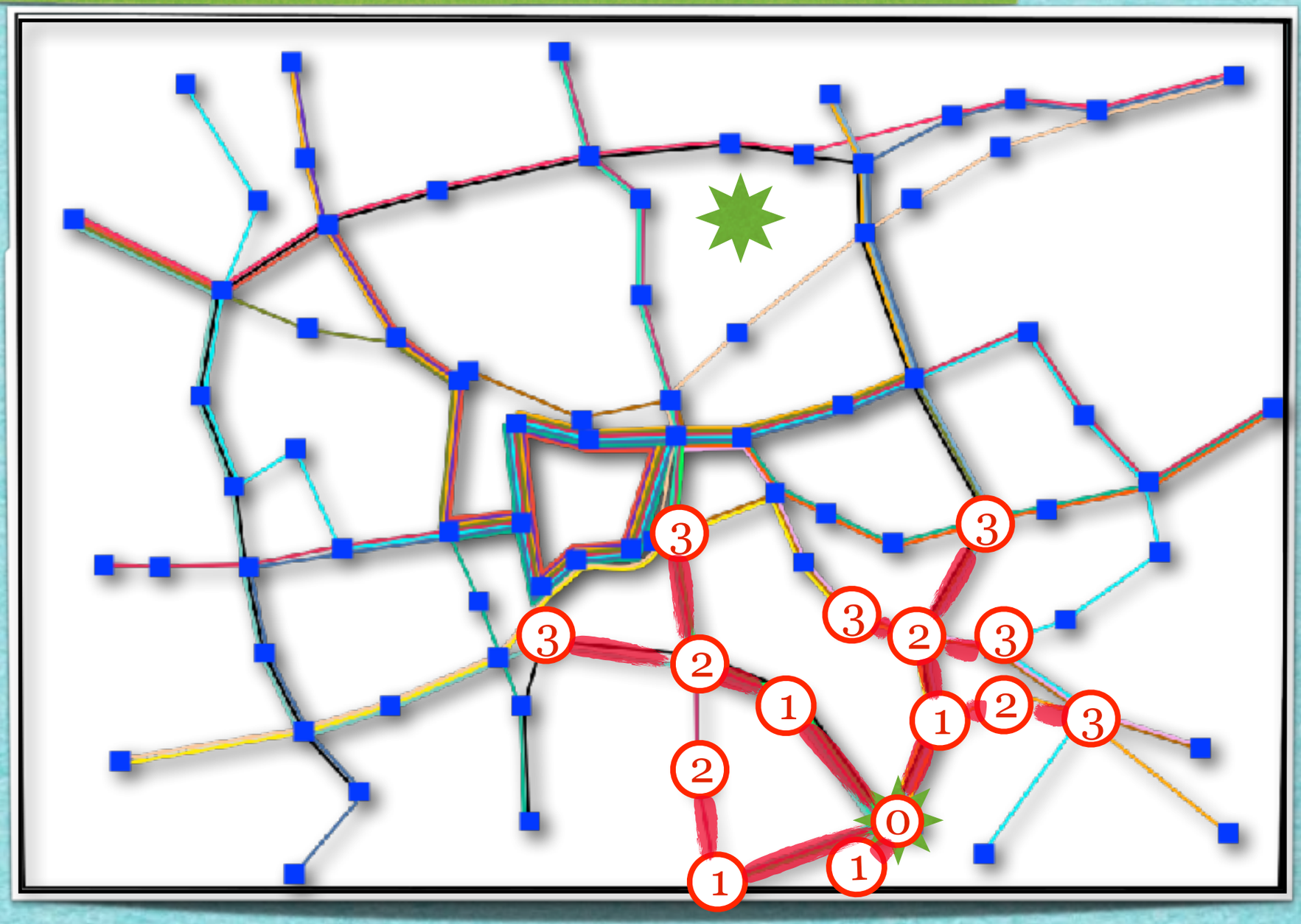

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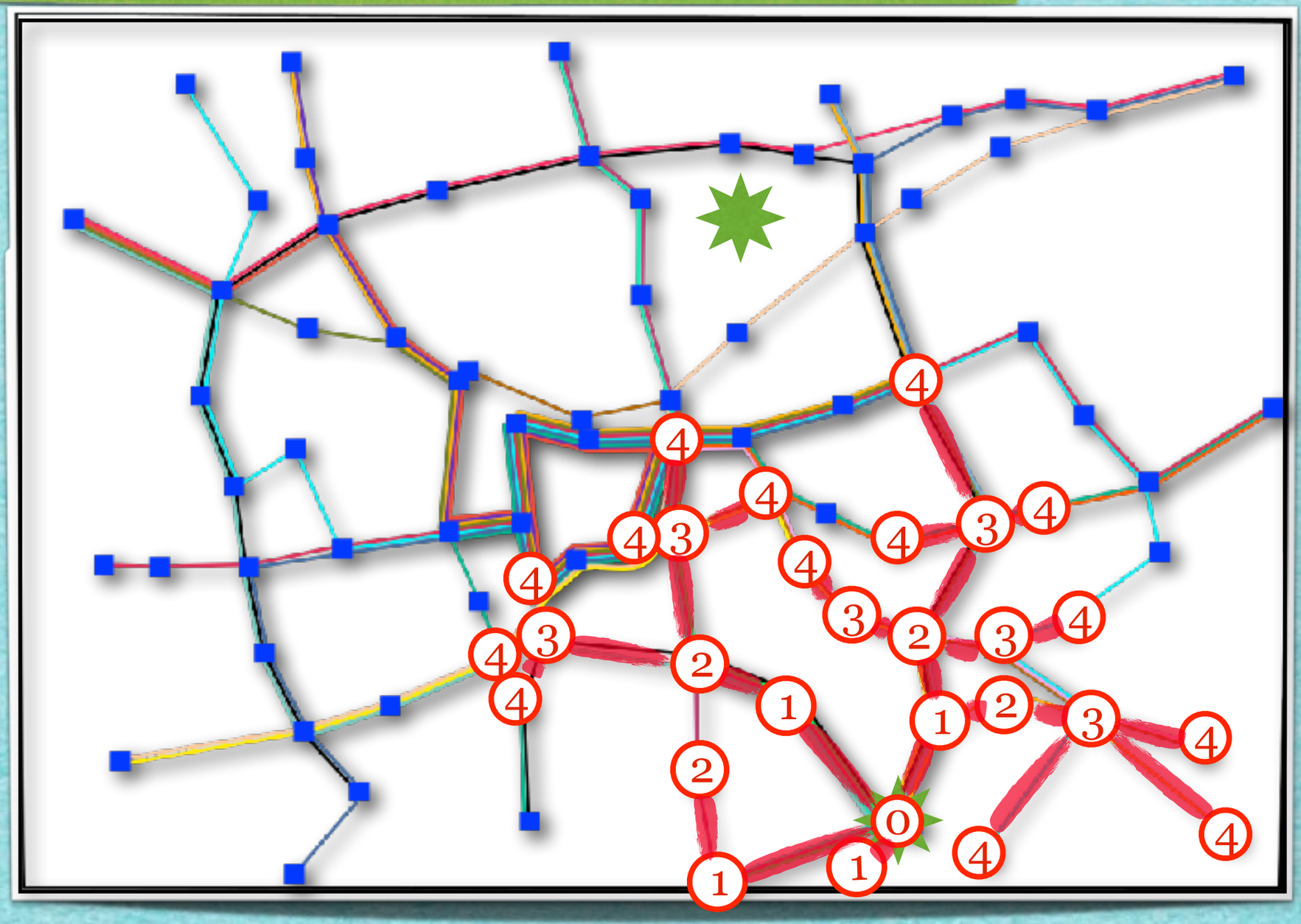

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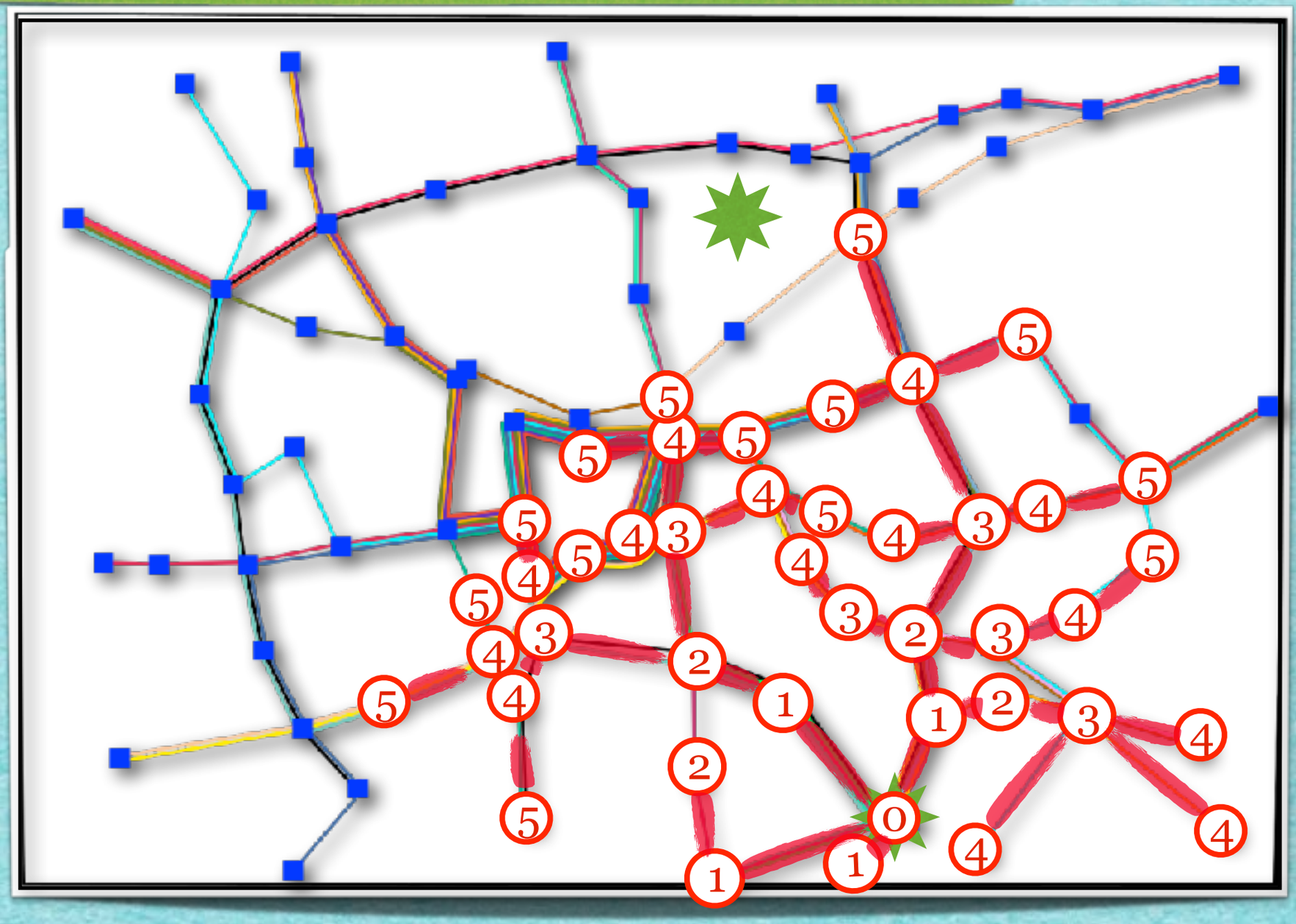

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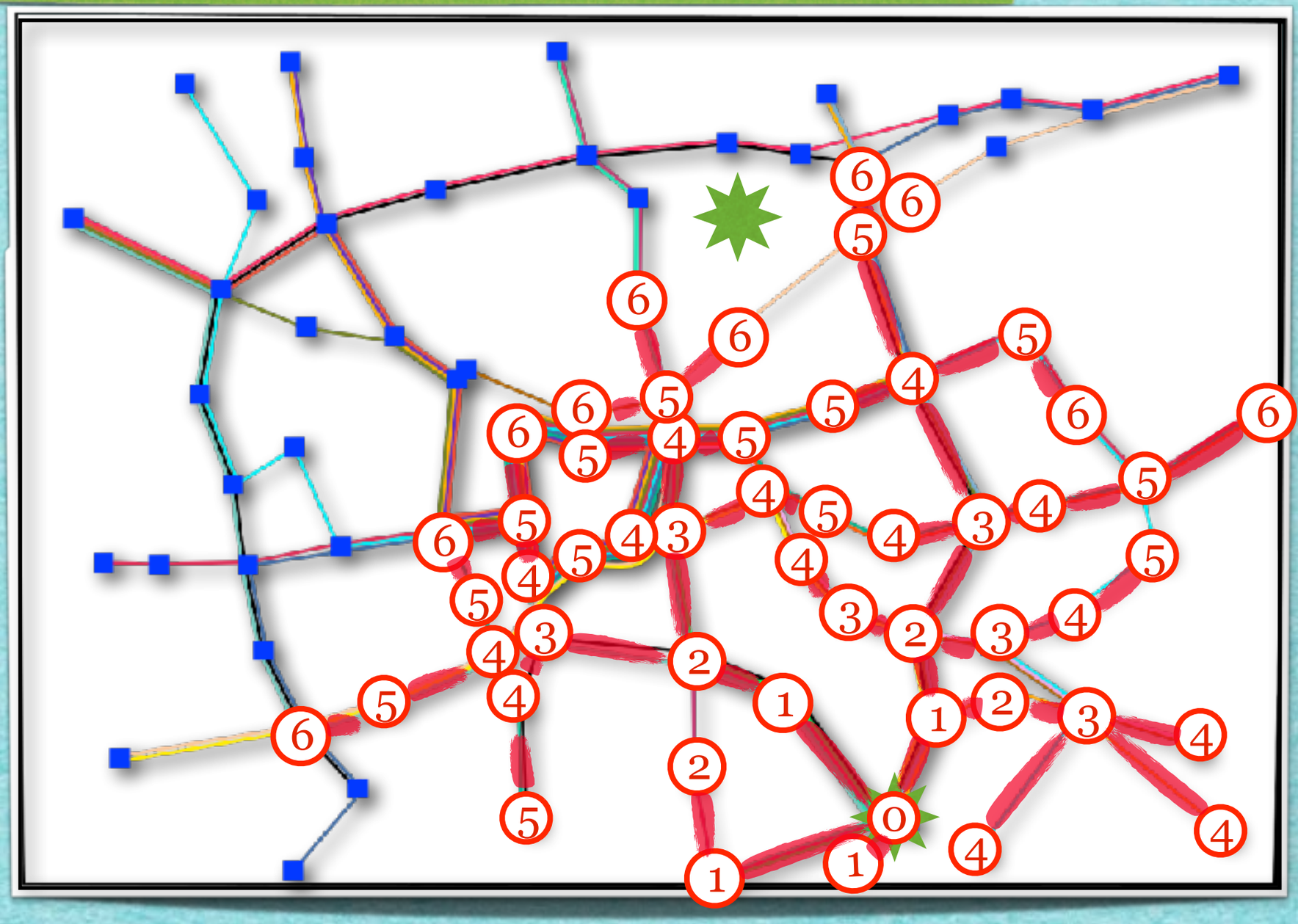

