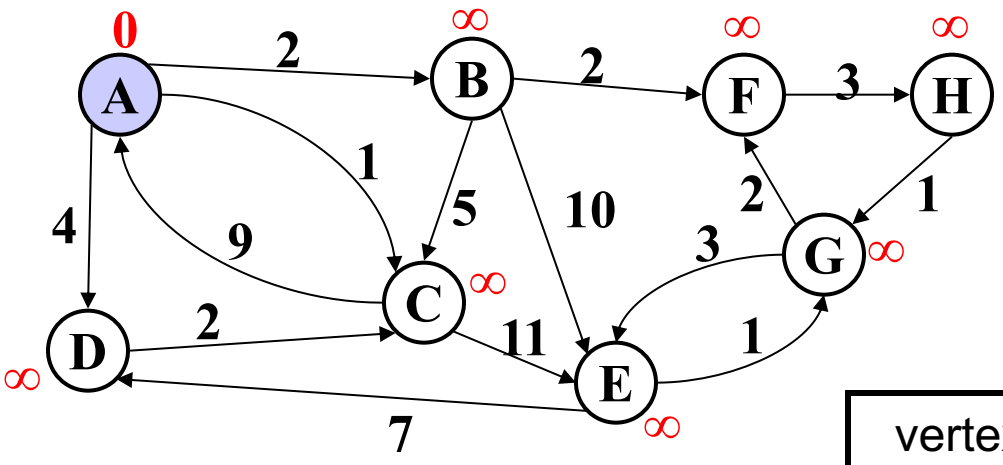
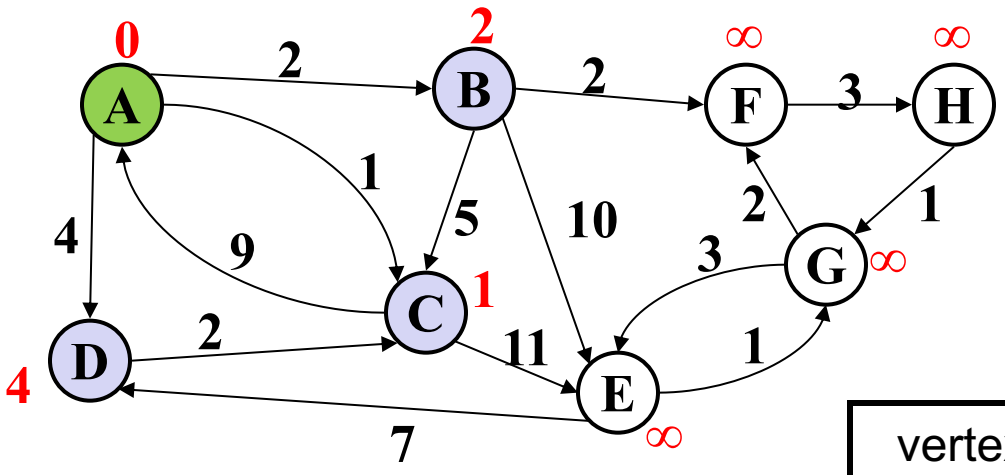
# Example #1




Order Added to Known Set:

| vertex | known? | cost | path |
|---|---|---|---|
| A | | 0 | |
| B | | ?? | |
| C | | ?? | |
| D | | ?? | |
| E | | ?? | |
| F | | ?? | |
| G | | ?? | |
| H | | ?? | |

# Example #1

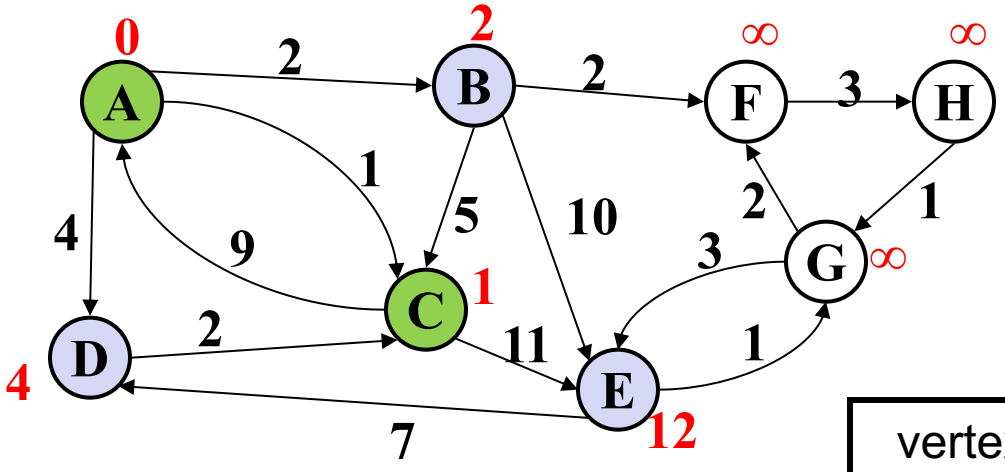



| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | | ≤ 2 | A |
| C | | ≤ 1 | A |
| D | | ≤ 4 | A |
| E | | ?? | |
| F | | ?? | |
| G | | ?? | |
| H | | ?? | |

