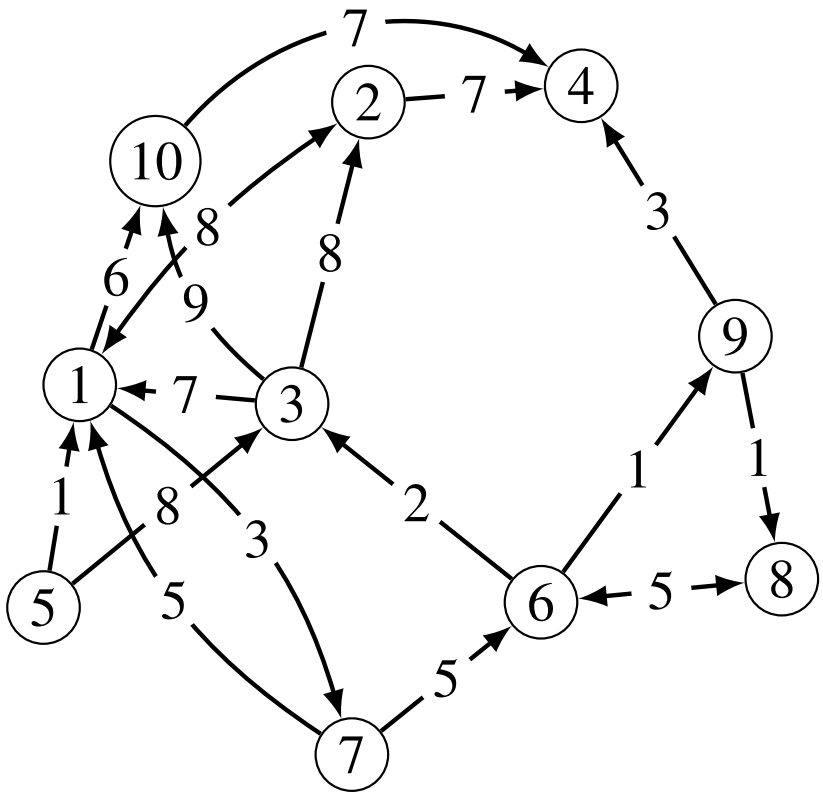
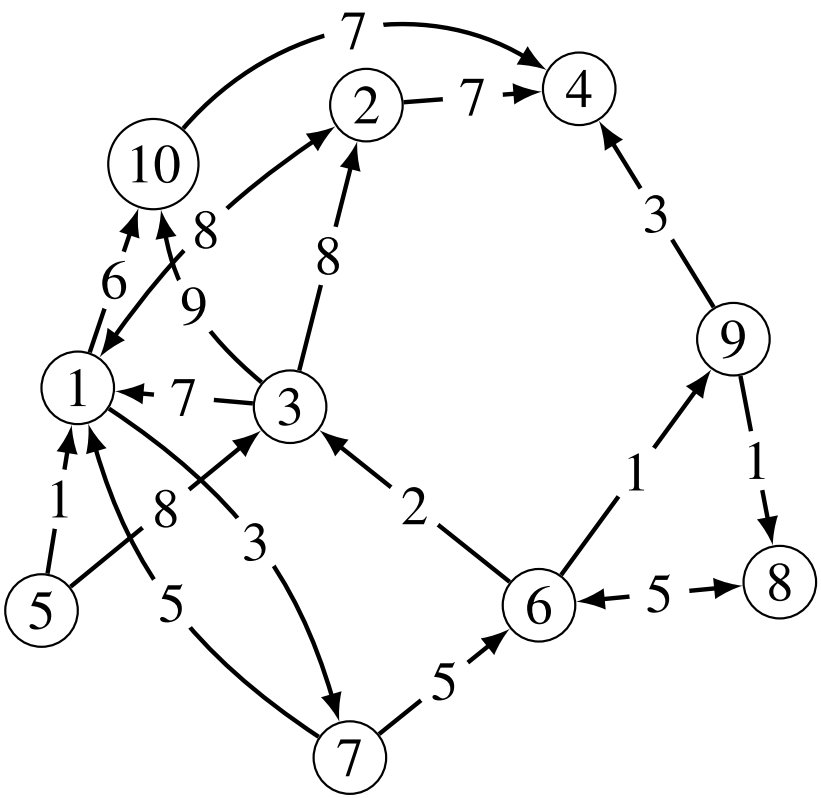
Bitte nicht Drucken!

Dies ist Daumenkino, für die Betrachtung am PC.
Es auszudrucken wäre Papierverschwendung.

Adjaszenzmatrix und -liste

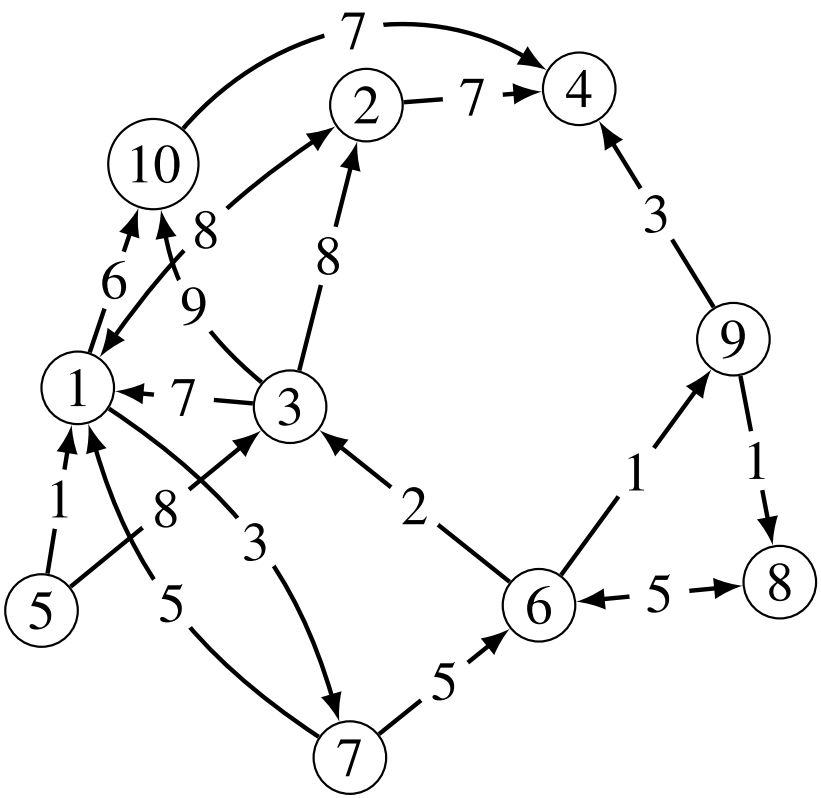


Adjaszenzmatrix und -liste



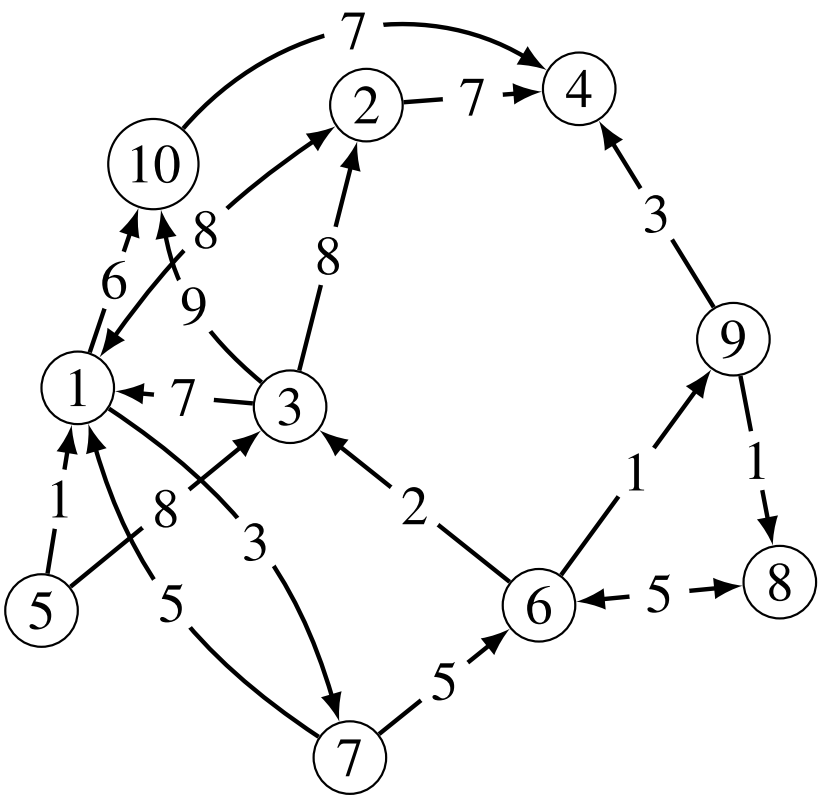
	1	2	3	4	5	6	7	8	9	10
1	–									
2		–								
3			–							
4				–						
5					–					
6						–				
7							–			
8								–		
9									–	
10										–

Adjaszenzmatrix und -liste



	1	2	3	4	5	6	7	8	9	10
1	–	8	–	–	–	–	3	–	–	6
2	8	–	–	7	–	–	–	–	–	–
3	7	8	–	–	–	–	–	–	–	9
4	–	–	–	–	–	–	–	–	–	–
5	1	–	8	–	–	–	–	–	–	–
6	–	–	2	–	–	–	–	5	1	–
7	5	–	–	–	–	5	–	–	–	–
8	–	–	–	–	–	5	–	–	–	–
9	–	–	–	3	–	–	–	1	–	–
10	–	–	–	7	–	–	–	–	–	–

Adjaszenzmatrix und -liste



	Adjazenzliste
1	
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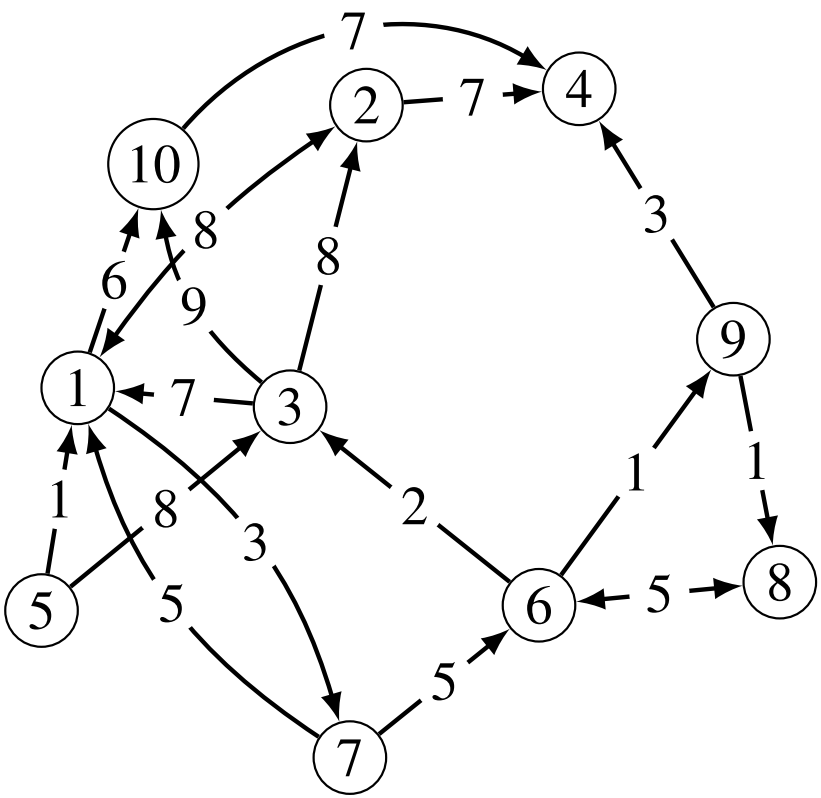
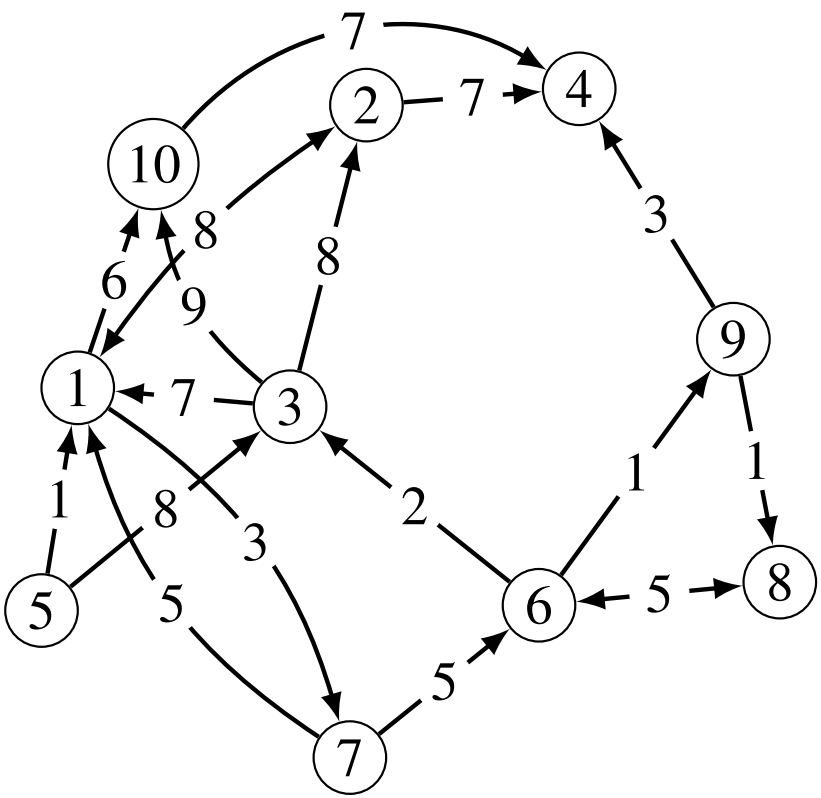
Adjaszenzmatrix und -liste



	Adjazenzliste
1	2 (8), 7 (3), 10 (6)
2	1 (8), 4 (7)
3	1 (7), 2 (8), 10 (9)
4	
5	1 (1), 3 (8)
6	3 (2), 8 (5), 9 (1)
7	1 (5), 6 (5)
8	6 (5)
9	4 (3), 8 (1)
10	4 (7)

Tiefensuche



2

1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
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3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
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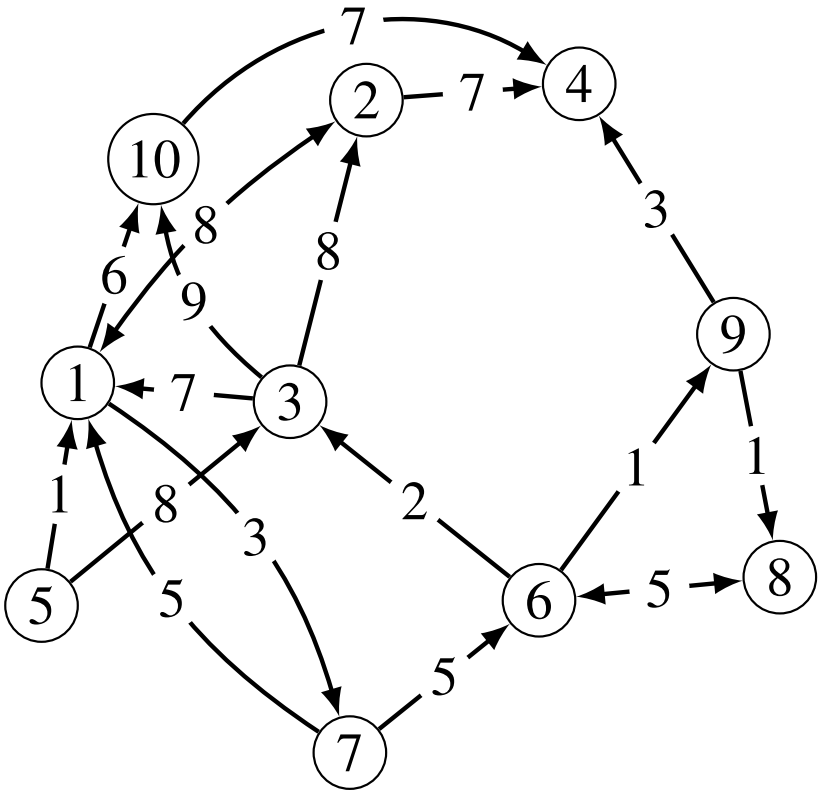
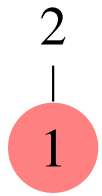
Tiefensuche





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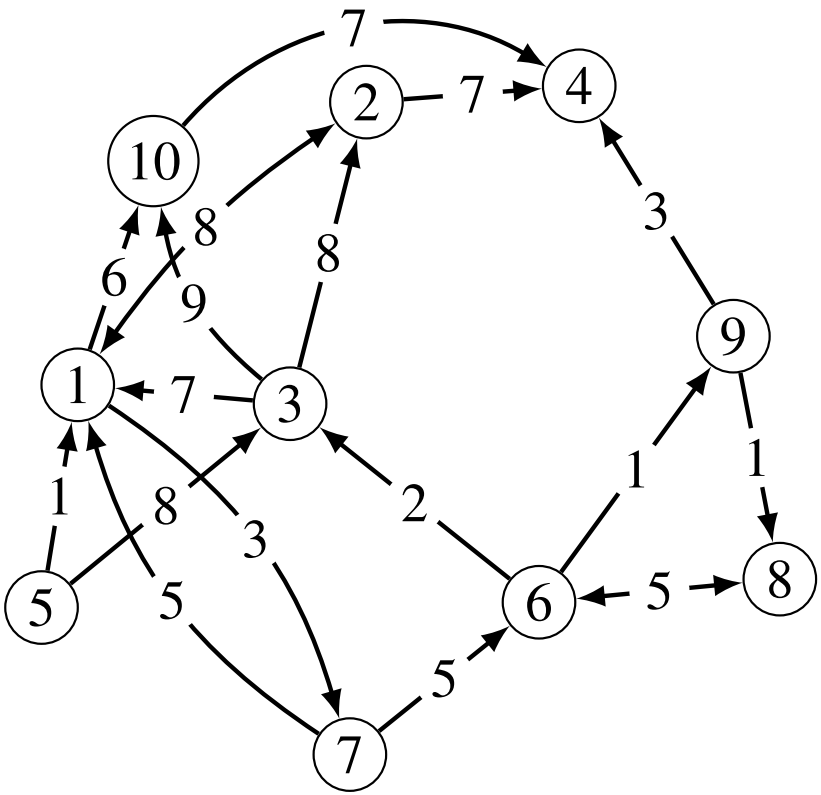
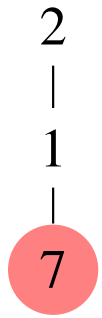
Tiefensuche





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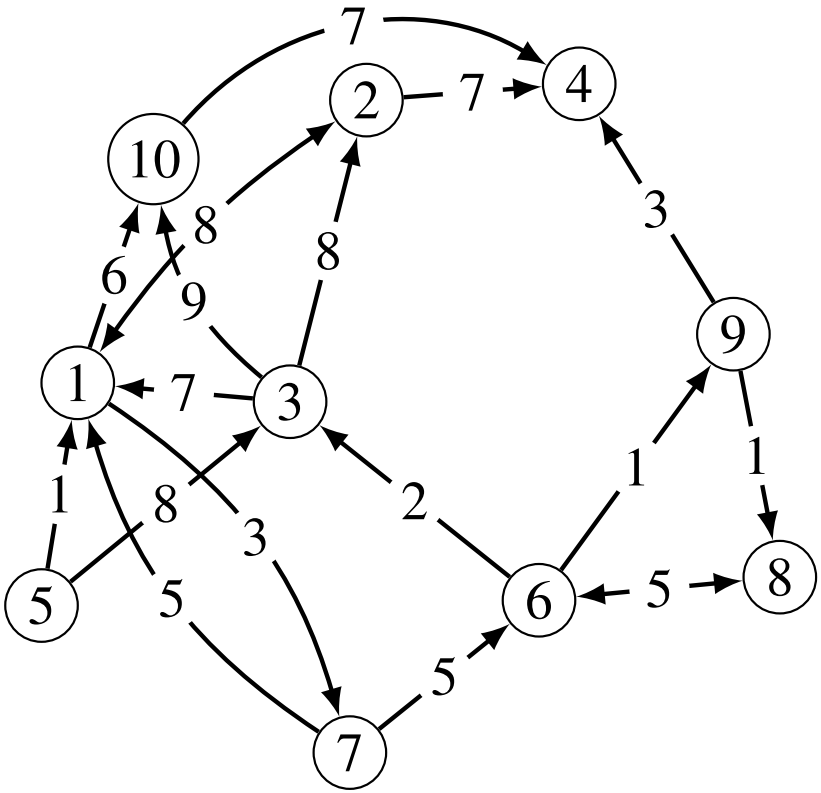
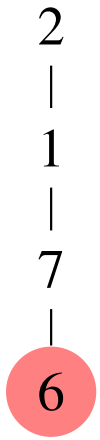
Tiefensuche