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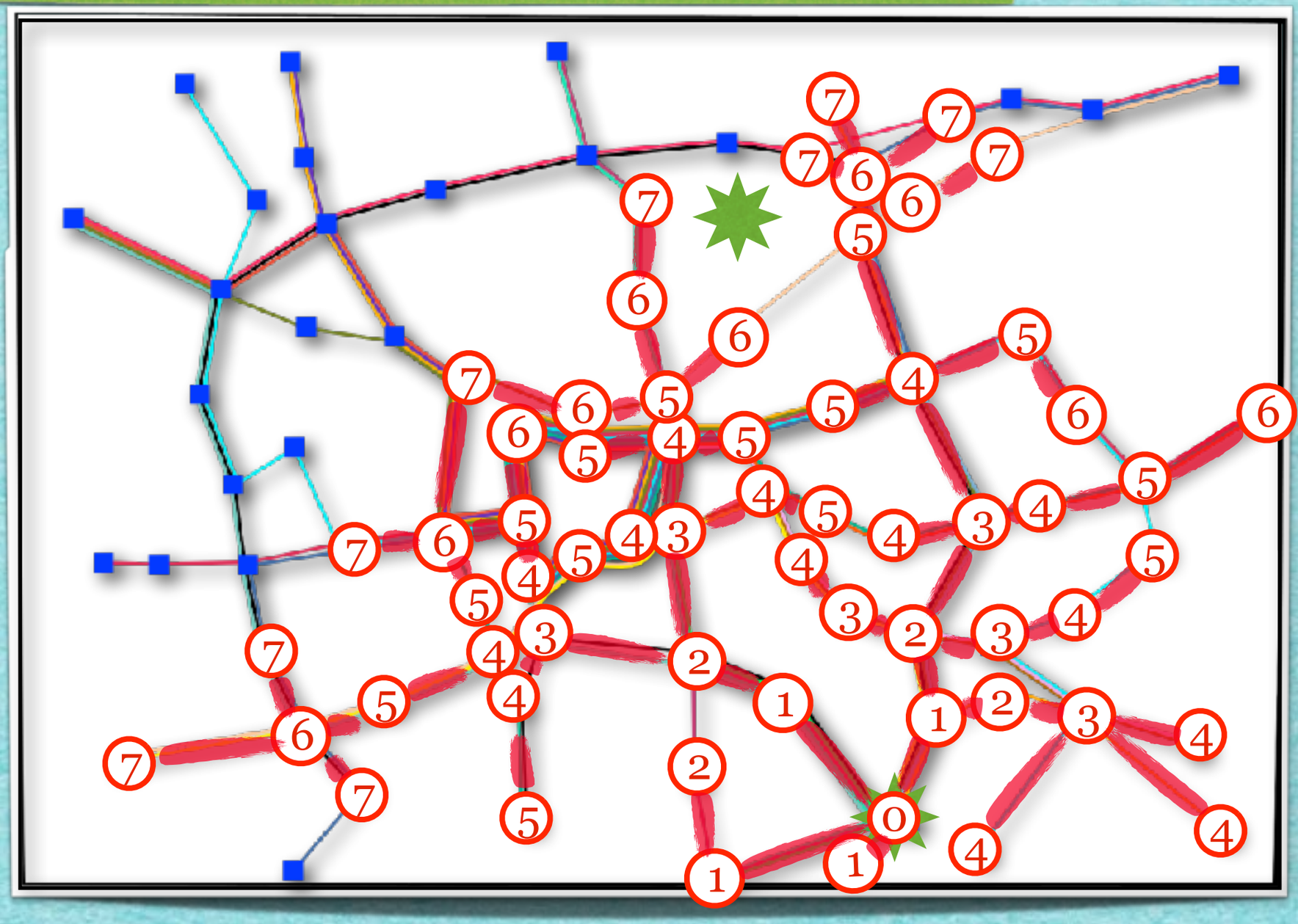

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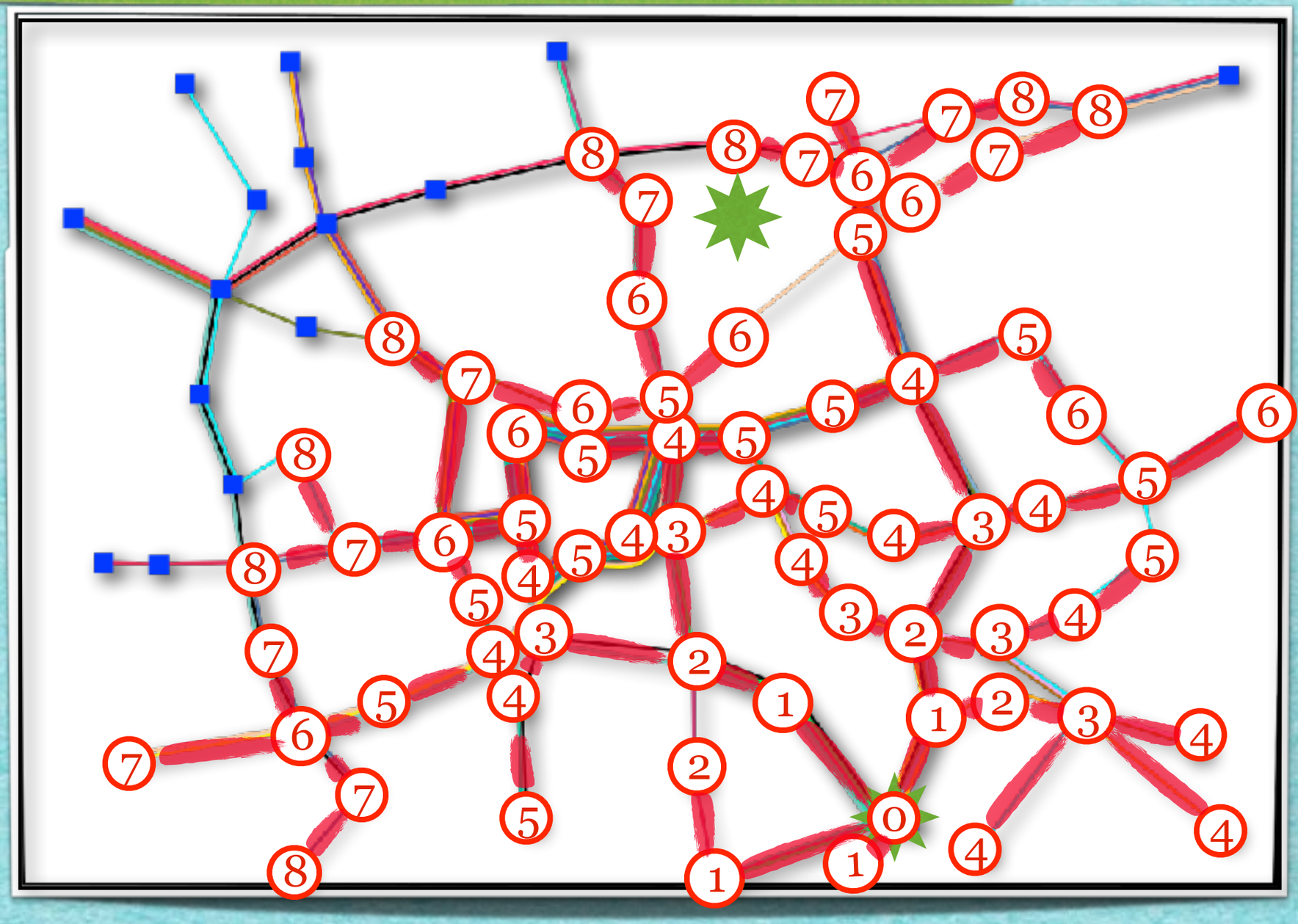

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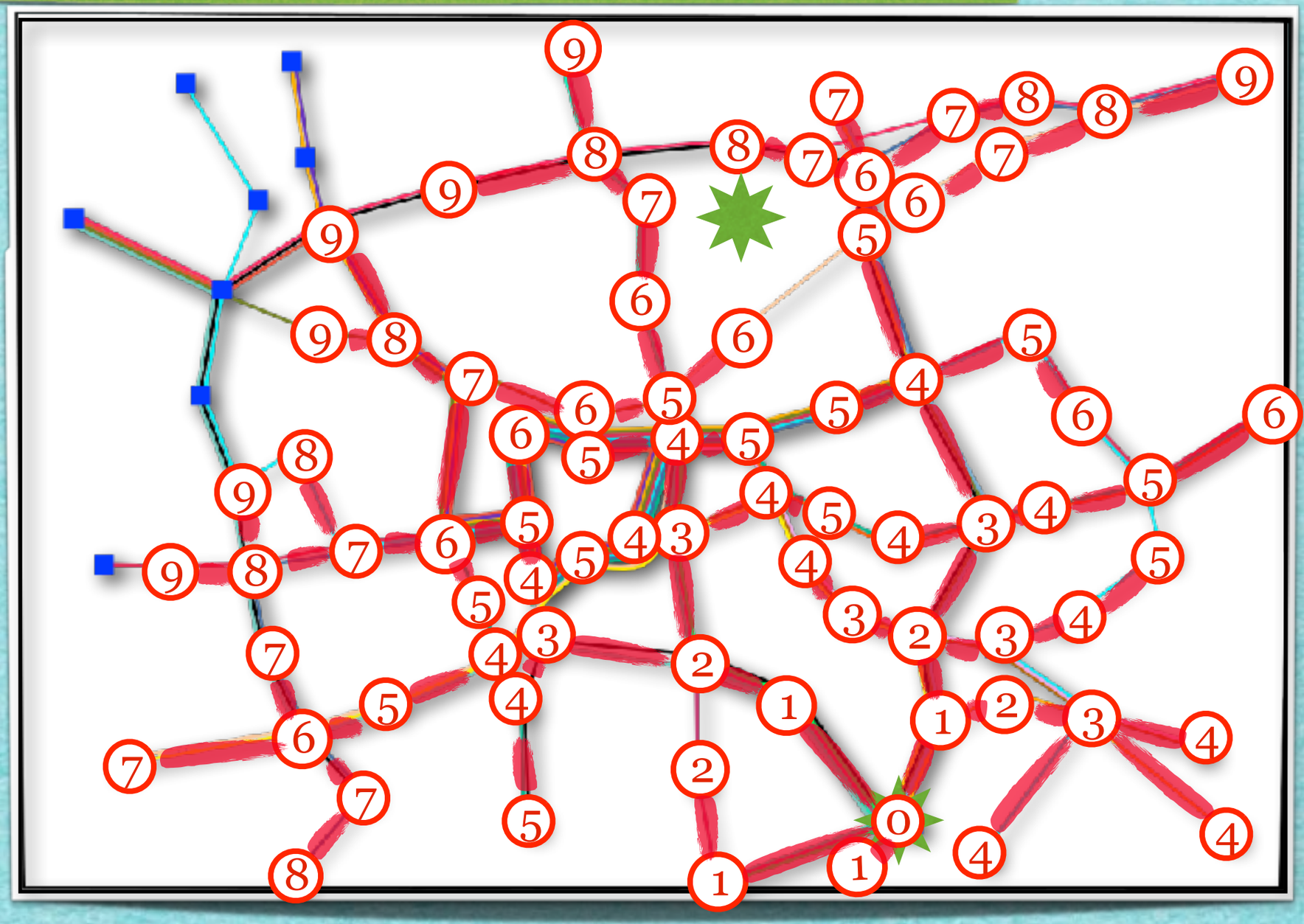