Order Added to Known Set:

A

# Example #1

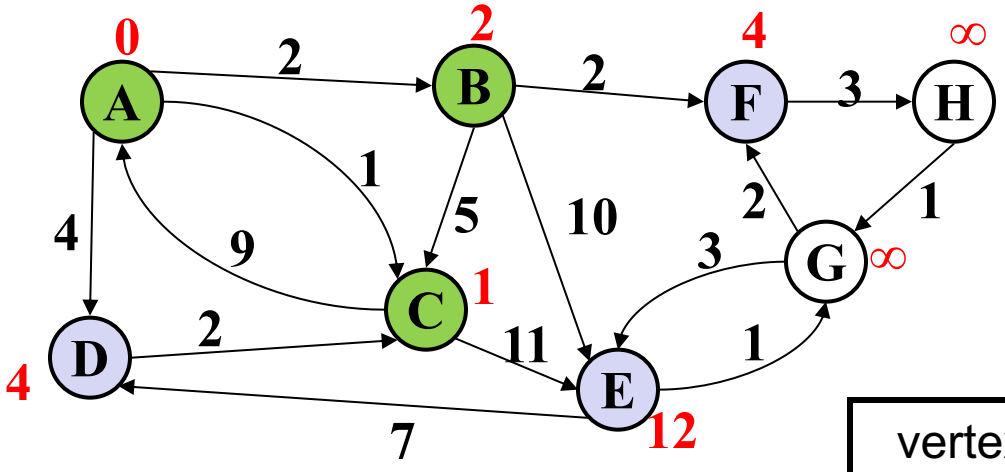



| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | | ≤ 2 | A |
| C | Y | 1 | A |
| D | | ≤ 4 | A |
| E | | ≤ 12 | C |
| F | | ?? | |
| G | | ?? | |
| H | | ?? | |

Order Added to Known Set:

A, C

# Example #1

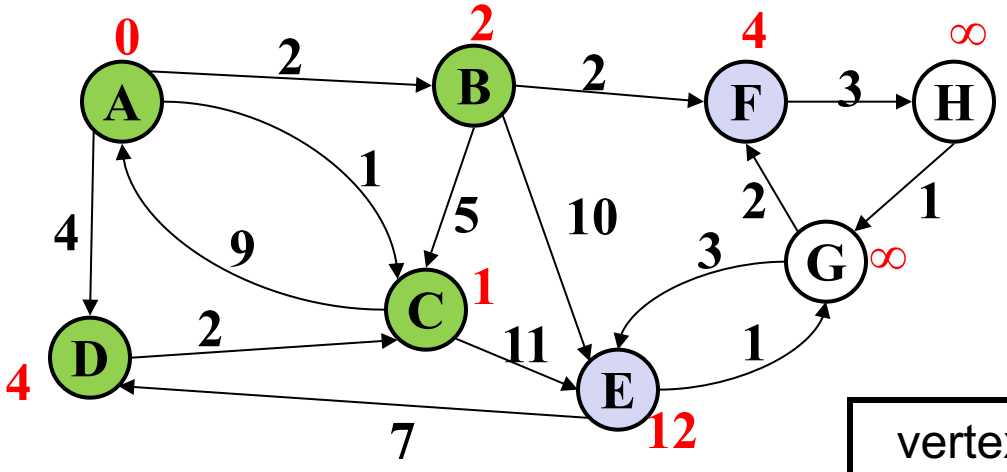



| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | | ≤ 4 | A |
| E | | ≤ 12 | C |
| F | | ≤ 4 | B |
| G | | ?? | |
| H | | ?? | |

Order Added to Known Set:

A, C, B

# Example #1

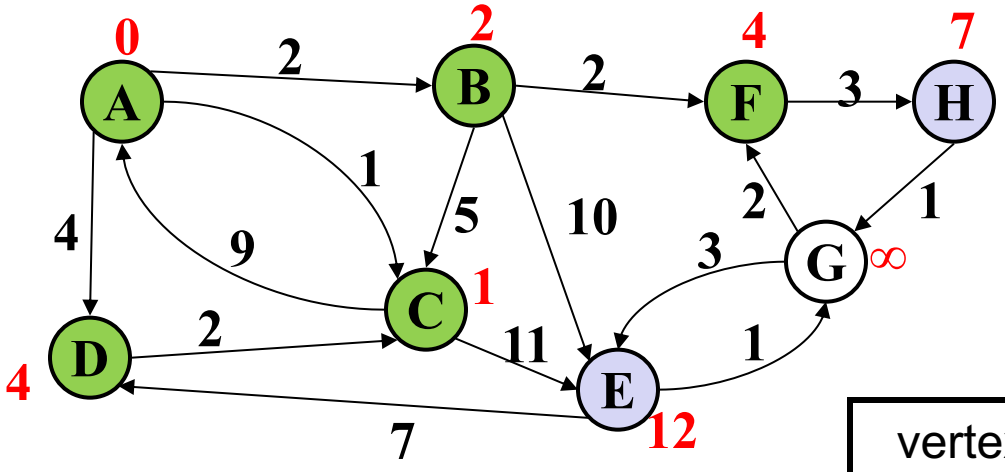



| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | | ≤ 12 | C |
| F | | ≤ 4 | B |
| G | | ?? | |
| H | | ?? | |

Order Added to Known Set:

A, C, B, D

# Example #1

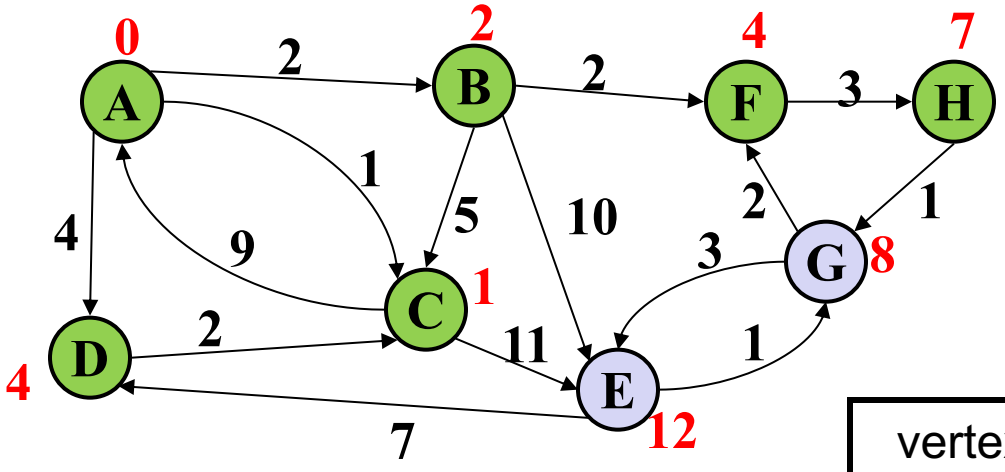



Order Added to Known Set:

A, C, B, D, F

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | | ≤ 12 | C |
| F | Y | 4 | B |
| G | | ?? | |
| H | | ≤ 7 | F |

# Example #1

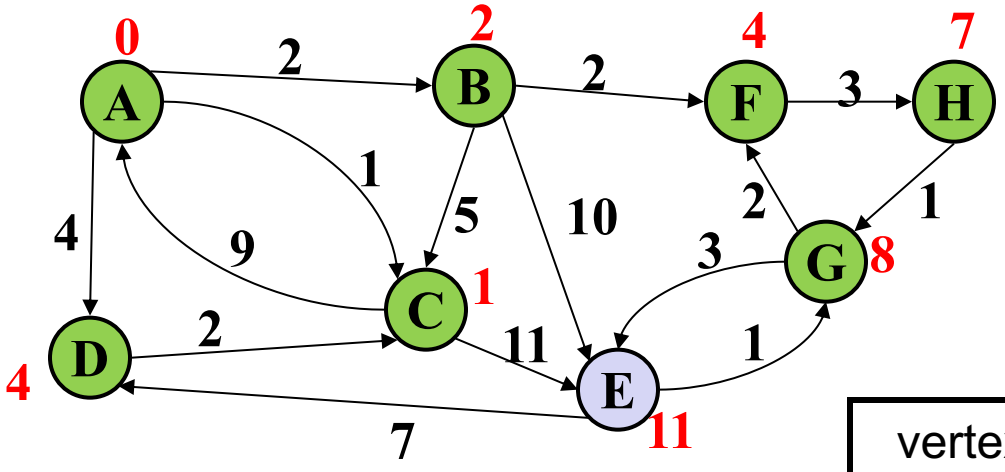



Order Added to Known Set:

A, C, B, D, F, H

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | | ≤ 12 | C |
| F | Y | 4 | B |
| G | | ≤ 8 | H |
| H | Y | 7 | F |