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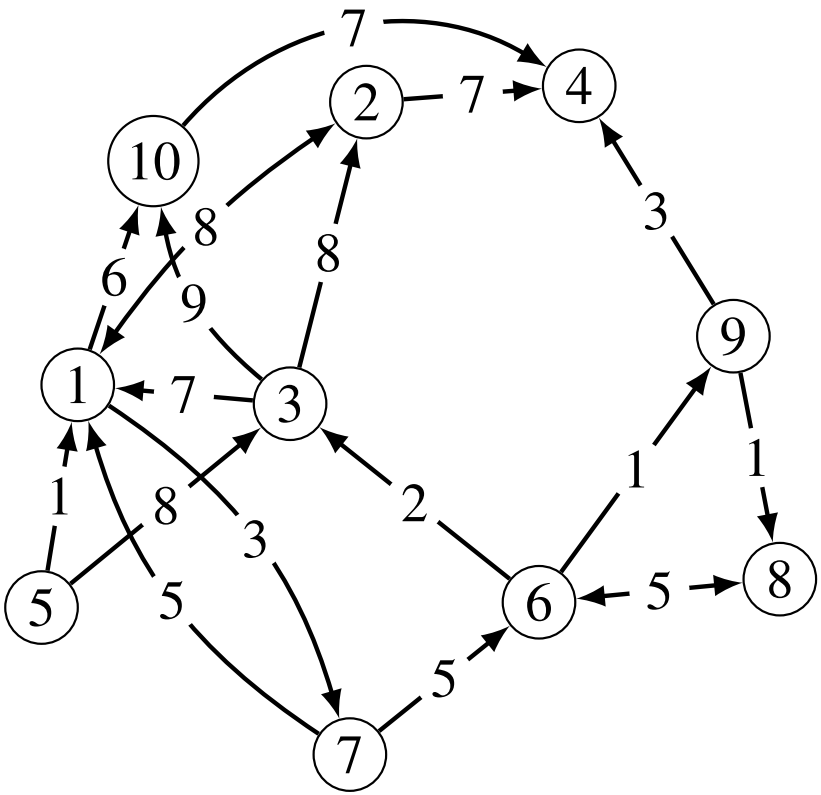
5	1 (1), 3 (8)	10	4 (7)

Tiefensuche



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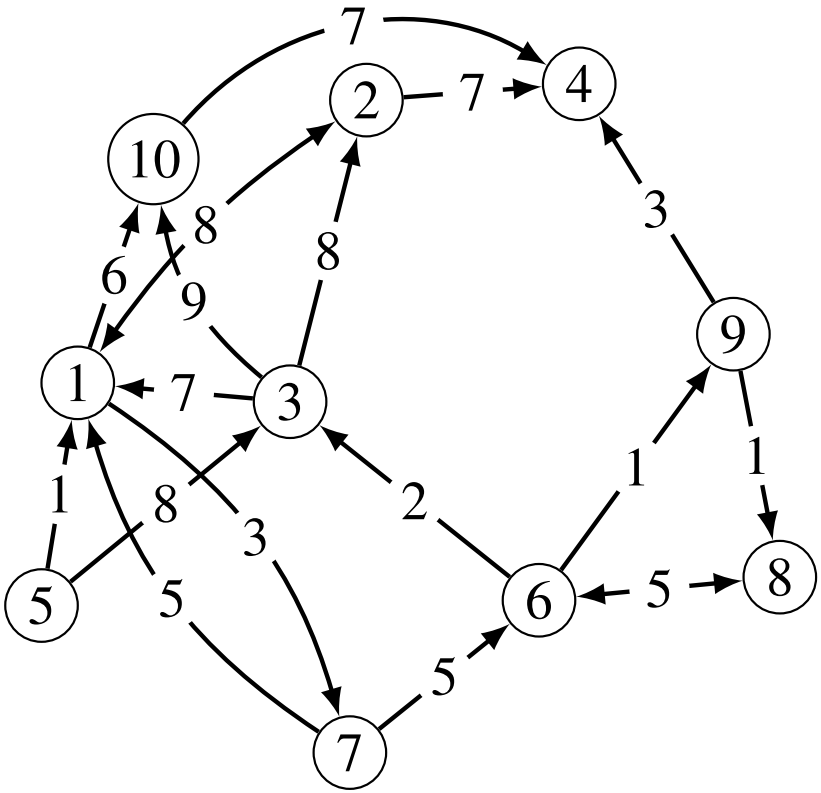

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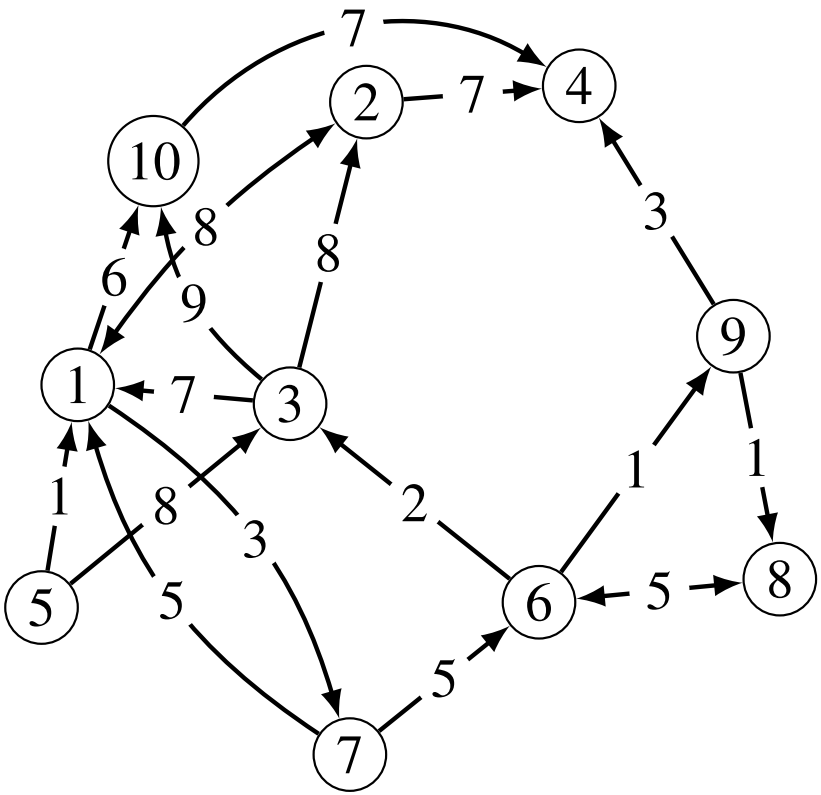
Tiefensuche



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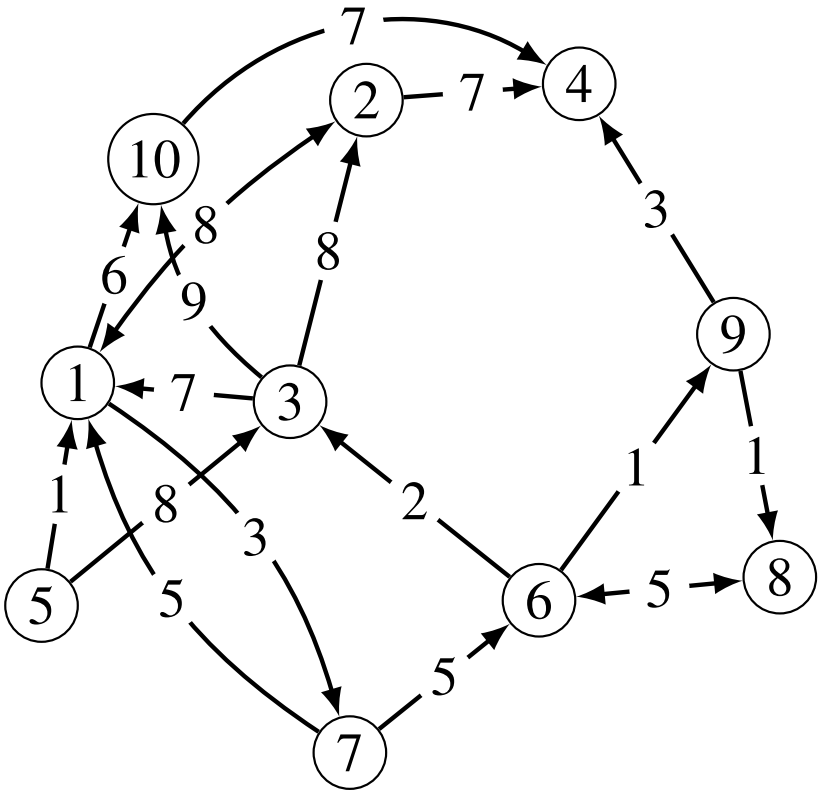
Tiefensuche



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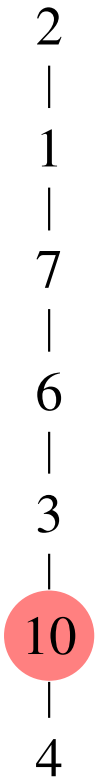

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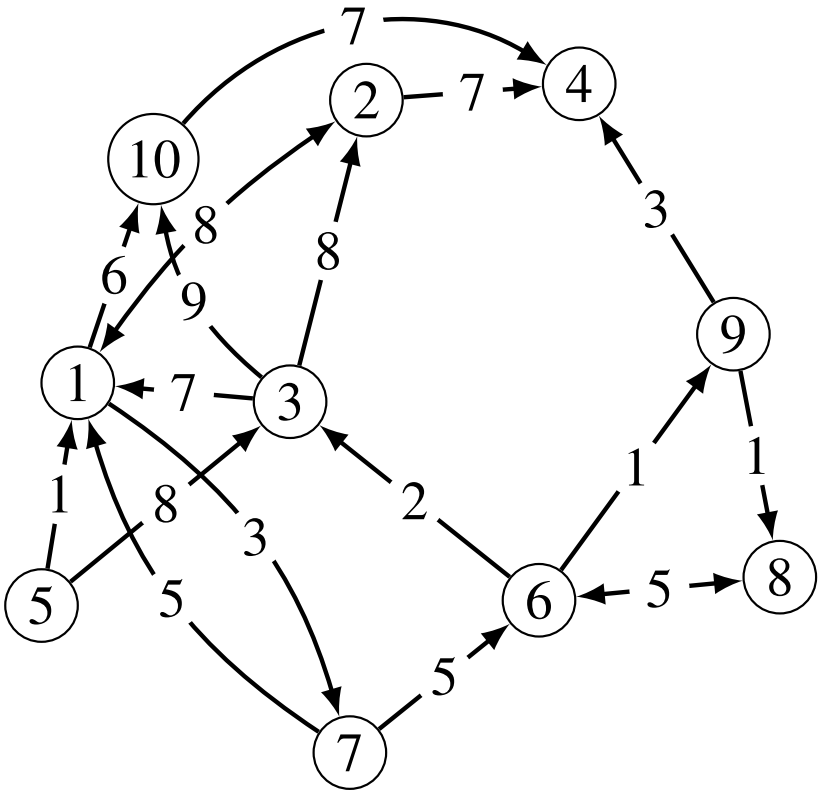

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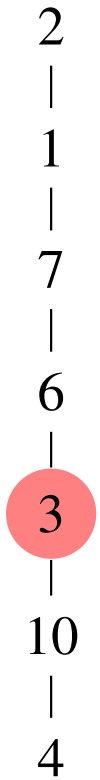

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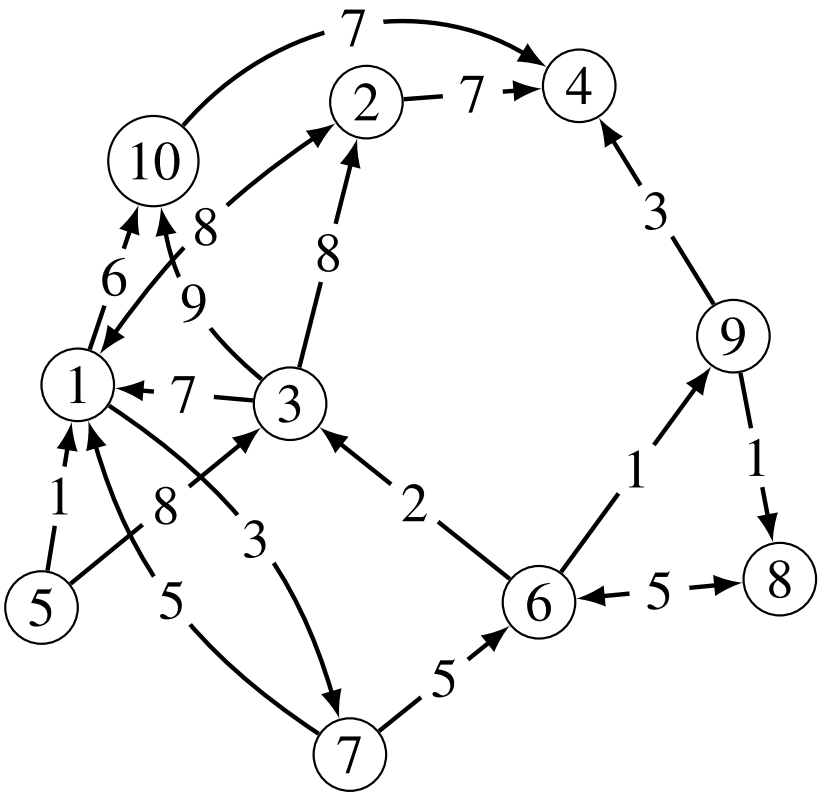

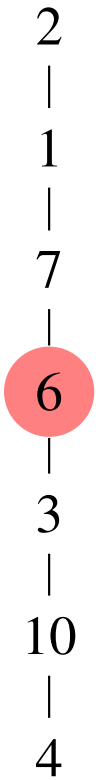

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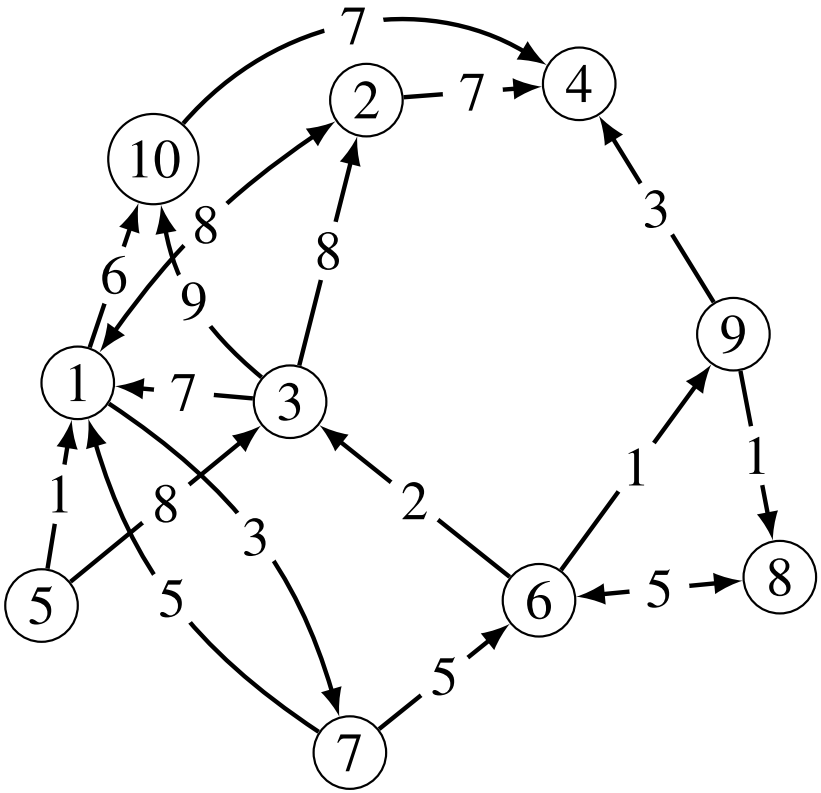

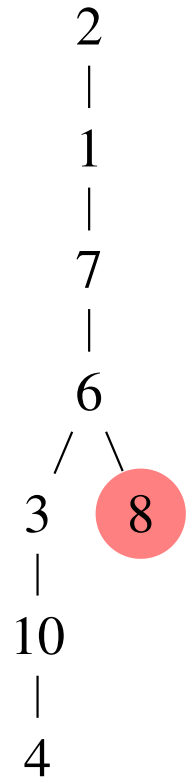

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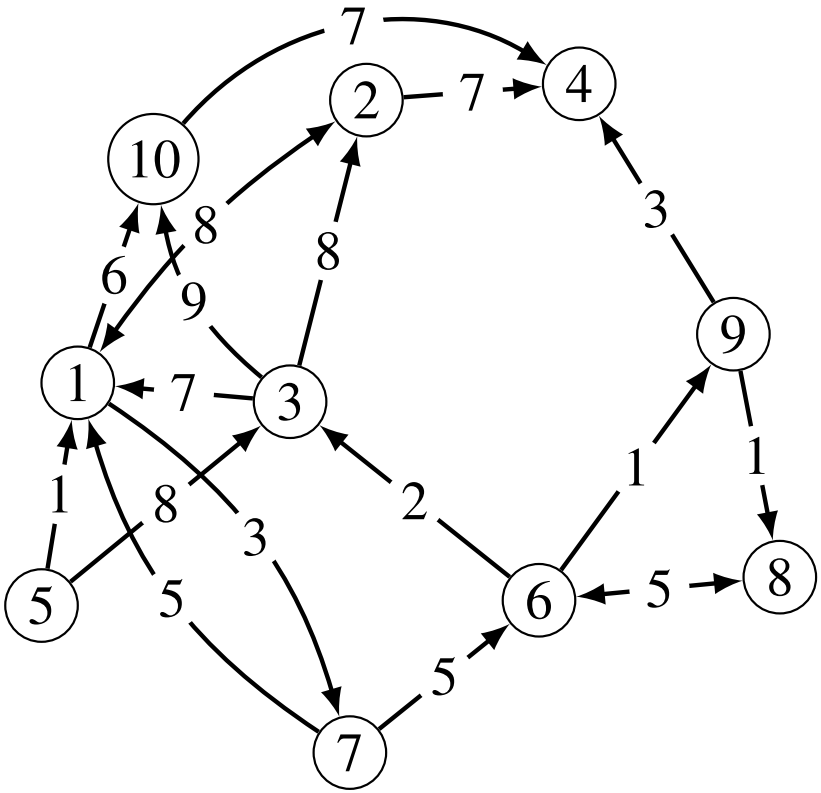

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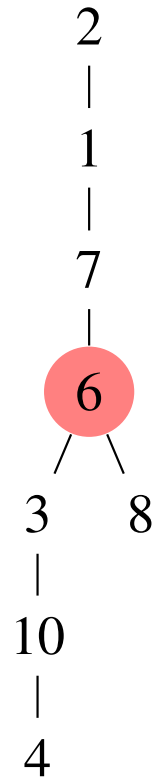

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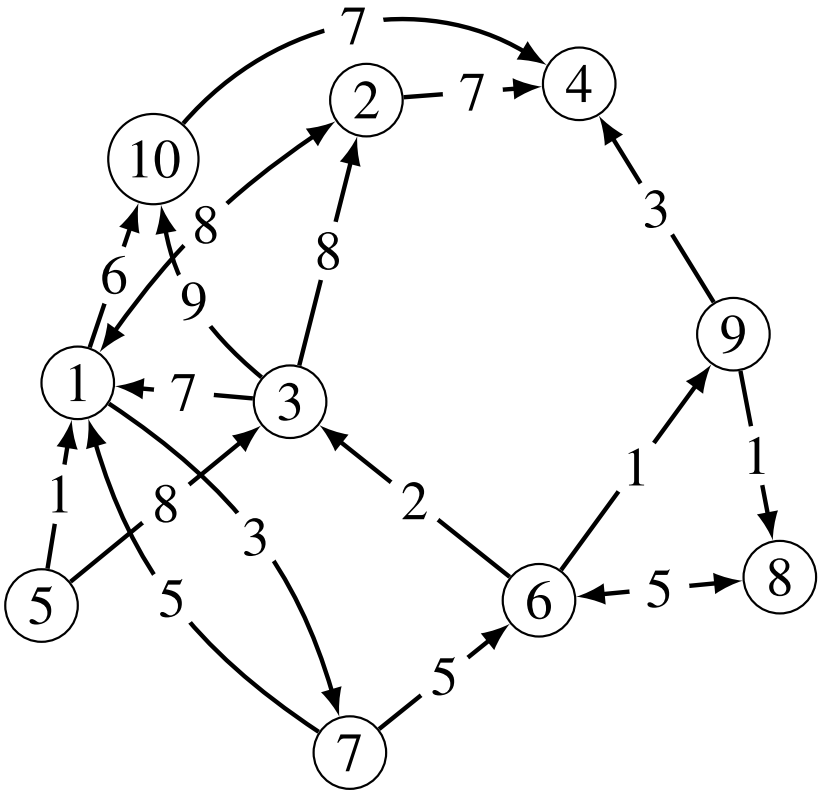