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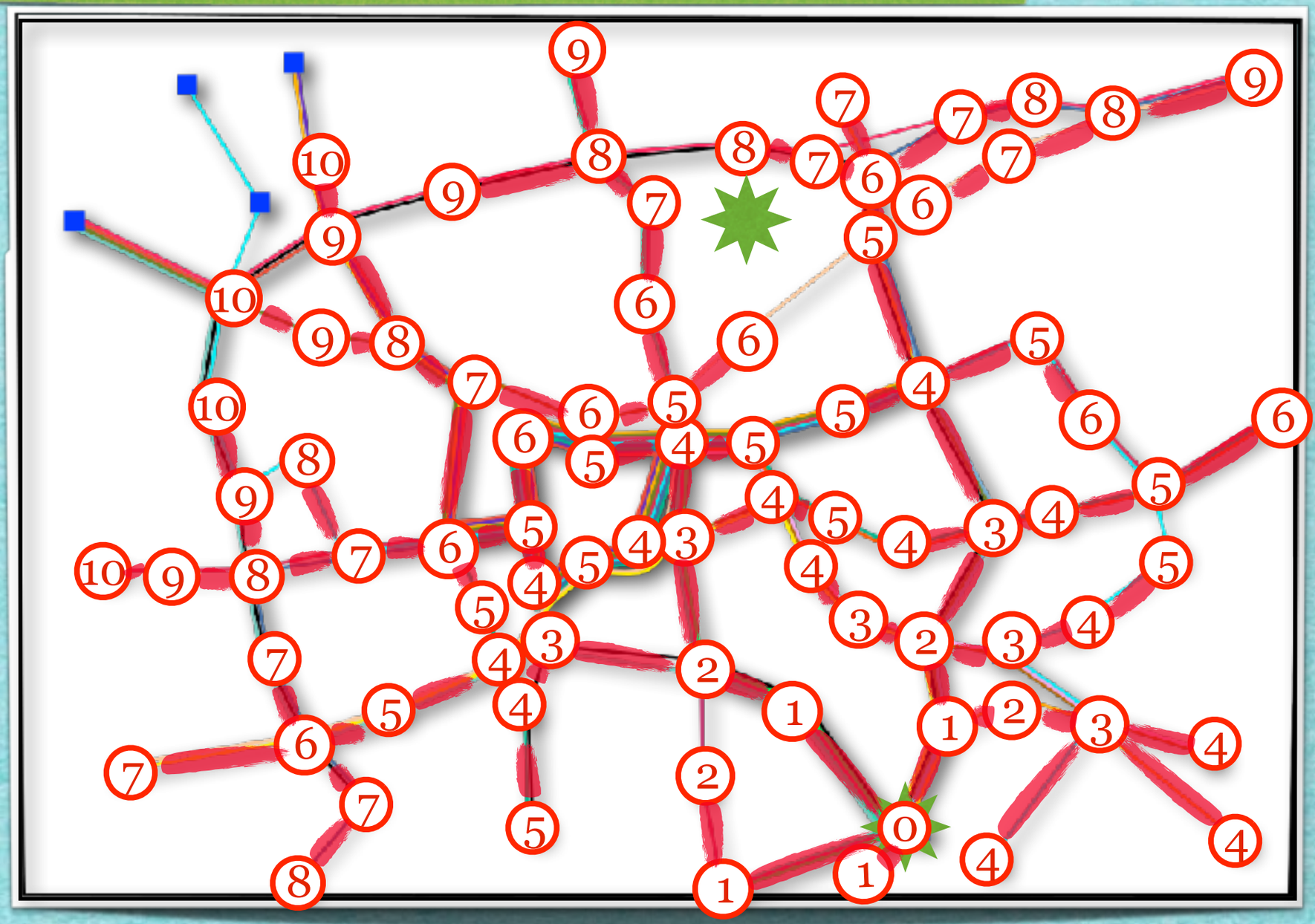

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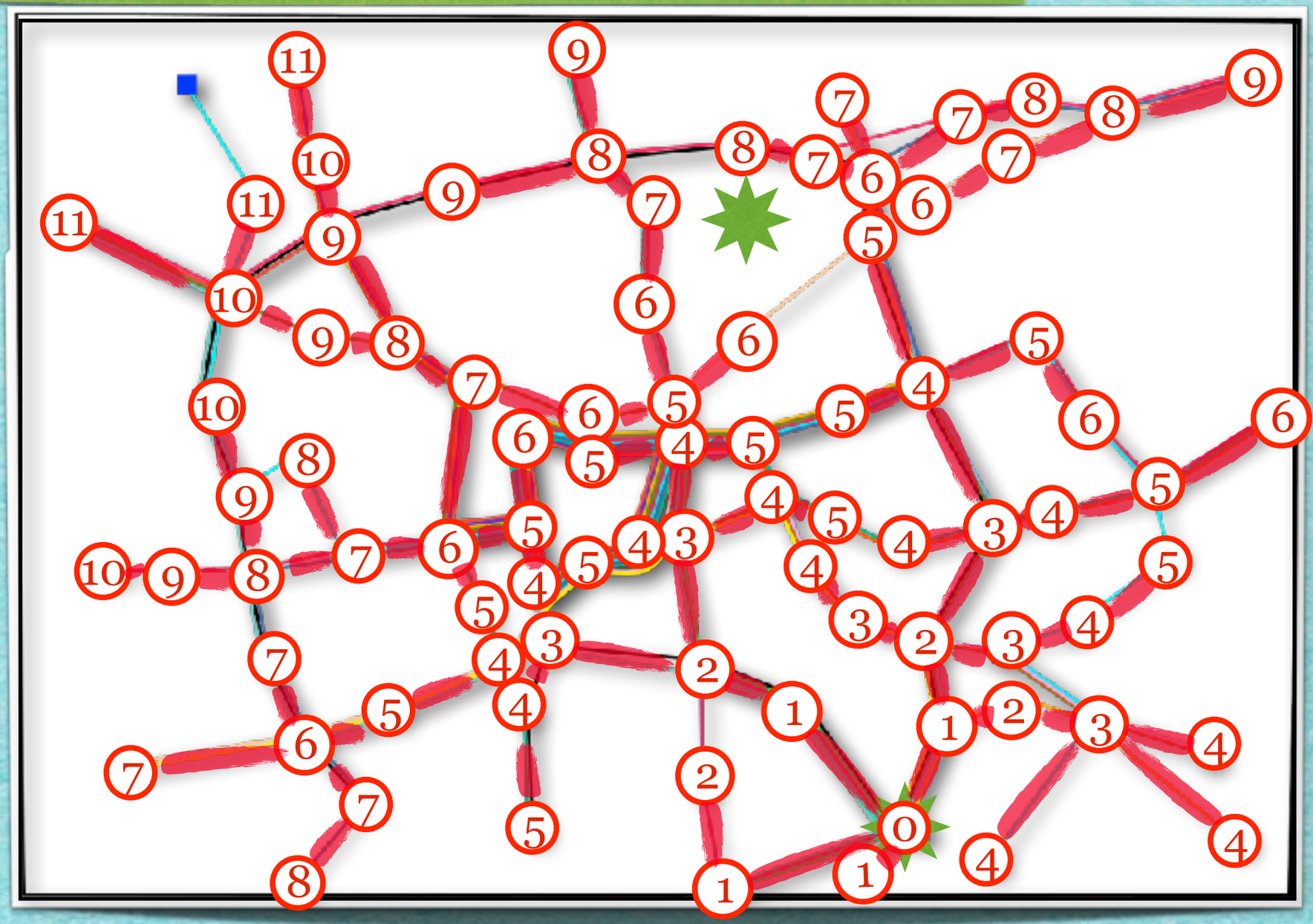

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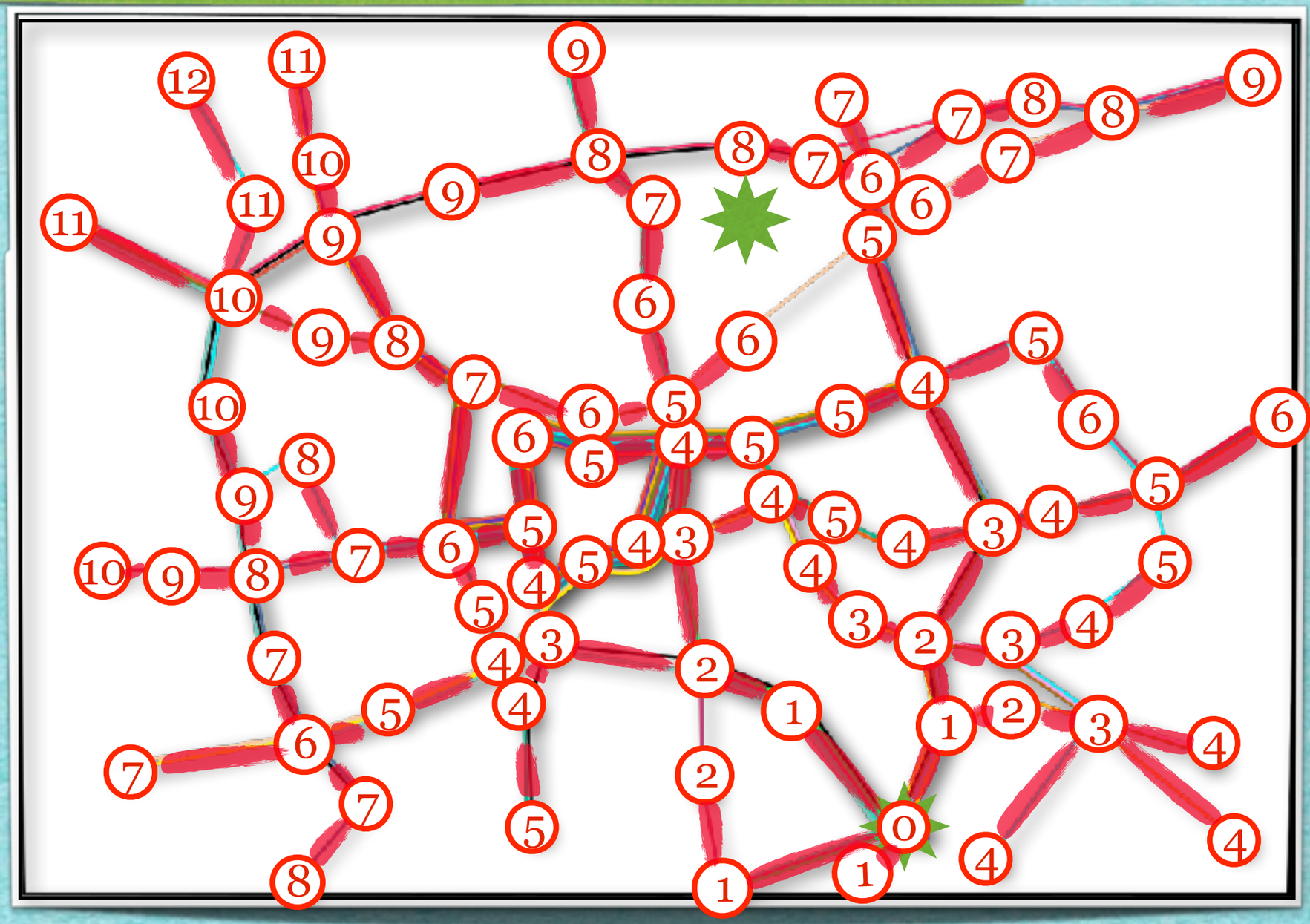

Breitensuche

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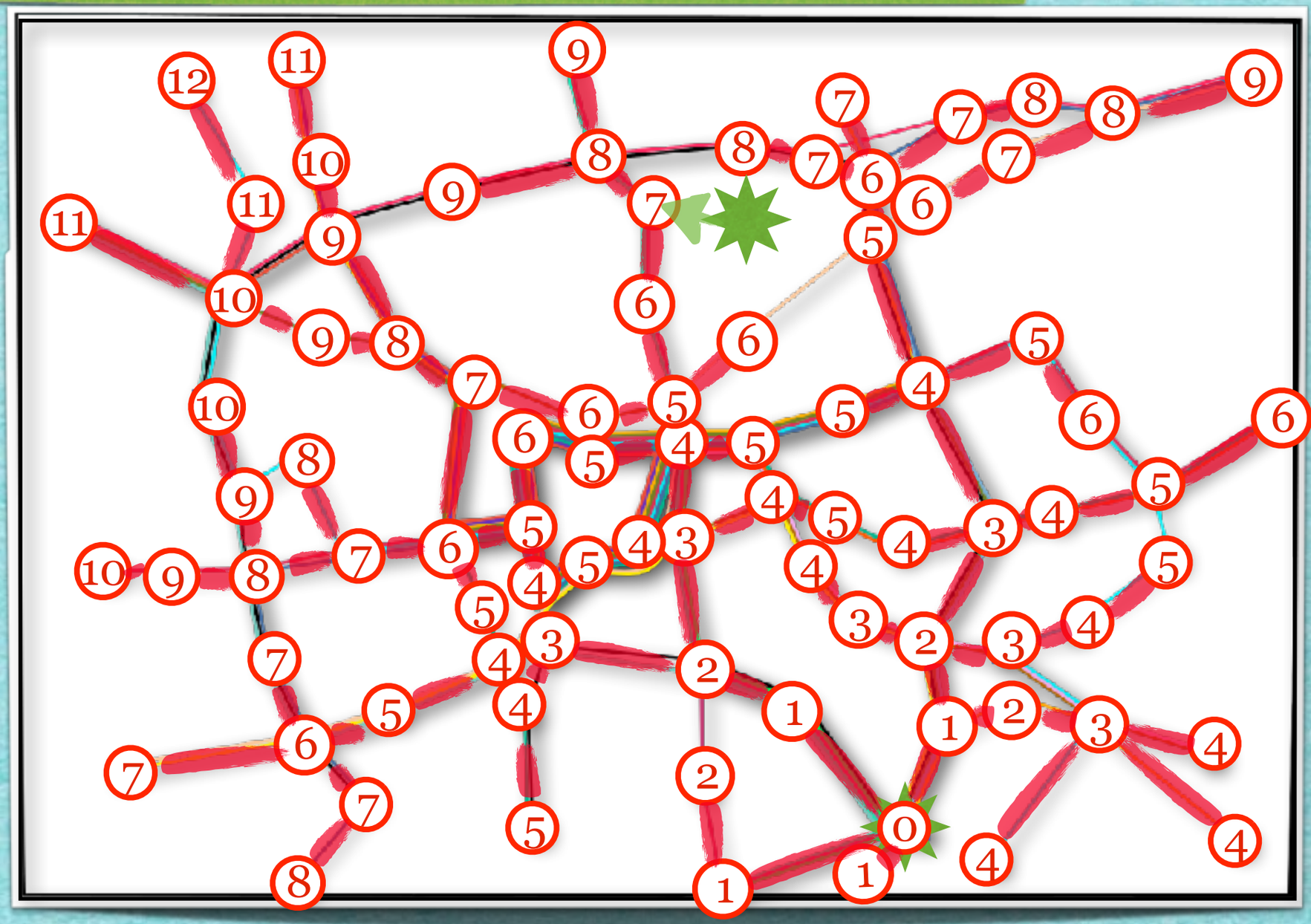

