Dijkstra's Shortest Path Algorithm
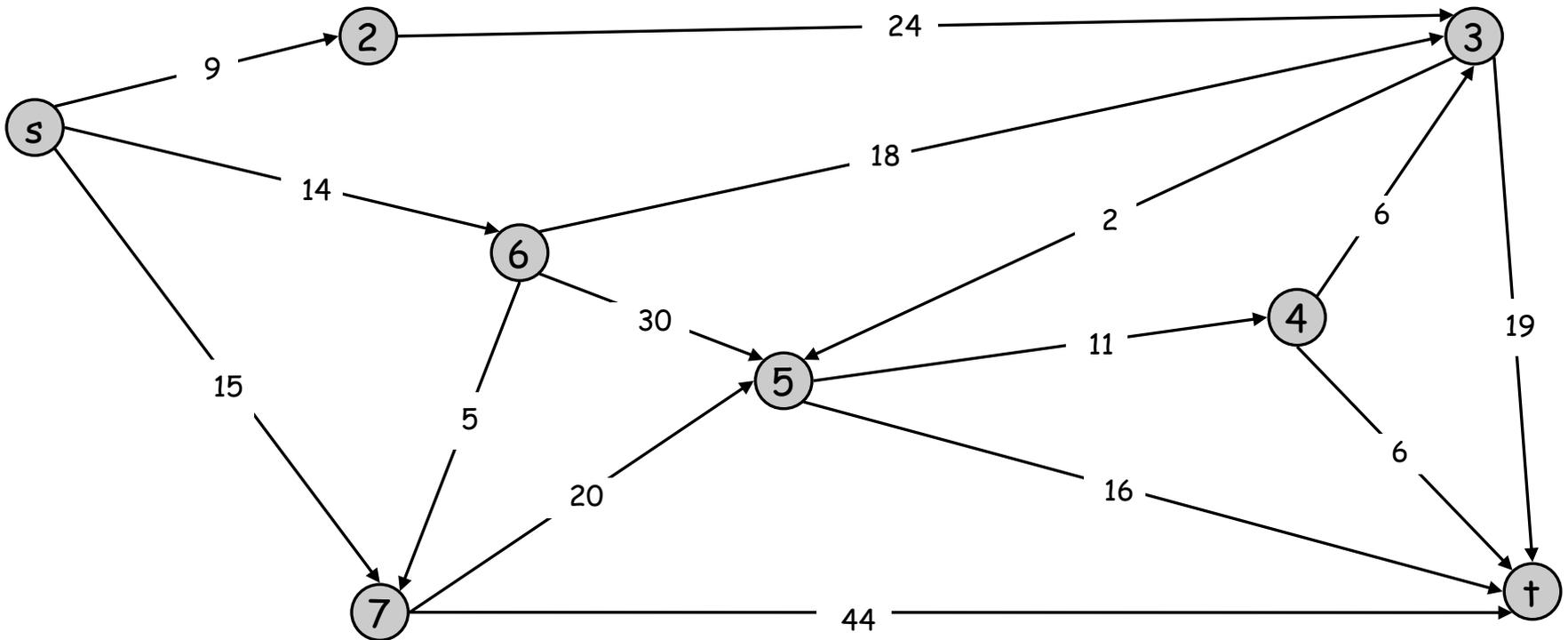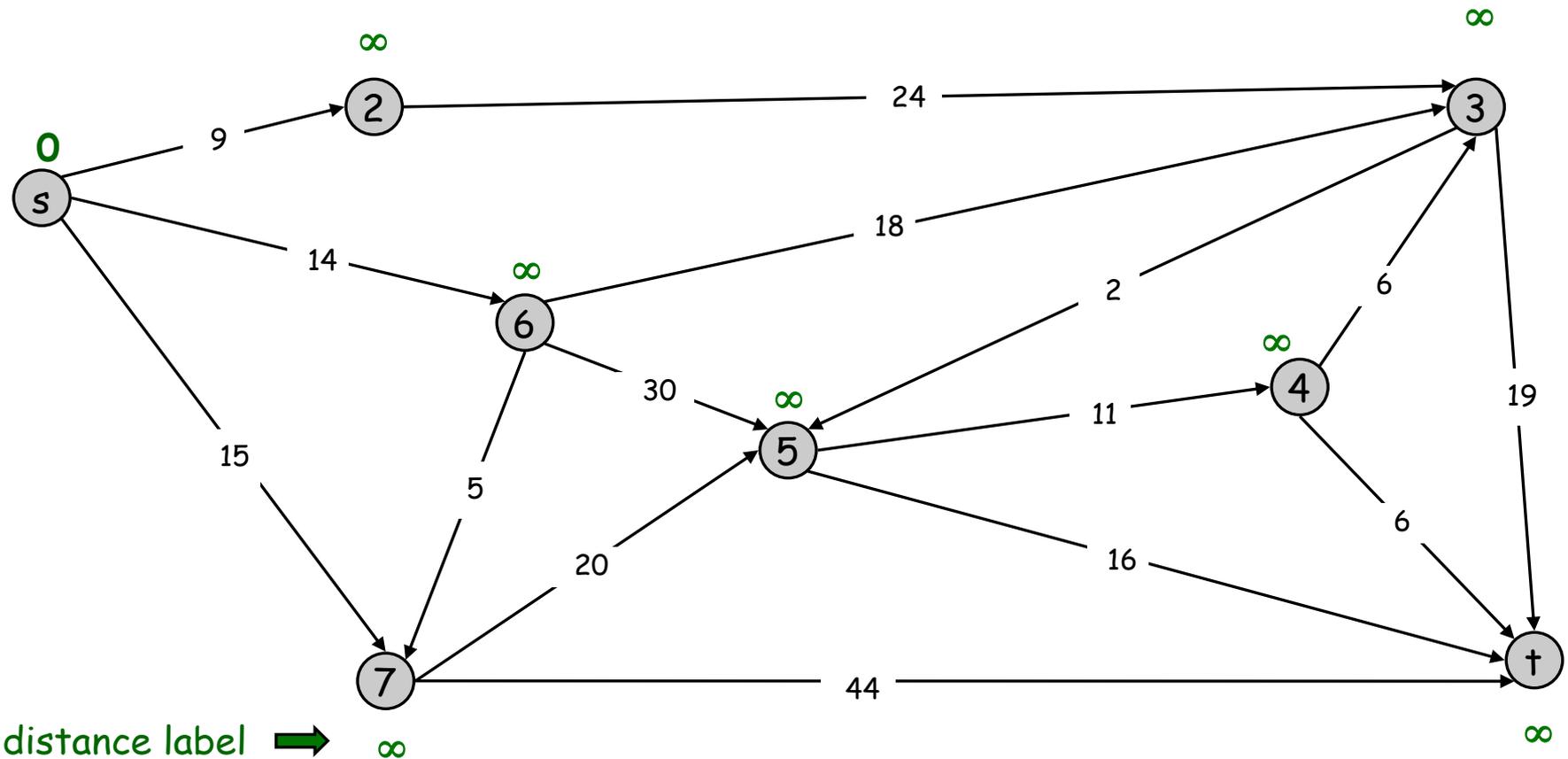
Find shortest path from s to t.