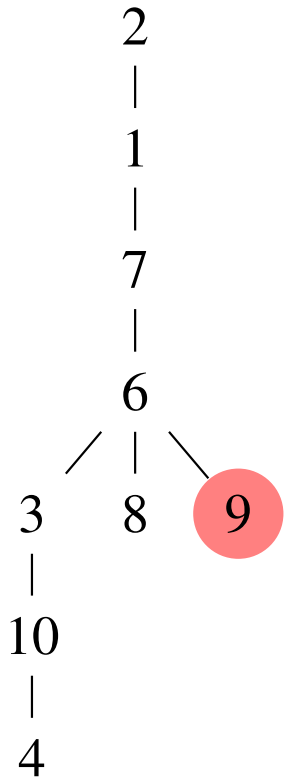

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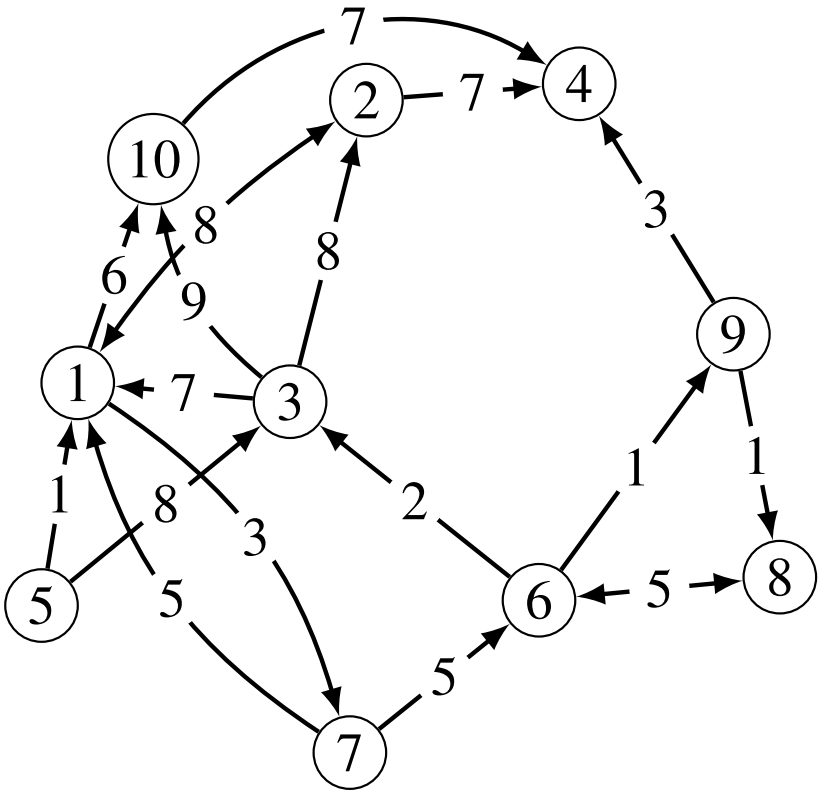

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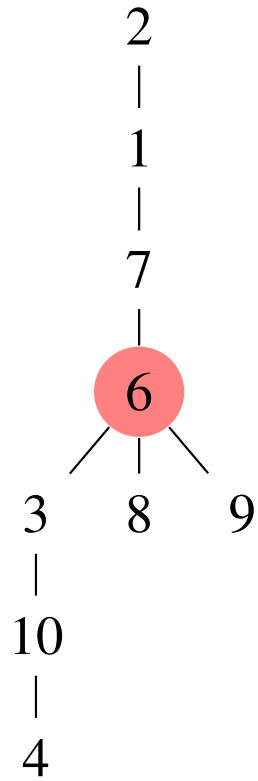

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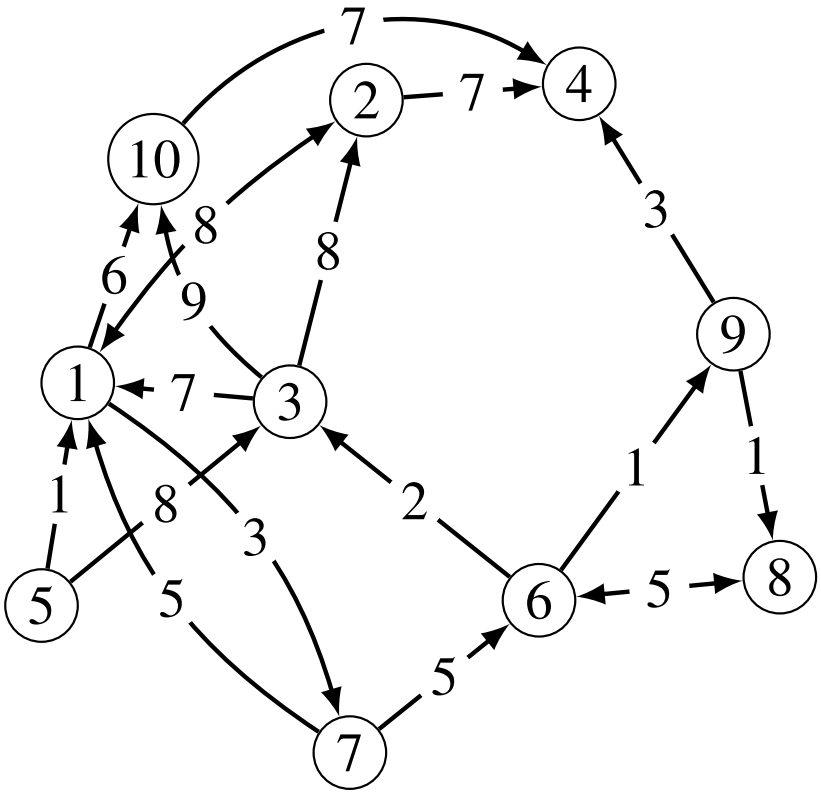

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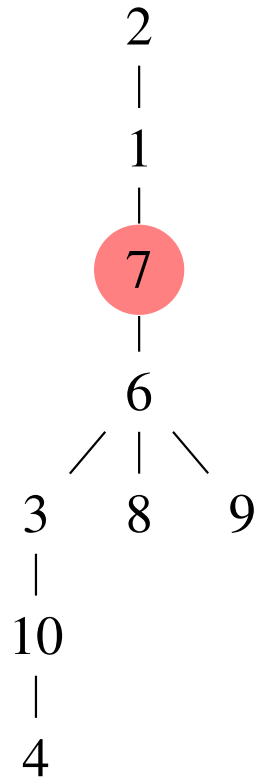

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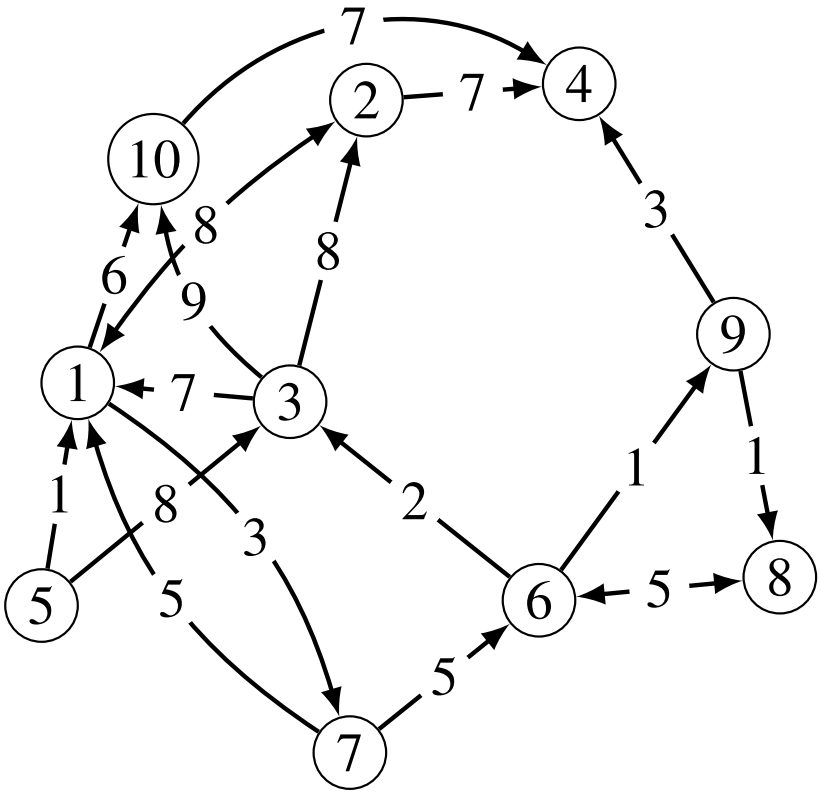

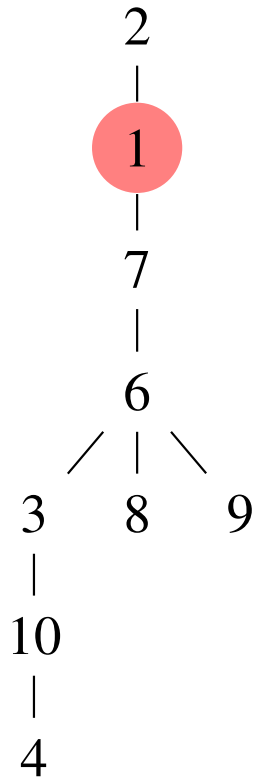

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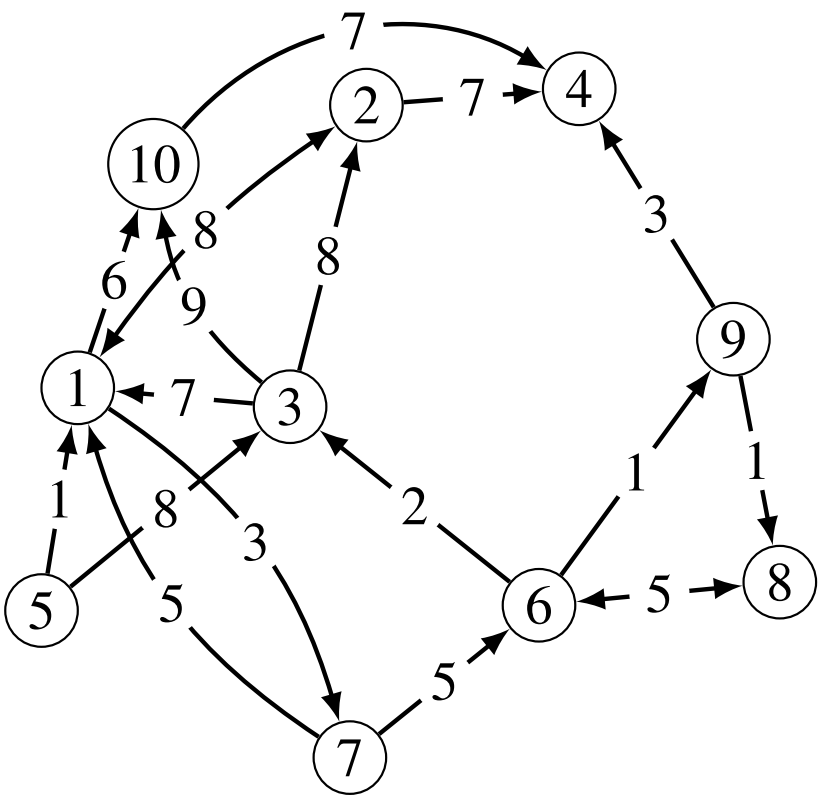
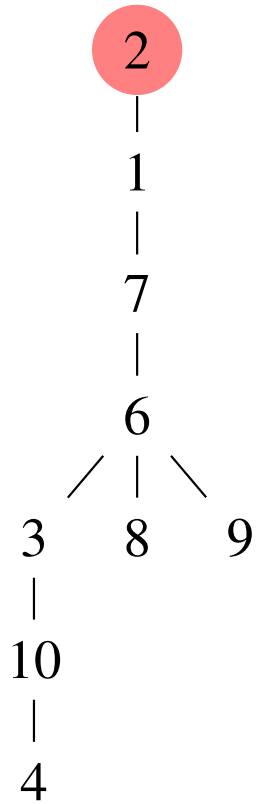
Tiefensuche





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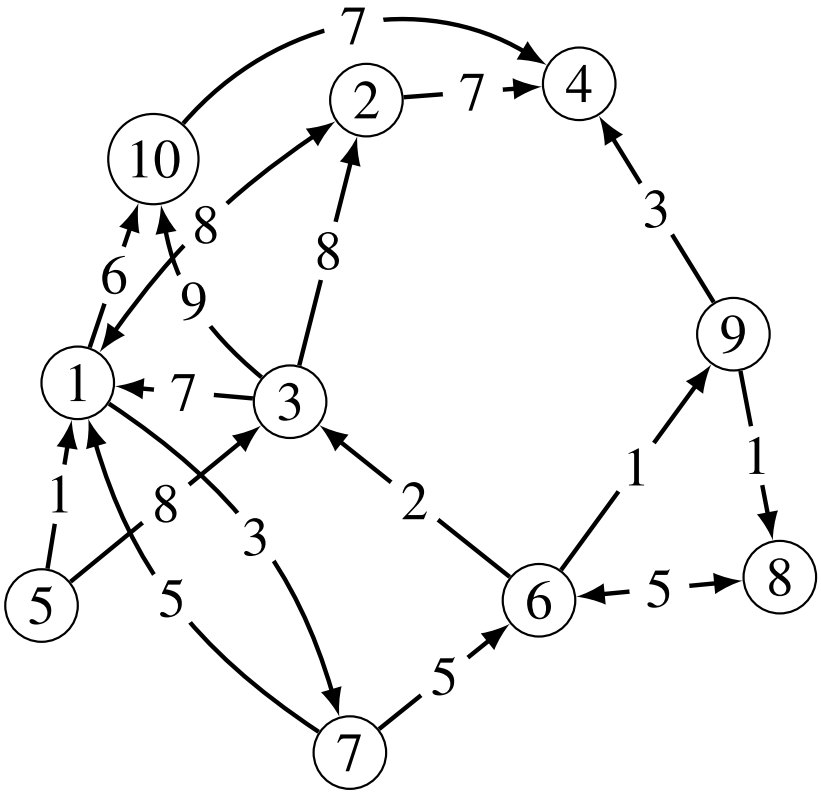
Breitensuche



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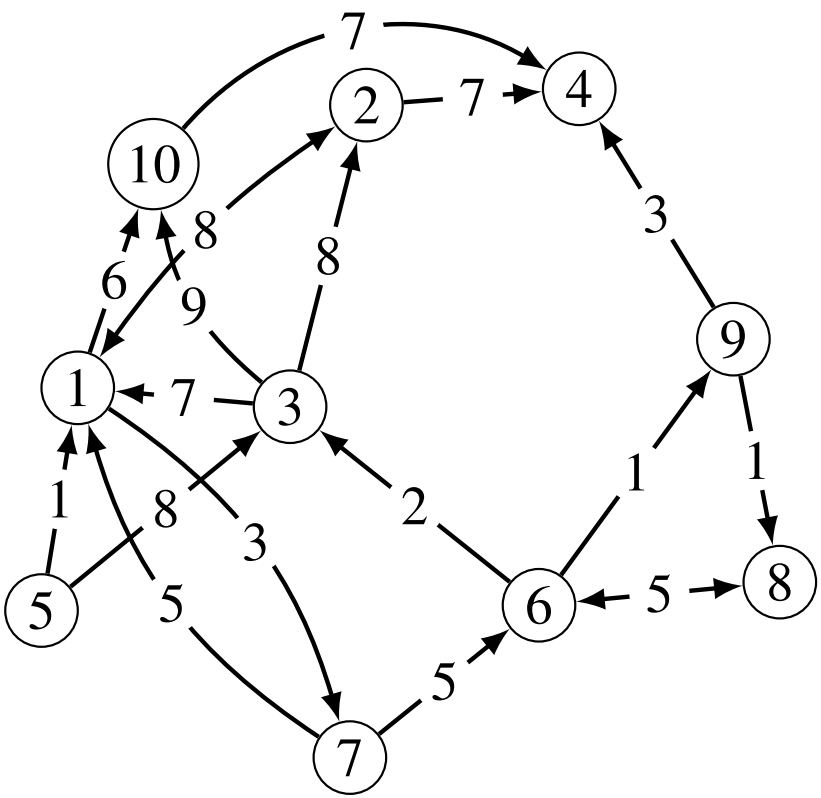
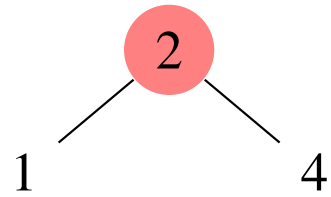
Breitensuche





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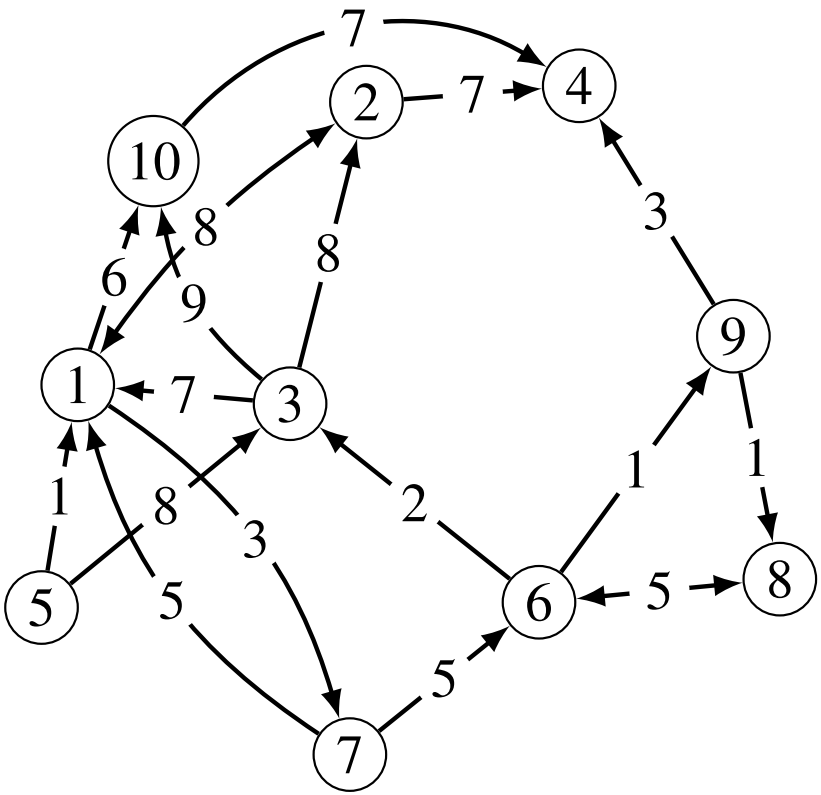
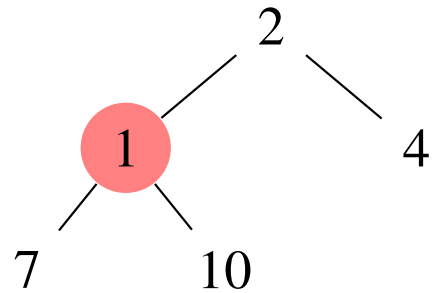
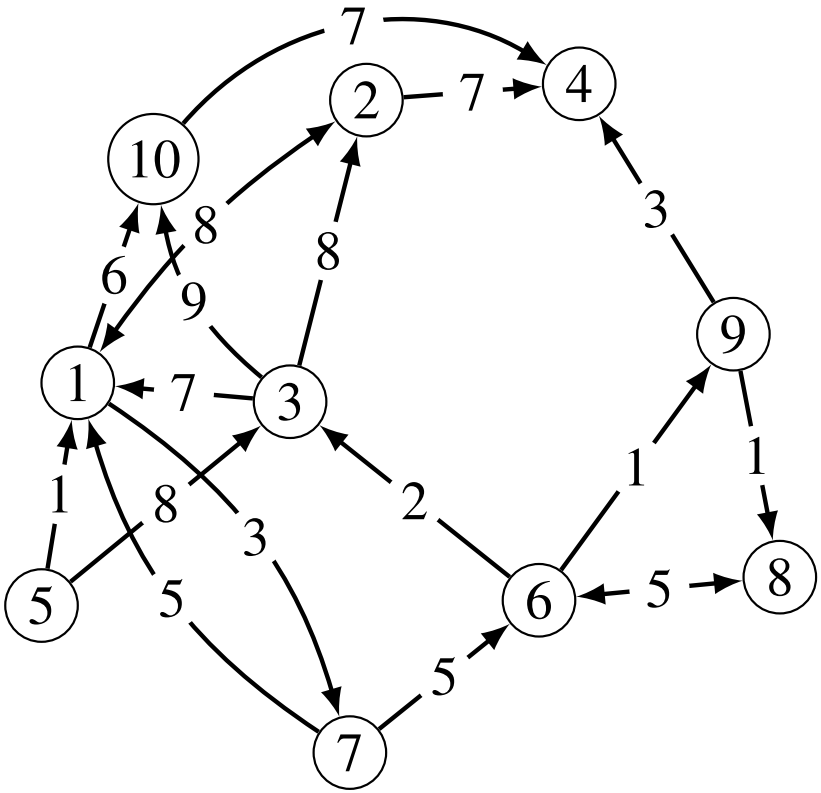
Breitensuche