Breitensuche

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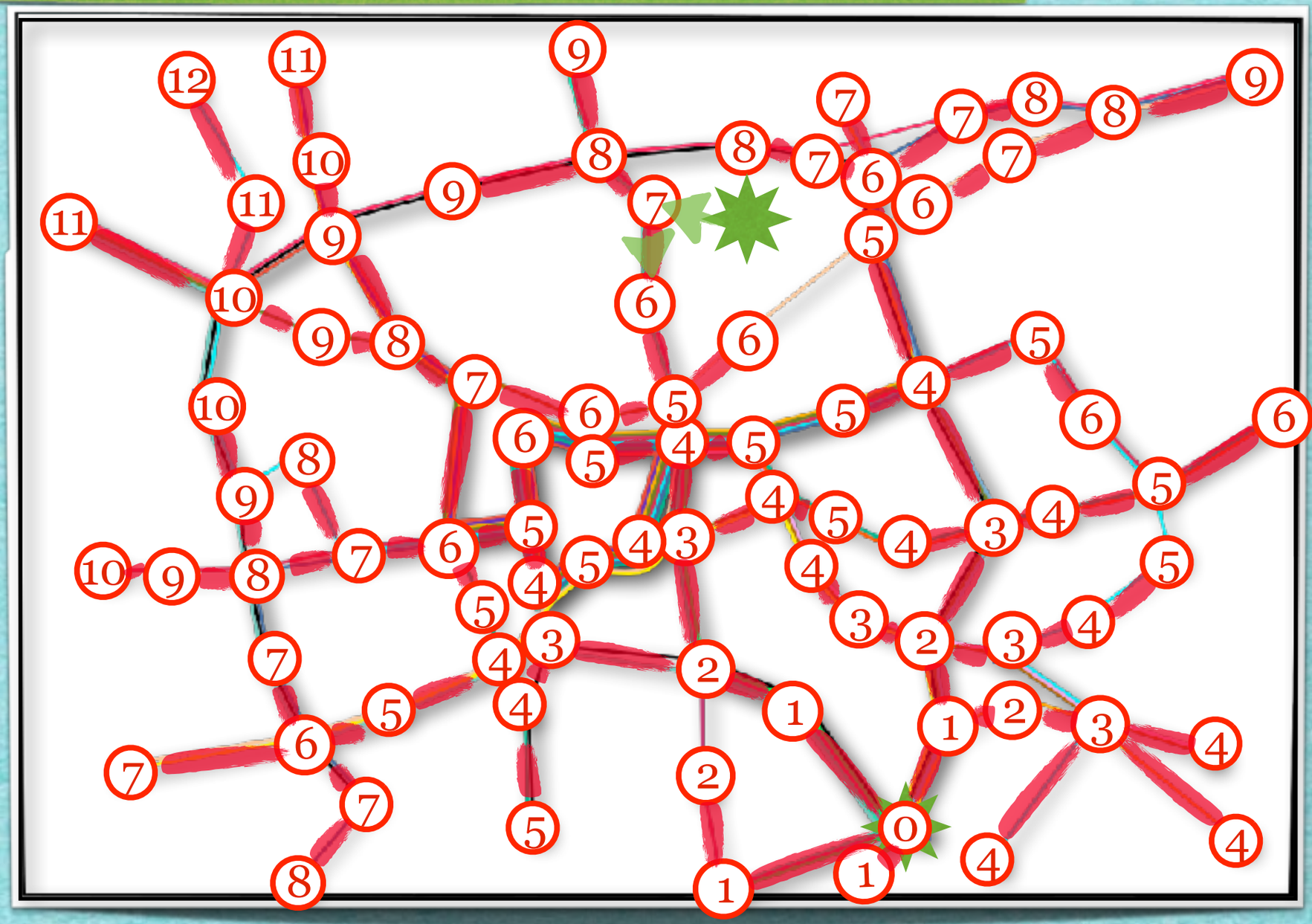

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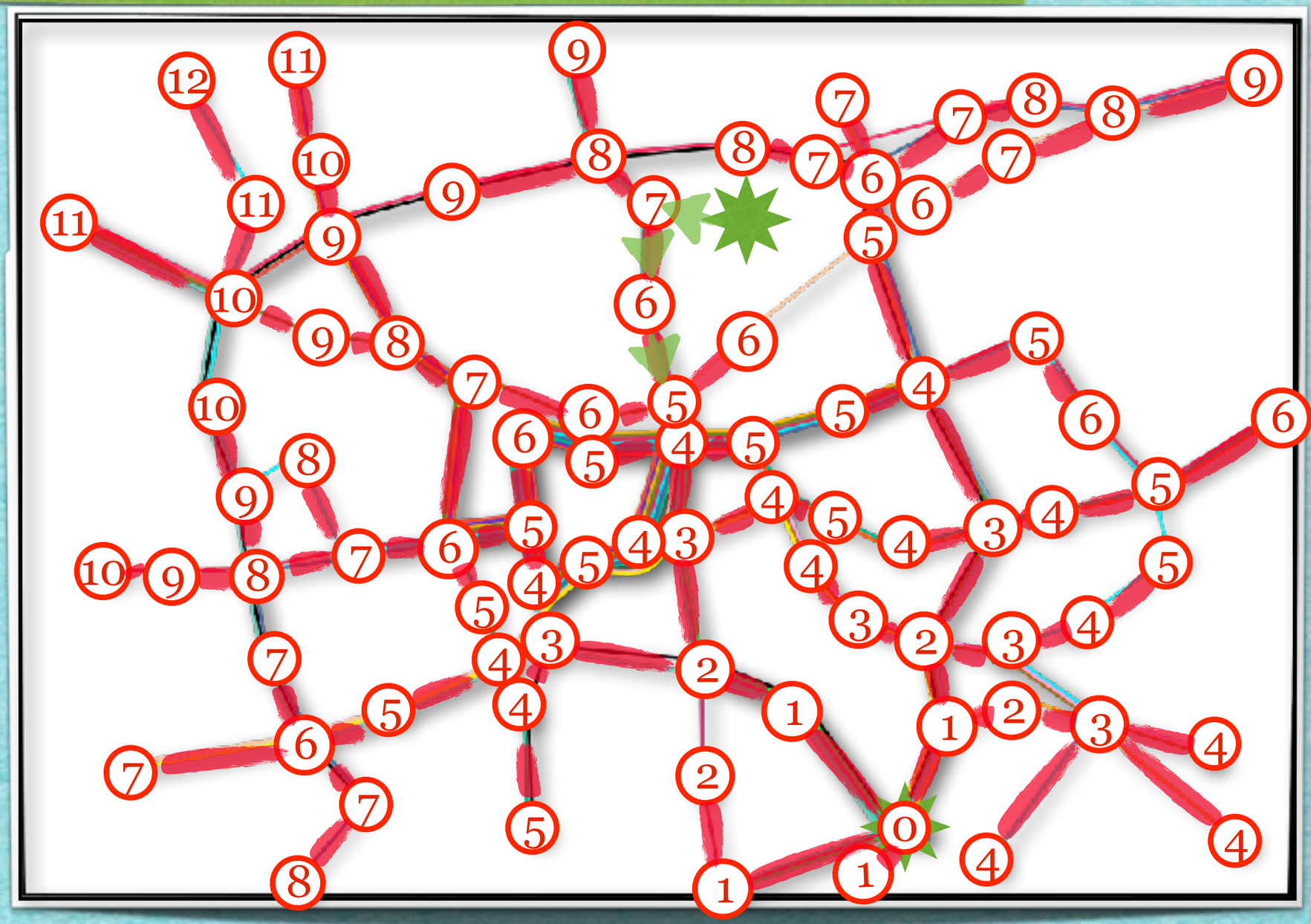

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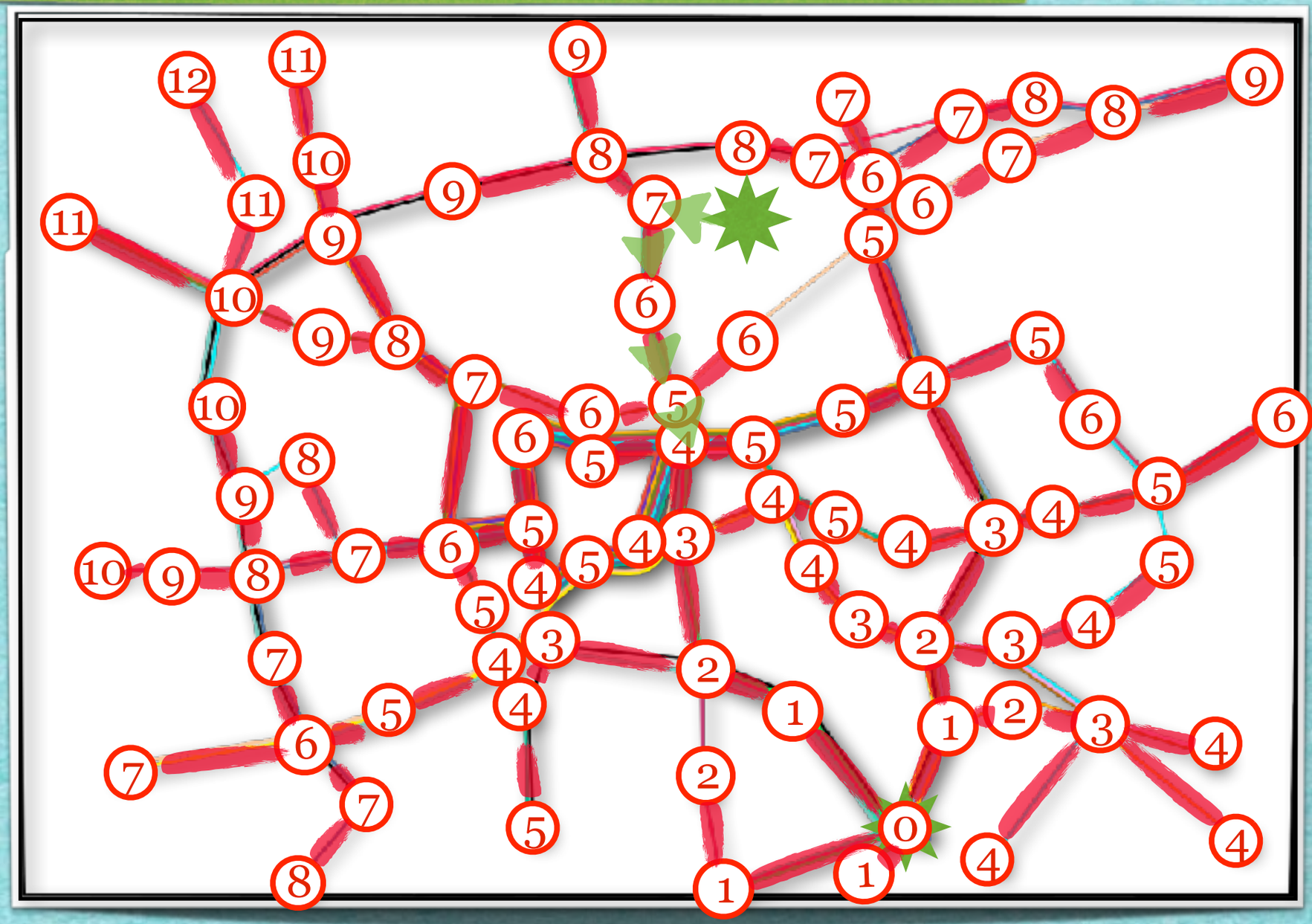

