PM tutor
Empowering Excellence

Network Diagram
(Forward Pass & Backward Pass)

Presented by

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At the end of this training, our goal is for you to:

- Be able to describe a network diagram
- Be able to calculate the forward pass
- Be able to calculate the backward pass

CPM Definition

A schedule network analysis technique used to determine the amount of scheduling flexibility (the amount of float) on various logical network paths in the project schedule network, and to determine the minimum total project duration

Early start and finish dates are calculated by means of a forward pass, using a specified start date. Late start and finish dates are calculated by means of a backward pass, starting from a specified completion date, which sometimes is the project early finish date determined during the forward pass calculation

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Forward Pass & Backward Pass

Forward Pass	•Determines early start and early finish dates
Backward Pass	•Determines late finish and late start dates

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Types of Networks

- Neural Network
- Artificial Neural Network
- Computer network diagram
- Sociogram
- PERT Network
- Project Network Diagram

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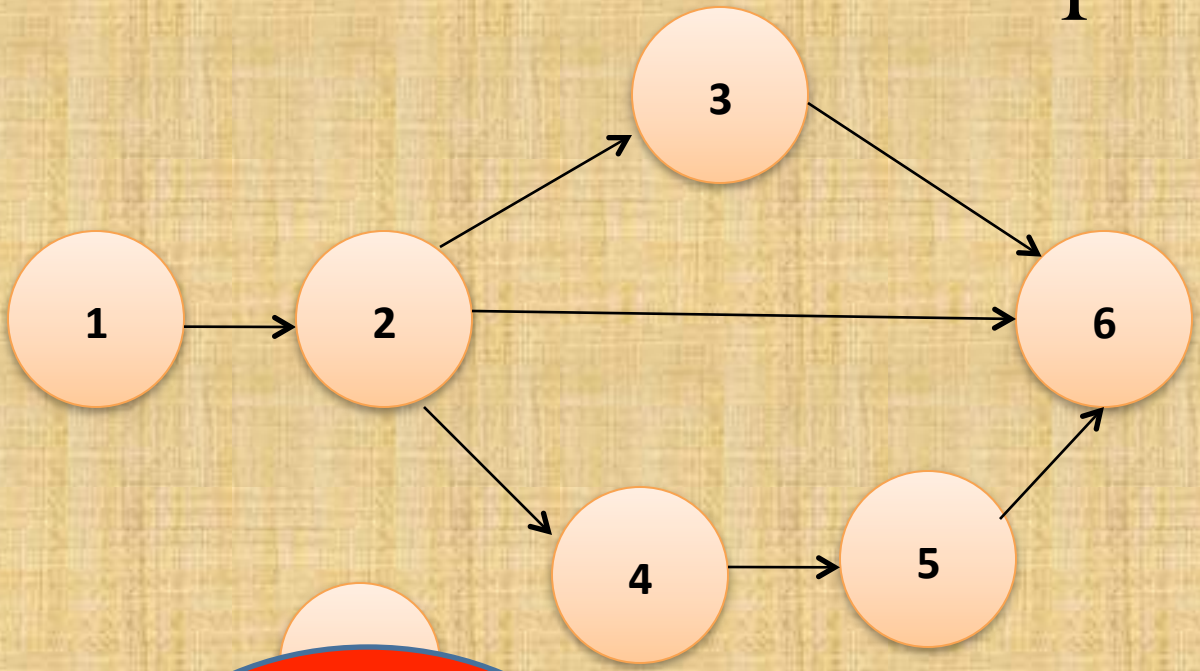
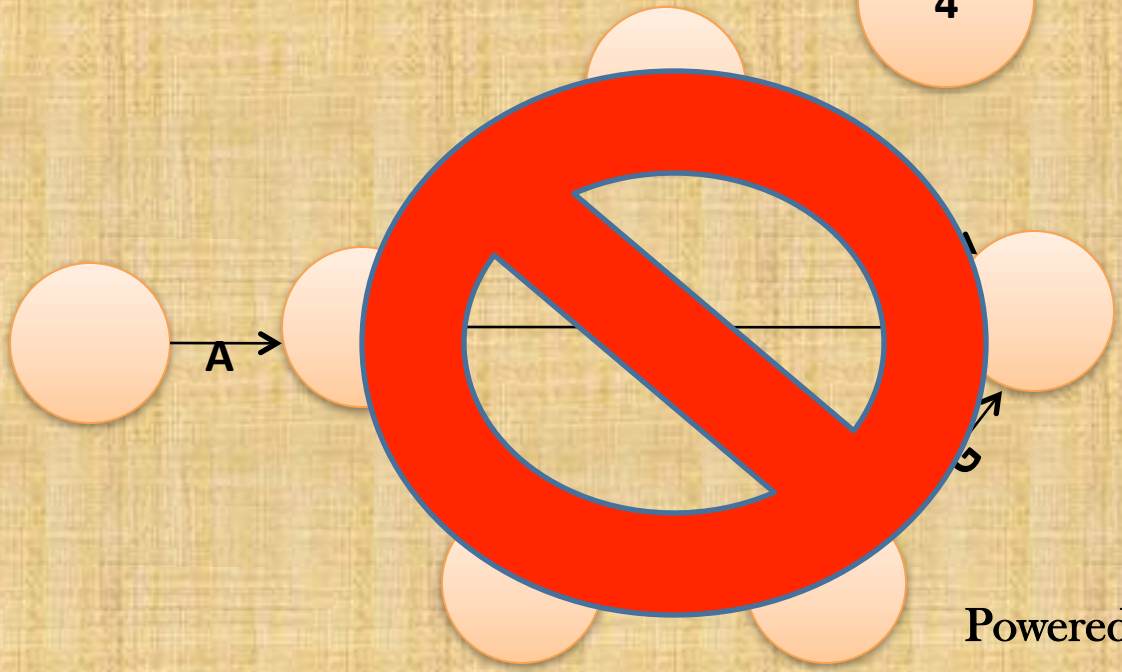
Basic PDM & ADM Example