Dijkstra's Shortest Path Algorithm

S = { }
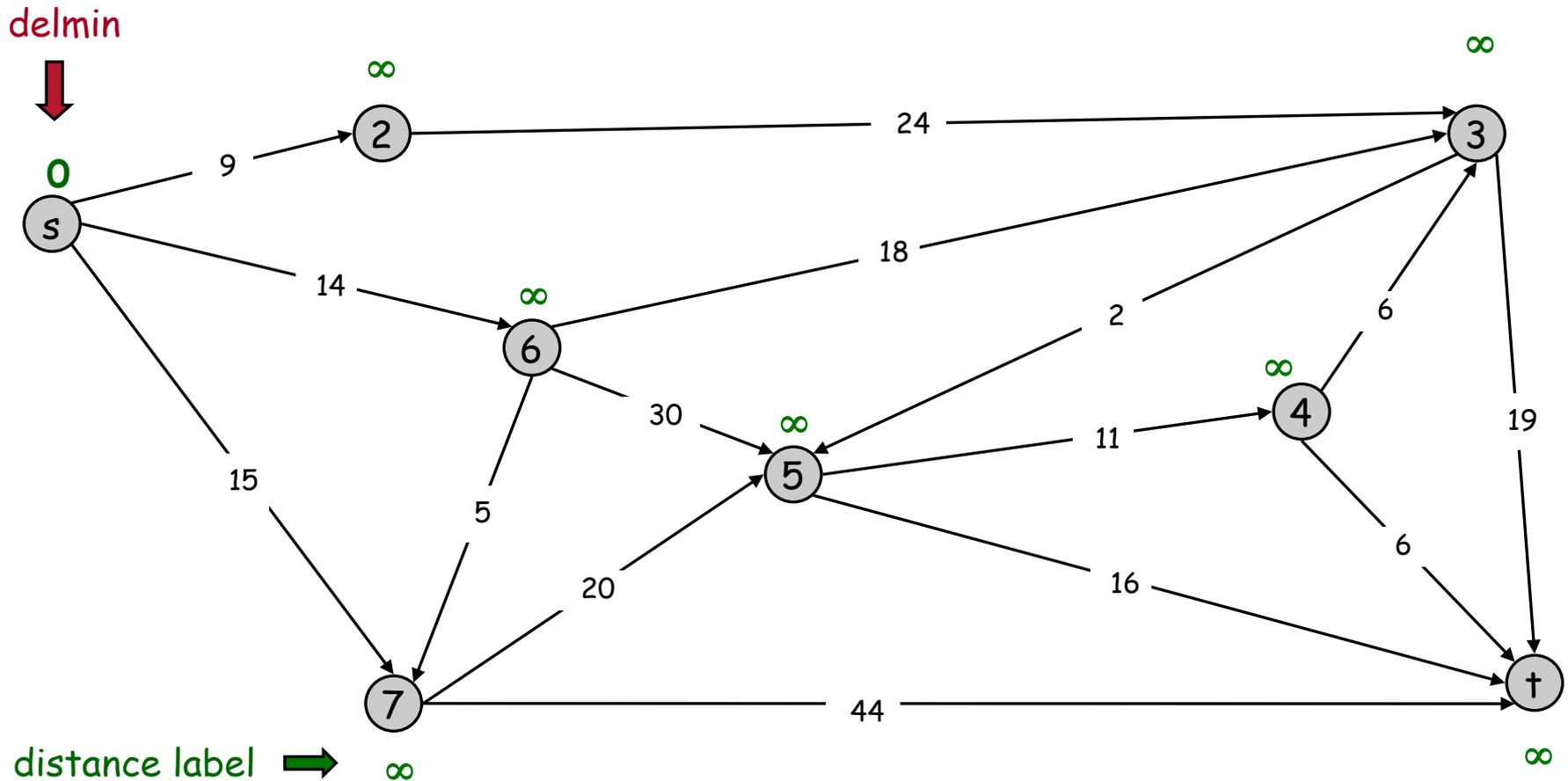PQ = { s, 2, 3, 4, 5, 6, 7, t }

distance label ➡

Dijkstra's Shortest Path Algorithm

S = { }
PQ = { s, 2, 3, 4, 5, 6, 7, t }

Dijkstra's Shortest Path Algorithm

S = { s }
PQ = { 2, 3, 4, 5, 6, 7, t }

decrease key

∞ 9
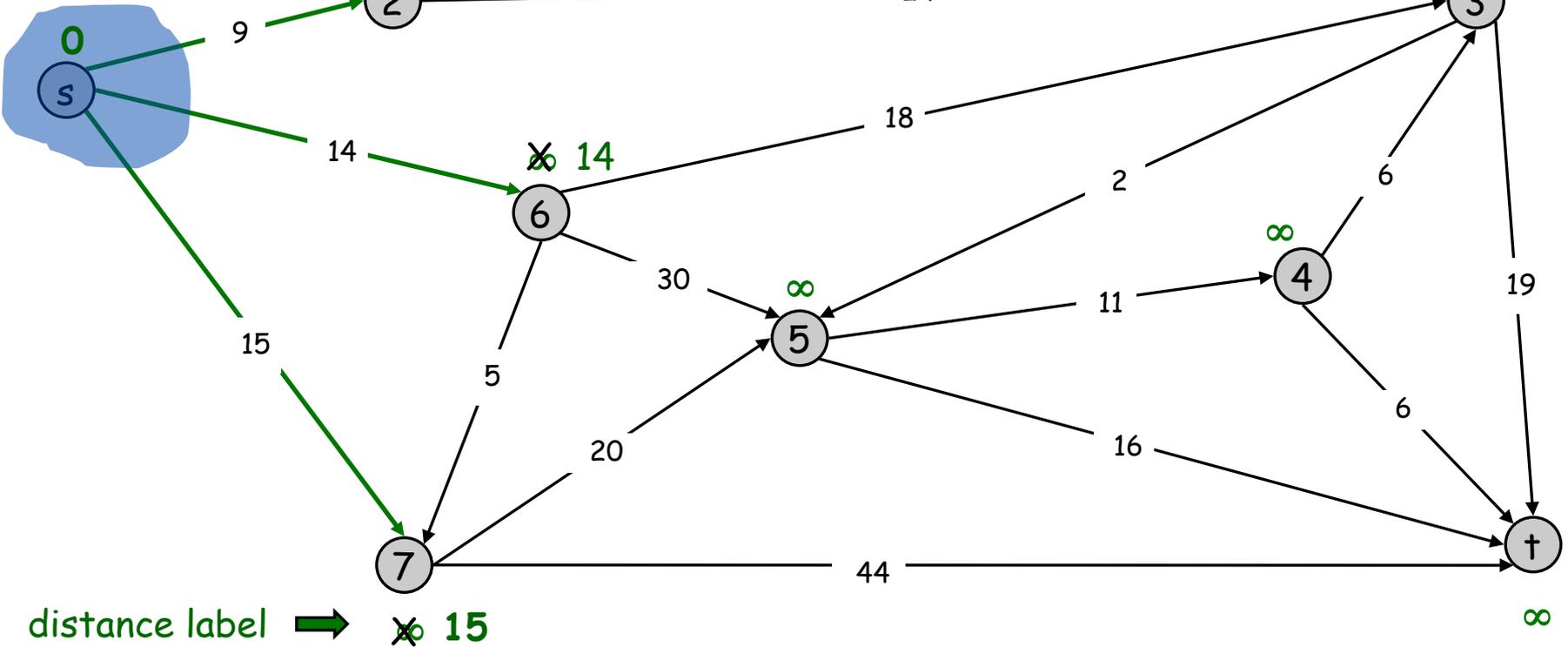
∞

24

0

9

2

18

14

∞ 14

2

6

6

4

∞

30

∞

11

5

5

19

20

16

6

15

7

44

t

distance label

∞ 15

∞

4

Dijkstra's Shortest Path Algorithm

S = { s }
PQ = { 2, 3, 4, 5, 6, 7, t }

delmin

✗ 9

∞

0

s

9

2

24

3

18

14

✗ 14

6

2

6

∞

30

∞

5

11

4

6

15

5

20

16

19

7

44

t

distance label ➡ ✗ **15**

∞

Dijkstra's Shortest Path Algorithm

S = { s, 2 }
PQ = { 3, 4, 5, 6, 7, t }

Dijkstra's Shortest Path Algorithm

S = { s, 2 }
PQ = { 3, 4, 5, 6, 7, t }
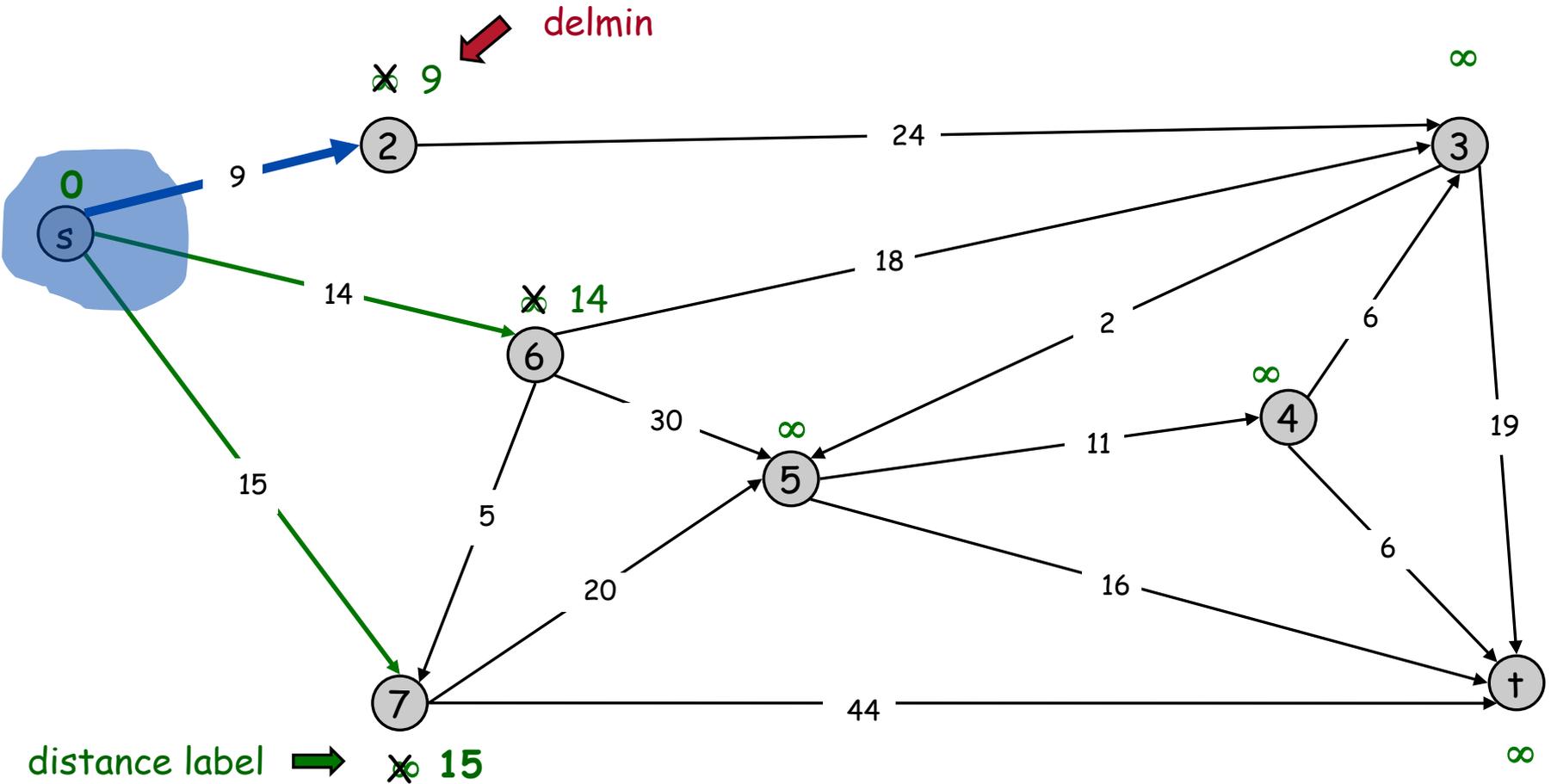
decrease key