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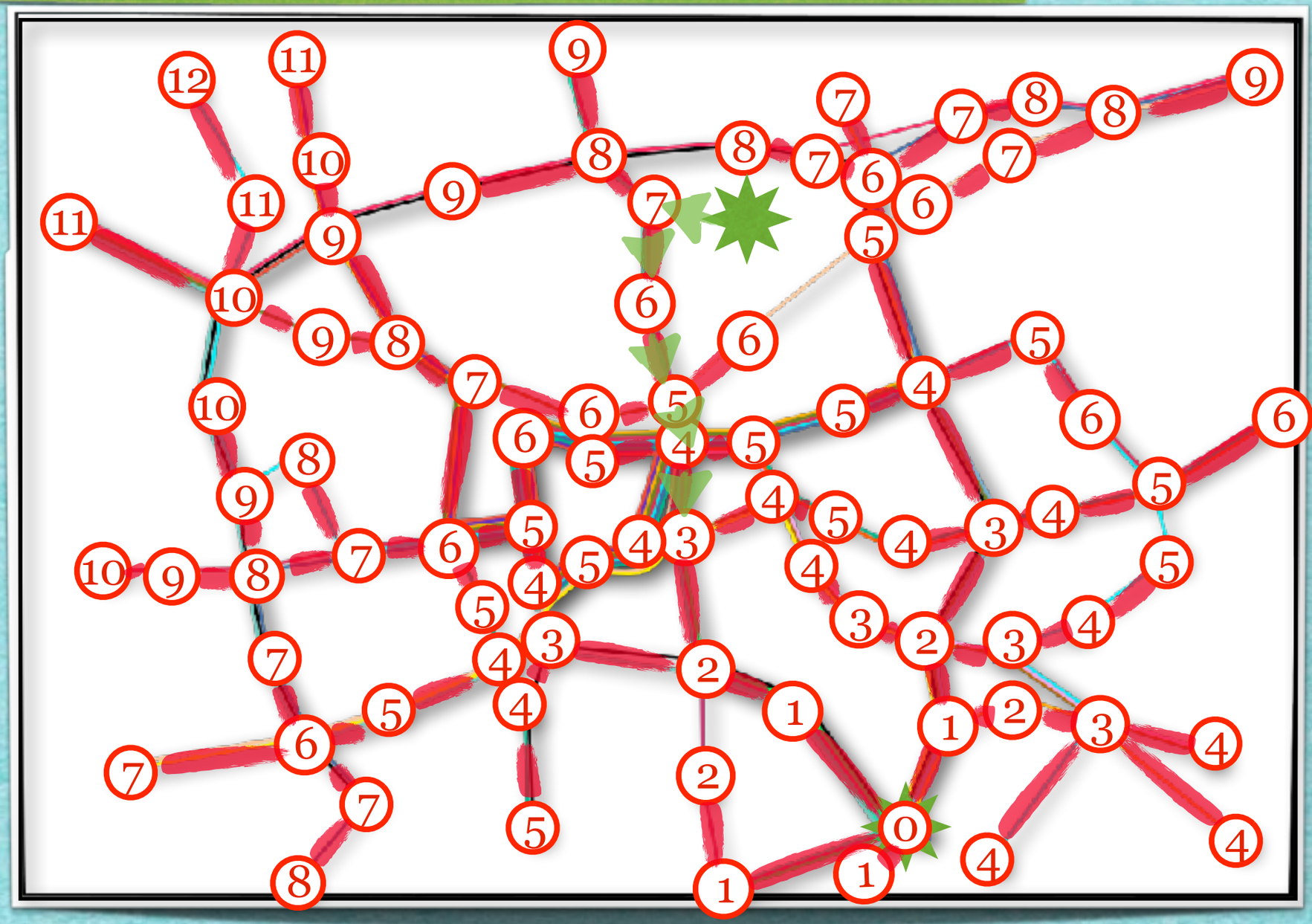

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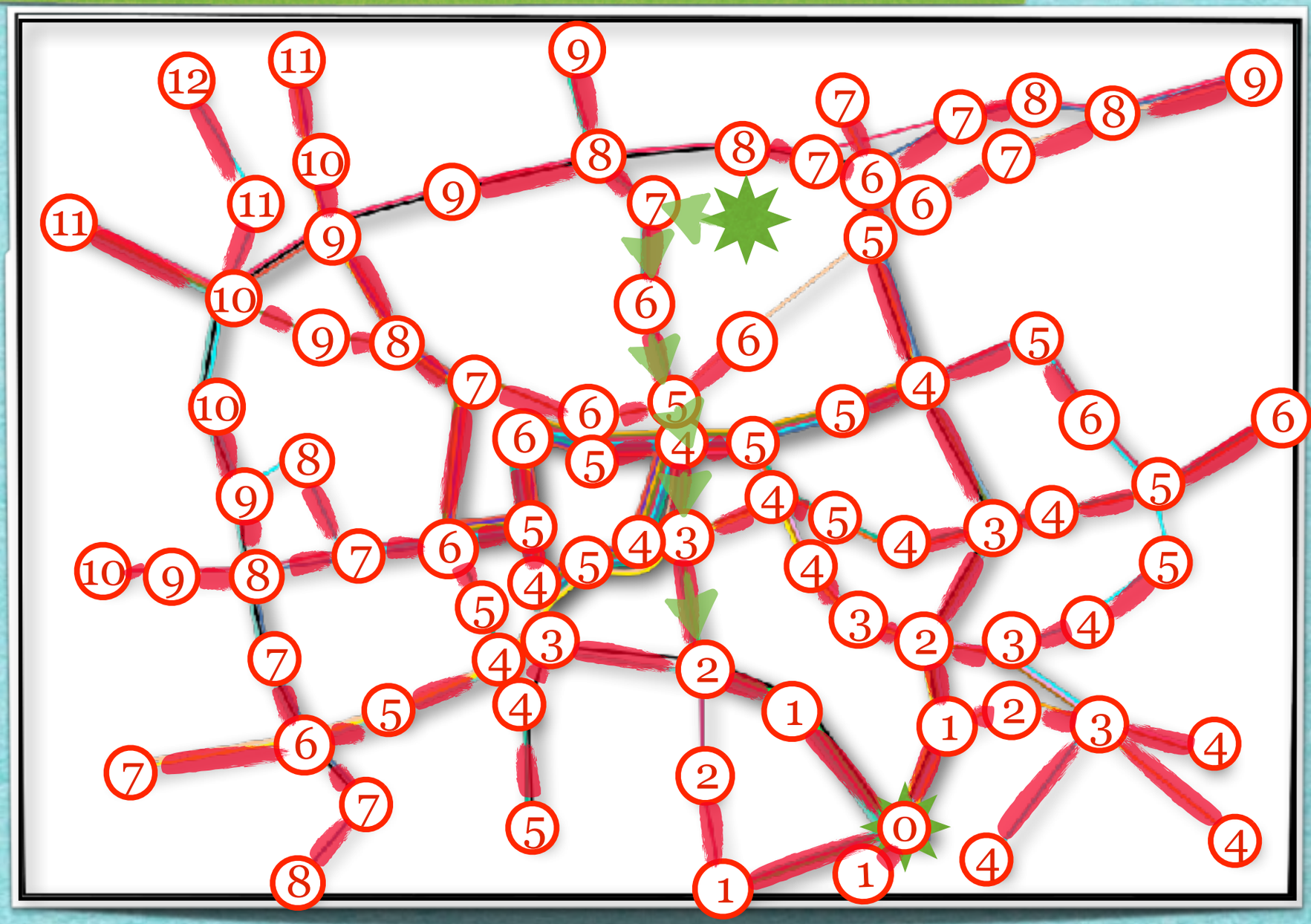

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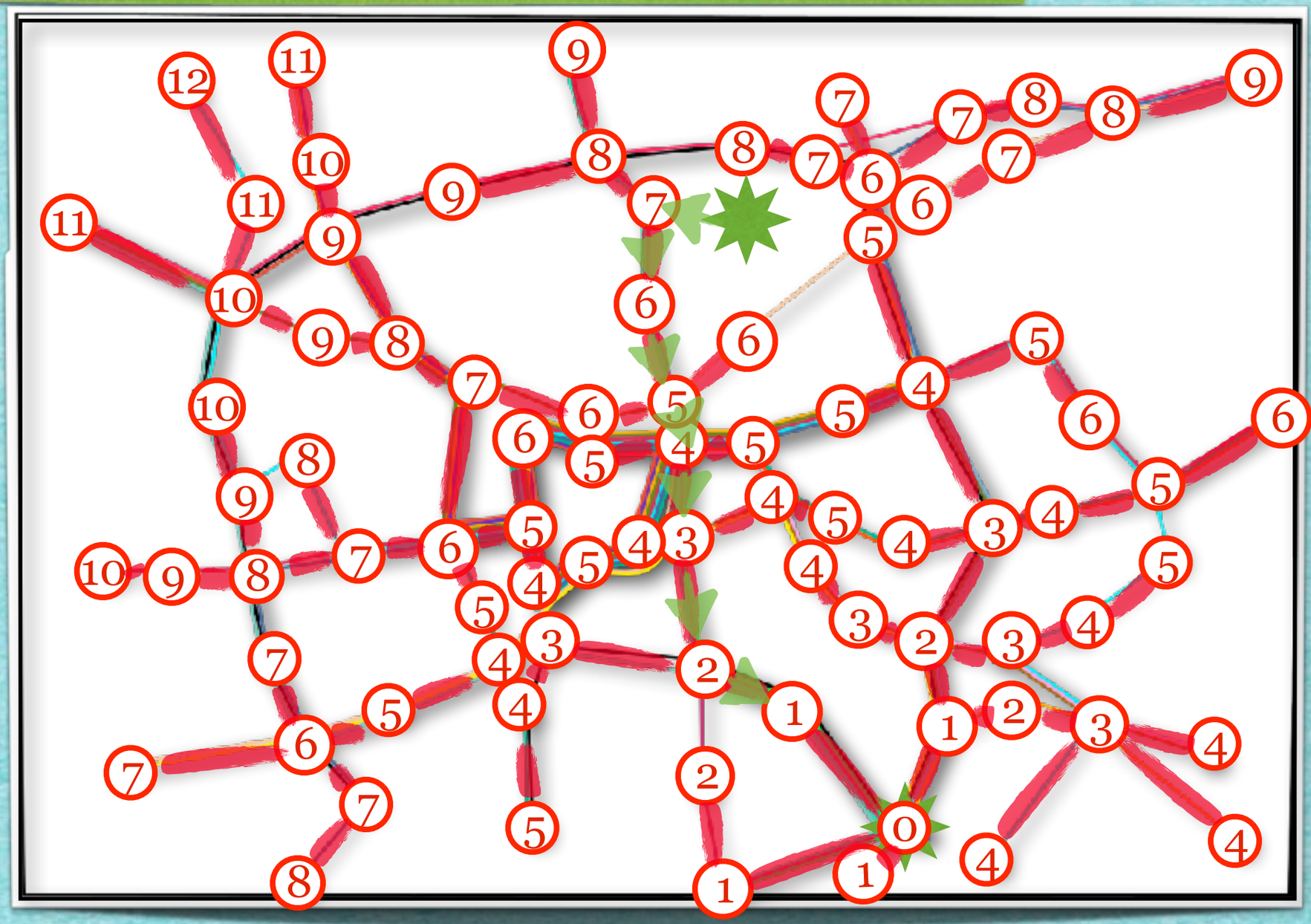

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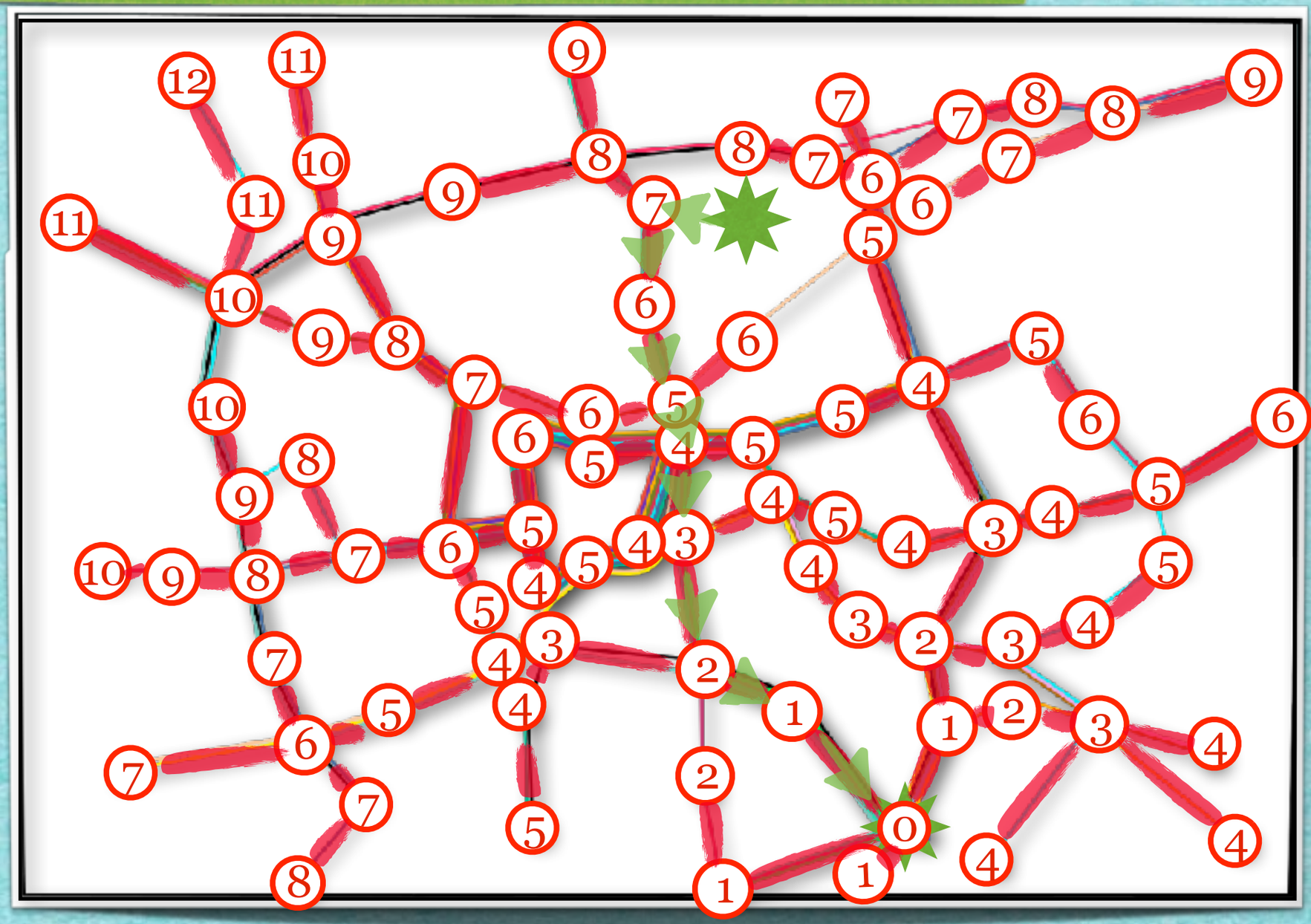