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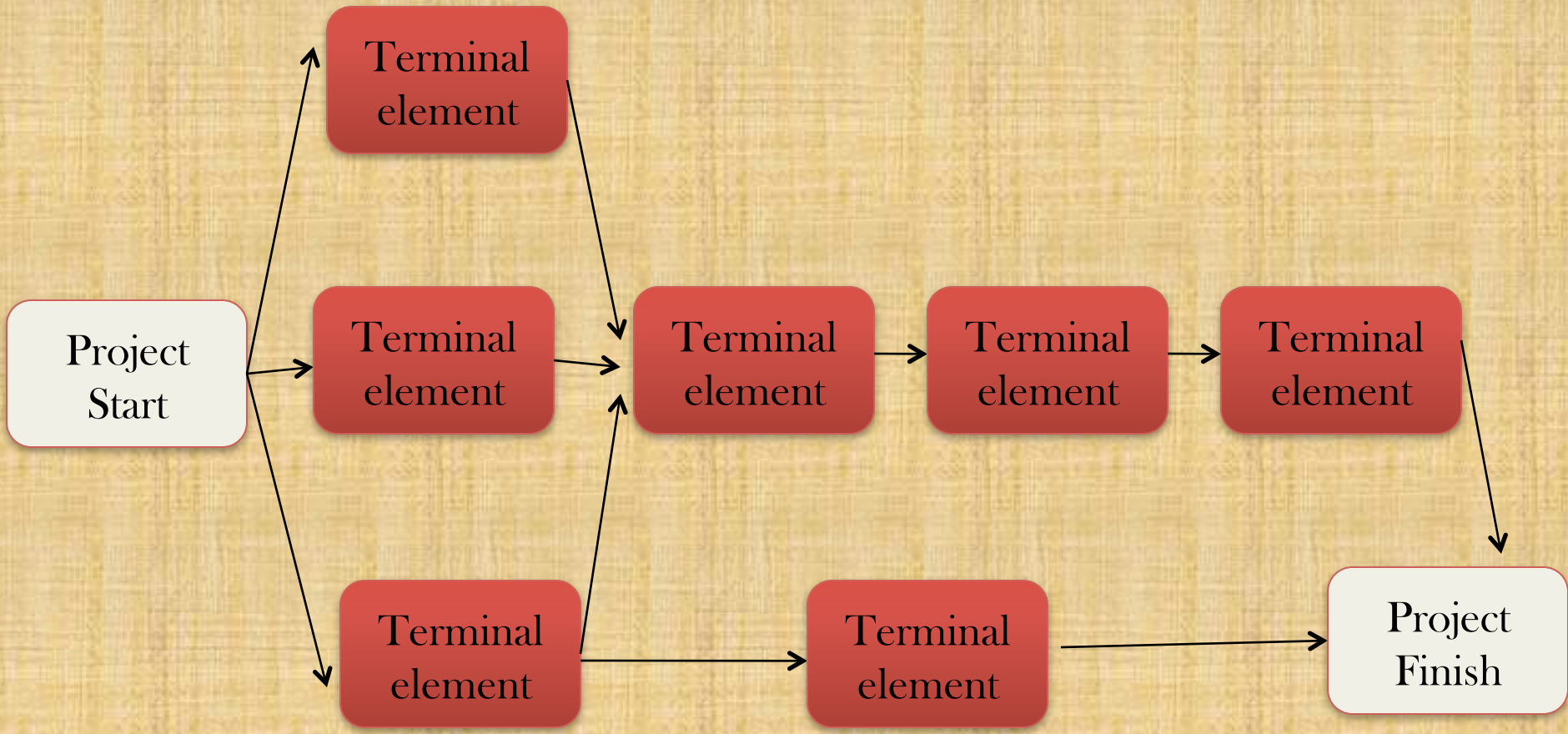
Example using boxes



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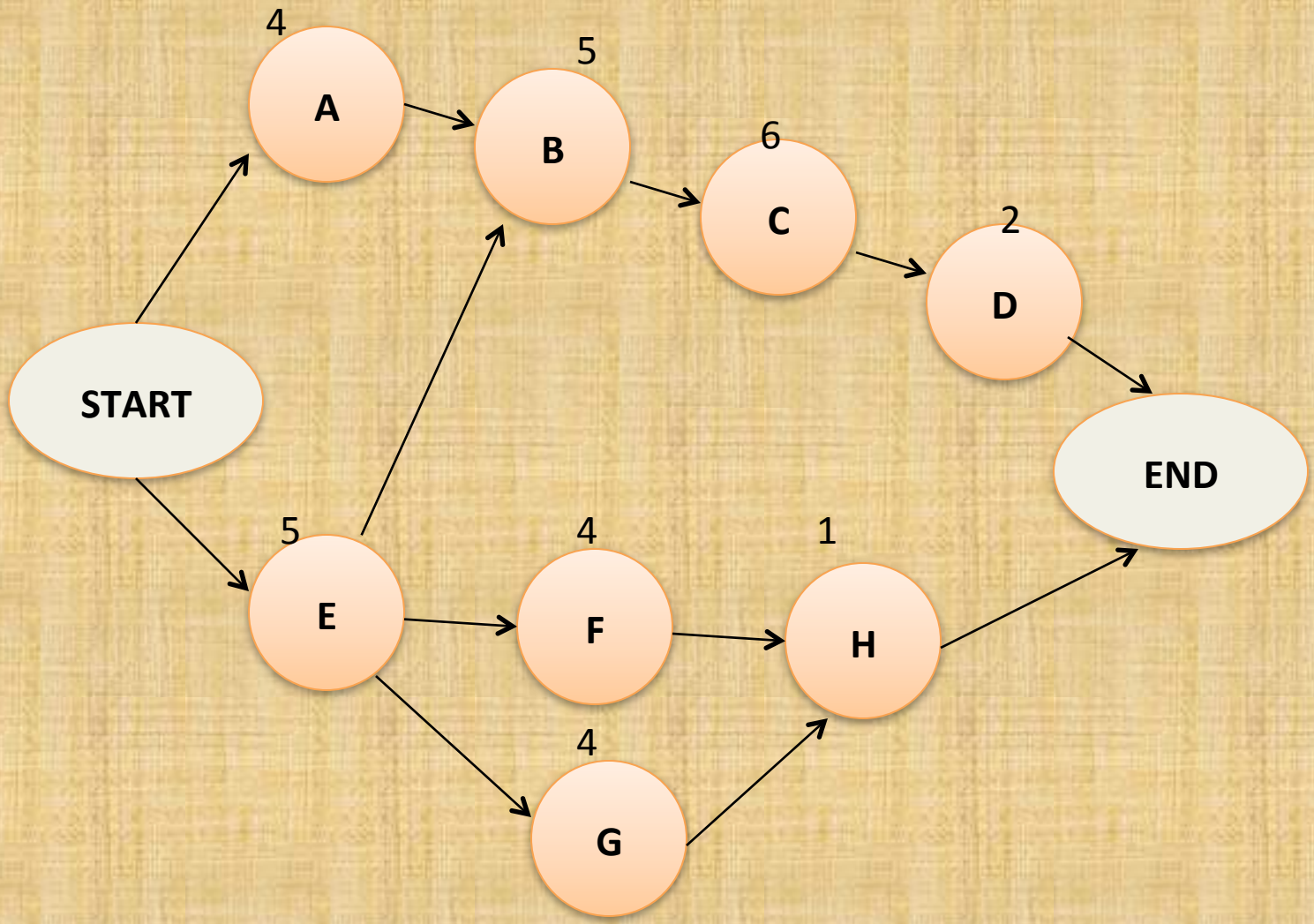
Example using Circles



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Abbreviations

PDM	AON
•Precedence Diagramming Method	•Activity on Node

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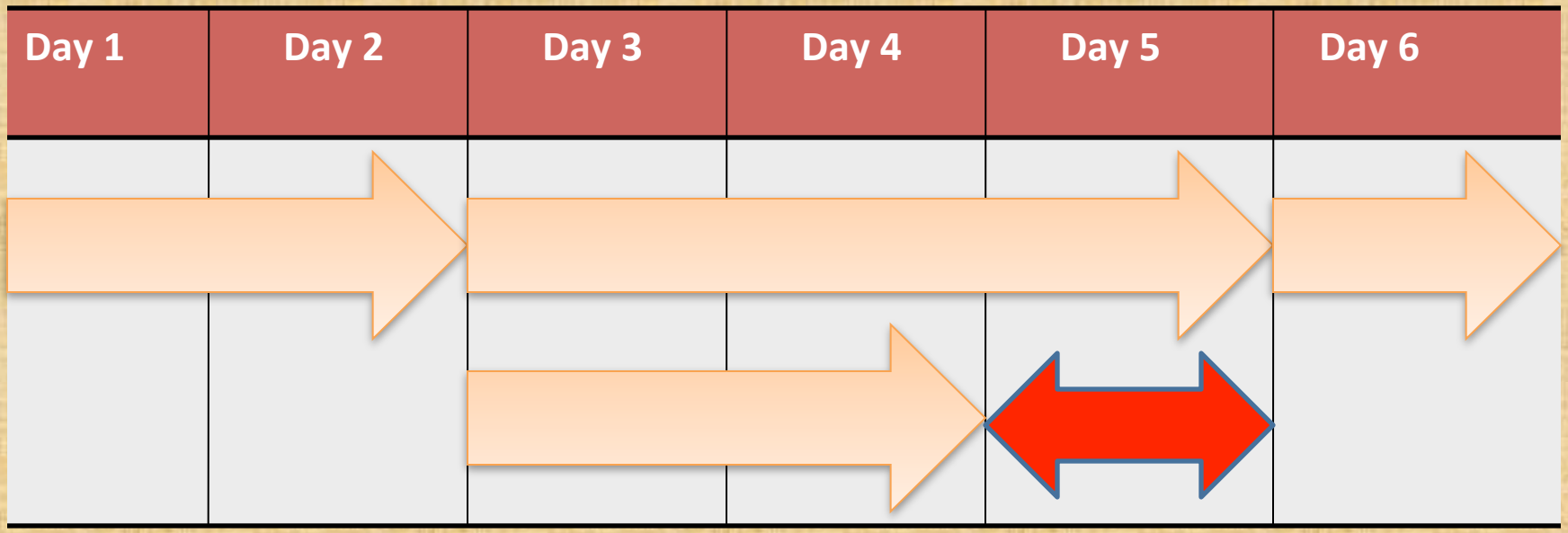
Your Assignment