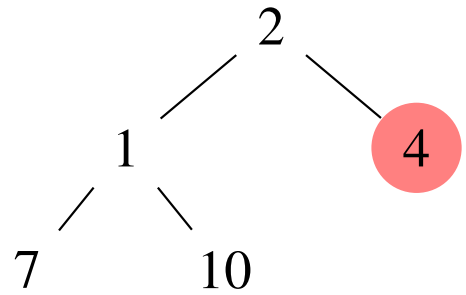




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

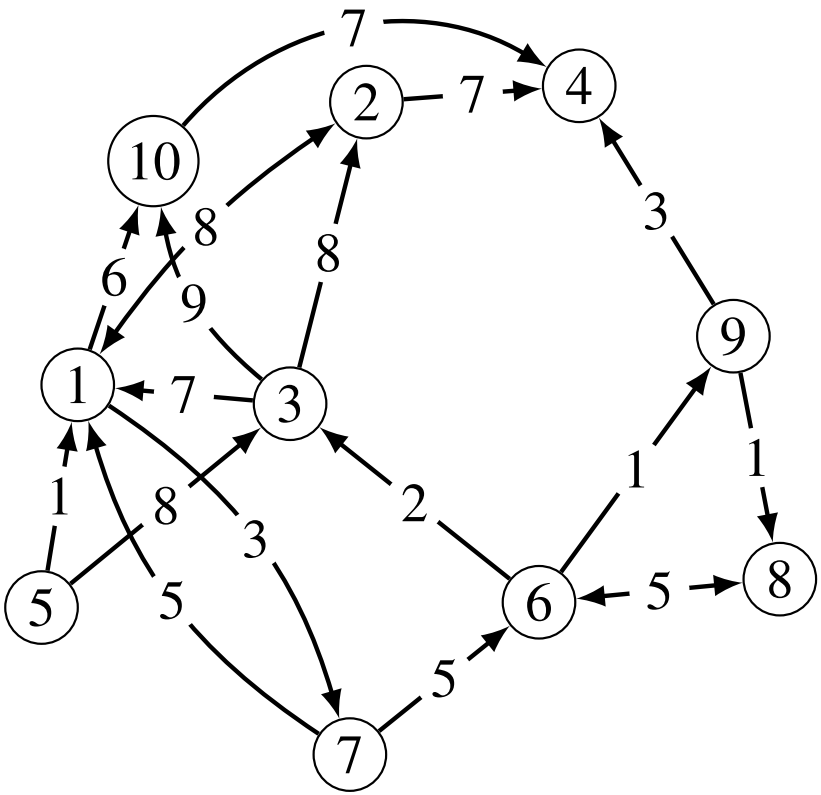
Breitensuche

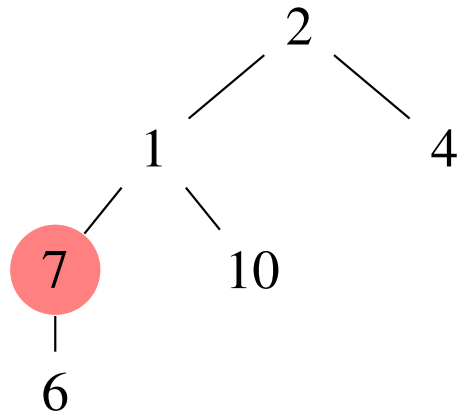




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

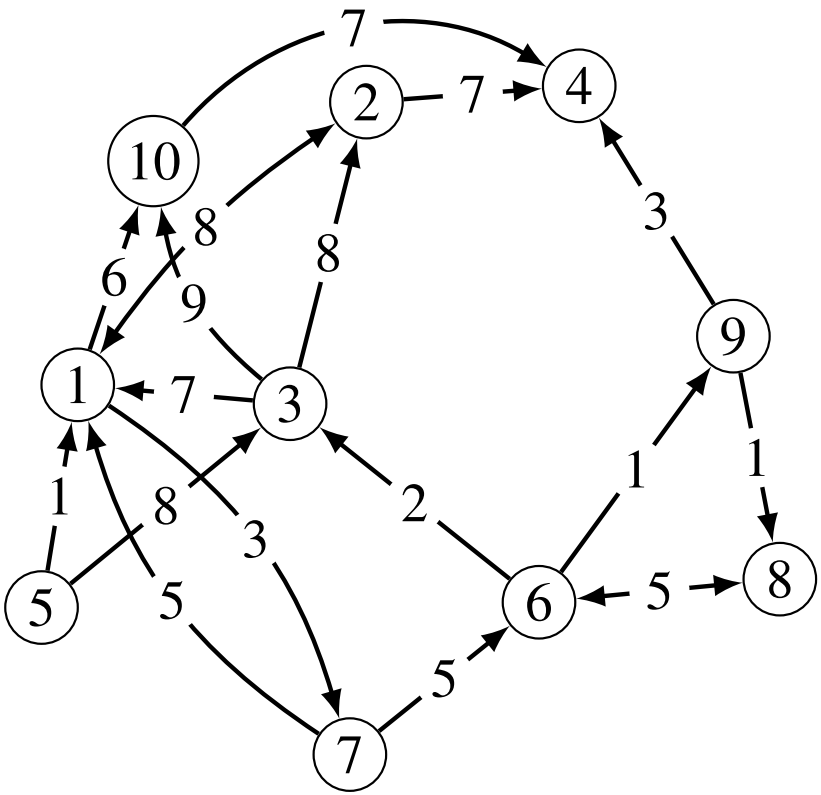
Breitensuche

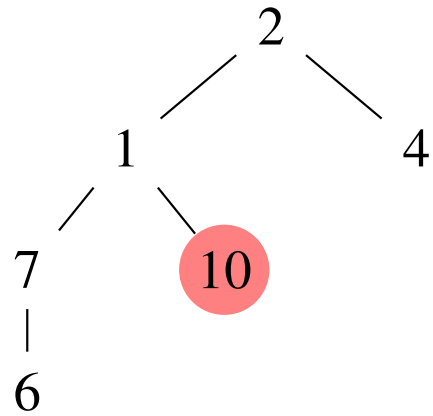




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

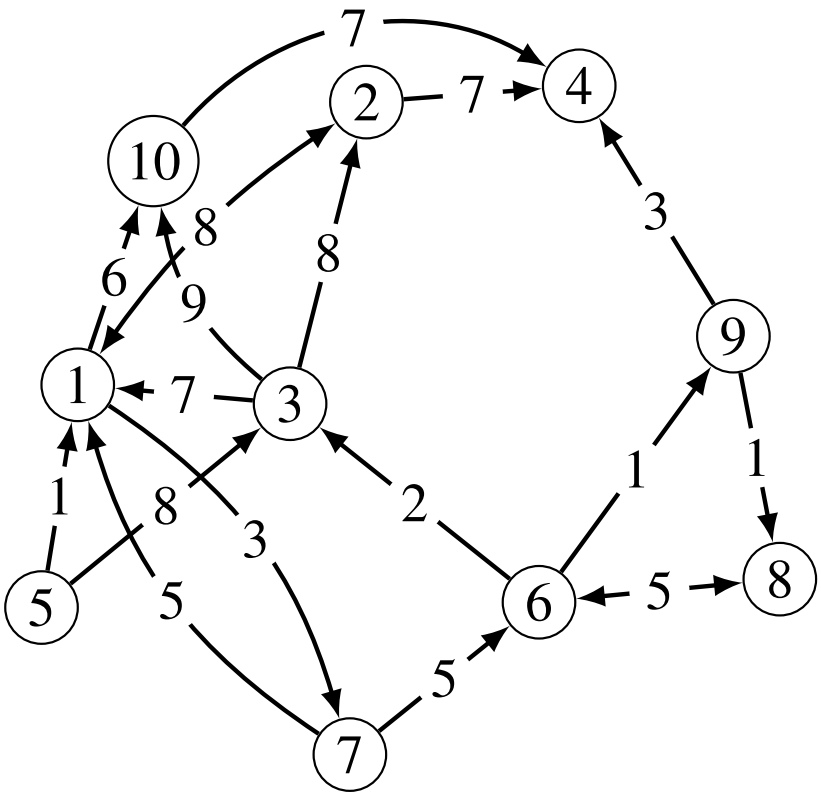
Breitensuche

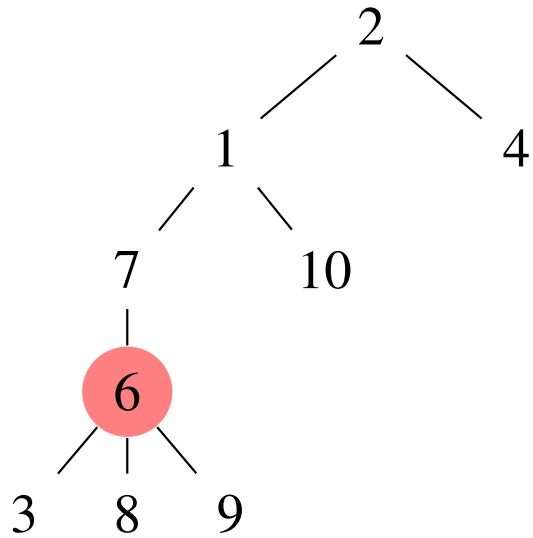




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

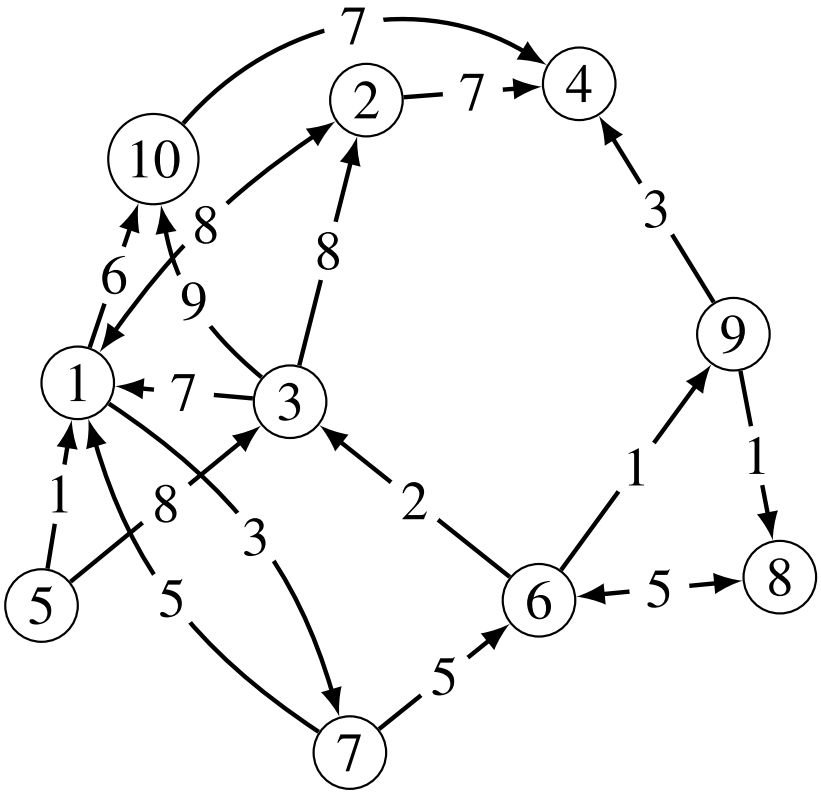
Breitensuche

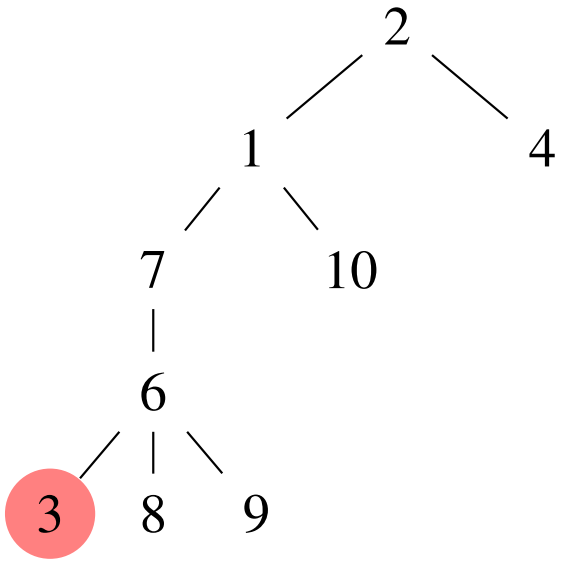




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

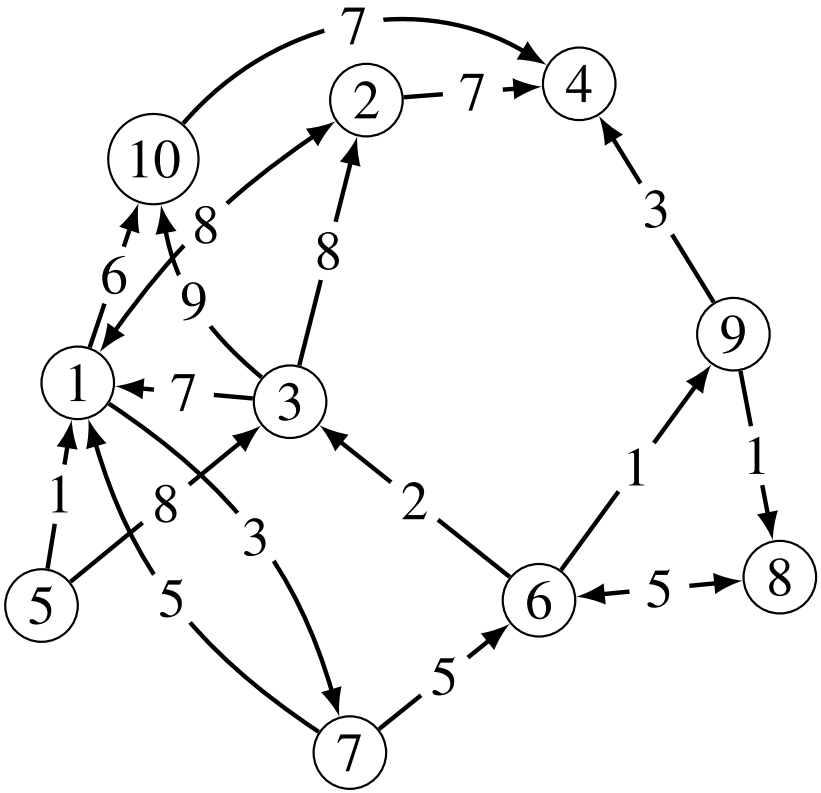
Breitensuche

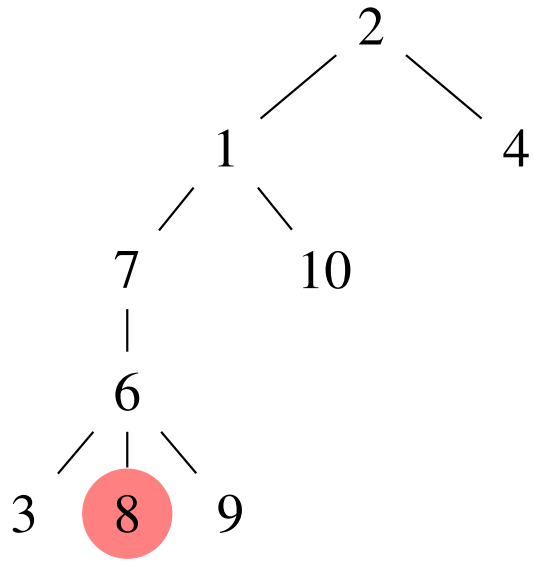




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

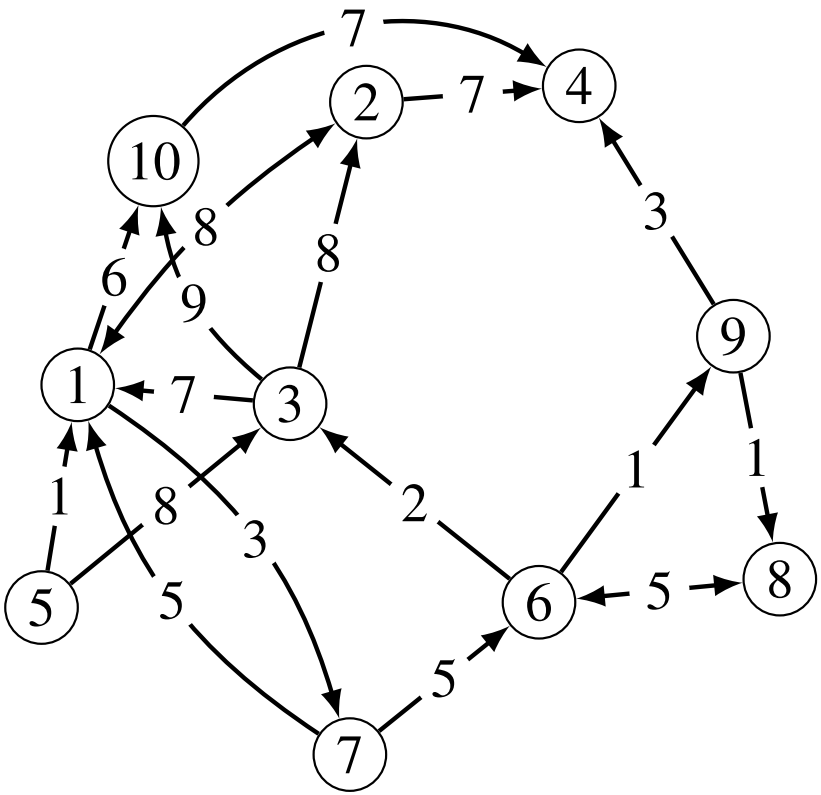
Breitensuche

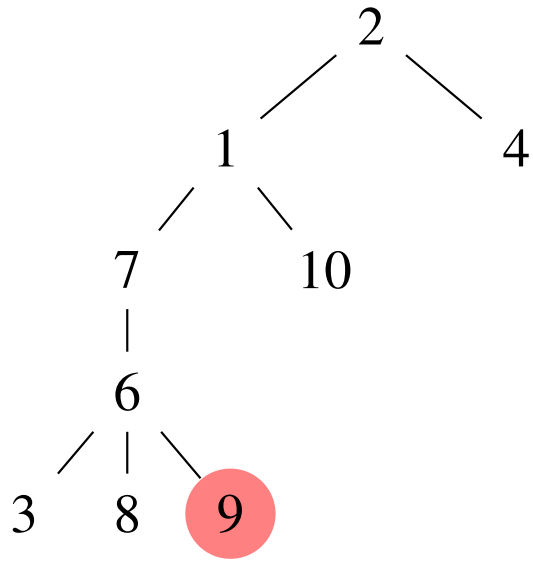




1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

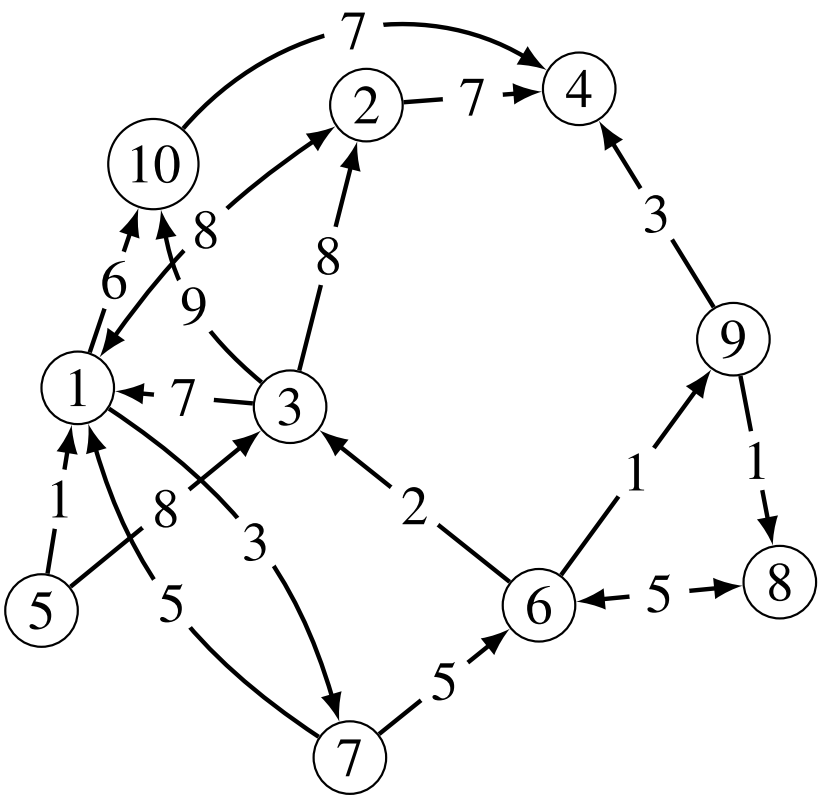
Breitensuche





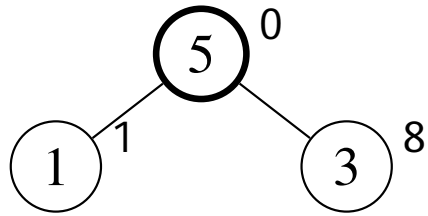
1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path



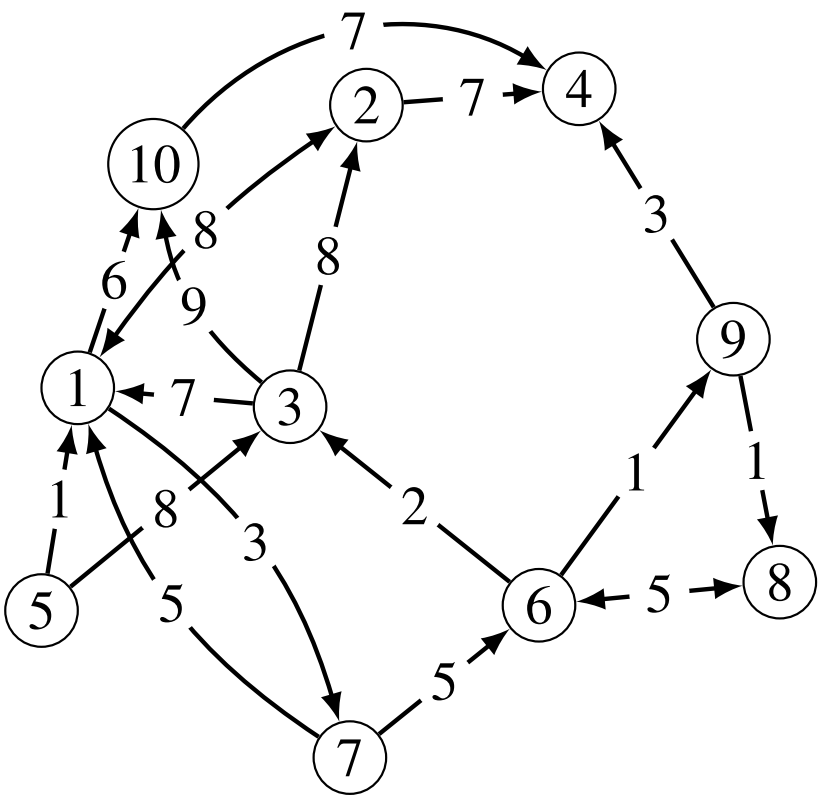
1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Besuch von 5 (0):

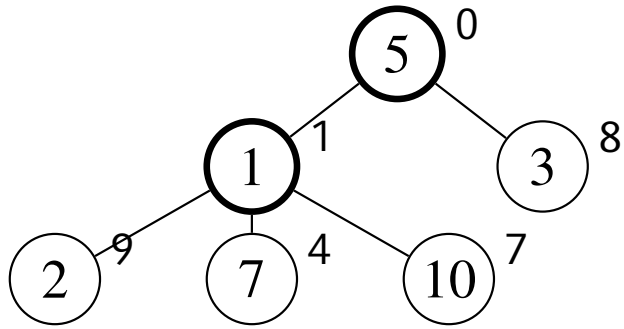


Dijkstra ist eine *Prioritätssuche*.