Dijkstra's Shortest Path Algorithm

S = { s, 2 }
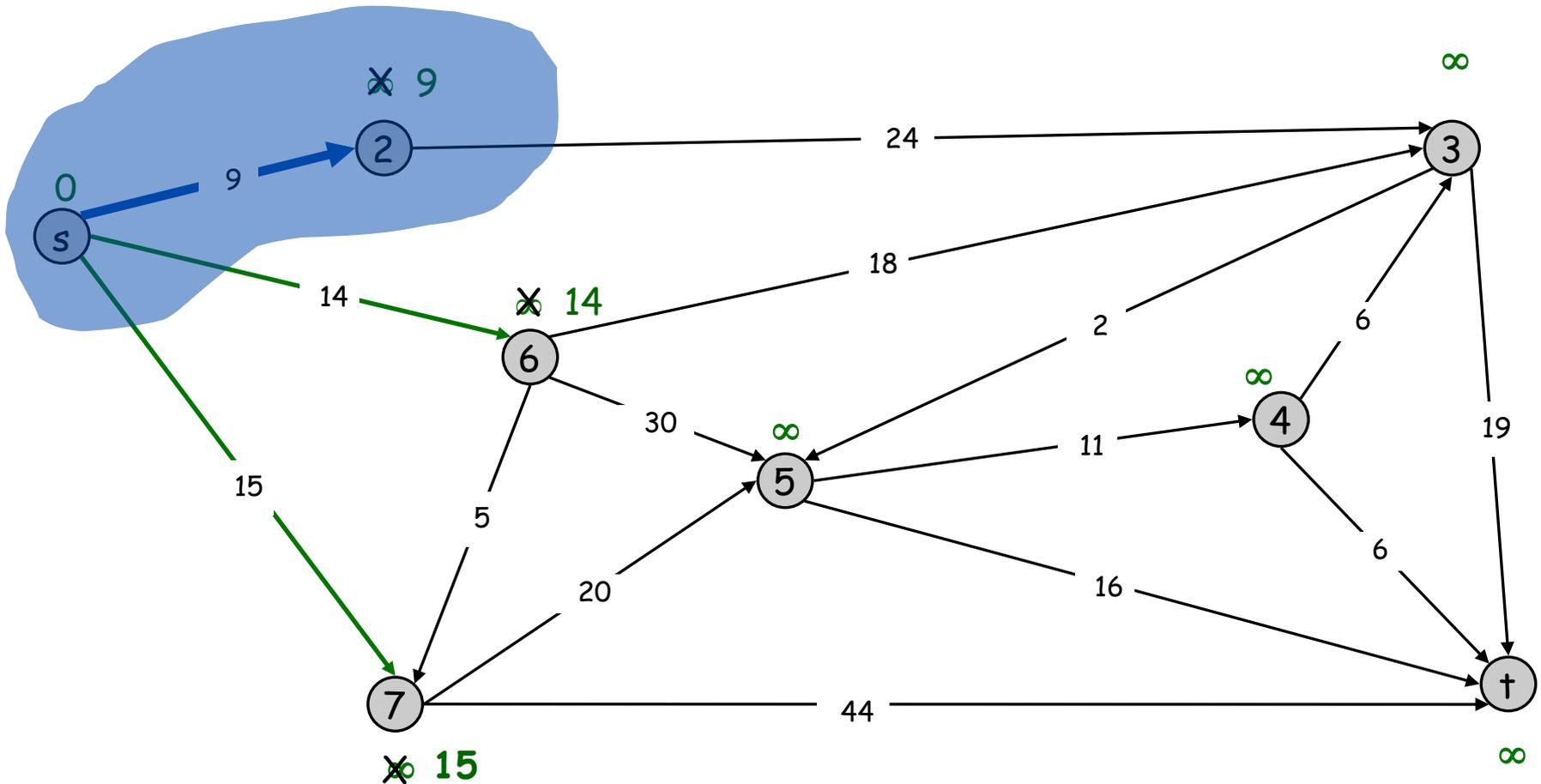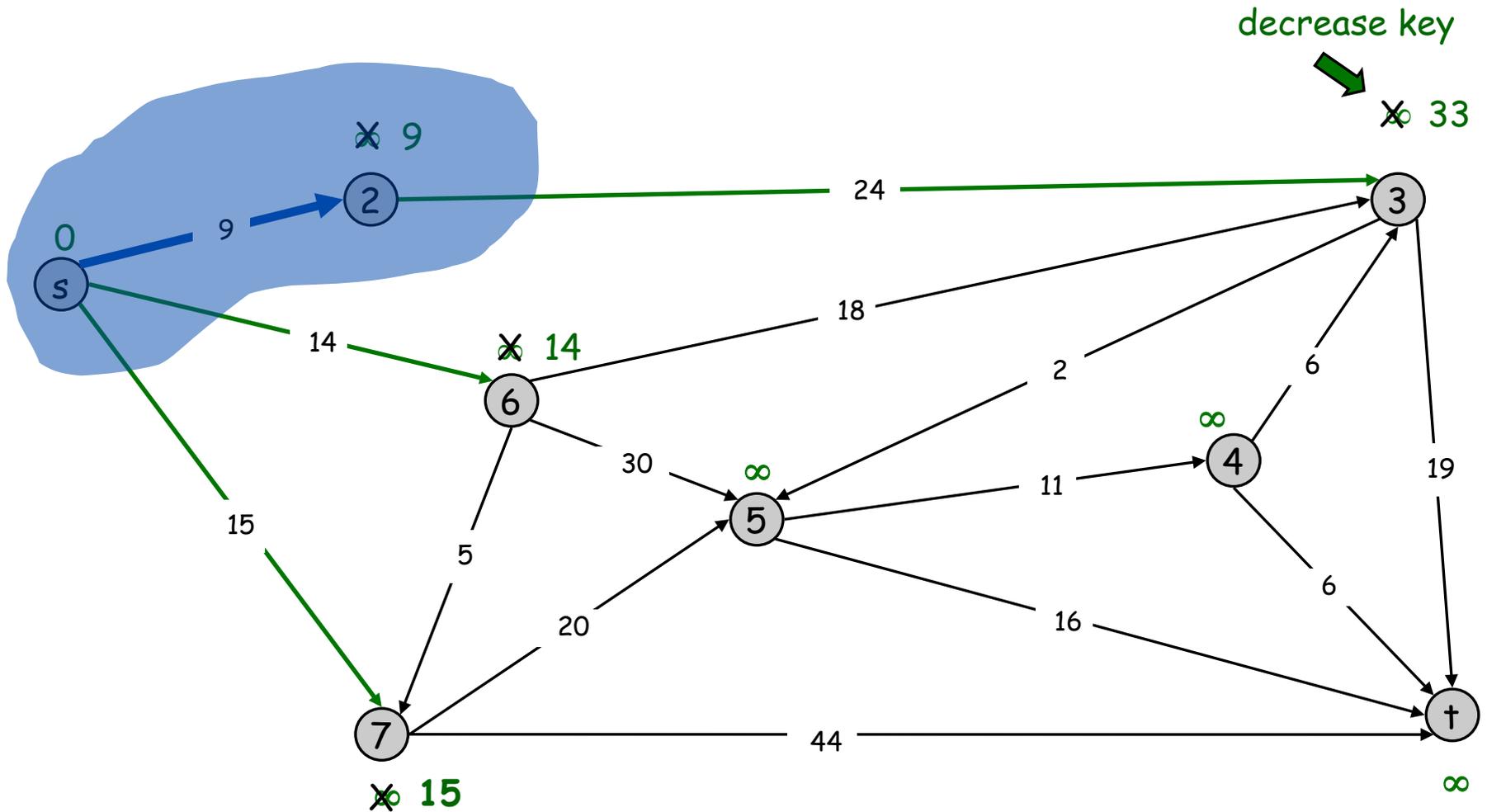