Breitensuche

Algorithmus 3.17

INPUT: Graph G = (V,E), Knoten s

OUTPUT: Knotenmenge $Y \subseteq V$, die von s aus erreichbar ist,

für jeden Knoten $v \in Y$ die Länge l(v) eines kürzesten s-v-Weges,

Kantenmenge $T \subseteq E$, die die Erreichbarkeit sicherstellt

1. Sei R:={s}, Y:={s}, T:=∅
2. WHILE (R≠∅) DO {
   - 2.1. wähle Element $v \in R$
   - 2.2. IF (es gibt kein w $V \setminus Y$ mit $e=\{v,w\} \in E$) THEN
     - 2.2.1. $R:=R \setminus \{v\}$
   - 2.3. ELSE {
     - 2.3.1. wähle ein $w \in V \setminus R$ mit $e=\{v,w\} \in E$;
     - 2.3.2. setze R := R u {w}, Y := Y u {w}, T := T u {e};
     - 2.3.3. setze l(w):=l(v)+1
     - }

}

Satz 3.18

(1) Das Verfahren 3.17 ist endlich.

(2) Die Laufzeit ist O(n+m).

(3) Am Ende ist für jeden erreichbaren Knoten $v \in Y$ die Länge eines kürzesten Weges von s nach v im Baum (Y,T) durch l(v) gegeben.

(4) Am Ende ist für jeden erreichbaren Knoten $v \in Y$ die Länge eines kürzesten Weges von s nach v im Graphen (V,E) durch l(v) gegeben.

Beweis:

(1) **Wie für Algorithmus 3.7 gelten alle Eigenschaften. zusätzlich ist für jeden Knoten $v \in Y$ per Induktion der Wert l(v) tatsächlich definiert.**

(2) **Die Laufzeit bleibt von Algorithmus 3.7 erhalten.**

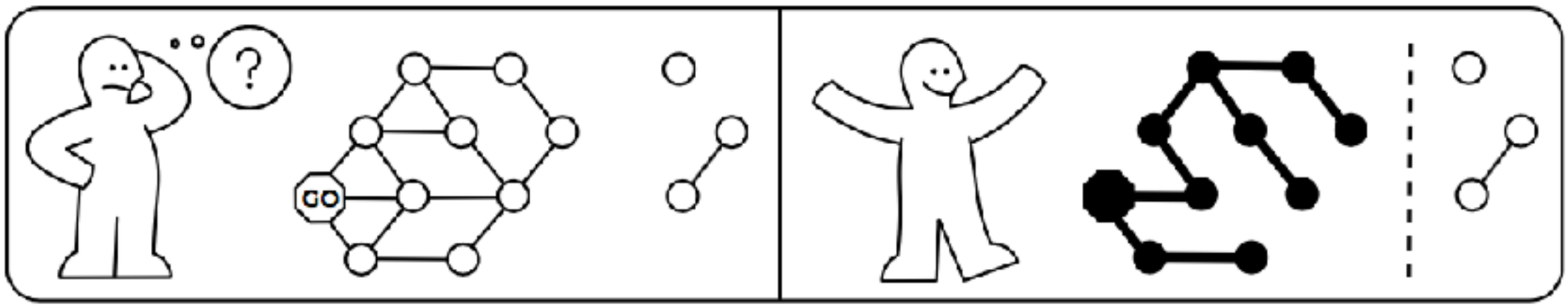
Mehr Details!

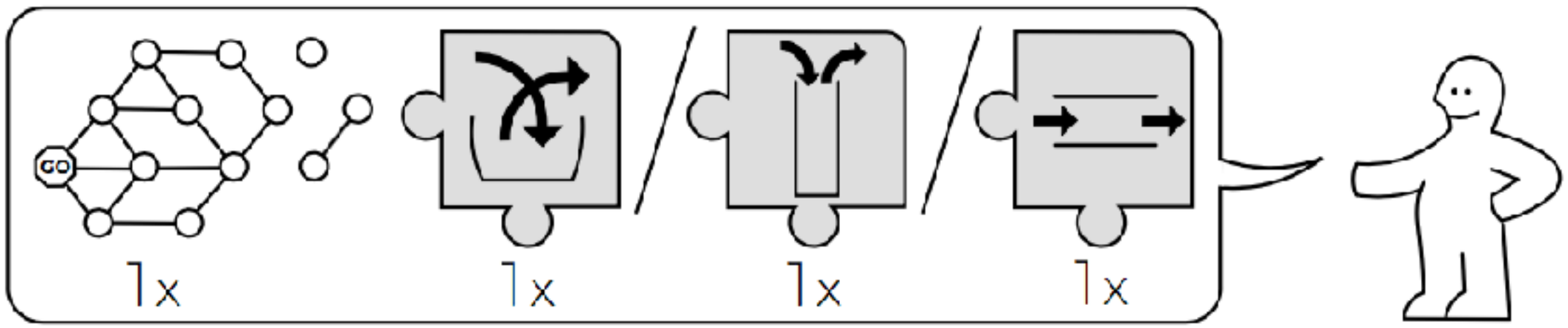
s.fekete@tu-bs.de

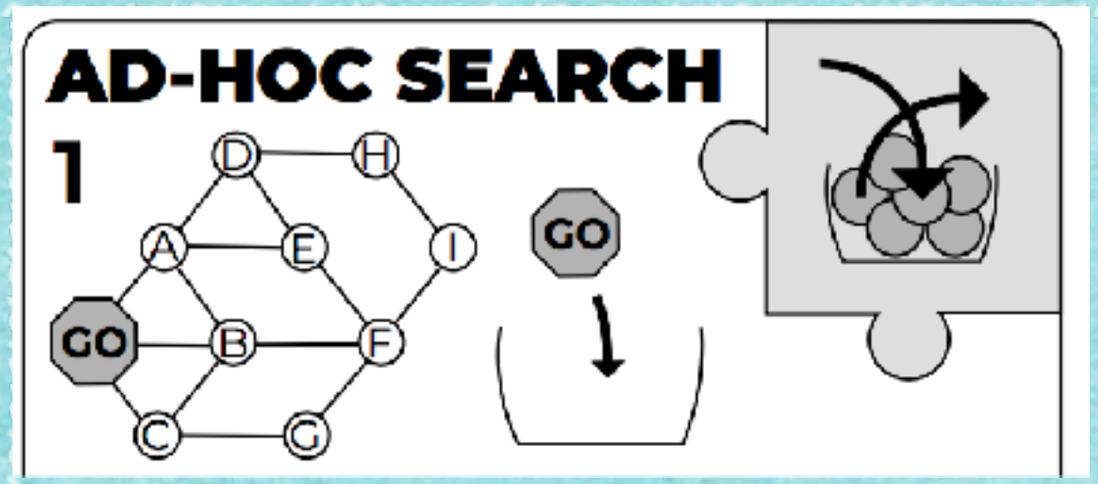
GRÅPH SCÄN

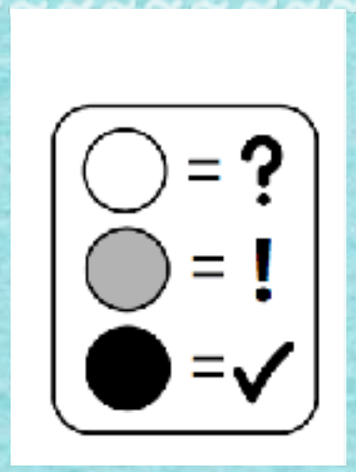
idea-instructions.com/graph-scan/
v1.0, CC by-nc-sa 4.0

IDEA






AD-HOC SEARCH
1
D
H
A
E
I
GO
B
F
C
G
GO


= ?
= !
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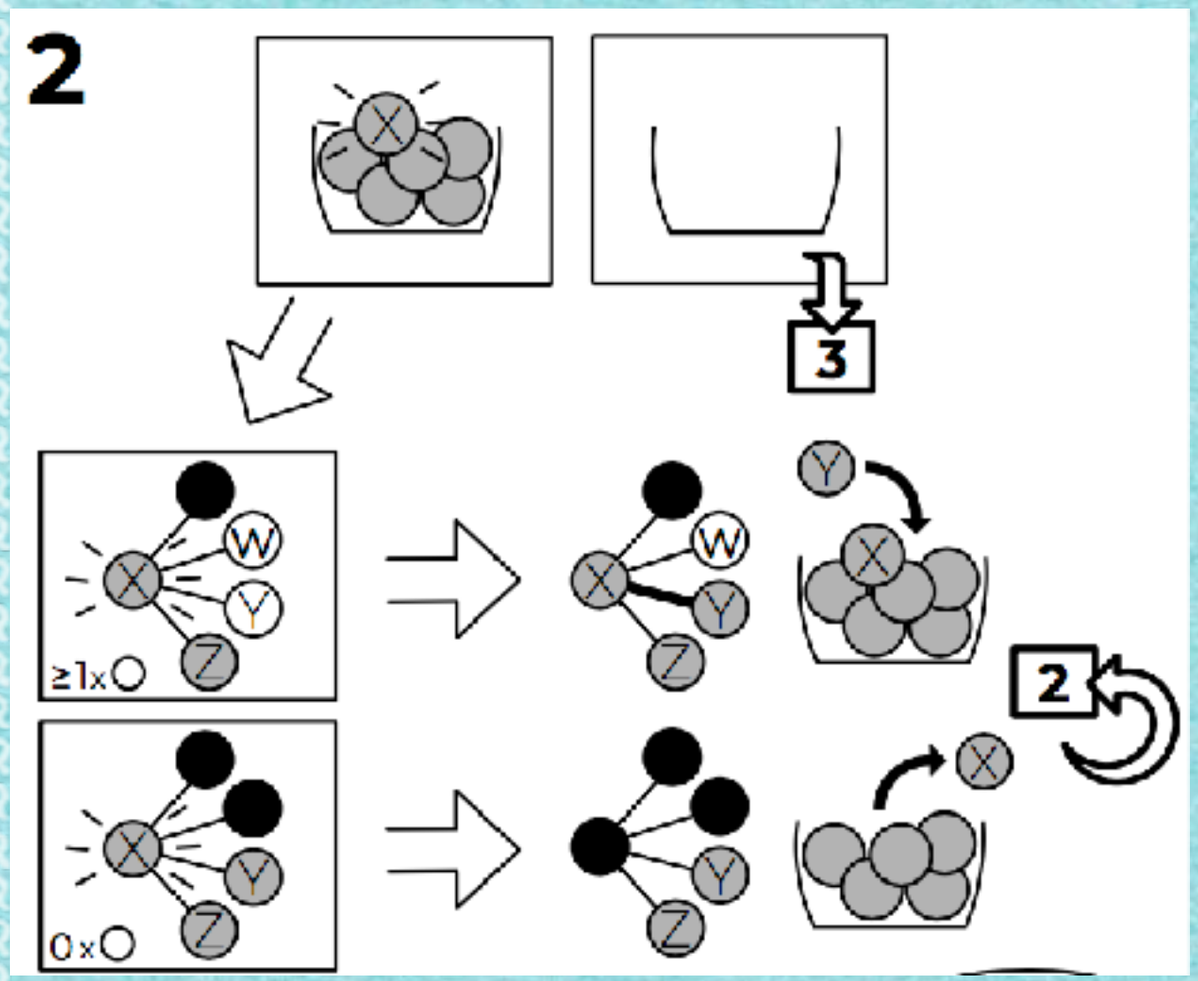
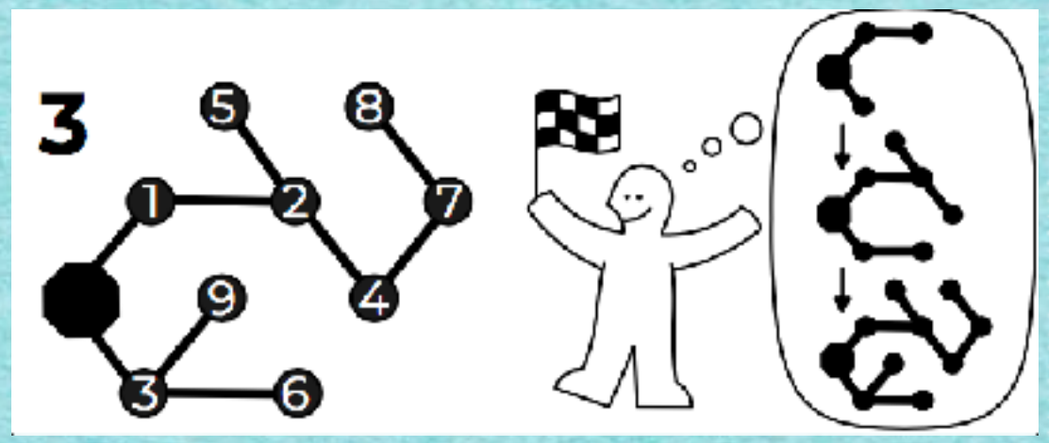
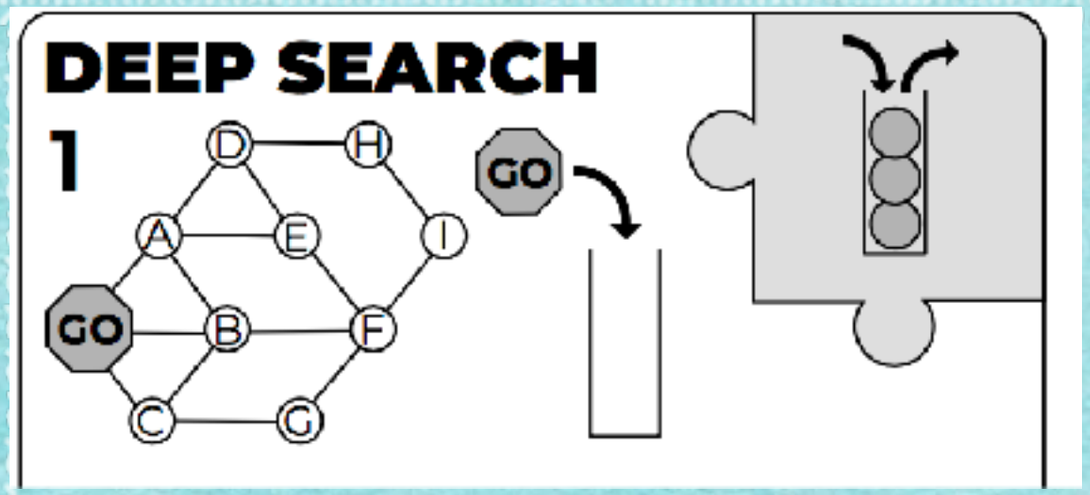
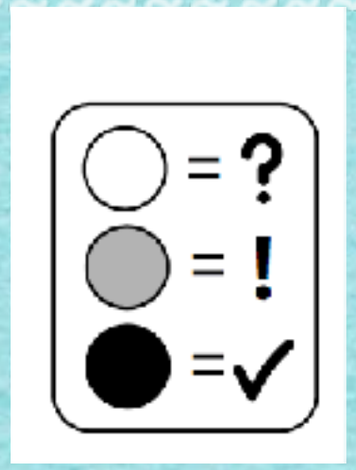