# Example #1

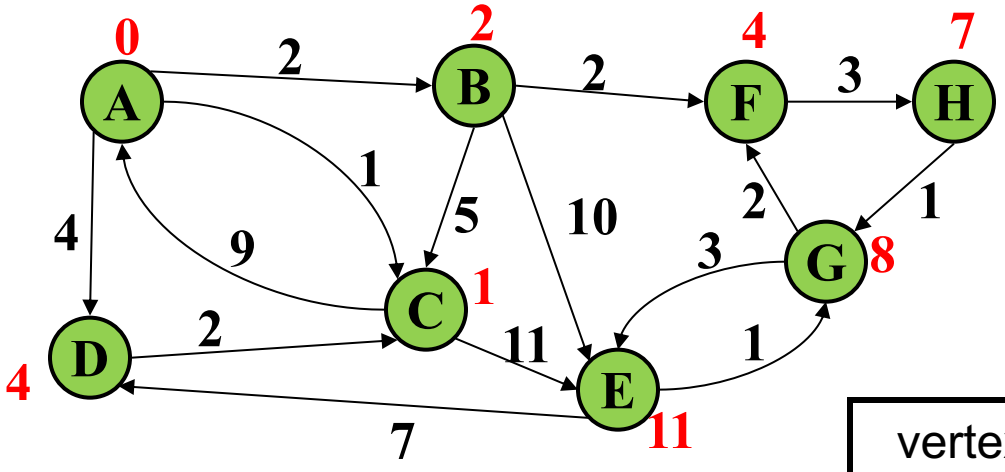



Order Added to Known Set:

A, C, B, D, F, H, G

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | | ≤ 11 | G |
| F | Y | 4 | B |
| G | Y | 8 | H |
| H | Y | 7 | F |

# Example #1



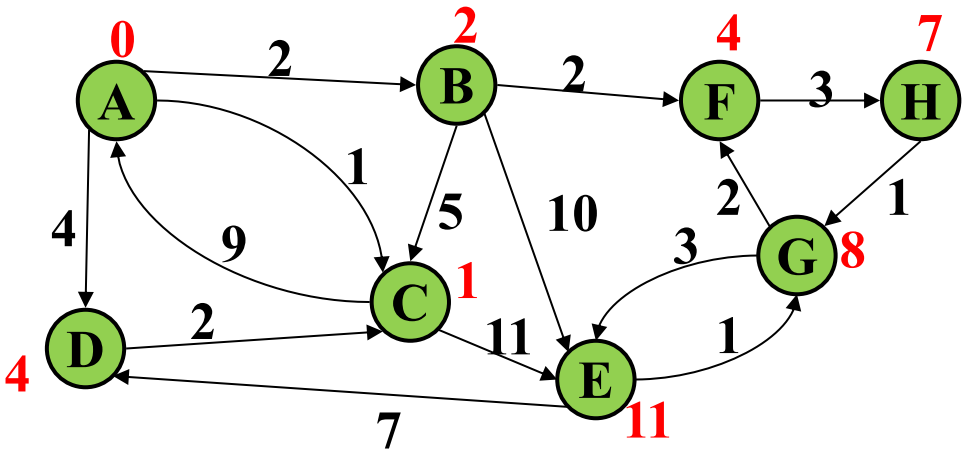

Order Added to Known Set:

A, C, B, D, F, H, G, E

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | Y | 11 | G |
| F | Y | 4 | B |
| G | Y | 8 | H |
| H | Y | 7 | F |

# *Interpreting the Results*

- Now that we're done, how do we get the path from, say, A to E?
  - Follow that path column in reverse E to G to H to F to B to A
  - So the path is A, B, F, H, G, E



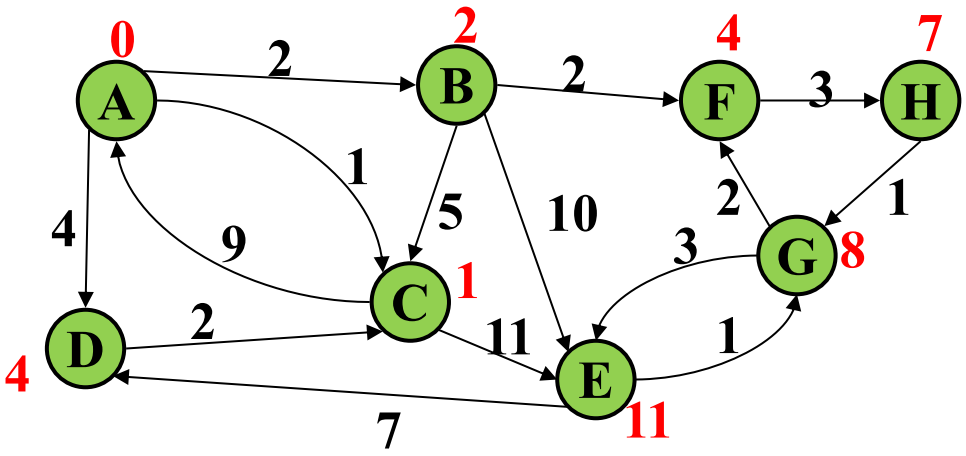

Order Added to Known Set:

A, C, B, D, F, H, G, E

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | Y | 11 | G |
| F | Y | 4 | B |
| G | Y | 8 | H |
| H | Y | 7 | F |

# *Stopping Short*

- How would this have worked differently if we were only interested in:
  - The path from A to F?
  - We can stop as soon as we add F to the known set

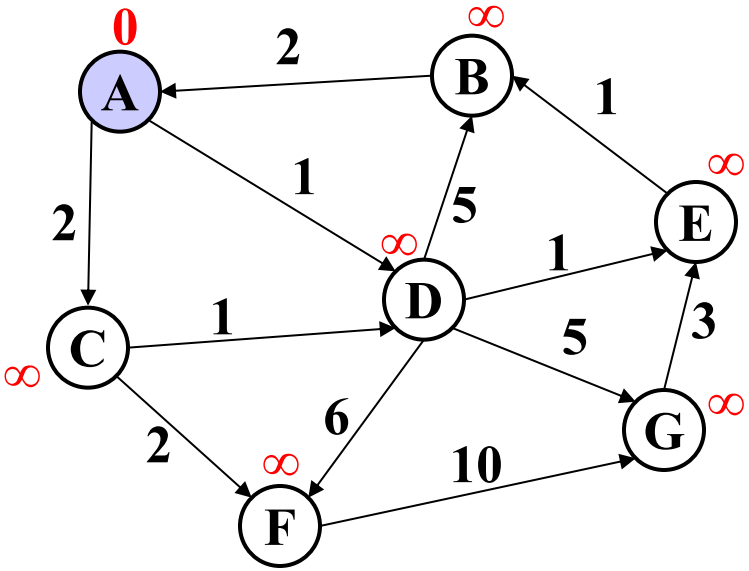



Order Added to Known Set:

A, C, B, D, F, H, G, E

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 2 | A |
| C | Y | 1 | A |
| D | Y | 4 | A |
| E | Y | 11 | G |
| F | Y | 4 | B |
| G | Y | 8 | H |
| H | Y | 7 | F |

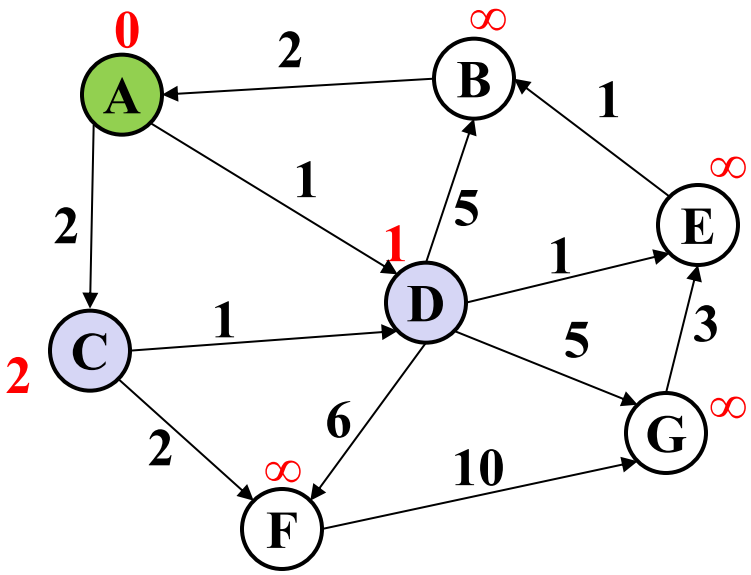
# Example #2




Order Added to Known Set:

| vertex | known? | cost | path |
|---|---|---|---|
| A | | 0 | |
| B | | ?? | |
| C | | ?? | |
| D | | ?? | |
| E | | ?? | |
| F | | ?? | |
| G | | ?? | |