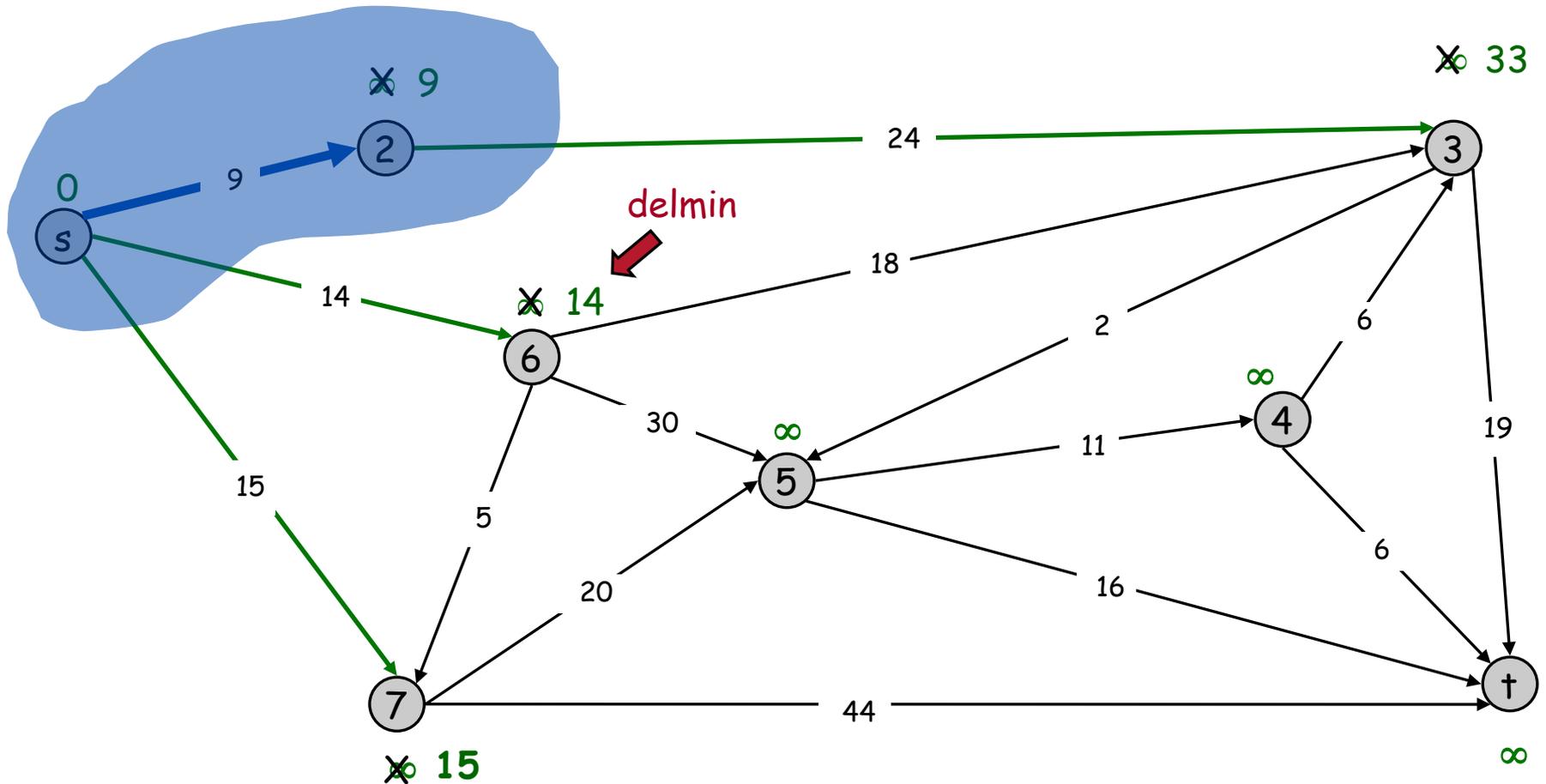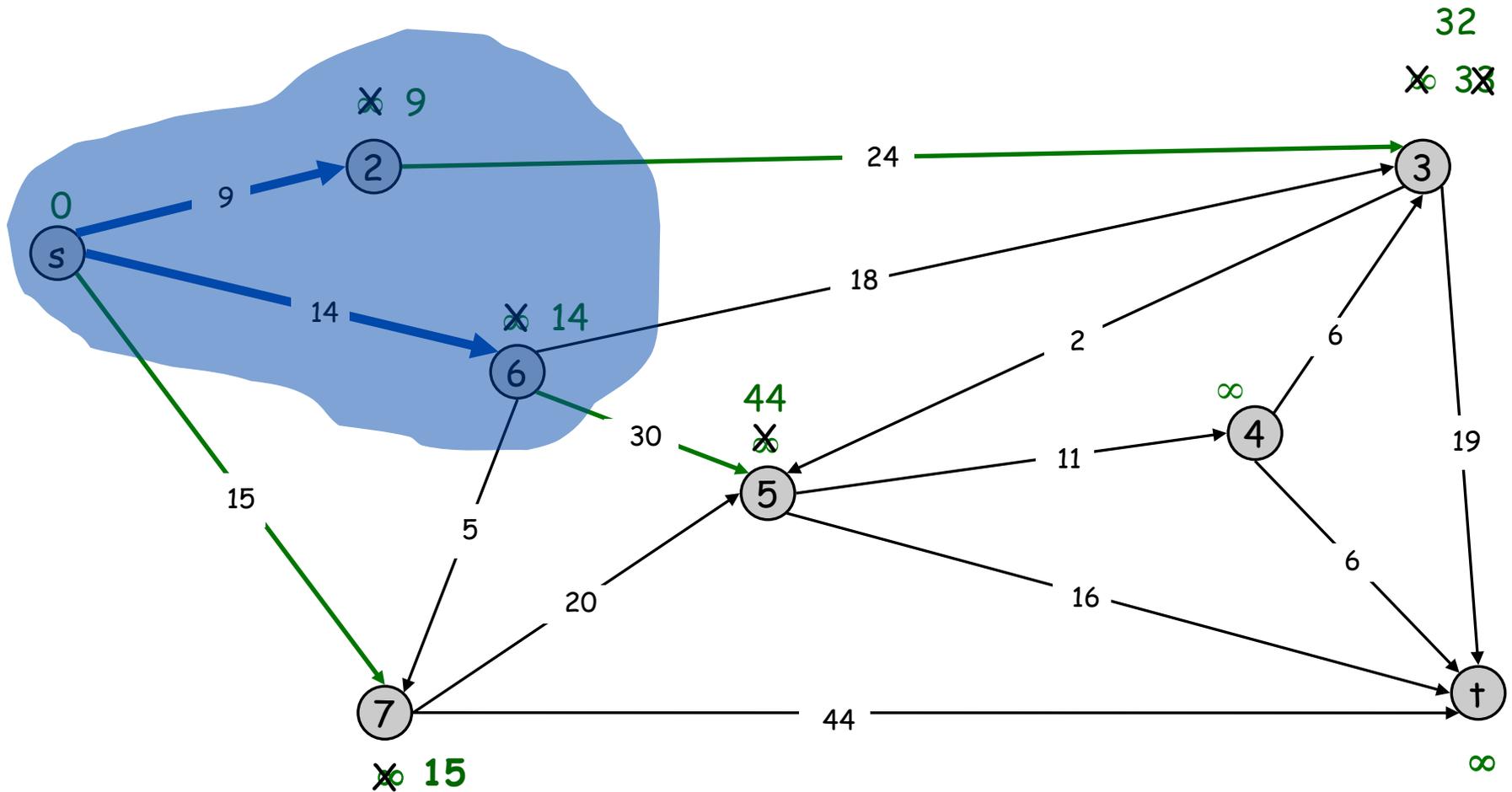PQ = { 3, 4, 5, 6, 7, † }