Dijkstra: Single-Source Shortest Path

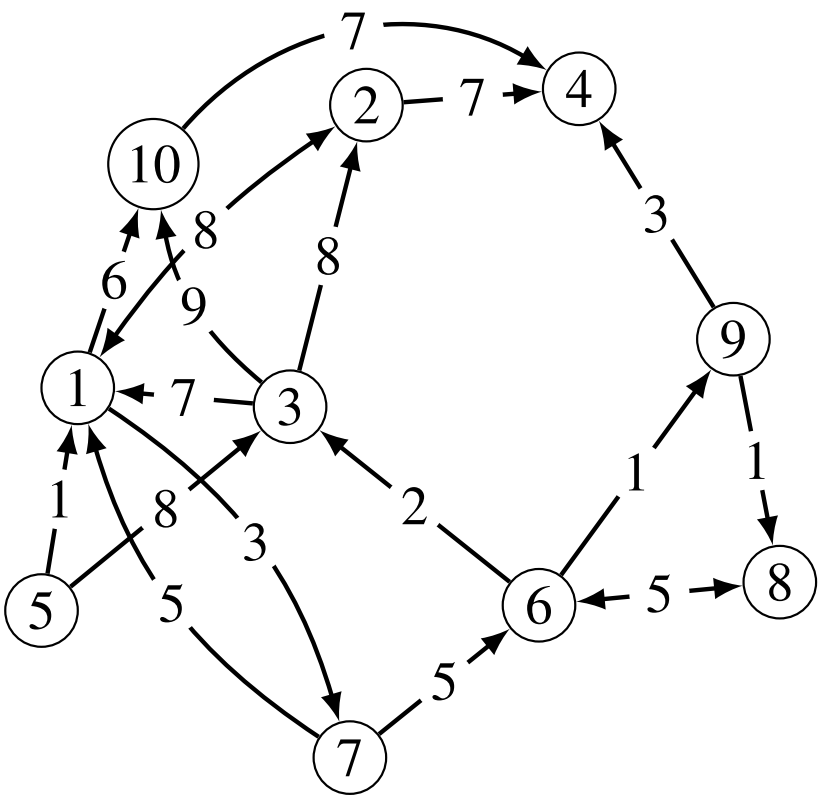


Besuch von 1 (1):

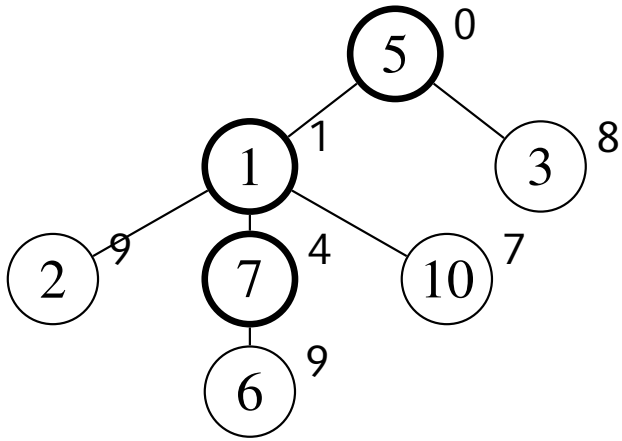


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

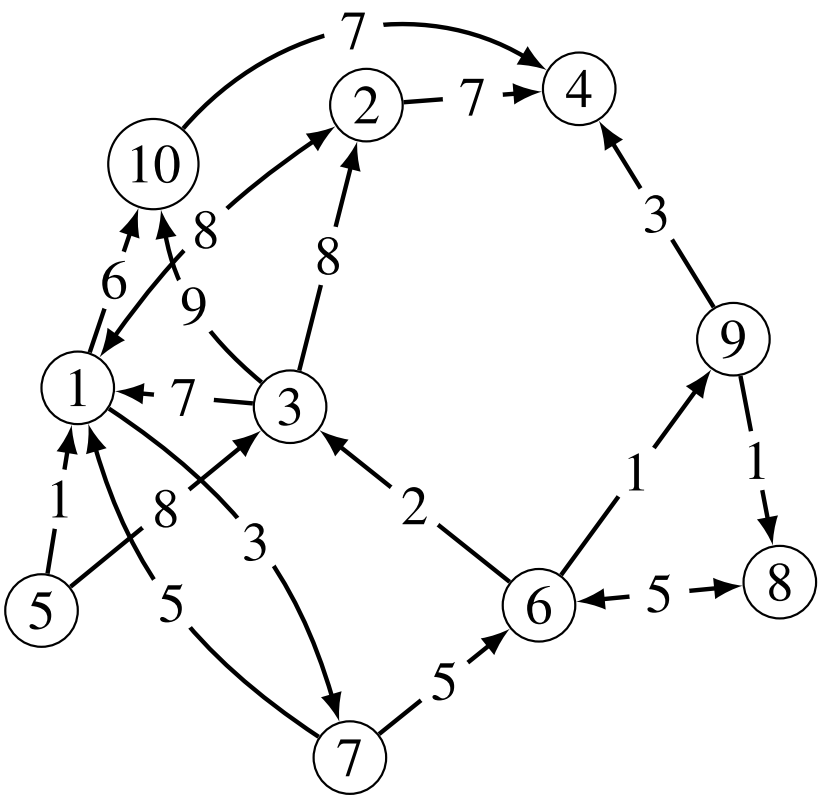


Besuch von 7 (4):

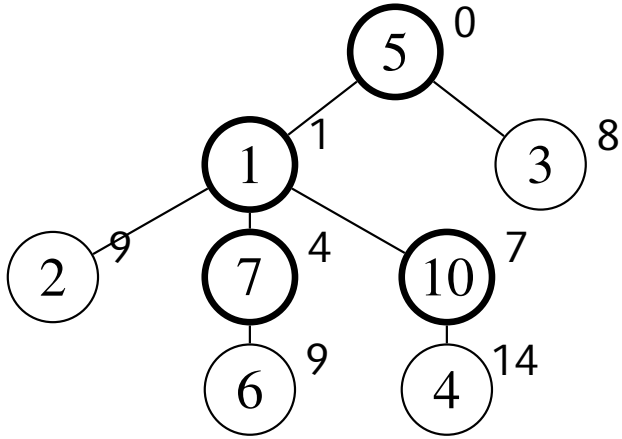


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

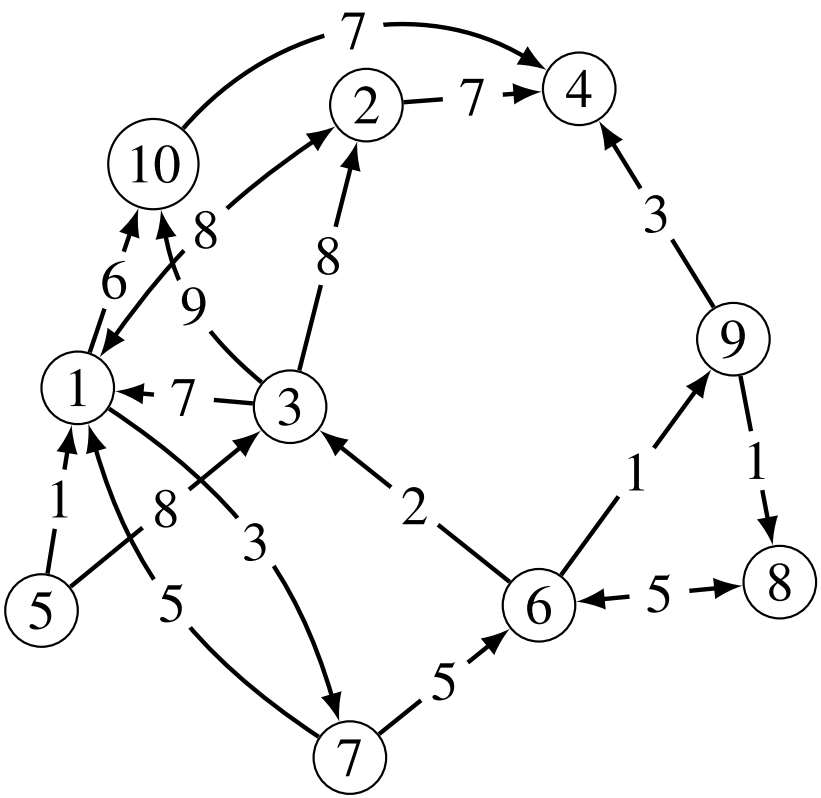


Besuch von 10 (7):

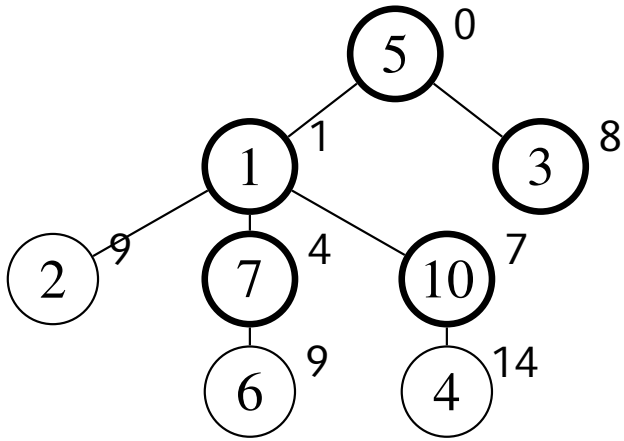


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

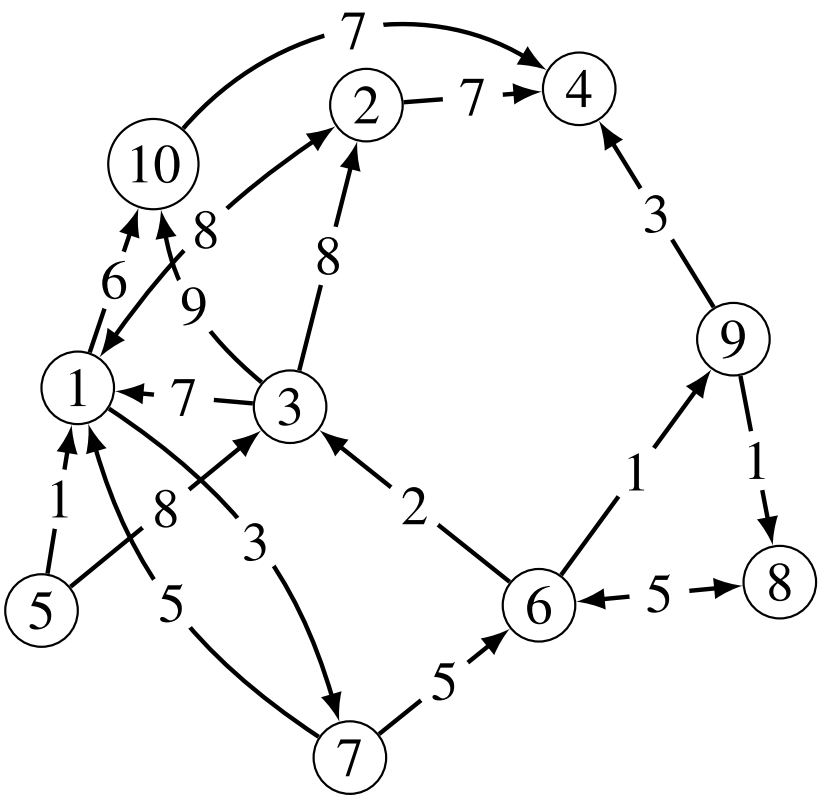


Besuch von 3 (8):

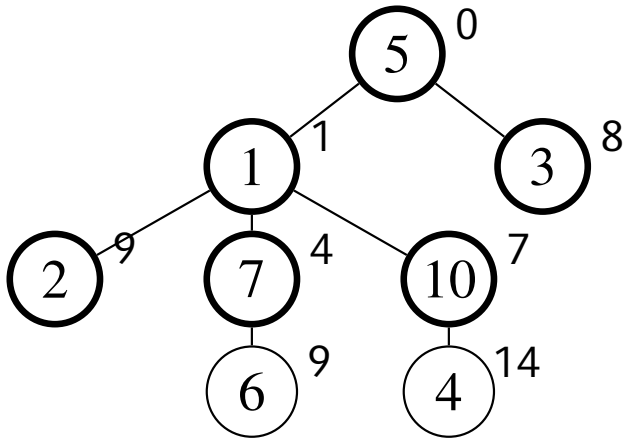


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

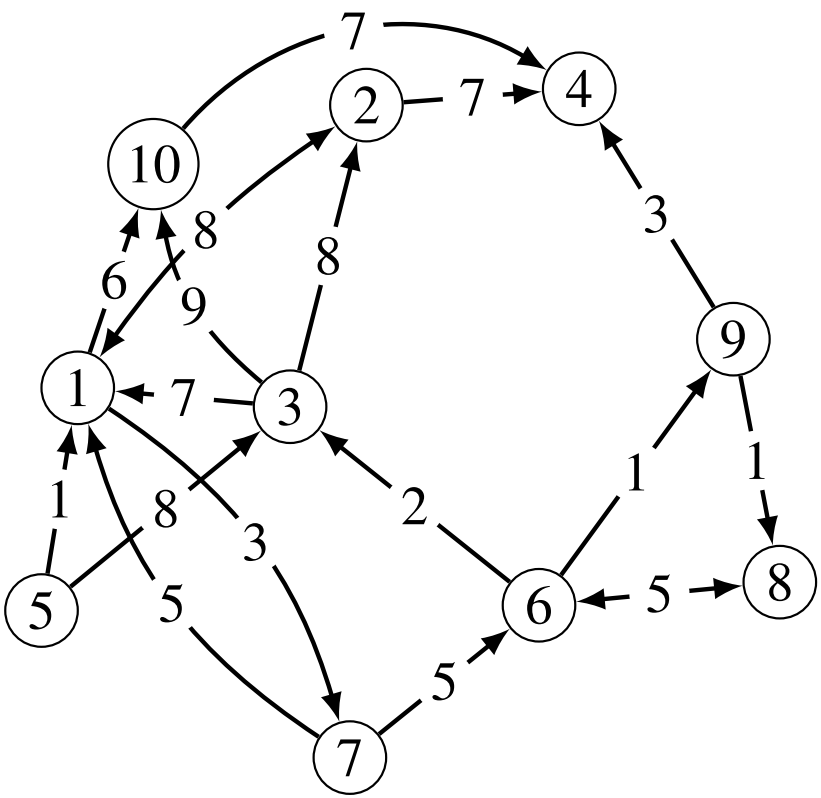


Besuch von 2 (9):

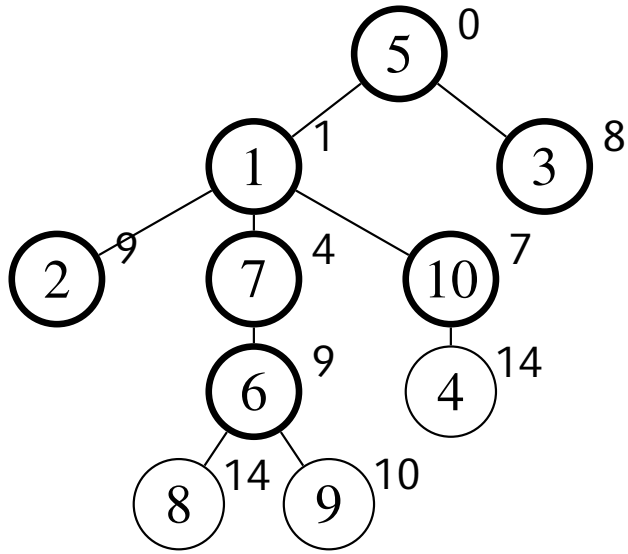


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

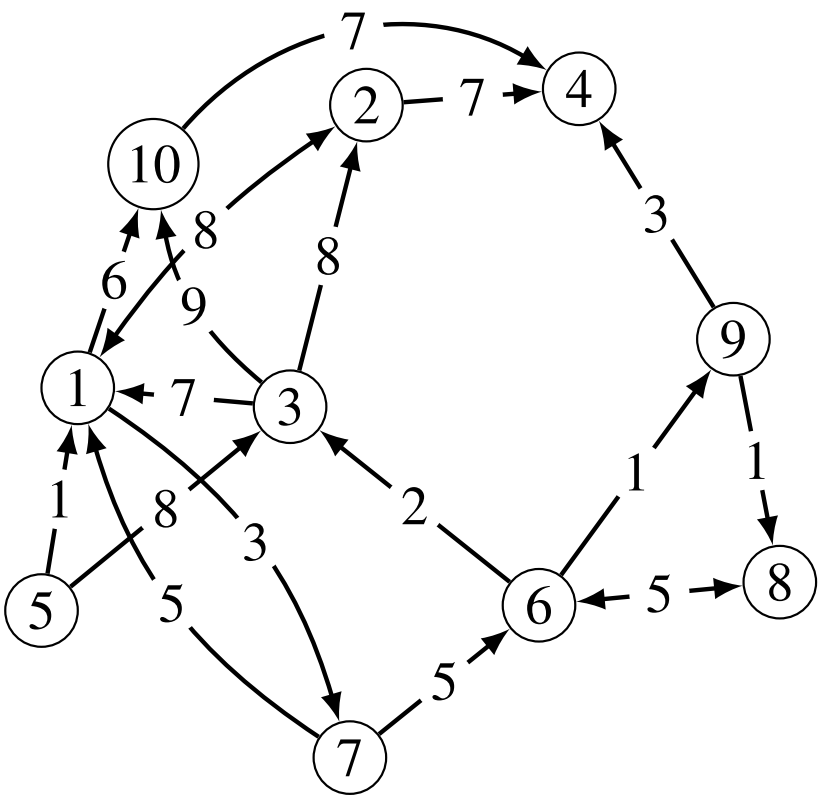


Besuch von 6 (9):