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Node Information

- Activity Name
- Activity Duration
- Activity Float
- Early Start
- Early Finish
- Late Start
- Late Finish

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Node Layout

Early Start	Duration	Early Finish
Activity ID		
Late Start	Float	Late Finish

Activity ID	
Dur.	Float
ES	EF
LS	LF

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Which is Your First Work Day?

Starting on Day 0

Starting on Day 1

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Formulas you need

Early Finish (EF) Determine when an activity will finish at the earliest.	EF = (ES + duration) - 1
Early Start (ES) Determine when an activity can start at the earliest.	ES = (EF of predecessor) + 1
Late Finish (LF) Determine when an activity should finish at the latest.	LF = (LS of successor) - 1
Late Start (LS) Determine when an activity should start at the latest.	LS = (LF - duration) + 1

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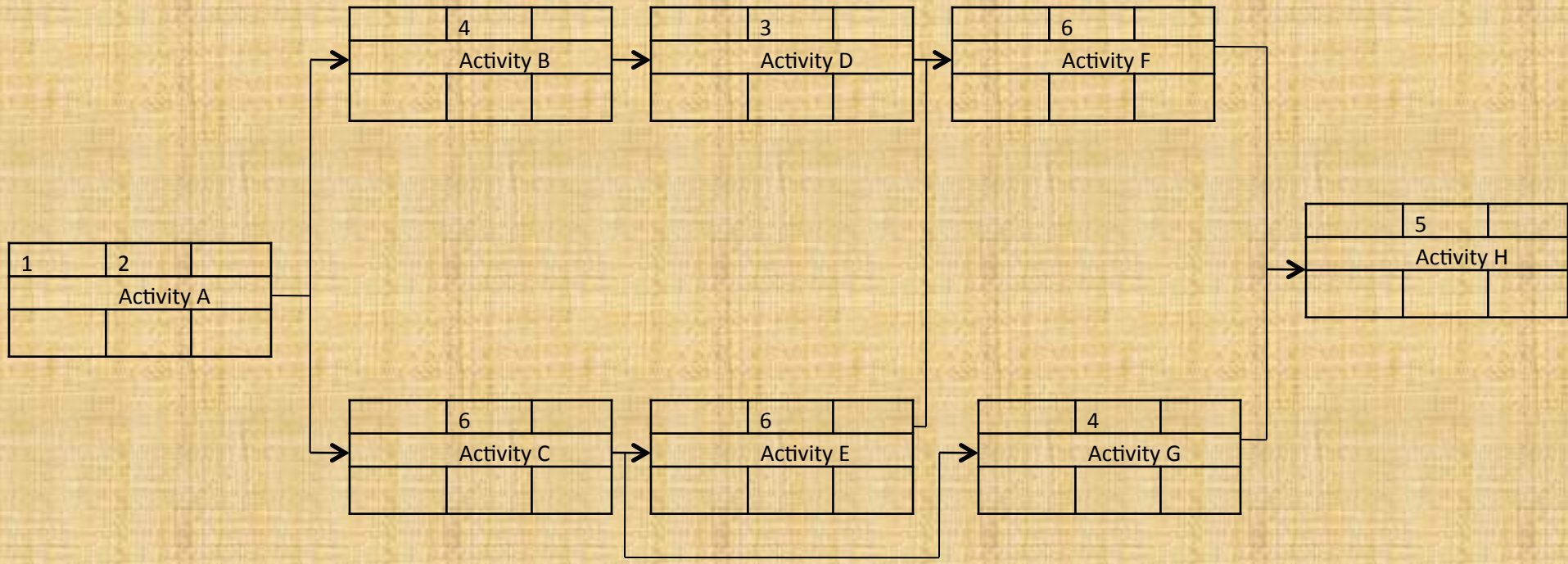
Our Network Diagram



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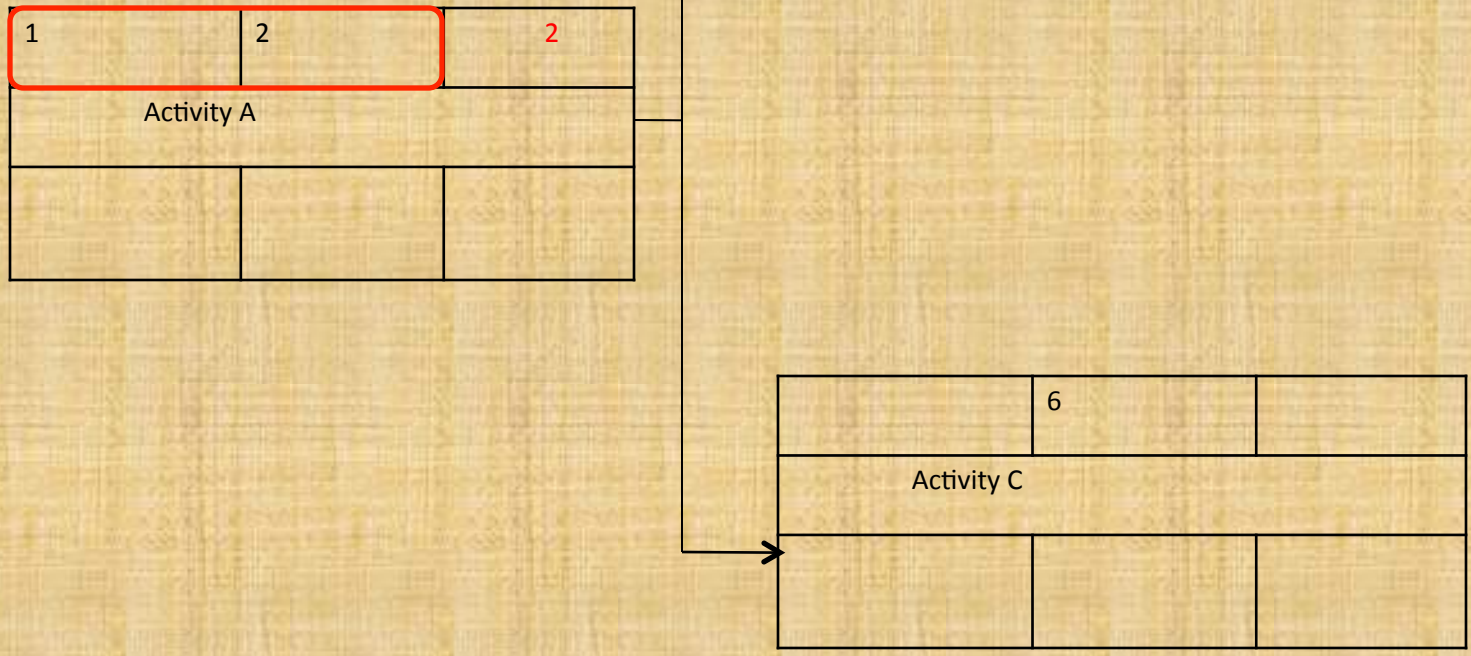
Calculate Early Finish