Dijkstra's Shortest Path Algorithm

S = { s, 2, 6 }
PQ = { 3, 4, 5, 7, t }

Dijkstra's Shortest Path Algorithm

S = { s, 2, 6 }
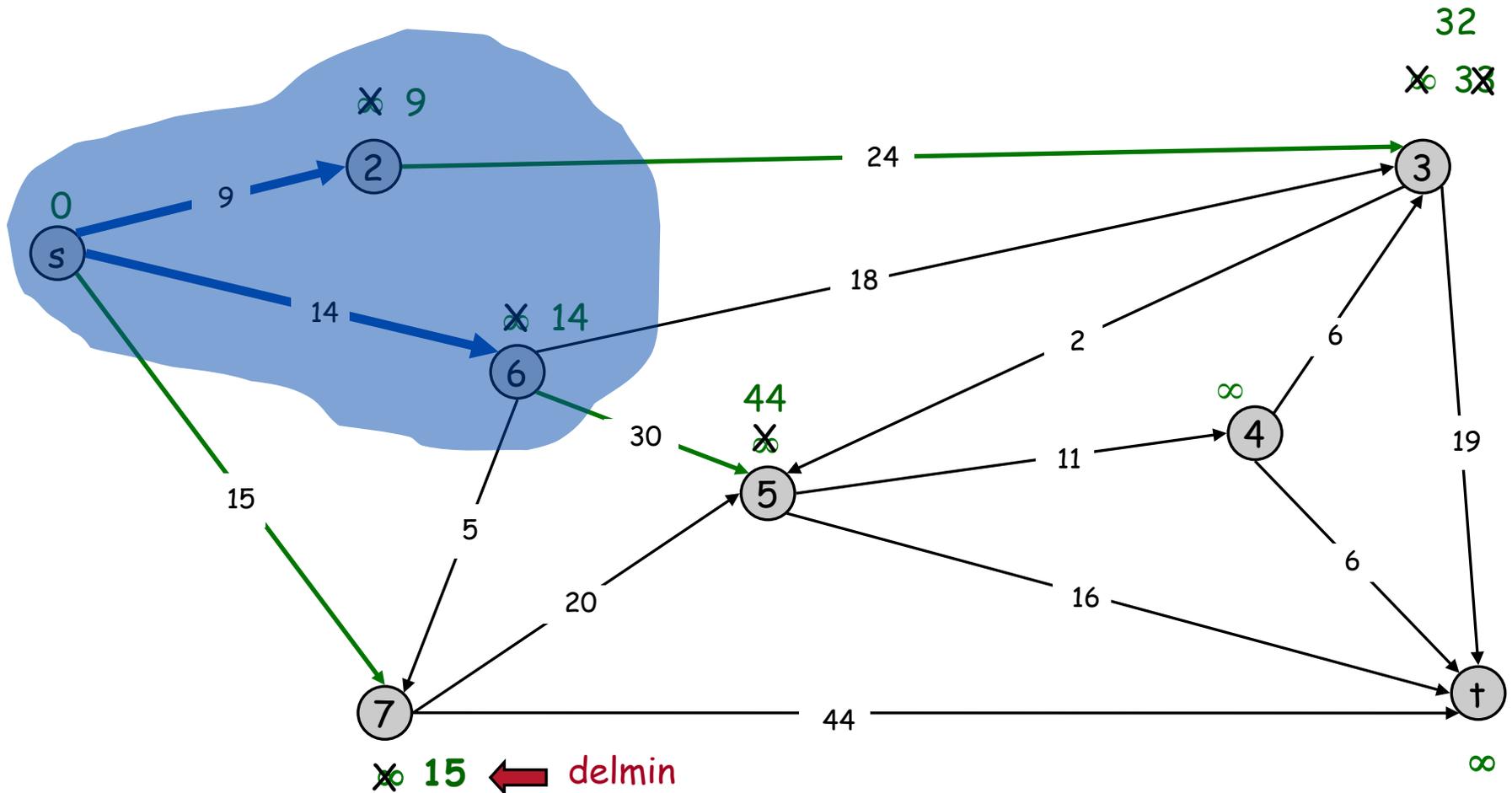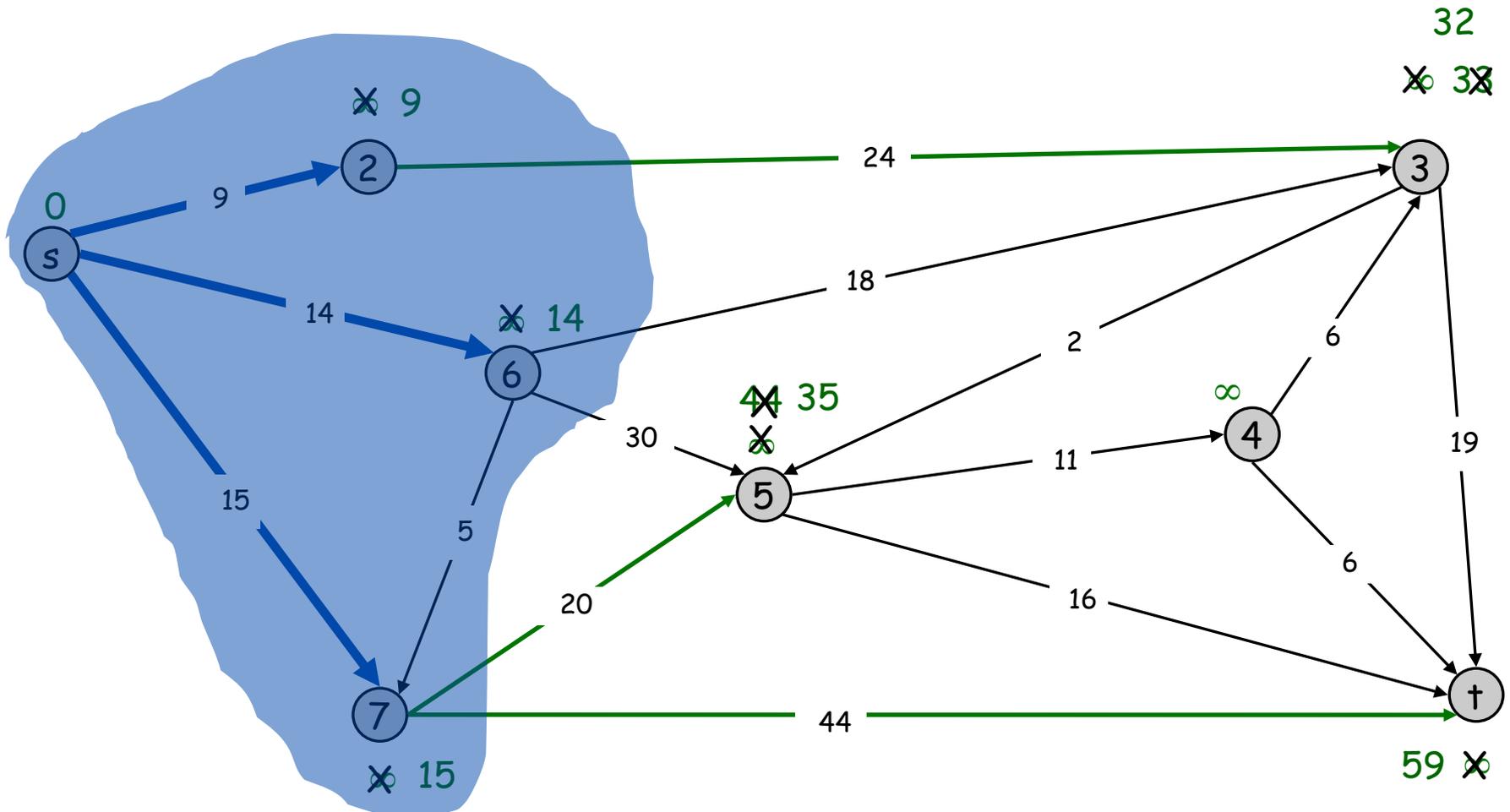PQ = { 3, 4, 5, 7, t }