2
X
3
W
X
Y
Z
≥1x ○
0x ○
2


3
5
8
1
2
7
9
4
3
6


DEEP SEARCH
1
D
H
GO
A
E
I
GO
B
F
C
G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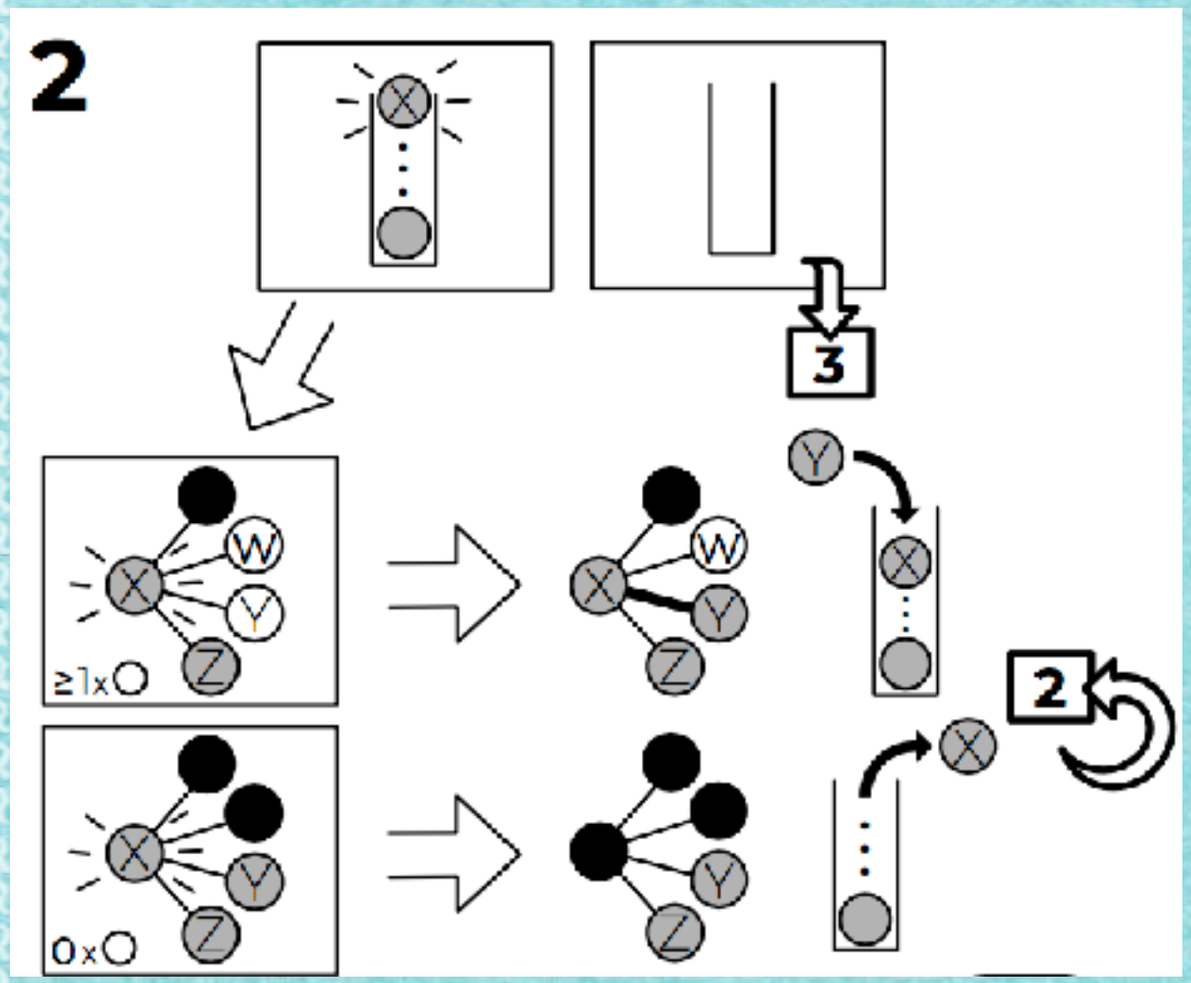
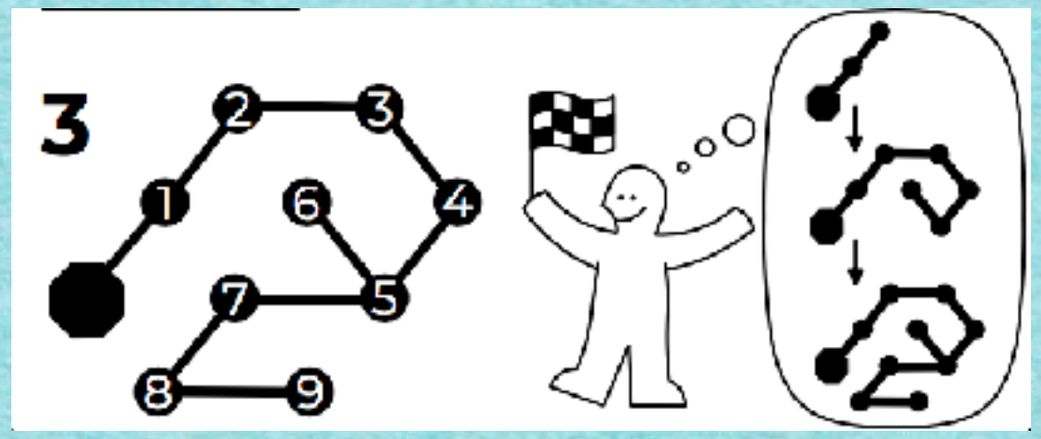
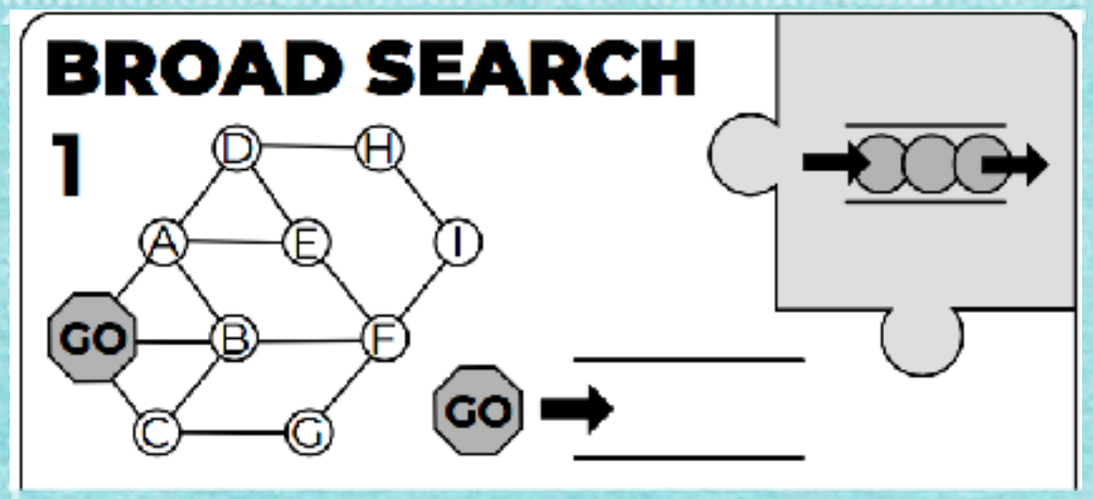
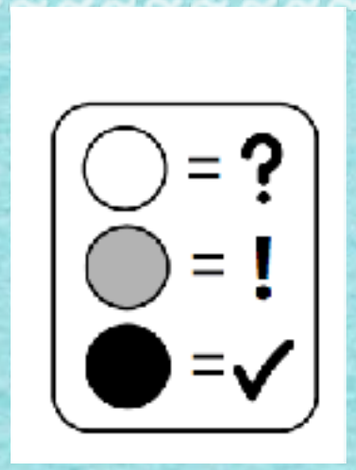
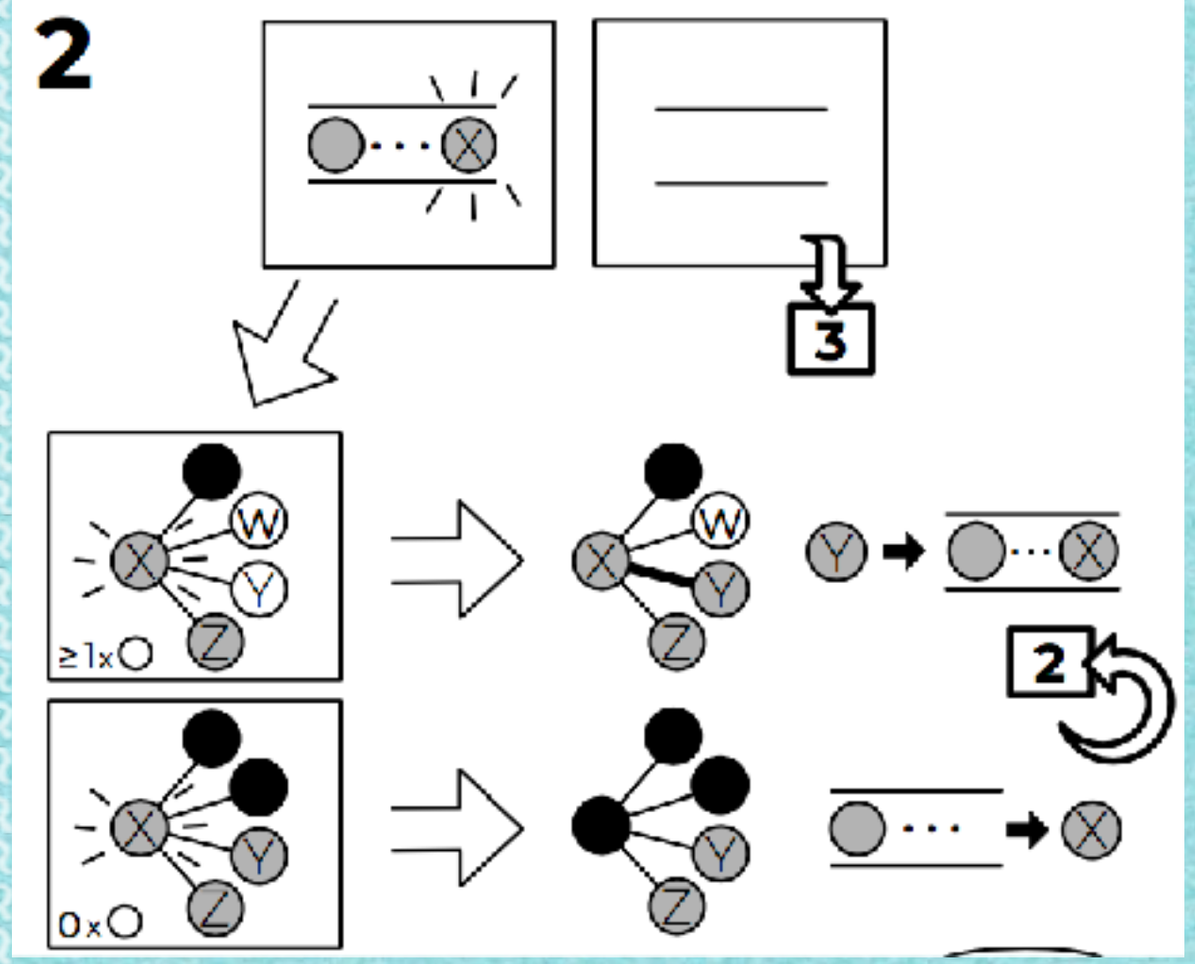