EF = (ES + duration) – 1

EF = 1 + 2 – 1 = 2



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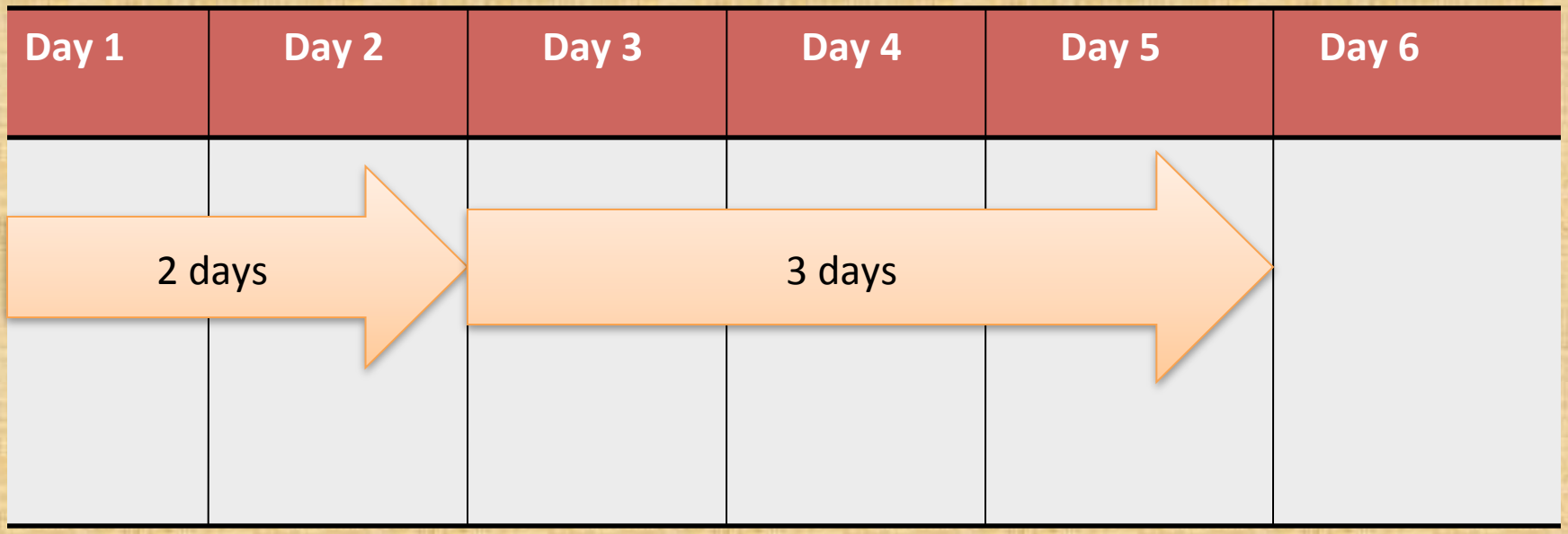
Why Minus 1/Plus 1



- **First Activity**
  - **1 + 2 = 3**
  - **1 + 2 – 1 = 2**
- **Second Activity**
  - **3 + 3 = 6**
  - **3 + 3 – 1 = 5**