# Example #2

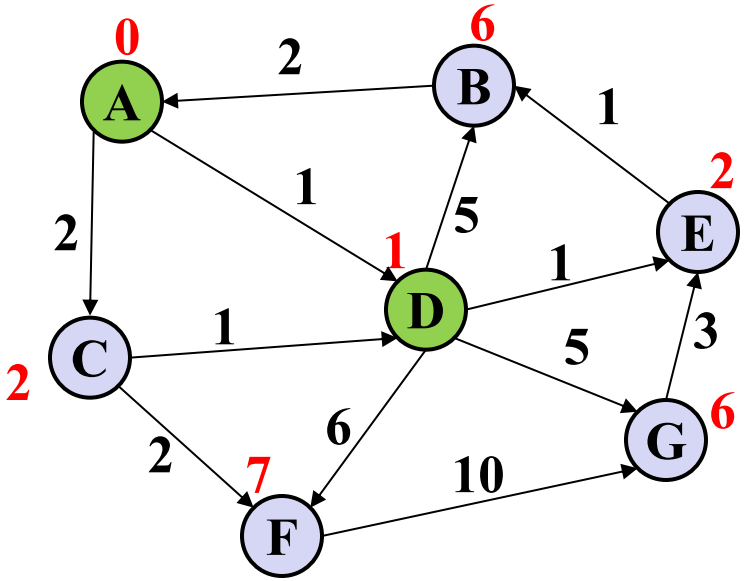



Order Added to Known Set:

A

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | | ?? | |
| C | | ≤ 2 | A |
| D | | ≤ 1 | A |
| E | | ?? | |
| F | | ?? | |
| G | | ?? | |

# Example #2

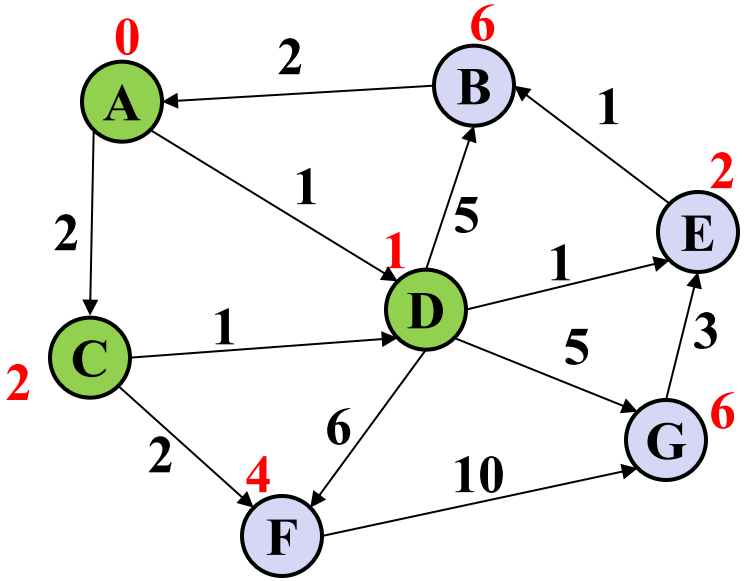



Order Added to Known Set:

A, D

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | | ≤ 6 | D |
| C | | ≤ 2 | A |
| D | Y | 1 | A |
| E | | ≤ 2 | D |
| F | | ≤ 7 | D |
| G | | ≤ 6 | D |

# Example #2

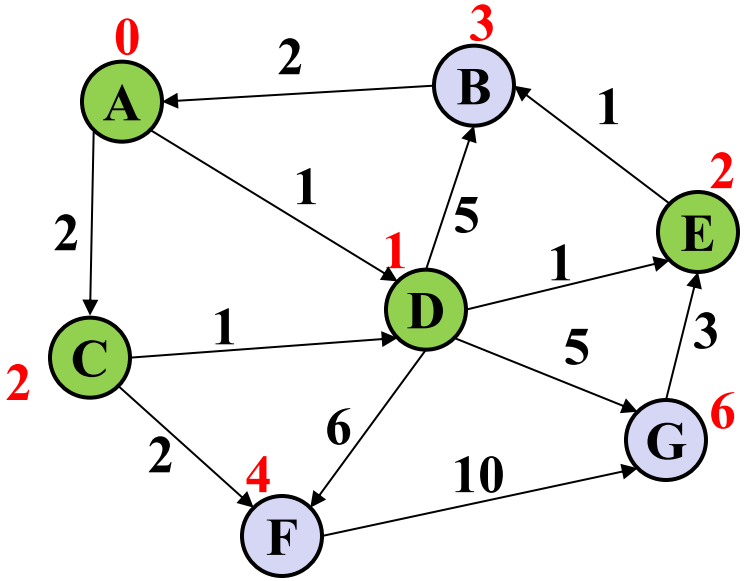



Order Added to Known Set:

A, D, C

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | | ≤ 6 | D |
| C | Y | 2 | A |
| D | Y | 1 | A |
| E | | ≤ 2 | D |
| F | | ≤ 4 | C |
| G | | ≤ 6 | D |