32
✗ 3✗

✗ 9
2

0
s

24
3

9

18

14
✗ 14
6
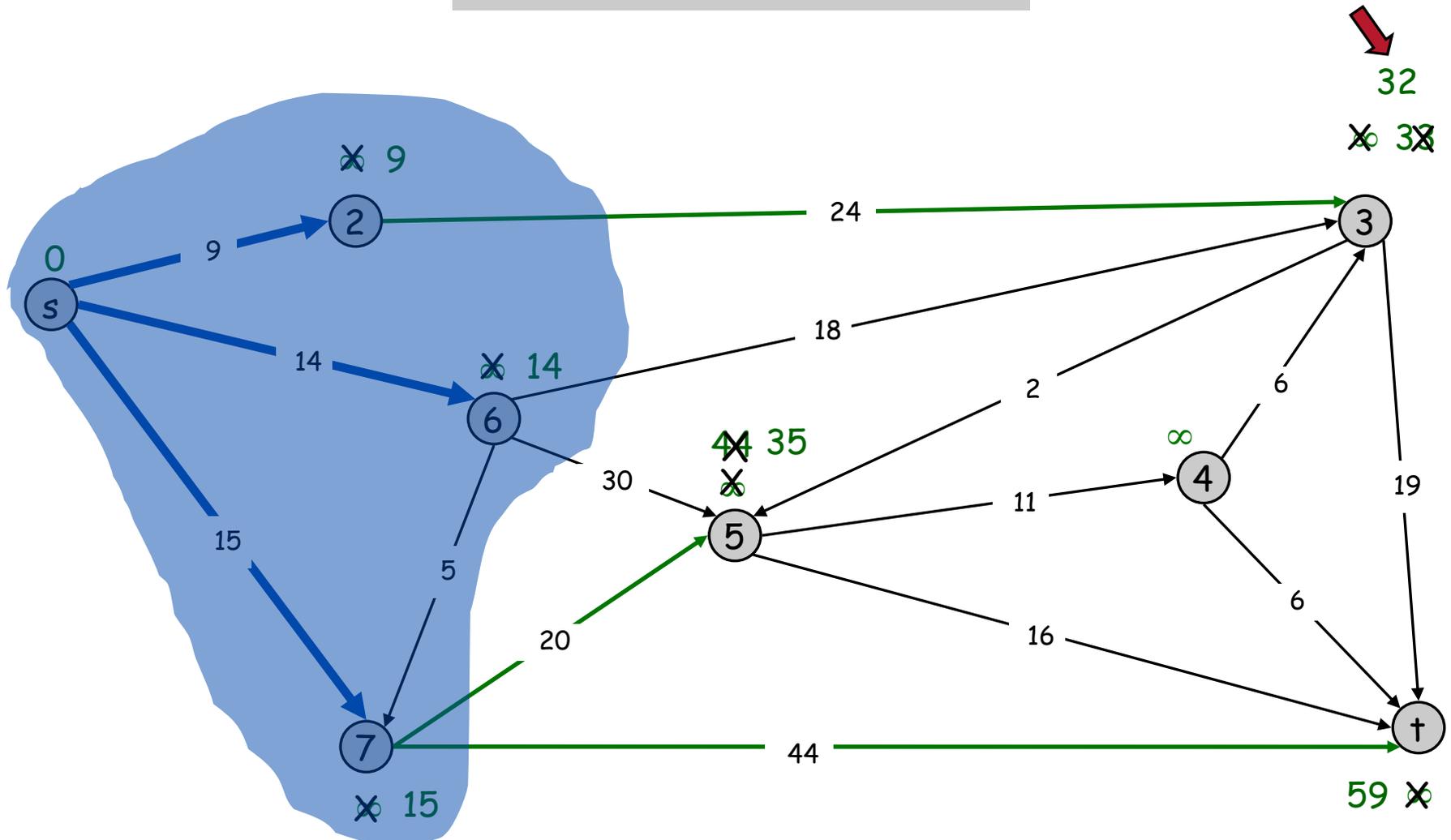
2

6

44
✗

∞
4

30

11

19

5

15

5

6

20

16

7

44

t

✗ 15 ⬅ delmin

∞

Dijkstra's Shortest Path Algorithm

S = { s, 2, 6, 7 }
PQ = { 3, 4, 5, t }

Dijkstra's Shortest Path Algorithm
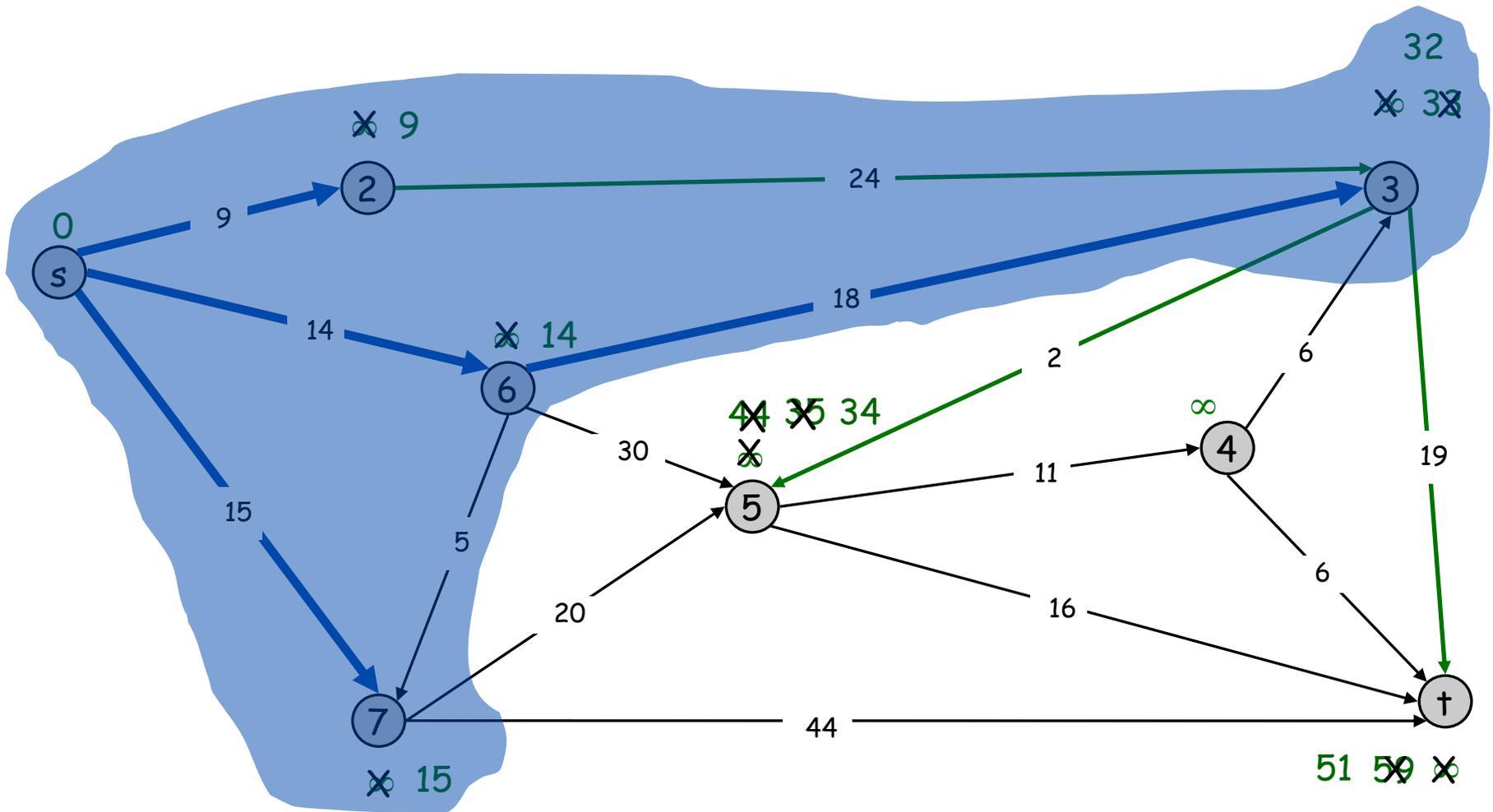
S = { s, 2, 6, 7 }
PQ = { 3, 4, 5, t }