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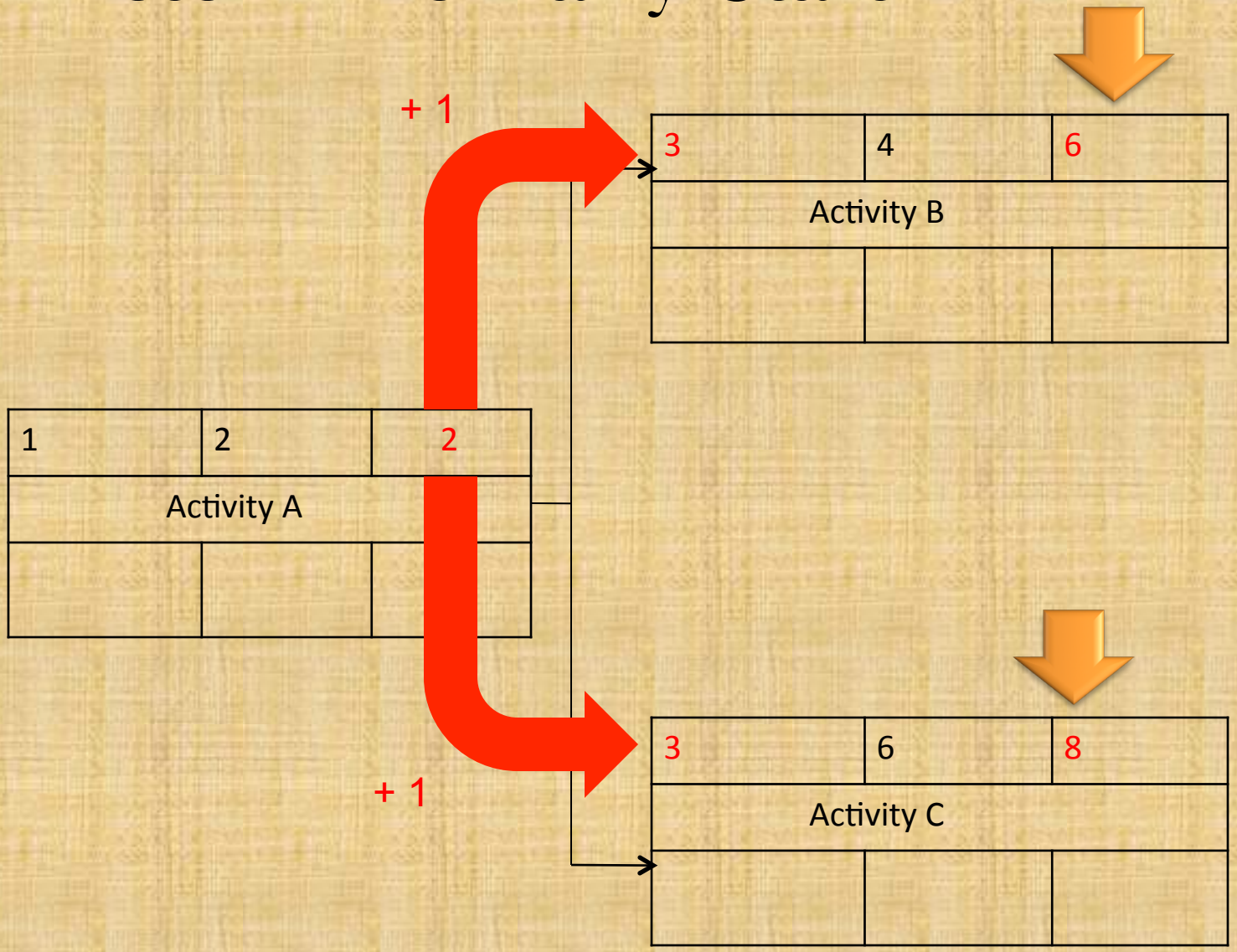
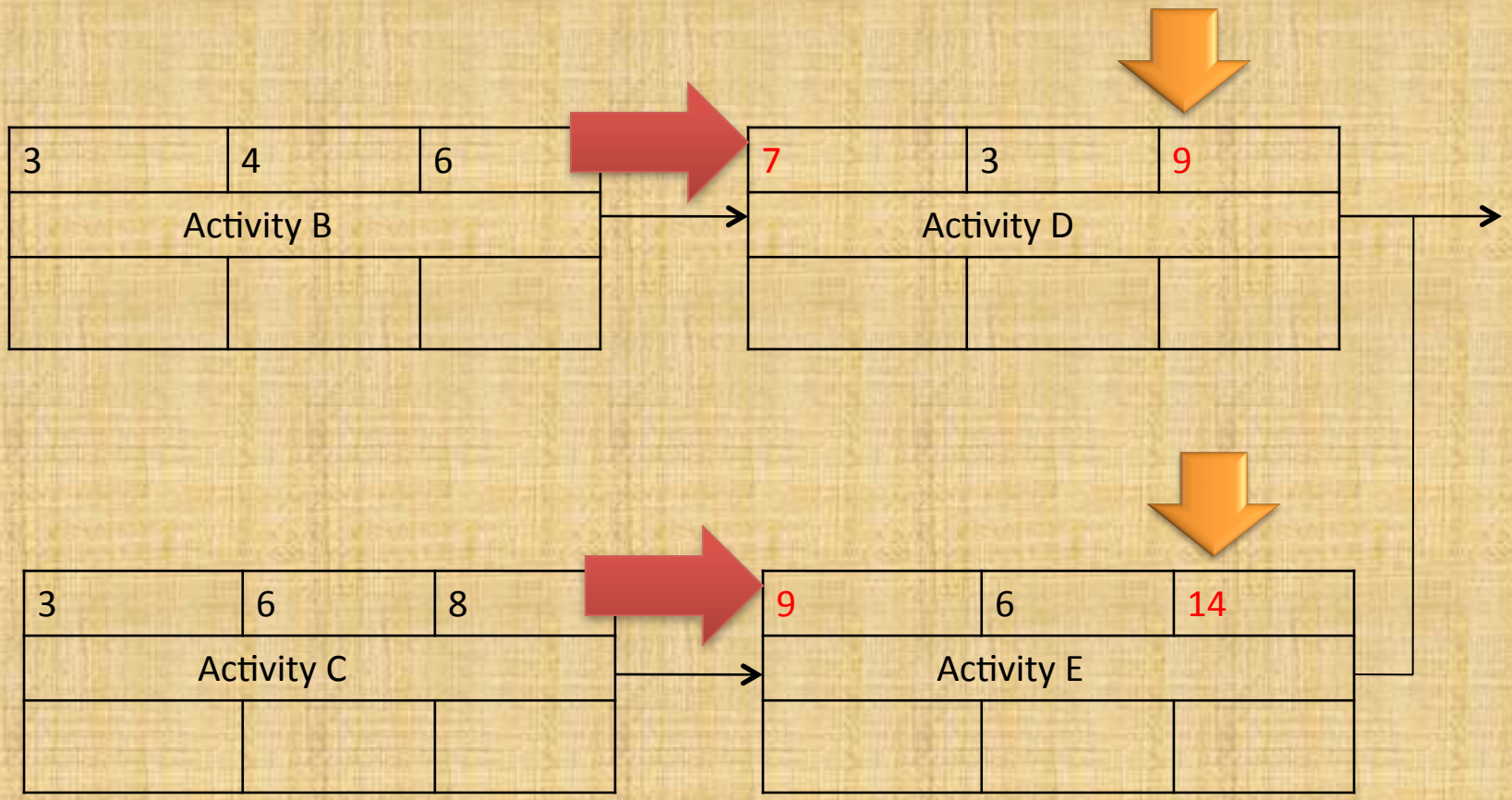
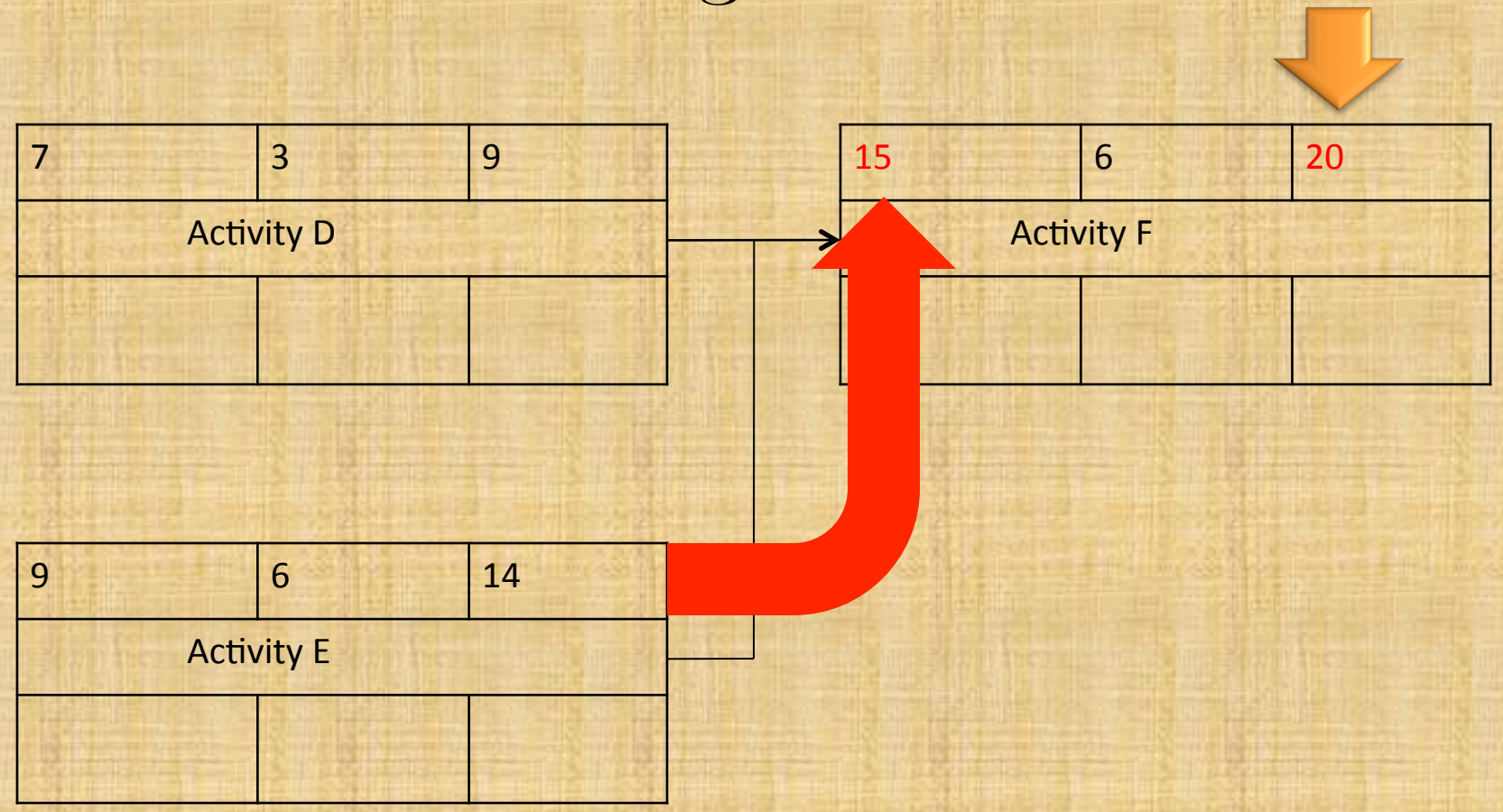
Determine Early Start