2
3
W
X
Y
Z
≥1x
0x
2

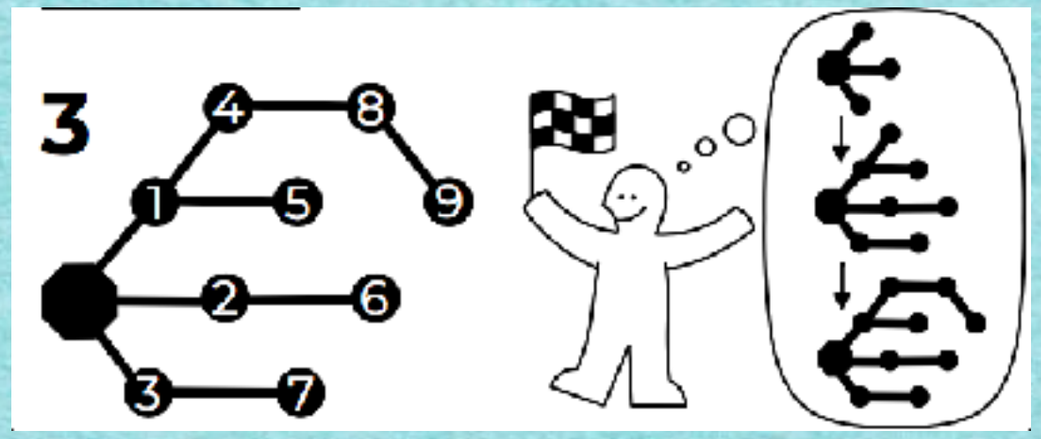

3
1
2
3
4
5
6
7
8
9

BROAD SEARCH





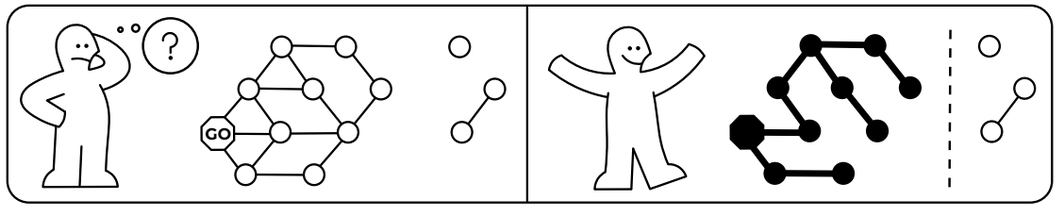


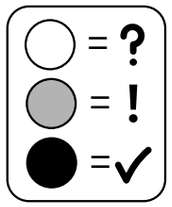


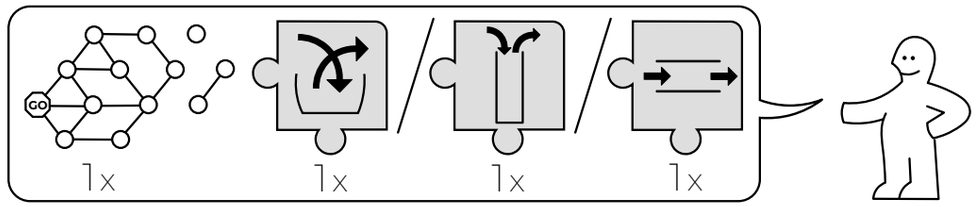
GRÅPH SCÄN

idea-instructions.com/graph-scan/
v1.0, CC by-nc-sa 4.0

IDEA







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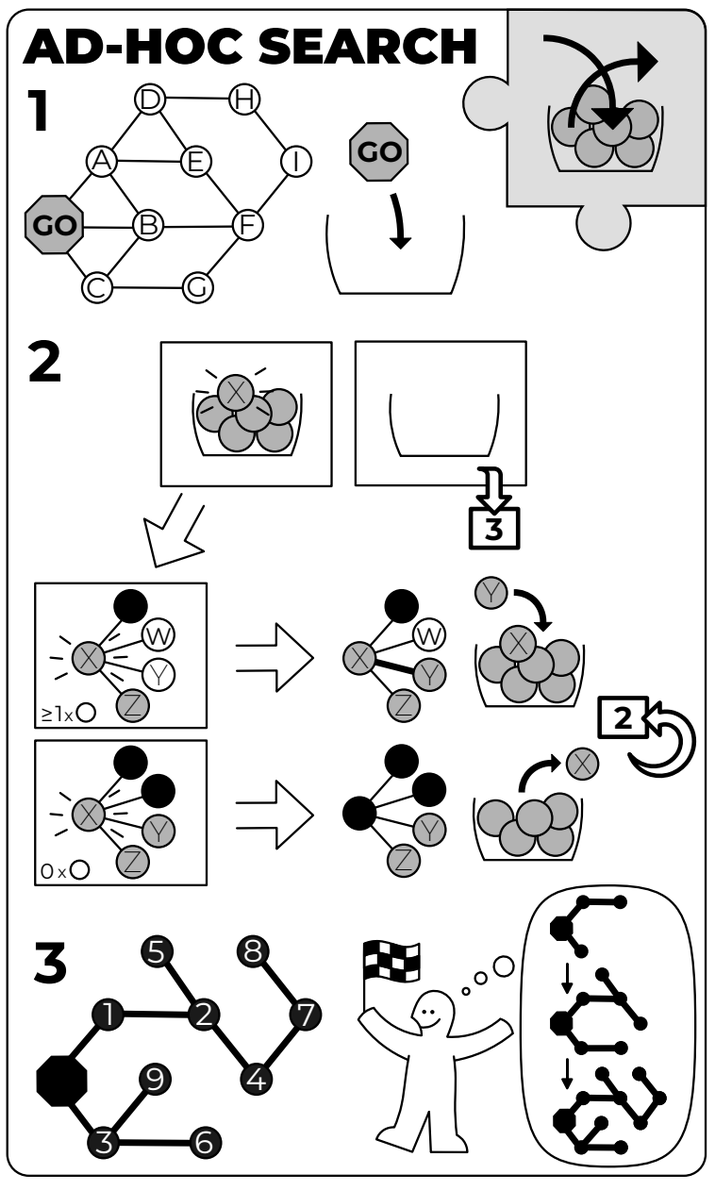
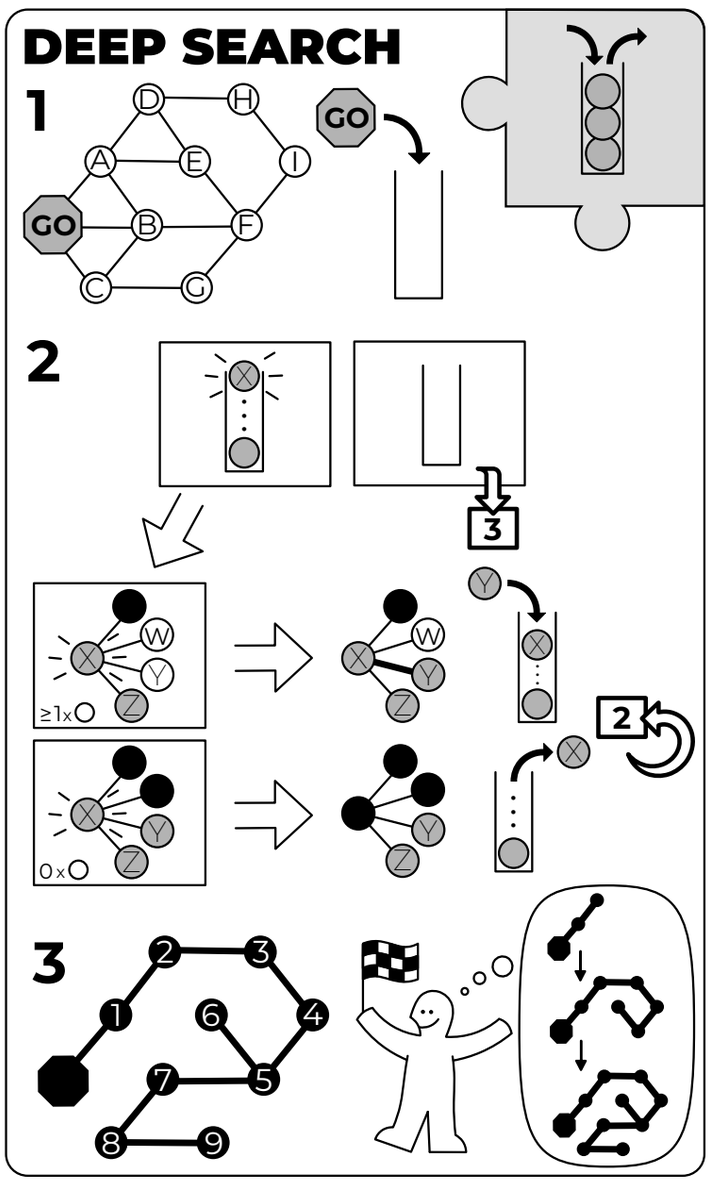


DEEP SEARCH



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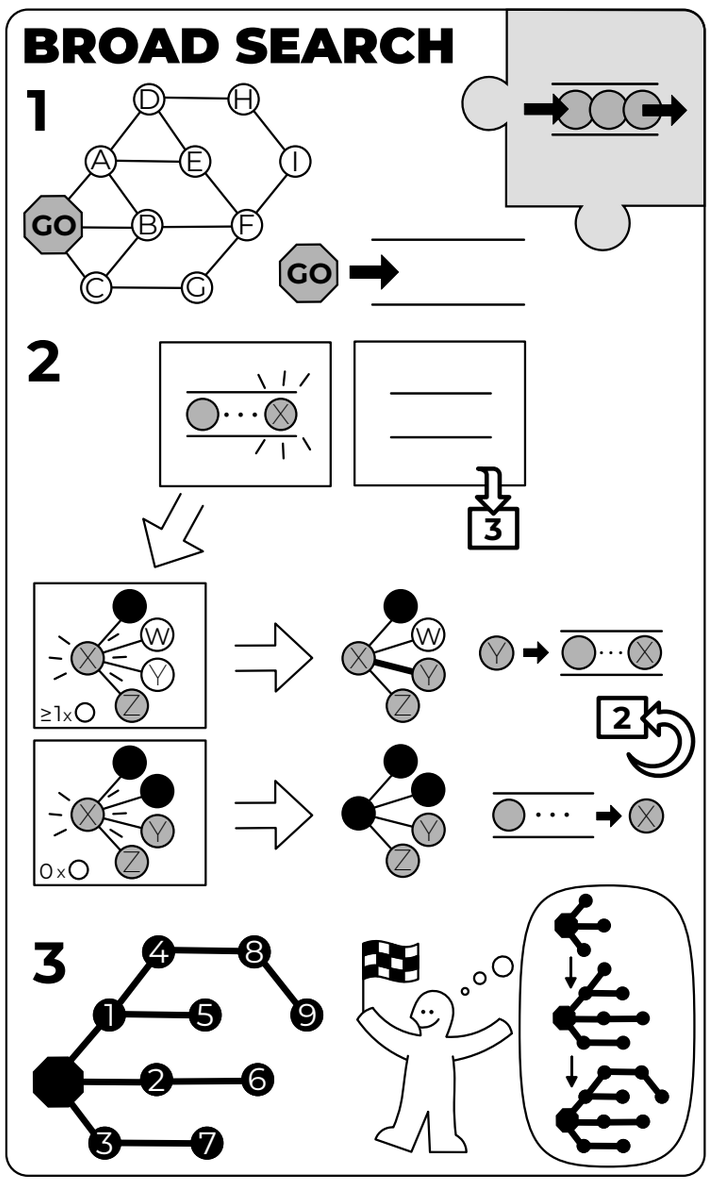

Kapitelende!

s.fekete@tu-bs.de