delmin

32

3̶6̶ 3̶5̶

9̶ 9

24

3

0

s

9

2

18

14

14

6

2

6

4̶4̶ 35

∞

4

30

5

11

19

15

5

6

20

16

7

44

t

15

59

12

Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 6, 7 }
PQ = { 4, 5, t }

32

✗ 3̶2̶

✗ 9

2 ———— 24 ———— 3

0

9

s

14 ———— 18

6

2

6

✗ 14

4̶4̶ 3̶5̶ 34

∞

4

30

✗

11

5

19

15

5

6

20

16

7 ———— 44 ———— t

✗ 15

51 5̶9̶ ✗

13

Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 6, 7 }
PQ = { 4, 5, t }

Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 5, 6, 7 }
PQ = { 4, t }

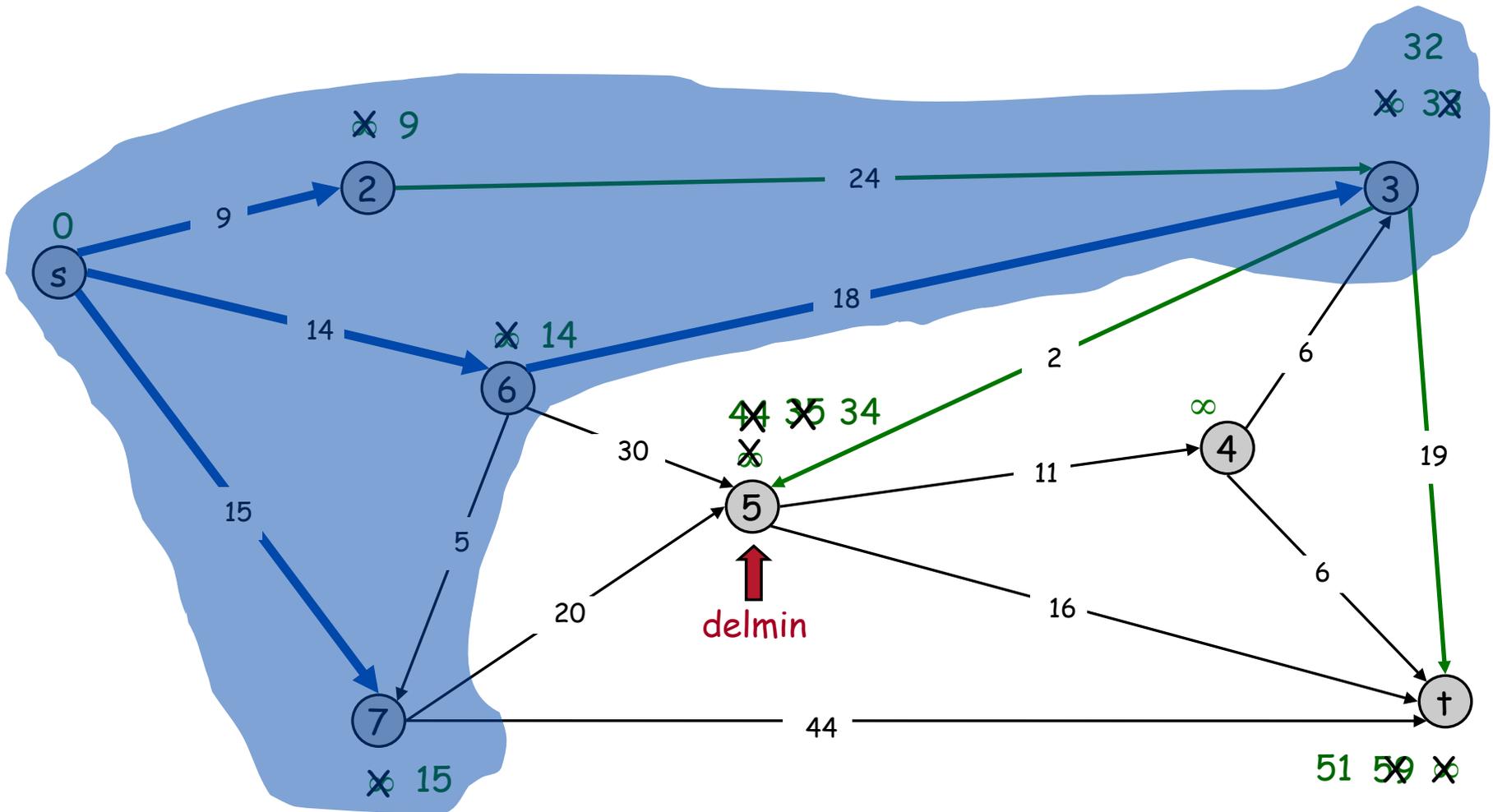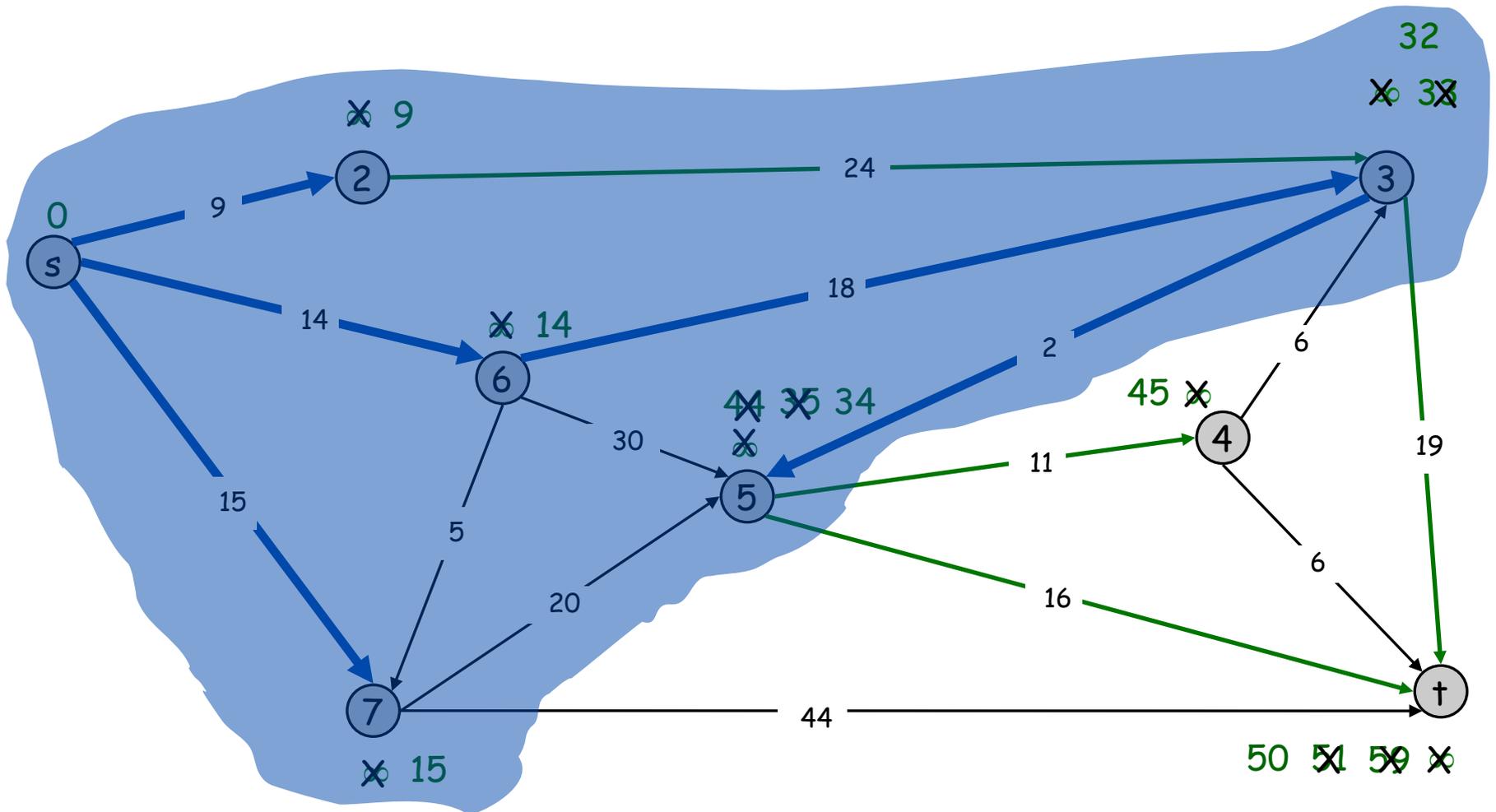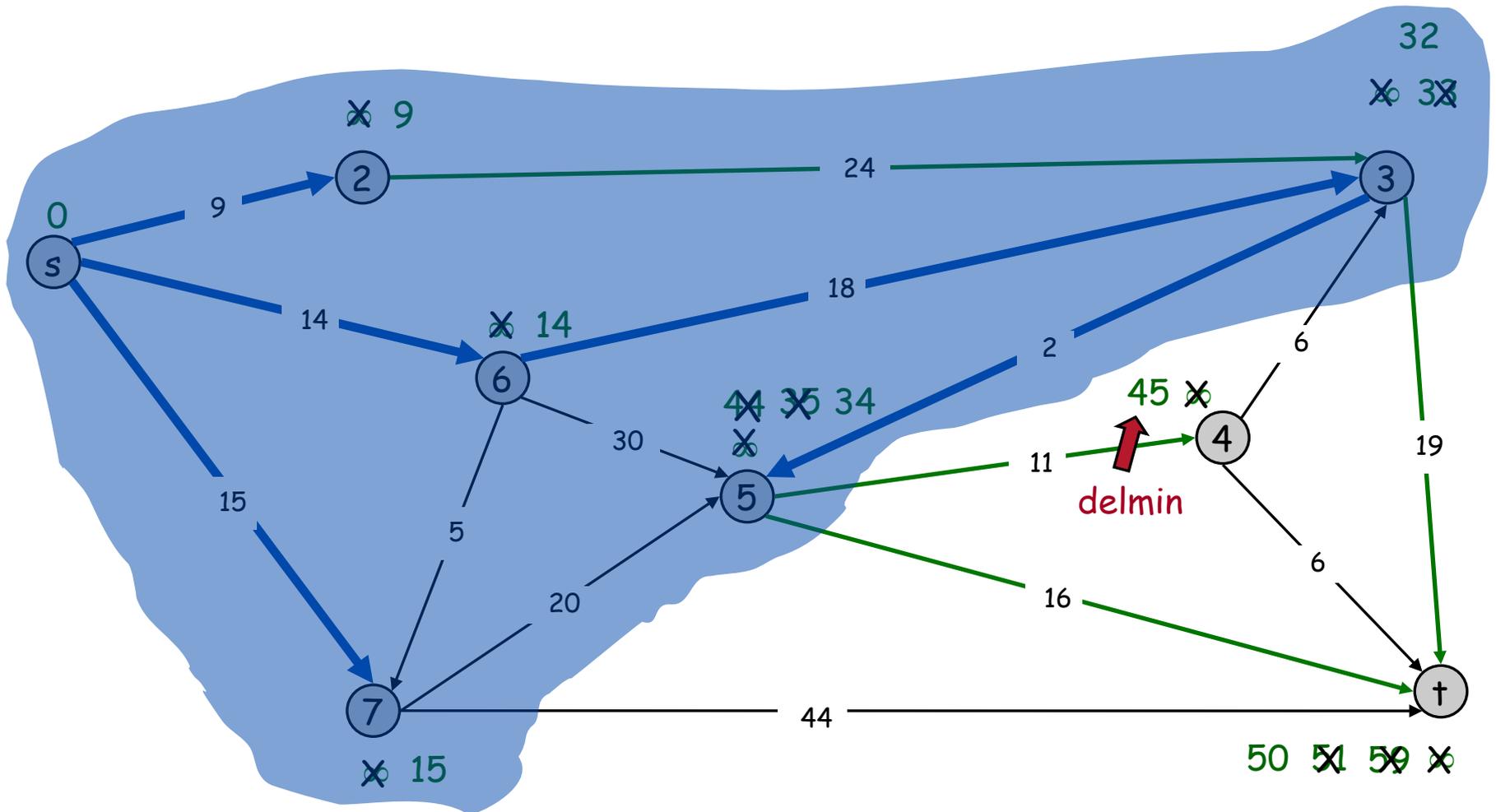# Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 5, 6, 7 }
PQ = { 4, t }