Continue Forward



Use Largest EF



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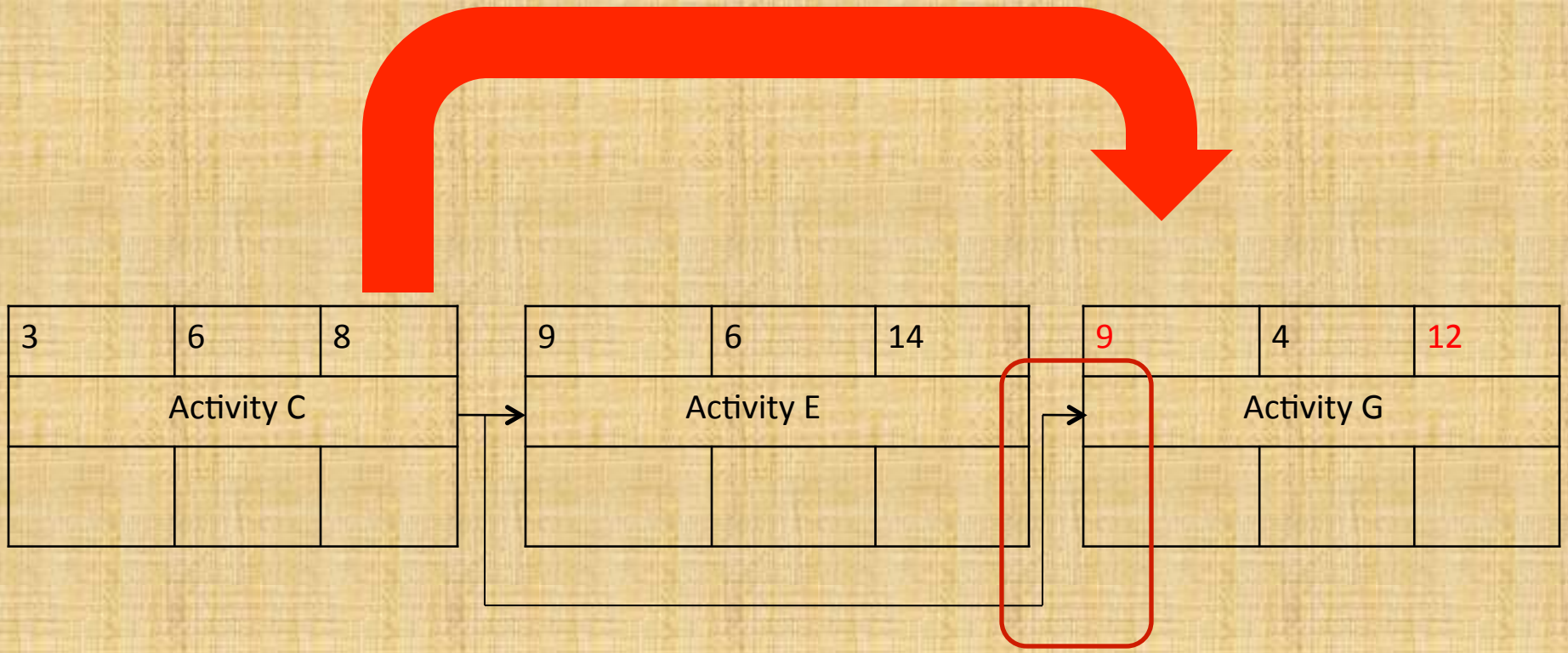
Follow the Arrows!