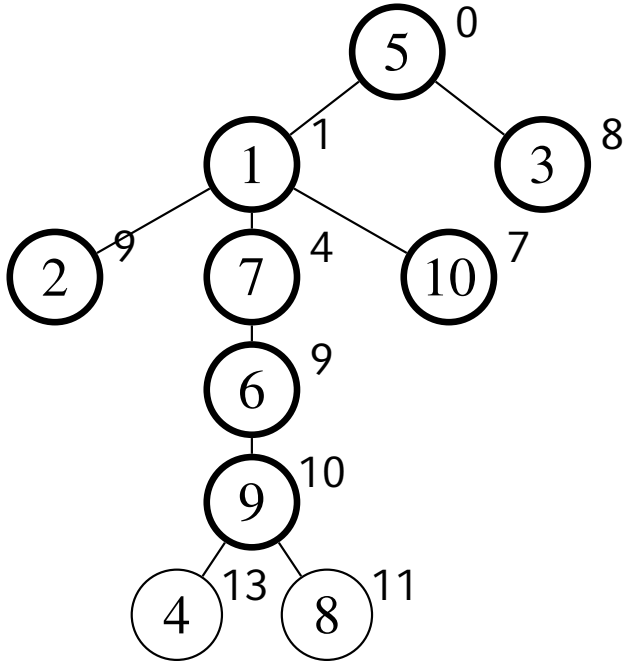


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

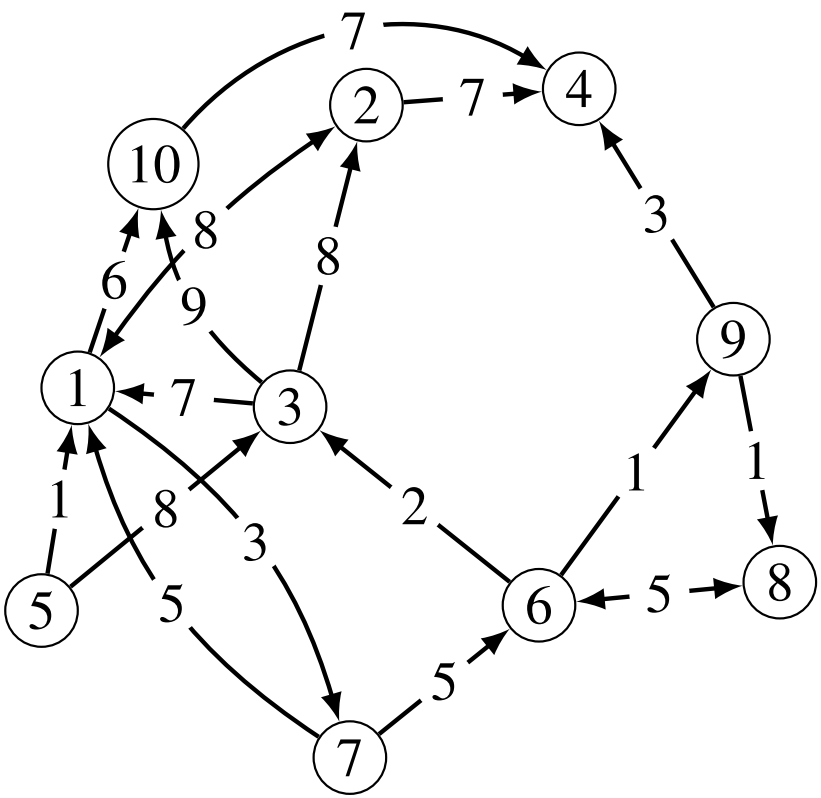


Besuch von 9 (10):

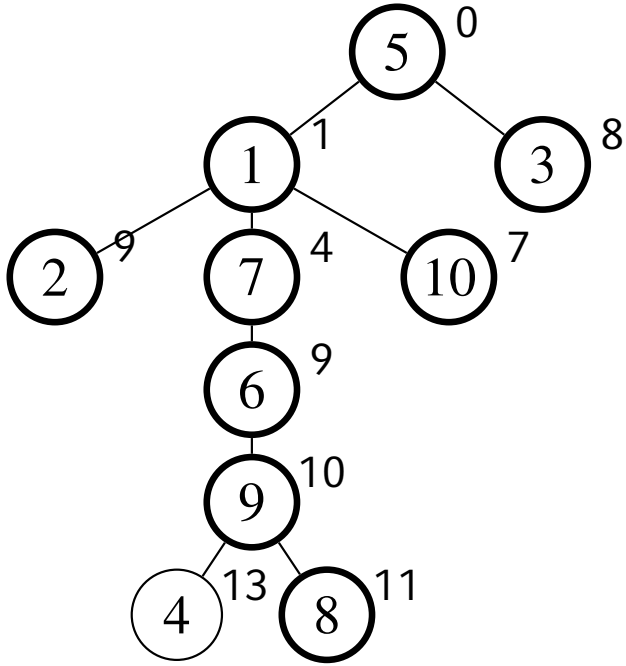


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path

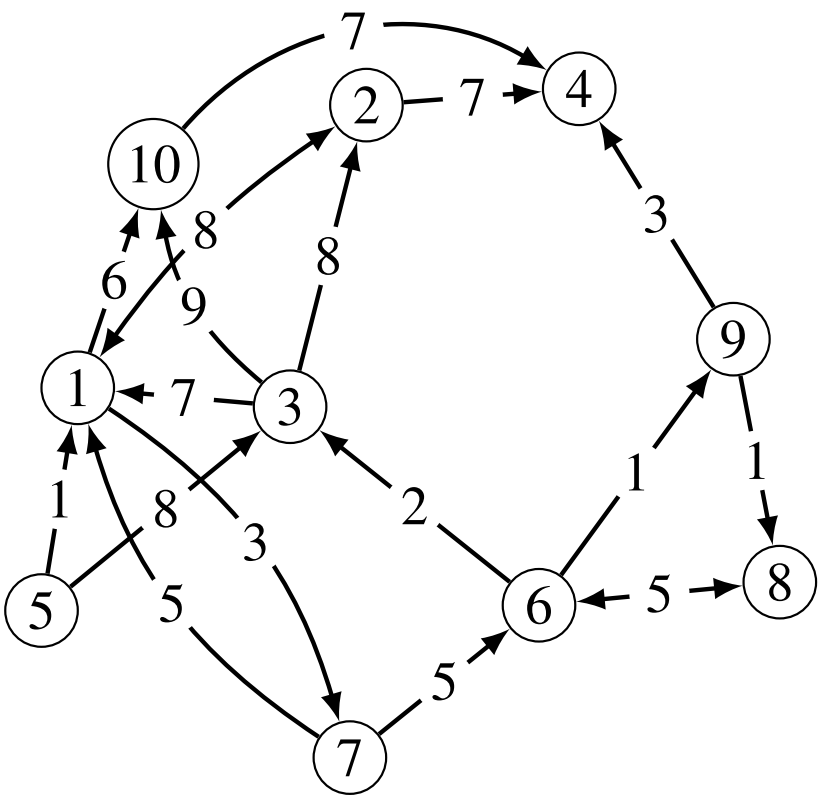


Besuch von 8 (11):

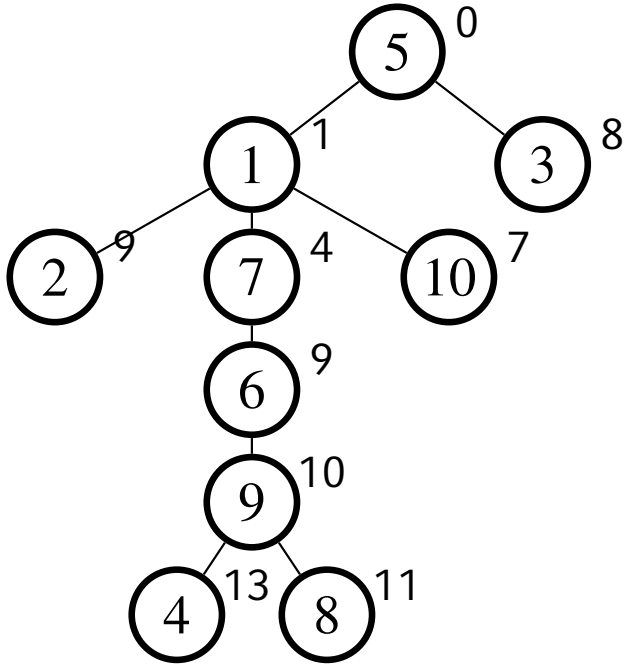


1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Dijkstra: Single-Source Shortest Path



Besuch von 4 (13): Ende



1	2 (8), 7 (3), 10 (6)	6	3 (2), 8 (5), 9 (1)
2	1 (8), 4 (7)	7	1 (5), 6 (5)
3	1 (7), 2 (8), 10 (9)	8	6 (5)
4		9	4 (3), 8 (1)
5	1 (1), 3 (8)	10	4 (7)

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	**Nach**
2	8 (-)	0	–	7 (-)	–	–	–	–	–	–
3	7 (-)	8 (-)	0	–	–	–	–	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	–	8 (-)	–	0	–	–	–	–	–
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	–	–	–	–	5 (-)	0	–	–	–
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	**Von**	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	**Nach**
2	8 (-)	0	–	7 (-)	–	–	–	–	–	–
3	7 (-)	8 (-)	0	–	–	–	–	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	–	8 (-)	–	0	–	–	–	–	–
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	–	–	–	–	5 (-)	0	–	–	–
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	**Von**	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	Nach
2	8 (-)	0	–	7 (-)	–	–	–	–	–	–
3	7 (-)	8 (-)	0	–	–	–	–	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	–	8 (-)	–	0	–	–	–	–	–
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	–	–	–	–	5 (-)	0	–	?	–
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	Von	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	Nach
2	8 (-)	0	–	7 (-)	–	–	–	–	–	–
3	7 (-)	8 (-)	0	–	–	–	–	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	–	8 (-)	–	0	–	–	–	–	–
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	–	–	–	–	5 (-)	0	–	–	–
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	Von	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	Nach
2	8 (-)	0	–	7 (-)	–	–	–	–	–	–
3	7 (-)	8 (-)	0	–	–	–	–	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	–	8 (-)	–	0	–	–	–	–	–
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	–	–	–	–	5 (-)	0	–	–	–
8	–	–	–	–	–	5 (-)	–	0	6 (6)	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	Von	–	–	7 (-)	–	–				

Von 8 nach 9 über 6

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Neue Kanten einfügen: Zeile $\rightarrow i \rightarrow$ Spalte, falls besser.

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	–	–	–	–
3	7 (-)	8 (-)	0	–	–	–	–	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	–	8 (-)	–	0	–	–	–	–	–
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	–	–	–	–	5 (-)	0	–	–	–
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	–	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	–	0	–	4 (1)	–	–	7 (1)
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	13 (1)	–	–	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Pfade über Knoten 1, bspw. $7 \rightarrow 1 \rightarrow 2$, Länge $5 + 8 = 13$ (1)

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	–	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	–	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	–	0	–	4 (1)	–	–	7 (1)
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	13 (1)	–	–	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	–	–	2 (-)	–	–	0	–	5 (-)	1 (-)	–
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	–	20 (2)	–	5 (-)	0	–	–	11 (1)
8	–	–	–	–	–	5 (-)	–	0	–	–
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	20 (2)	–	5 (-)	0	10 (6)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	22 (6)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	–	15 (2)	–	–	3 (-)	–	–	6 (-)
2	8 (-)	0	–	7 (-)	–	–	11 (1)	–	–	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	–	10 (1)	–	–	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	–	4 (1)	–	–	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	20 (2)	–	5 (-)	0	10 (6)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	22 (6)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	15 (2)	–	8 (7)	3 (-)	13 (7)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	21 (7)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	20 (7)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	9 (7)	4 (1)	14 (7)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	20 (2)	–	5 (-)	0	10 (6)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	22 (6)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	15 (2)	–	8 (7)	3 (-)	13 (7)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	21 (7)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	20 (7)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	9 (7)	4 (1)	14 (7)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	20 (2)	–	5 (-)	0	10 (6)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	22 (6)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	–	–	–	3 (-)	–	–	–	1 (-)	0	–
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	15 (2)	–	8 (7)	3 (-)	13 (7)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	21 (7)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	20 (7)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	9 (7)	4 (1)	14 (7)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	20 (2)	–	5 (-)	0	10 (6)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	22 (6)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	15 (2)	–	8 (7)	3 (-)	13 (7)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	21 (7)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	20 (7)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	16 (2)	0	9 (7)	4 (1)	14 (7)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	17 (3)	–	0	12 (3)	5 (-)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	20 (2)	–	5 (-)	0	10 (6)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	22 (6)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Achtung: Verbesserungen möglich!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

. . . und manchmal ändert sich nichts.

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Knoten 5 ist nicht erreichbar

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Knoten 4 ist eine Sackgasse

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (8)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Knoten 10 führt nur in die Sackgasse 4

In jeder Zelle ein Paar: Distanz (Wegpunkt)

Der Wegpunkt muss *nicht* der nächste Schritt sein!

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	**Zusammenhängender (stark verbundener) Subgraph.**				–					
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \rightsquigarrow 7 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \rightsquigarrow 1 \rightsquigarrow 7 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \to_1 1 \rightsquigarrow 7 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \to_1 1 \to_3 7 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \to_1 1 \to_3 7 \rightsquigarrow 6 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \to_1 1 \to_3 7 \to_5 6 \rightsquigarrow 9 \rightsquigarrow 4$$

Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

$$5 \to_1 1 \to_3 7 \to_5 6 \to_1 9 \rightsquigarrow 4$$

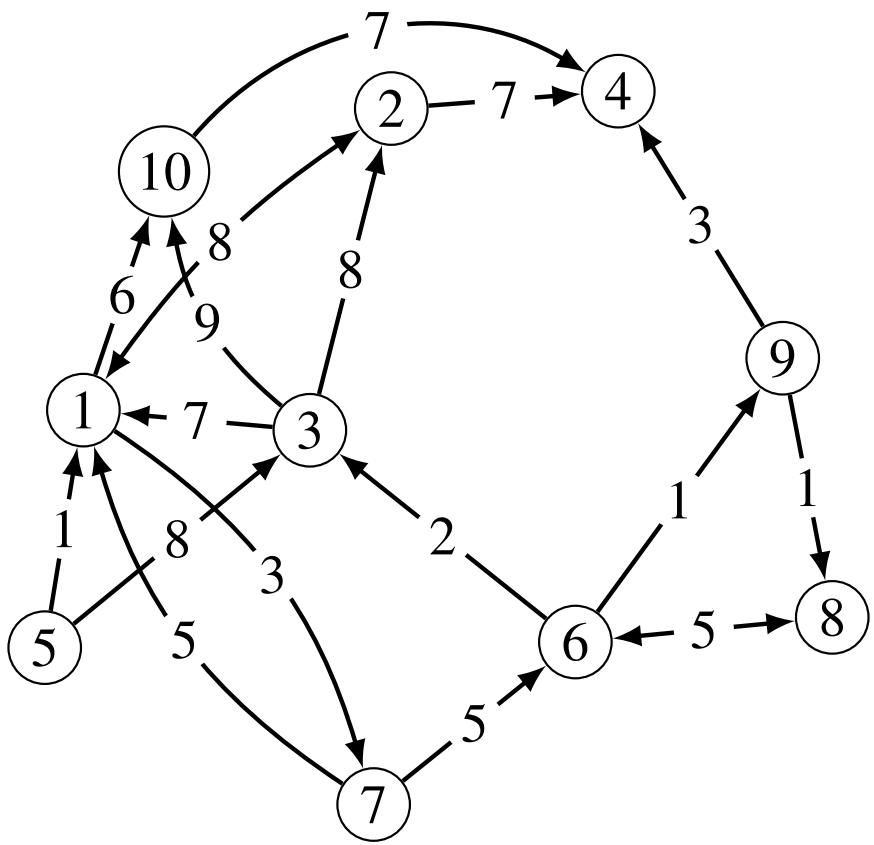
Floyd: All-Pairs Shortest Path

	1	2	3	4	5	6	7	8	9	10
1	0	8 (-)	10 (7)	12 (9)	–	8 (7)	3 (-)	10 (9)	9 (7)	6 (-)
2	8 (-)	0	18 (7)	7 (-)	–	16 (7)	11 (1)	18 (9)	17 (7)	14 (1)
3	7 (-)	8 (-)	0	15 (2)	–	15 (7)	10 (1)	17 (9)	16 (7)	9 (-)
4	–	–	–	0	–	–	–	–	–	–
5	1 (-)	9 (1)	8 (-)	13 (9)	0	9 (7)	4 (1)	11 (9)	10 (7)	7 (1)
6	9 (3)	10 (3)	2 (-)	4 (9)	–	0	12 (3)	2 (9)	1 (-)	11 (3)
7	5 (-)	13 (1)	7 (6)	9 (9)	–	5 (-)	0	7 (9)	6 (6)	11 (1)
8	14 (6)	15 (6)	7 (6)	9 (9)	–	5 (-)	17 (6)	0	6 (6)	16 (6)
9	15 (8)	16 (8)	8 (8)	3 (-)	–	6 (8)	18 (8)	1 (-)	0	17 (8)
10	–	–	–	7 (-)	–	–	–	–	–	0

Beispiel: Weg von 5 nach 4.

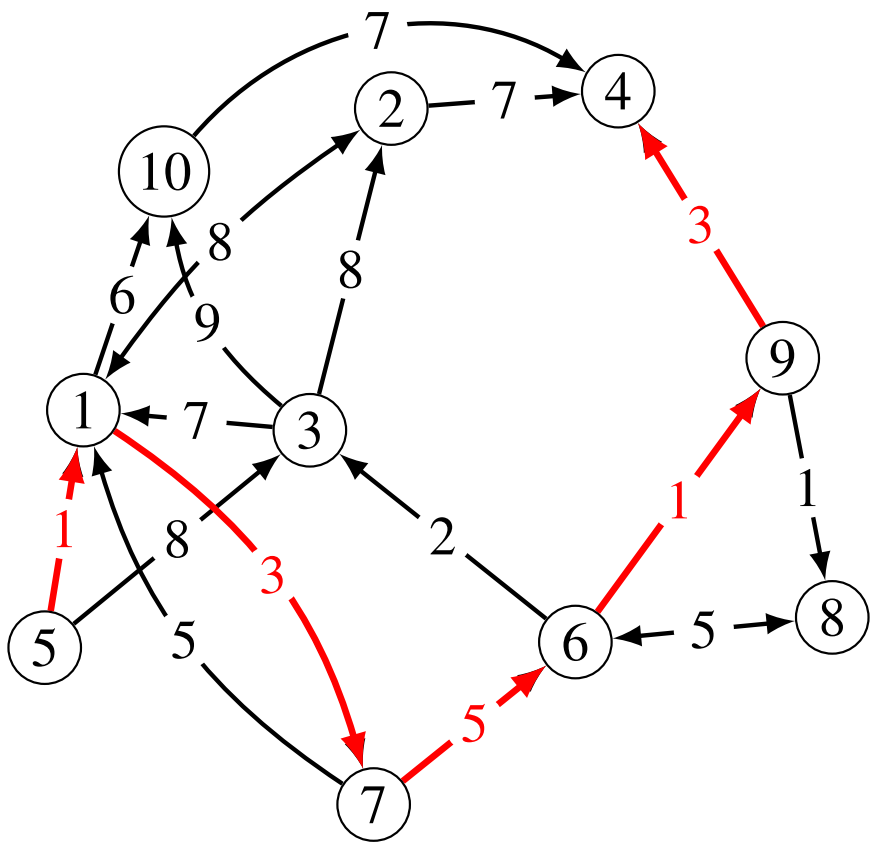
$$5 \rightarrow_1 1 \rightarrow_3 7 \rightarrow_5 6 \rightarrow_1 9 \rightarrow_3 4 = 13$$

Floyd: All-Pairs Shortest Path



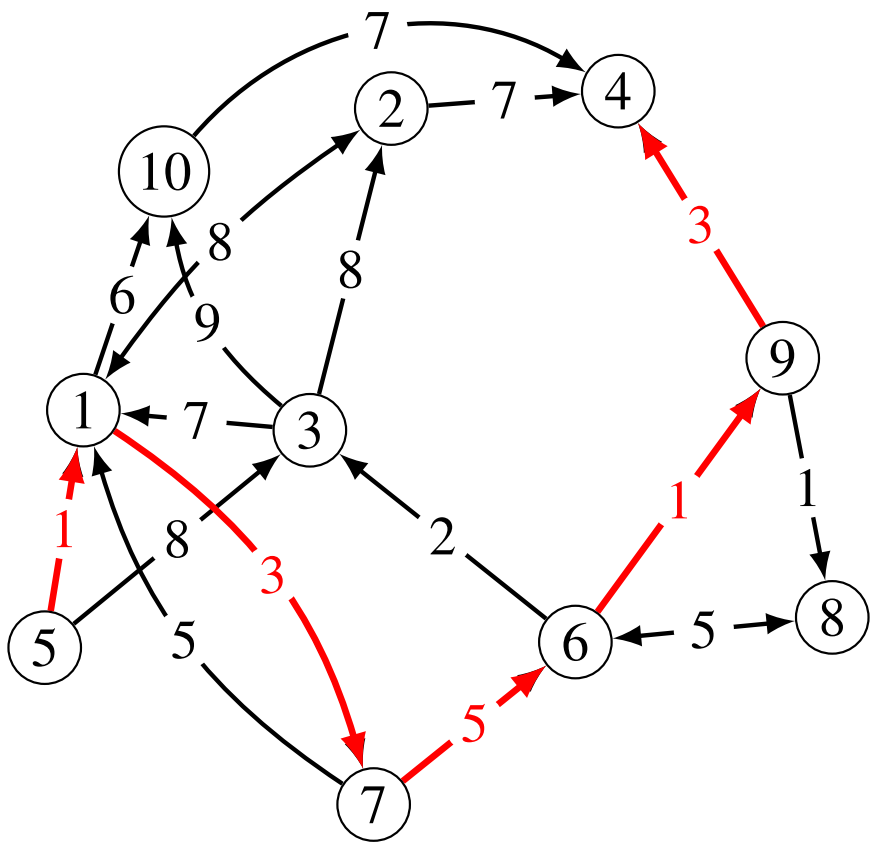
$$5 \rightarrow_1 1 \rightarrow_3 7 \rightarrow_5 6 \rightarrow_1 9 \rightarrow_3 4 = 13$$

Floyd: All-Pairs Shortest Path



$$5 \rightarrow_1 1 \rightarrow_3 7 \rightarrow_5 6 \rightarrow_1 9 \rightarrow_3 4 = 13$$