32

✗ 3✗

✗ 9

24

0

9

s

14

18

2

✗ 14

6

6

45 ✗

✗✗ ✗ 34

4

30

delmin

19

5

11

5

16

6

15

20

7

44

t

✗ 15

50 ✗✗ ✗✗ ✗

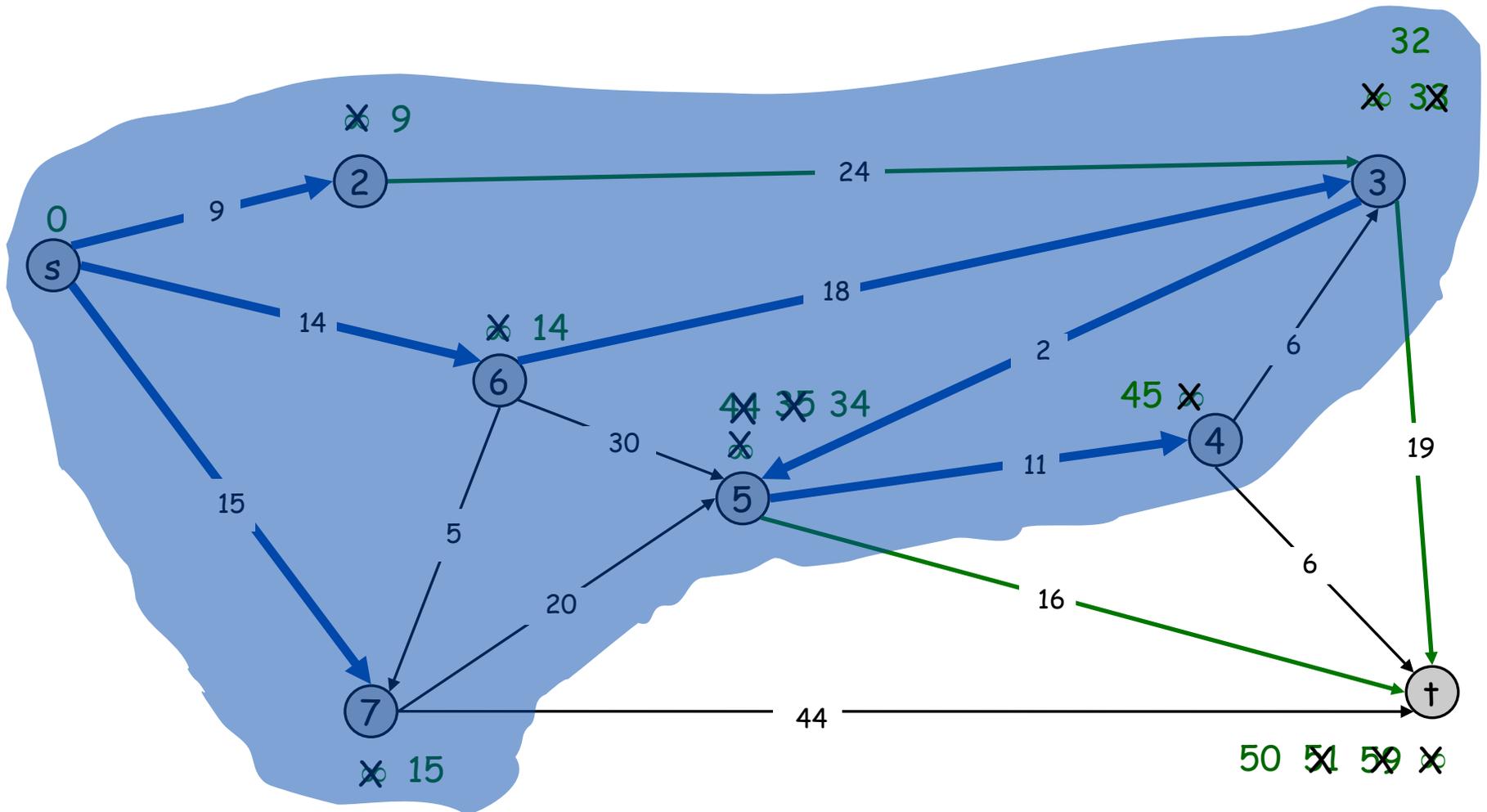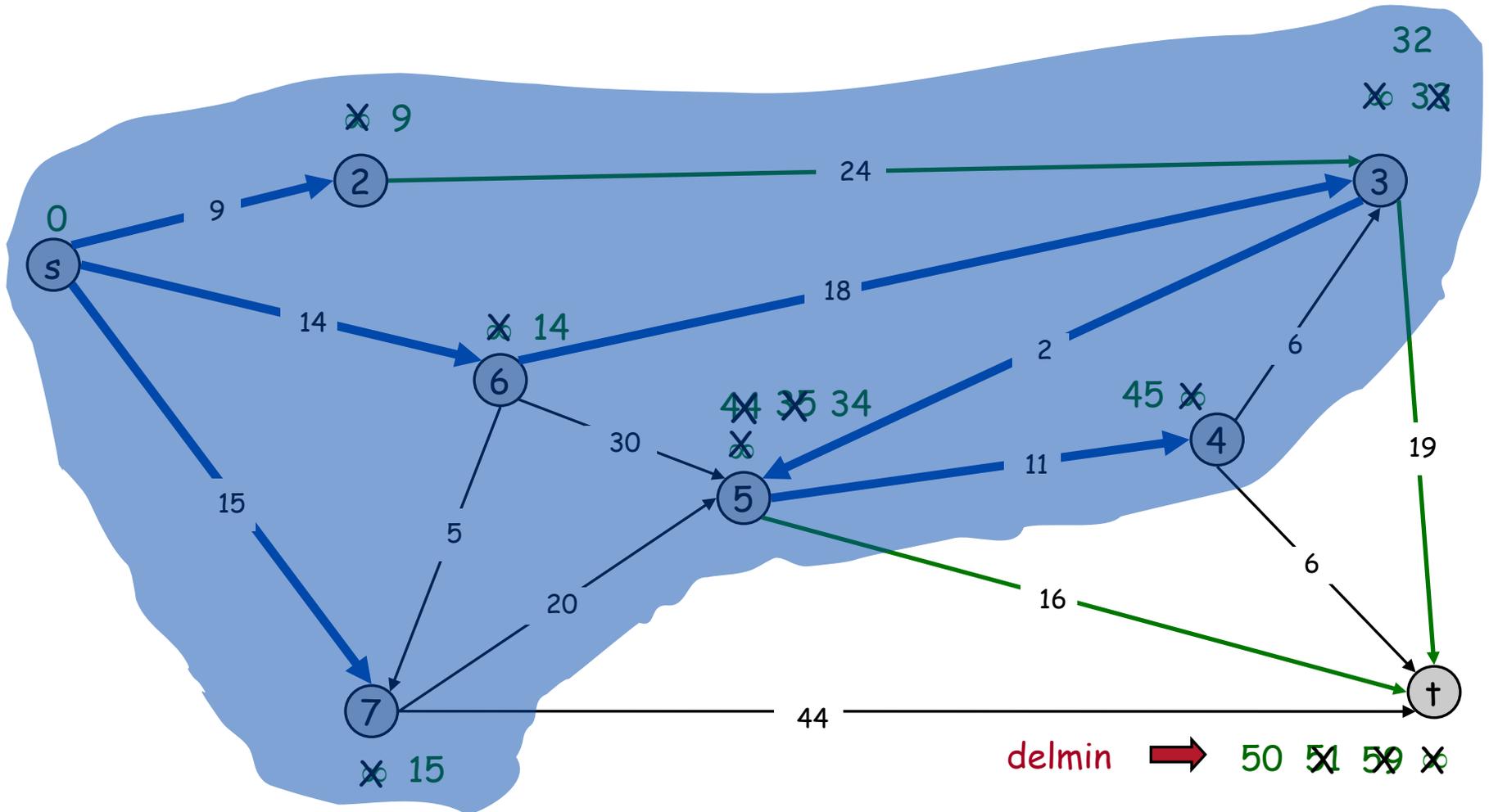# Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 4, 5, 6, 7 }
PQ = { t }

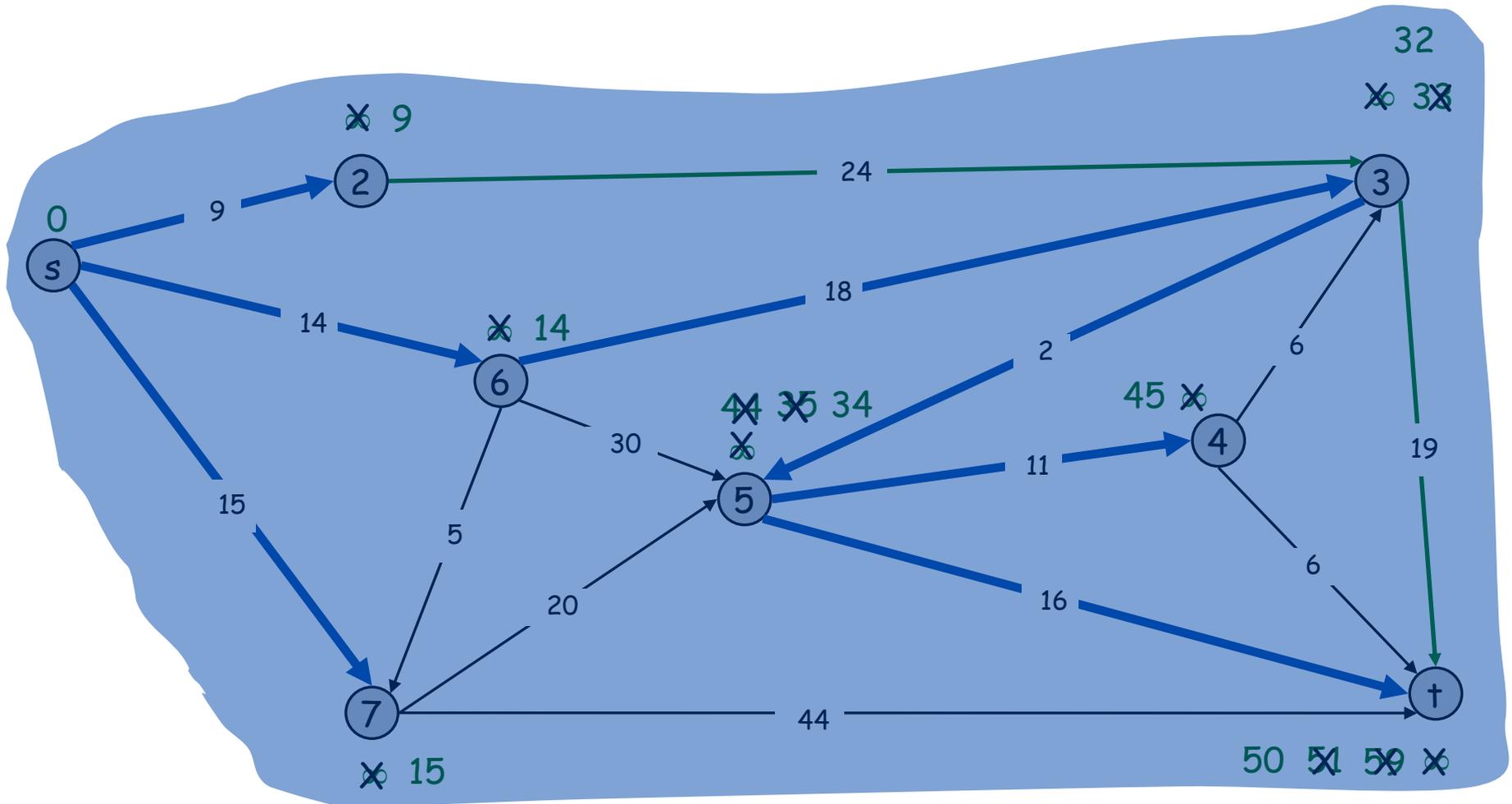# Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 4, 5, 6, 7 }
PQ = { t }

Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 4, 5, 6, 7, † }
PQ = { }

Dijkstra's Shortest Path Algorithm

S = { s, 2, 3, 4, 5, 6, 7, † }
PQ = { }