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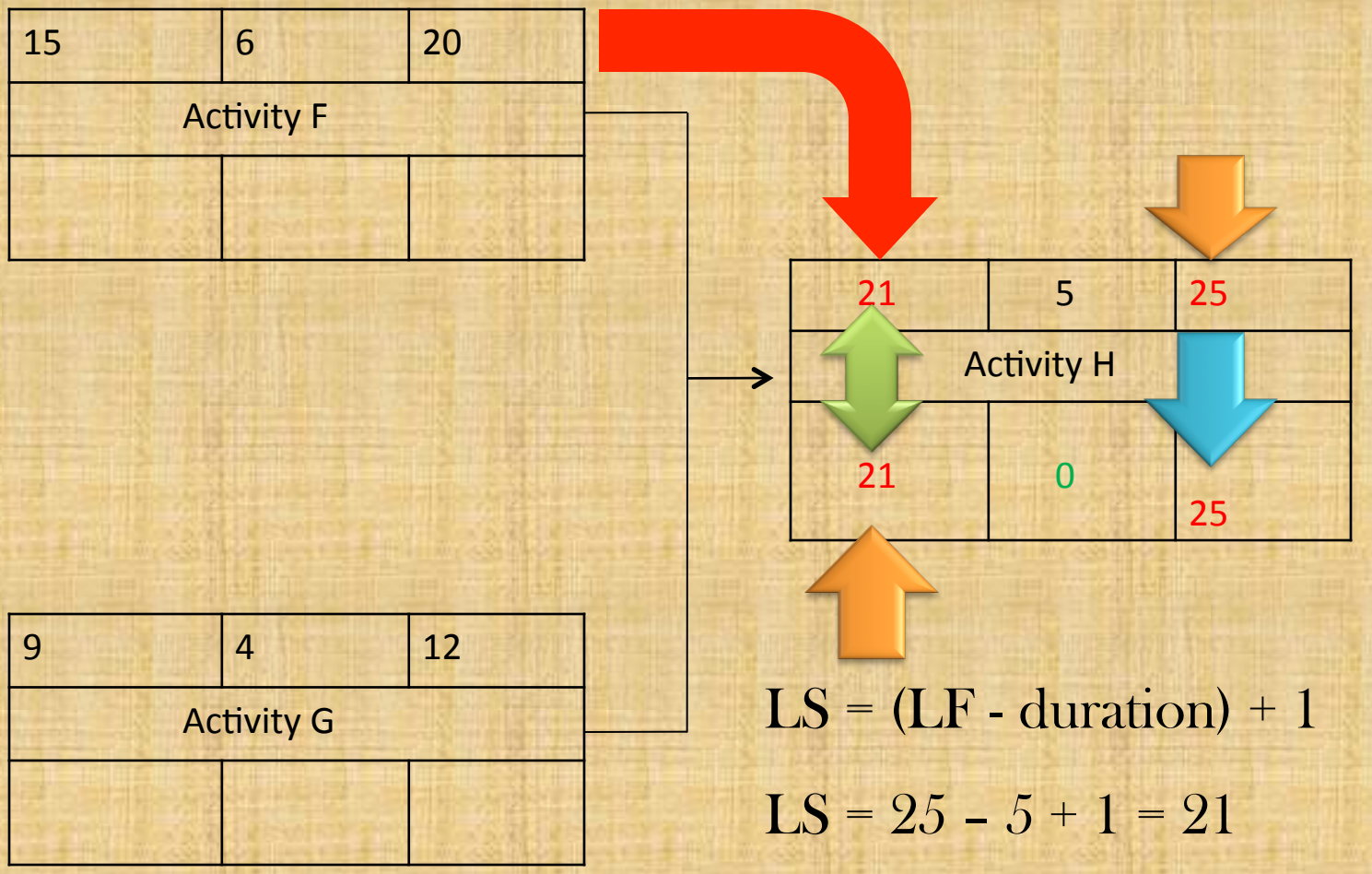
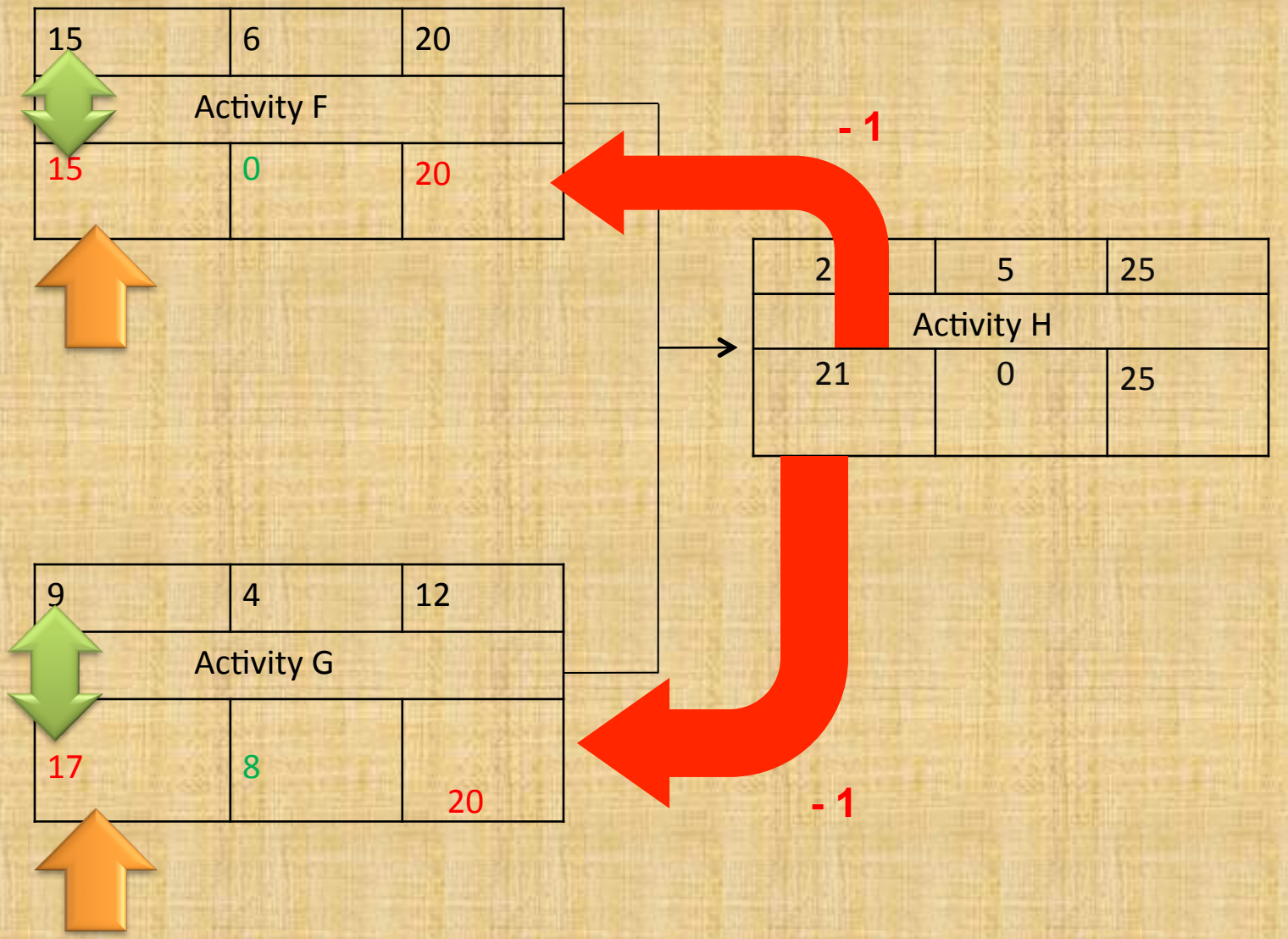
Finish & Return



LS = (LF - duration) + 1

LS = 25 – 5 + 1 = 21

Determine Late Finish



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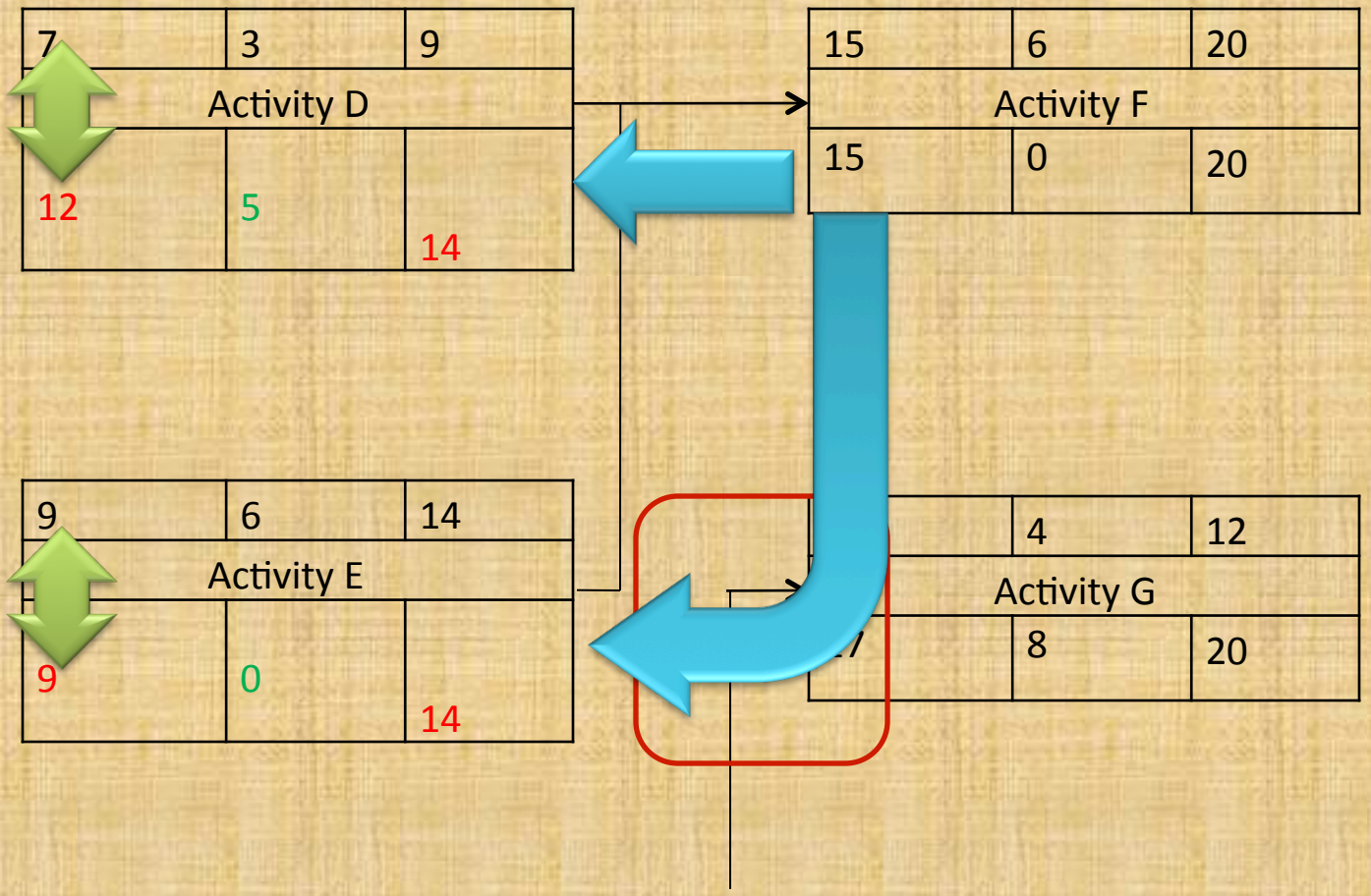
Continue Backwards