# Example #2

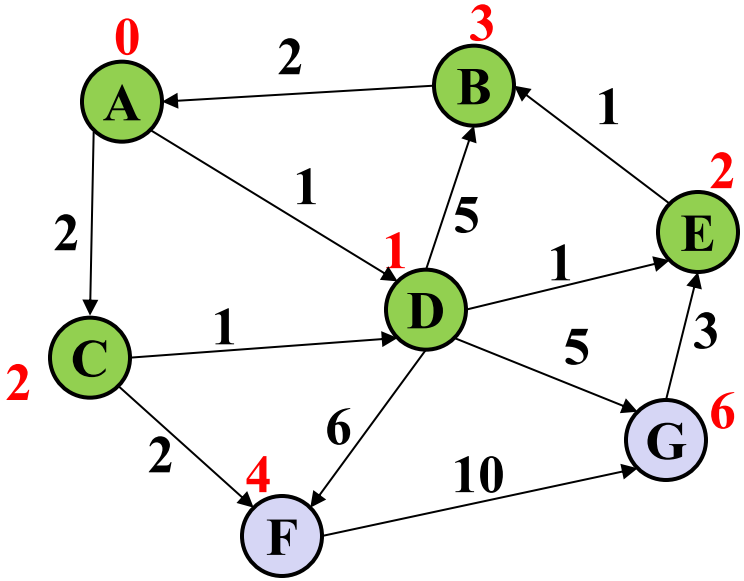



Order Added to Known Set:

A, D, C, E

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | | ≤ 3 | E |
| C | Y | 2 | A |
| D | Y | 1 | A |
| E | Y | 2 | D |
| F | | ≤ 4 | C |
| G | | ≤ 6 | D |

# Example #2

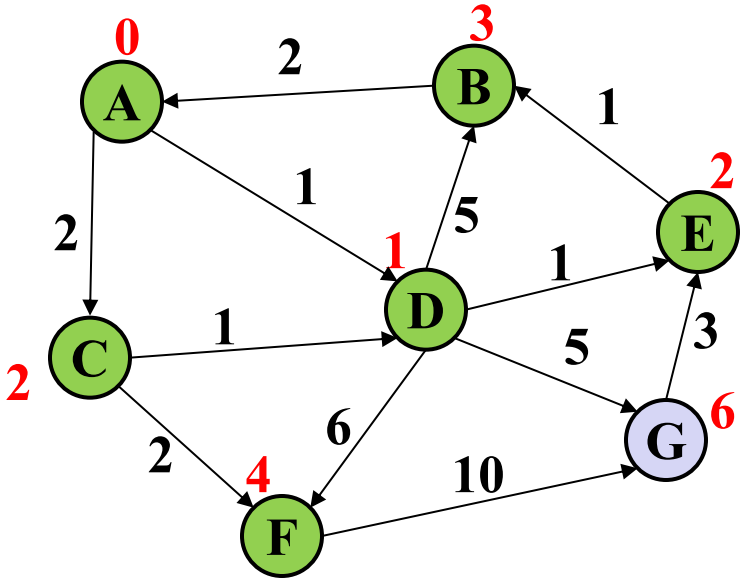



Order Added to Known Set:

A, D, C, E, B

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 3 | E |
| C | Y | 2 | A |
| D | Y | 1 | A |
| E | Y | 2 | D |
| F | | ≤ 4 | C |
| G | | ≤ 6 | D |

# Example #2

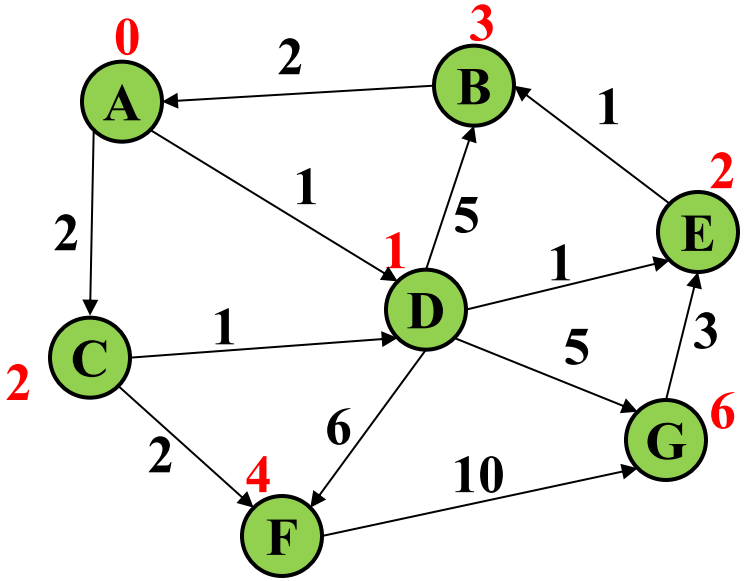



Order Added to Known Set:

A, D, C, E, B, F

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 3 | E |
| C | Y | 2 | A |
| D | Y | 1 | A |
| E | Y | 2 | D |
| F | Y | 4 | C |
| G | | $\leq 6$ | D |

# Example #2

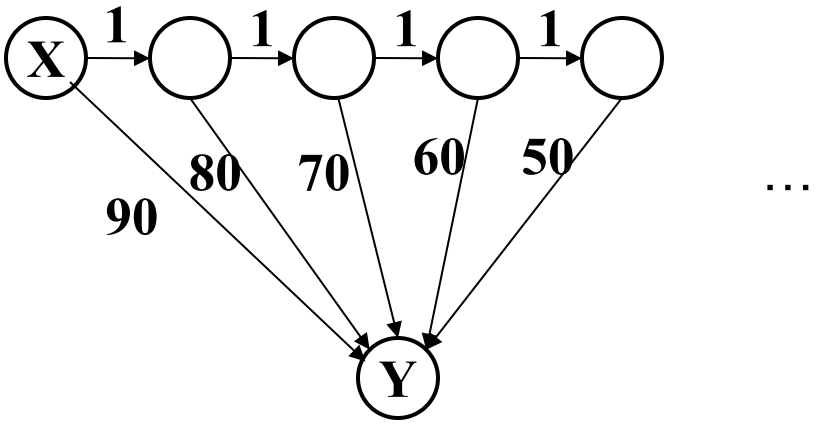



Order Added to Known Set:

A, D, C, E, B, F, G

| vertex | known? | cost | path |
|---|---|---|---|
| A | Y | 0 | |
| B | Y | 3 | E |
| C | Y | 2 | A |
| D | Y | 1 | A |
| E | Y | 2 | D |
| F | Y | 4 | C |
| G | Y | 6 | D |

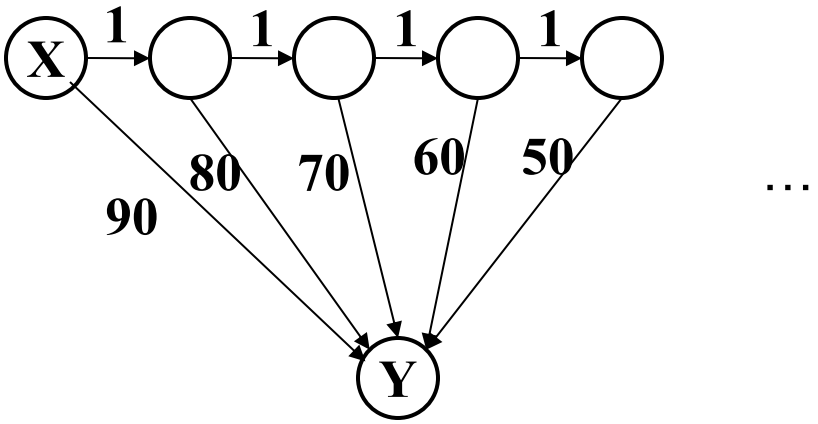
# *Example #3*




How will the best-cost-so-far for Y proceed?

Is this expensive?

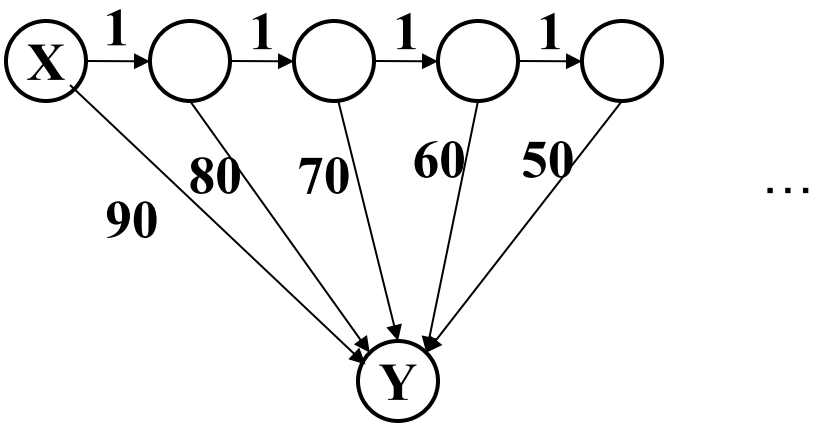
# *Example #3*




How will the best-cost-so-far for Y proceed? 90, 81, 72, 63, 54, …

Is this expensive?

# *Example #3*




How will the best-cost-so-far for Y proceed? 90, 81, 72, 63, 54, …

Is this expensive? No, each *edge* is processed only once