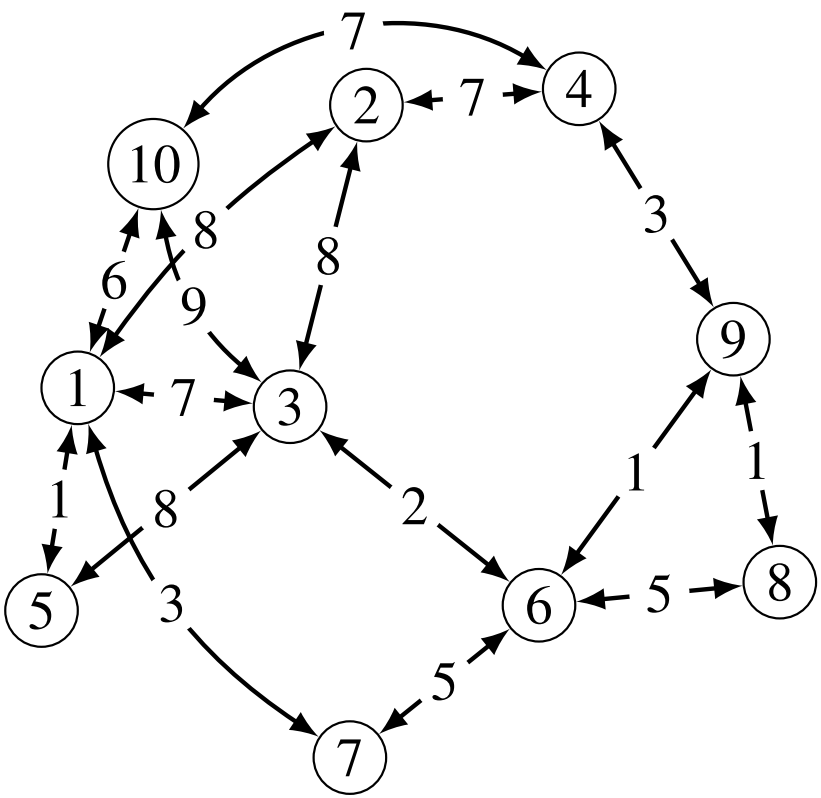
Floyd: All-Pairs Shortest Path



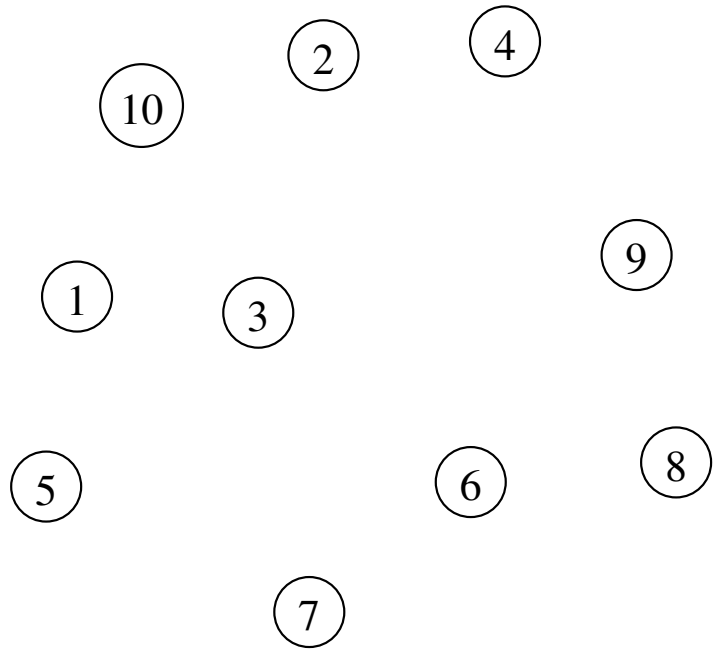
$$5 \rightarrow_1 1 \rightarrow_3 7 \rightarrow_5 6 \rightarrow_1 9 \rightarrow_3 4 = 13$$

Siehe auch: Dijkstra, beginnend bei 5 ...

Kruskal's Minimum Spanning Tree

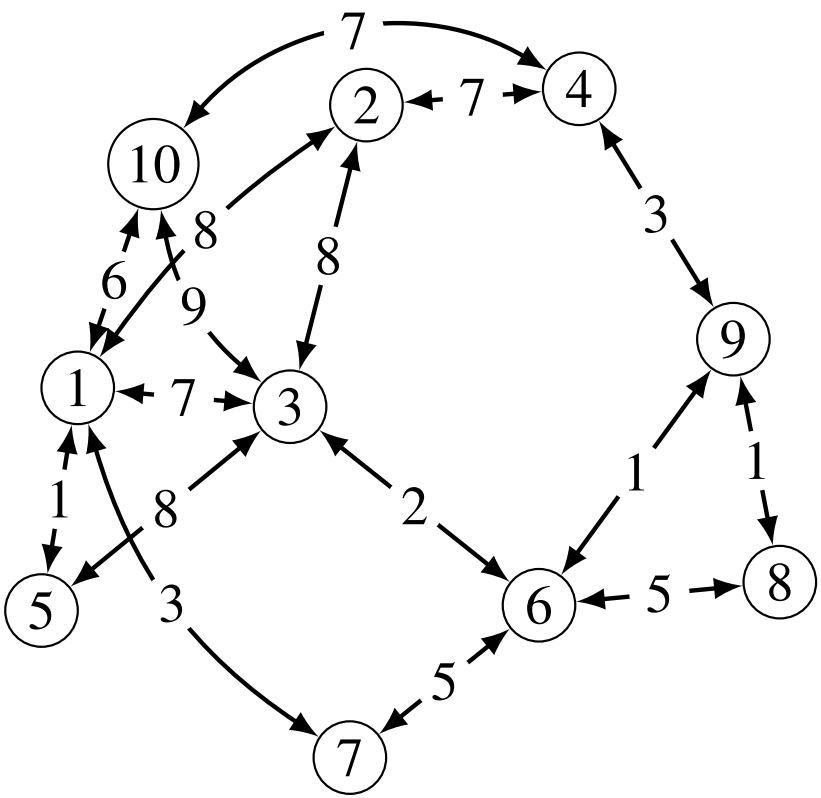


Unverbundener Graph:

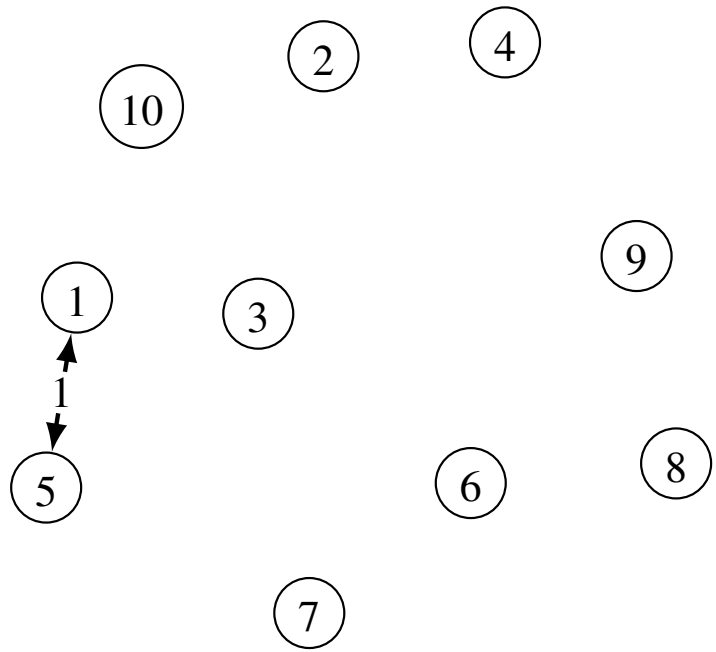


Beispiel Aufgabenstellung:
Kanten = Möglichkeiten, ein Glasfaserkabel zu legen.
Kosten = Kosten, das Kabel zu legen / zu betreiben.
Minimum Spanning Tree = günstigste Lösung, alles zu verbinden!

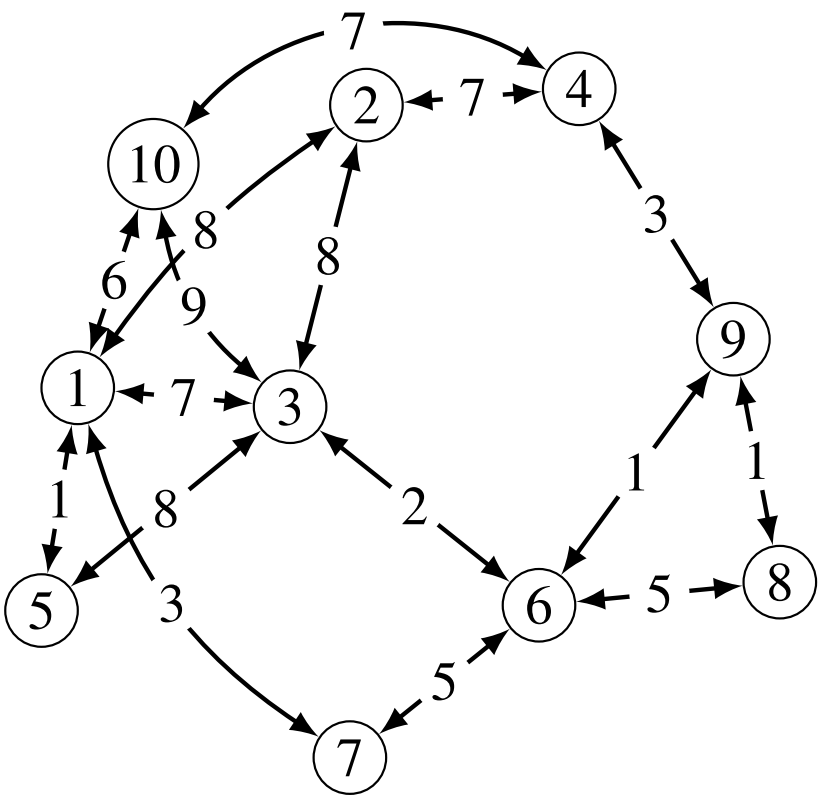
Kruskal's Minimum Spanning Tree



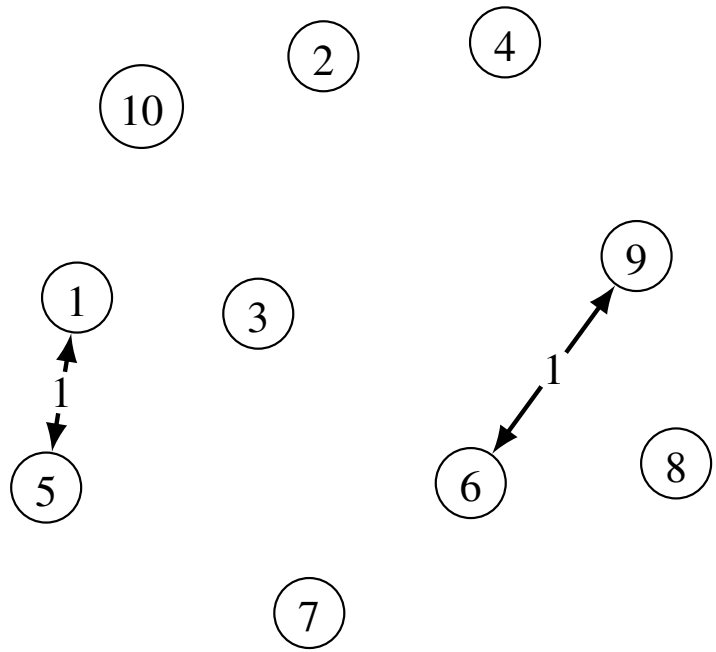
Nach Verarbeiten von 1-5:



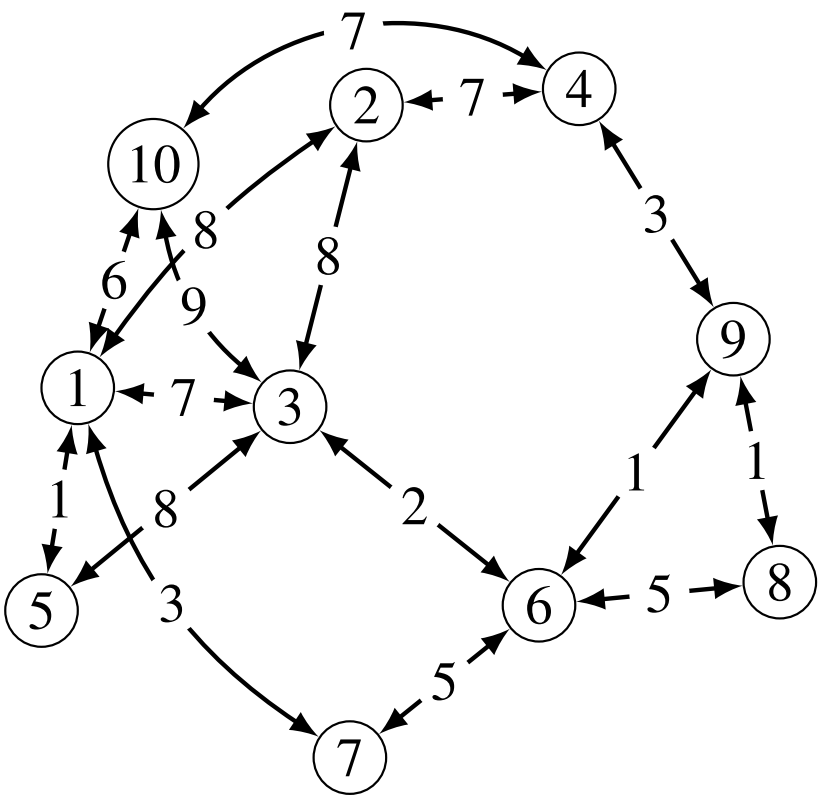
Kruskal's Minimum Spanning Tree



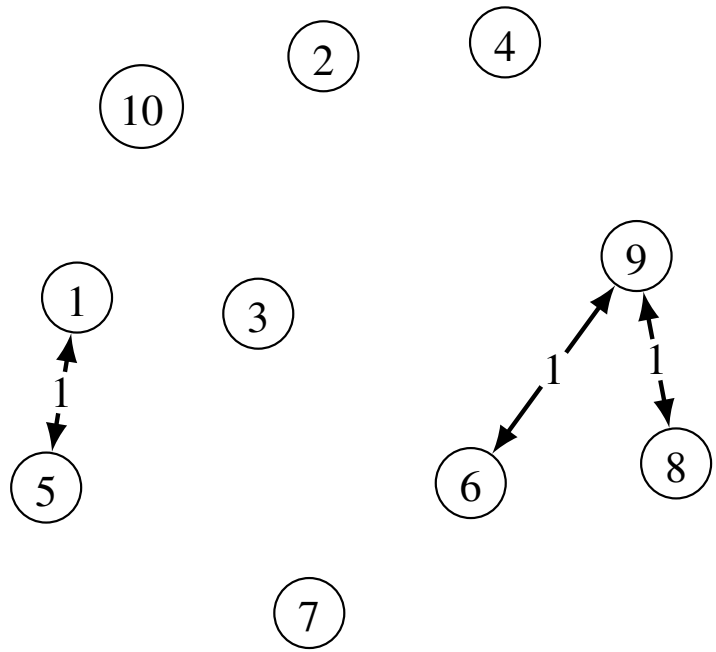
Nach Verarbeiten von 6-9:



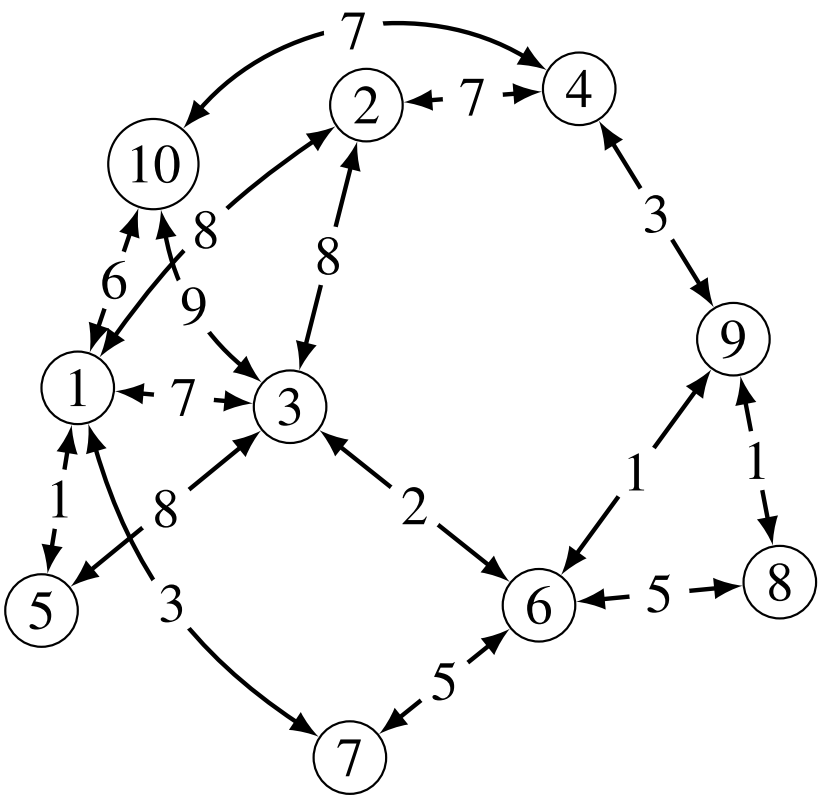
Kruskal's Minimum Spanning Tree



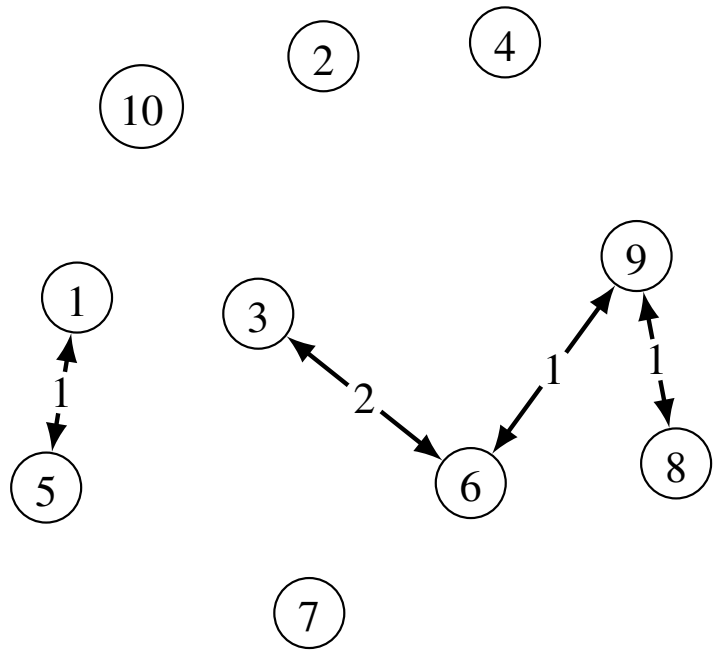
Nach Verarbeiten von 8-9:



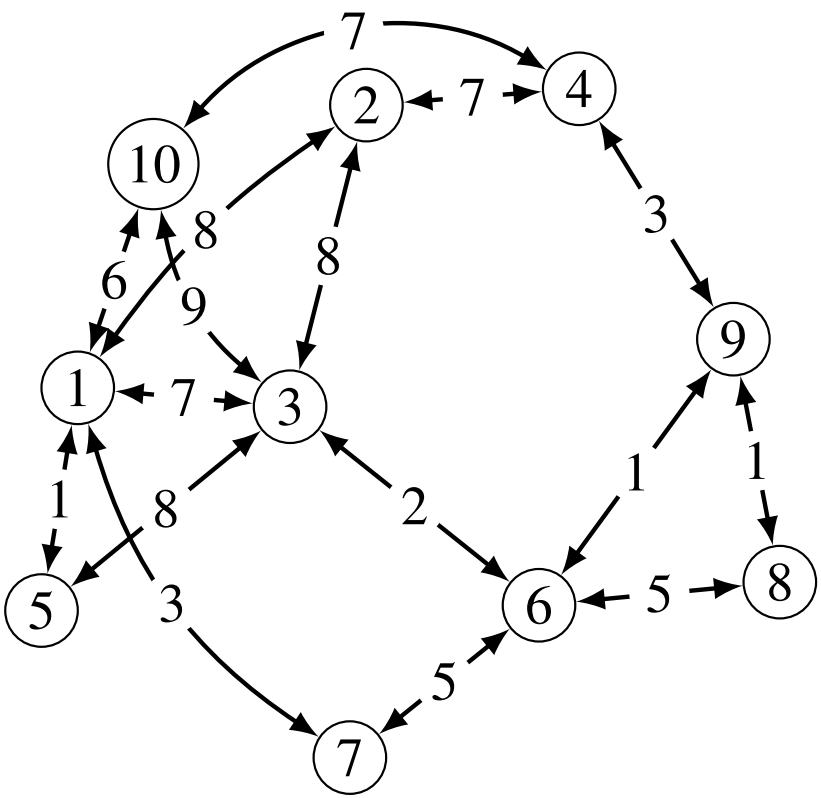
Kruskal's Minimum Spanning Tree



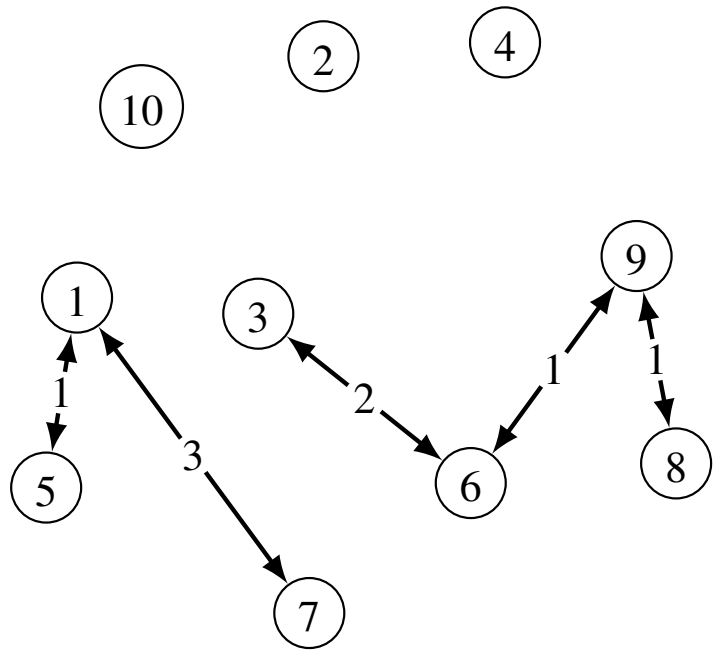
Nach Verarbeiten von 3-6:



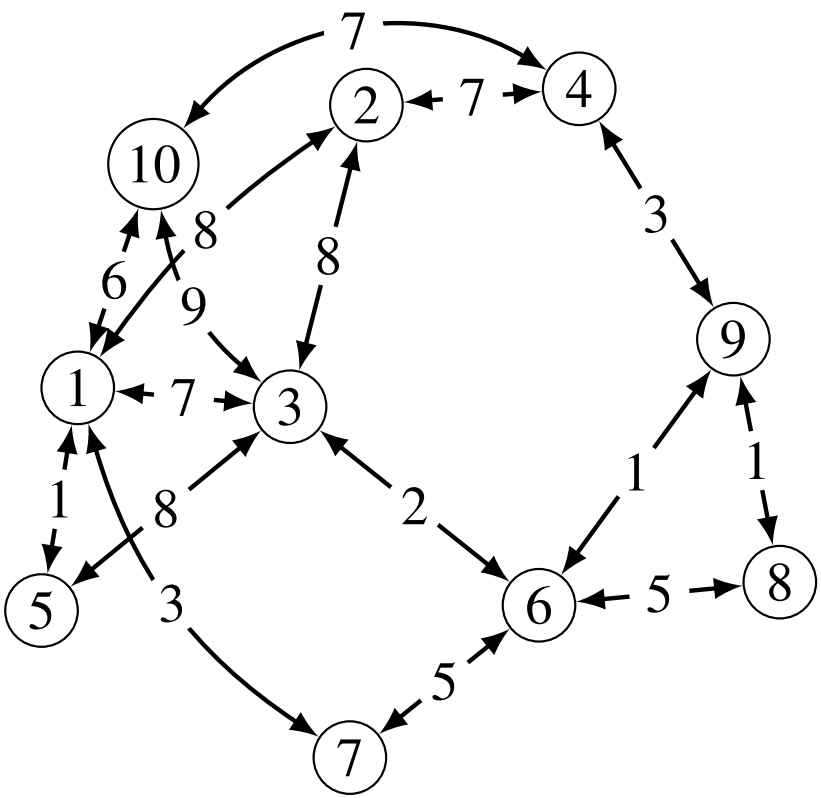
Kruskal's Minimum Spanning Tree



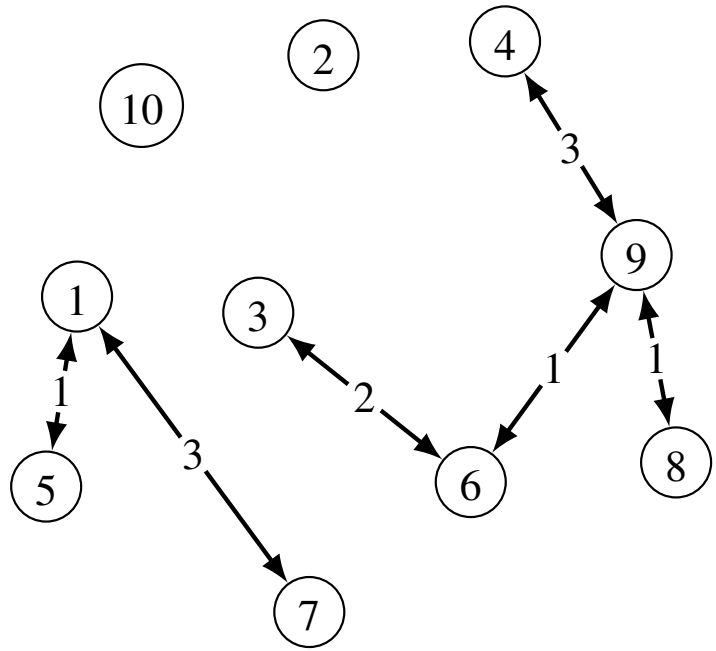
Nach Verarbeiten von 1-7:



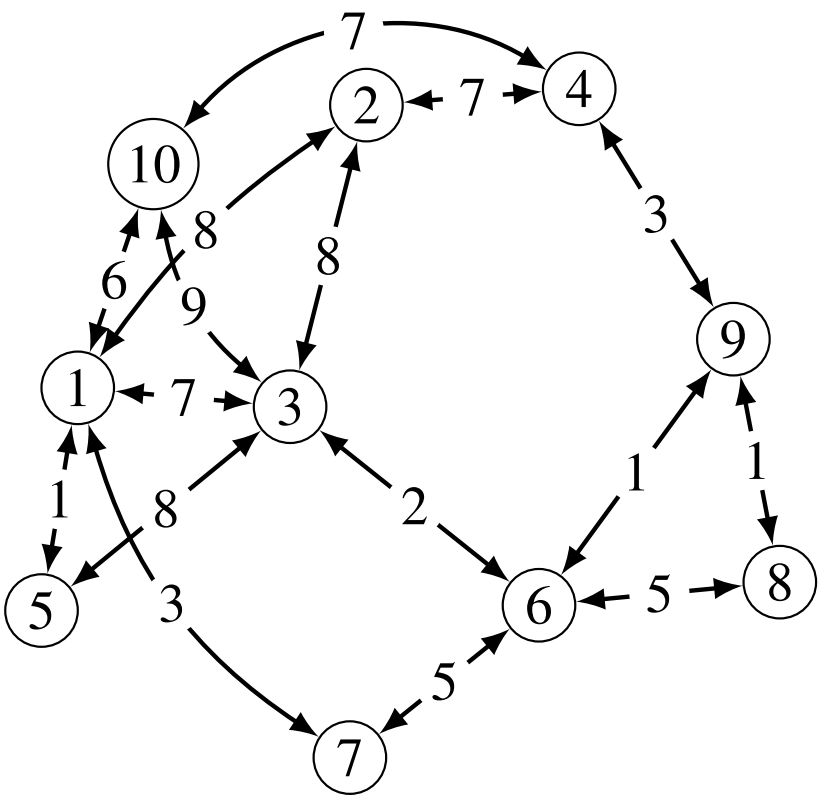
Kruskal's Minimum Spanning Tree



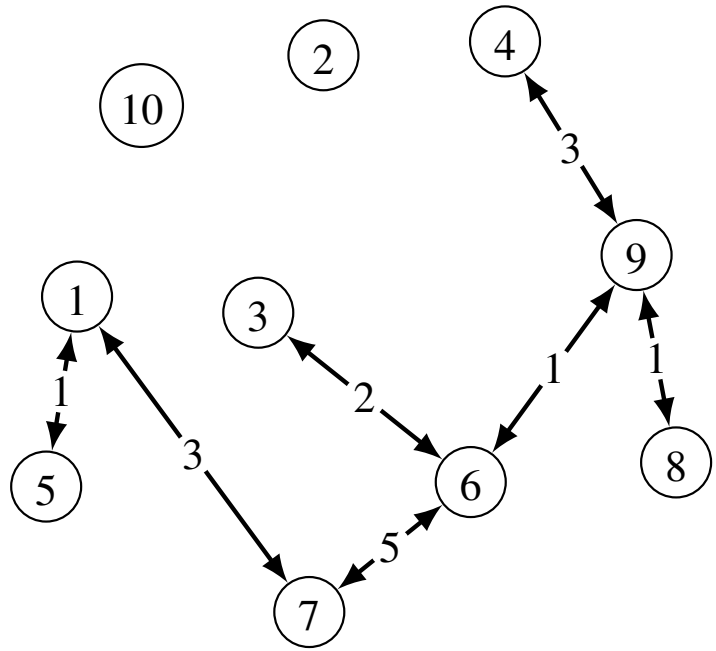
Nach Verarbeiten von 4-9:



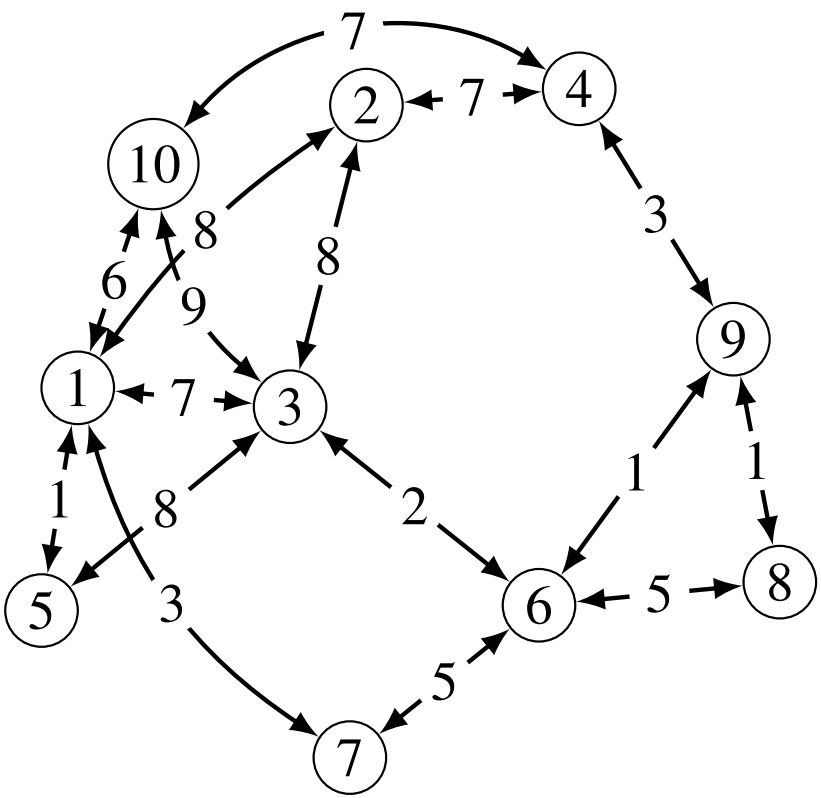
Kruskal's Minimum Spanning Tree



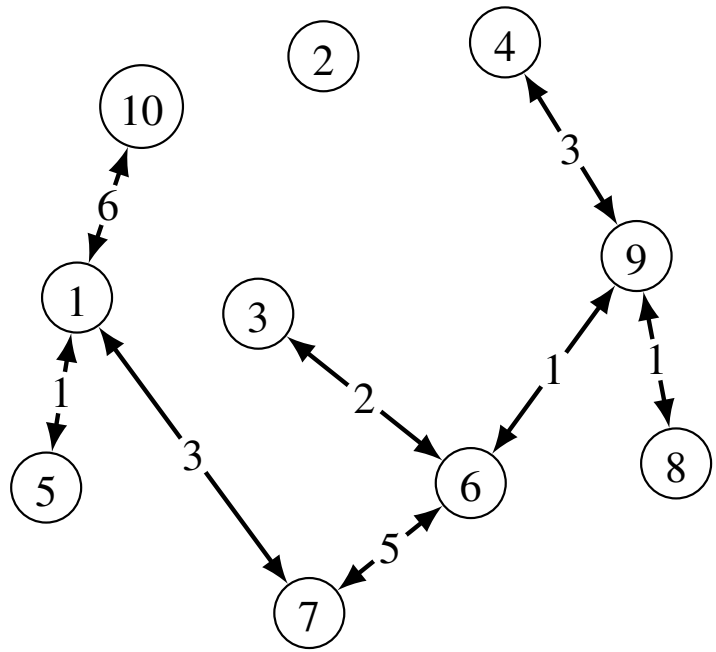
Nach Verarbeiten von 6-7:



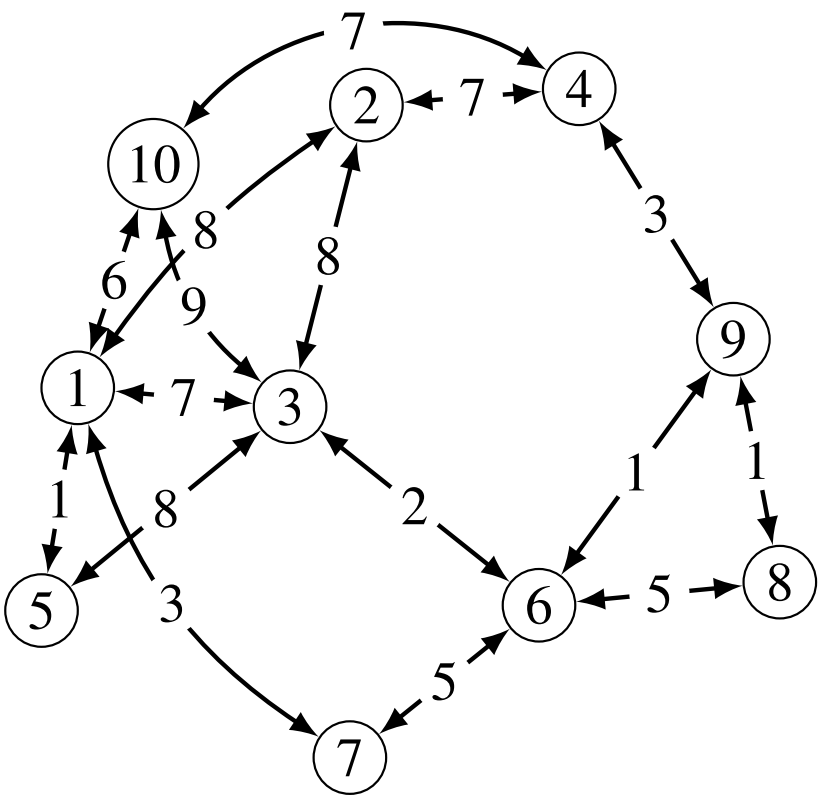
Kruskal's Minimum Spanning Tree



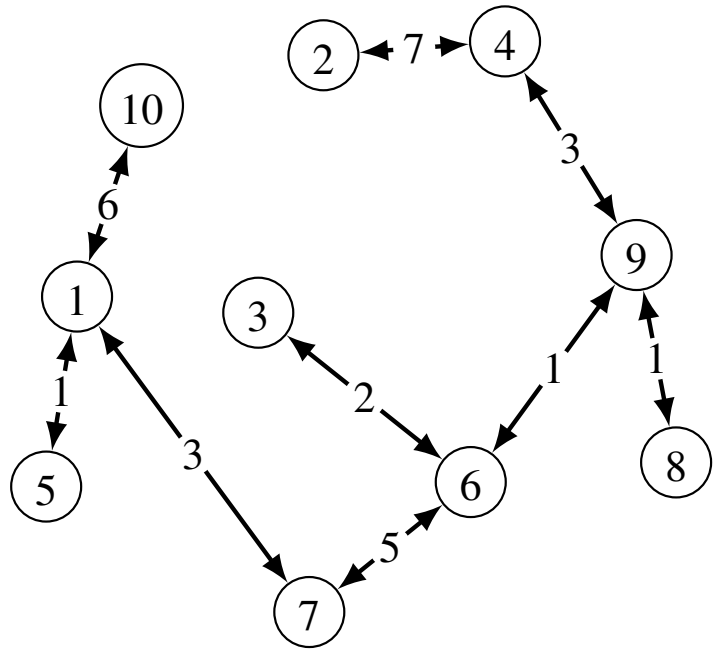
Nach Verarbeiten von 1-10:



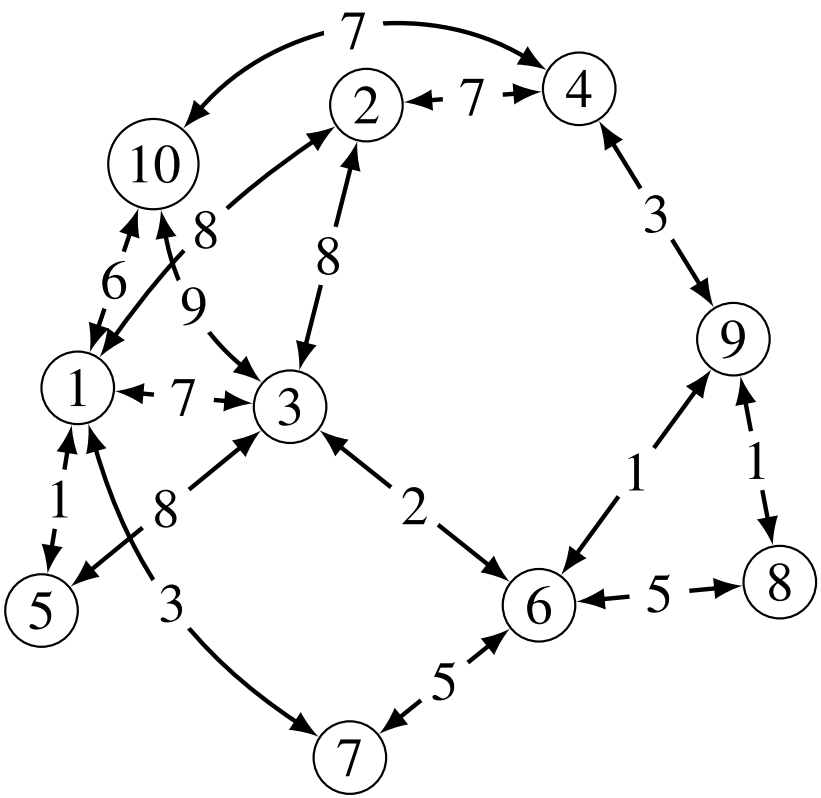
Kruskal's Minimum Spanning Tree



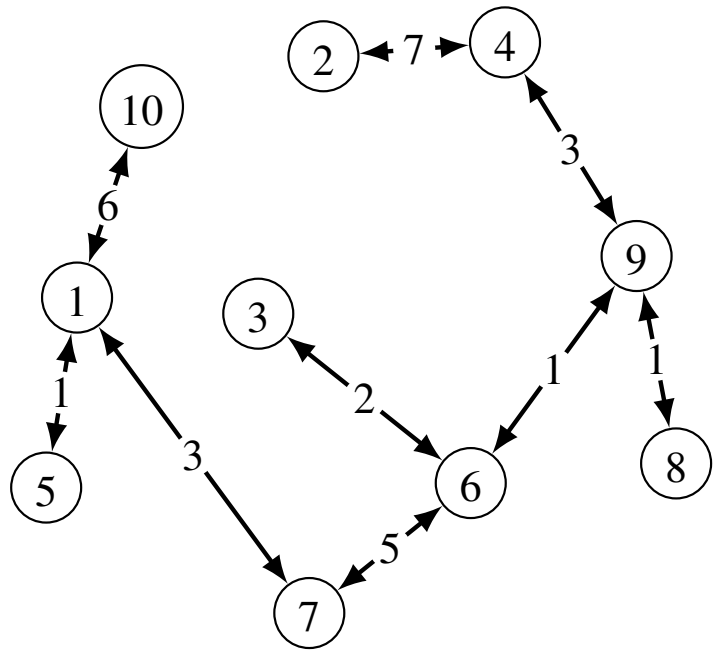
Nach Verarbeiten von 2-4:



Kruskal's Minimum Spanning Tree



Nach Verarbeiten von 2-4:



Gesamtkosten des Spannbaumes: 29

Dieser MST war eindeutig: Es gab keine Kanten mit gleichen Kosten, die zu unterschiedlichen MSTs geführt hätten.

Graphalgorithmen – Anwendungsgebiete

Graphalgorithmen tauchen überall auf!

- Routenplaner: kürzeste/schnellste (Straßen, MVV, ...)
- Computerspiele: Wegplanung (Gefahren, Hindernisse, ...)
- Planung von Netzwerken (Transport, Internet, Funk, ...)
- Empfehlung von Produkten, Freunden, Webseiten, ...
- Suche von Lösungen in anderen Problemen (z.B. Computeralgebrasysteme, Automatic Reasoning)

Beliebter Ansatz um ein neues Problem zu lösen:
1. Als Graph formulieren (z.B. Baum aller möglichen Lösungsansätze)
2. Einen Graphalgorithmus wie Dijkstra verwenden um bspw. die einfachste (kürzeste) Lösung zu finden.