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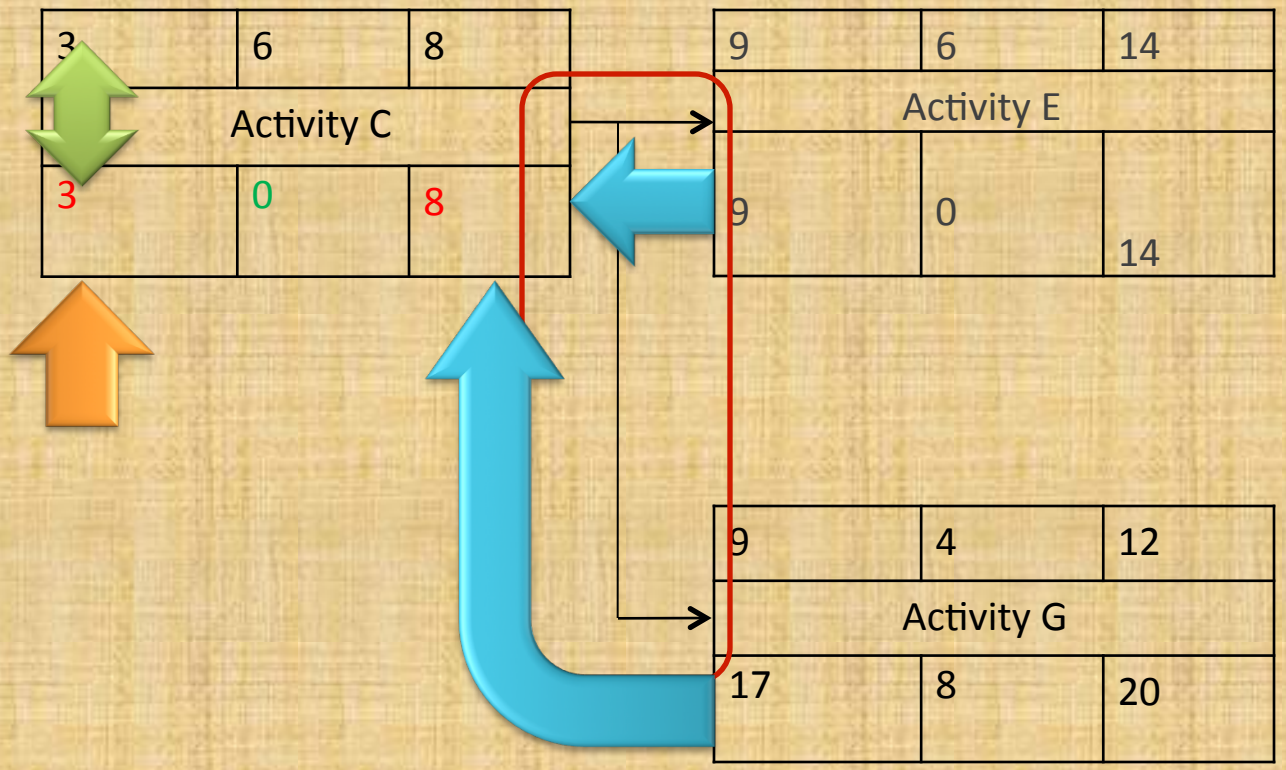
Use Smallest LS



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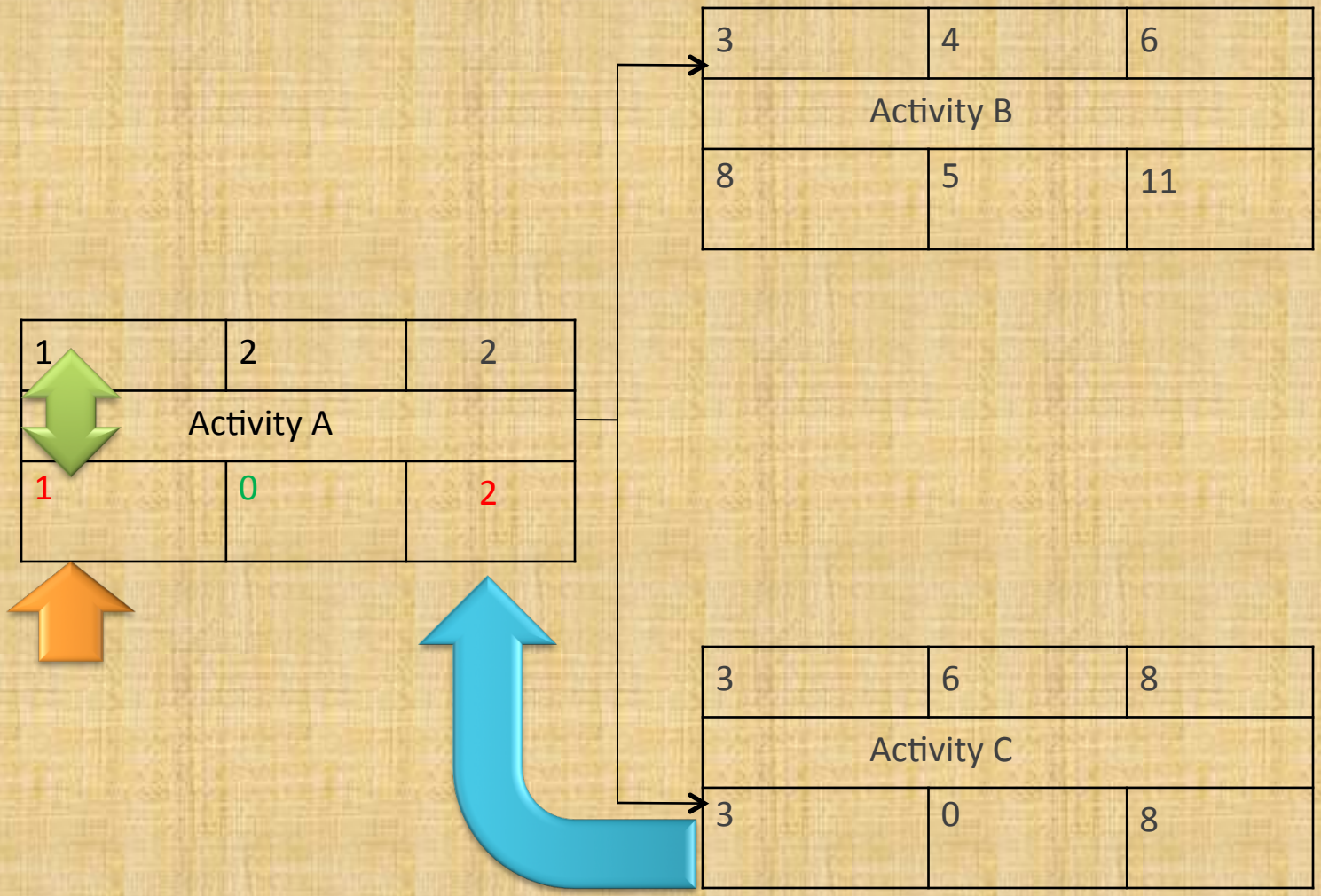
Finish up



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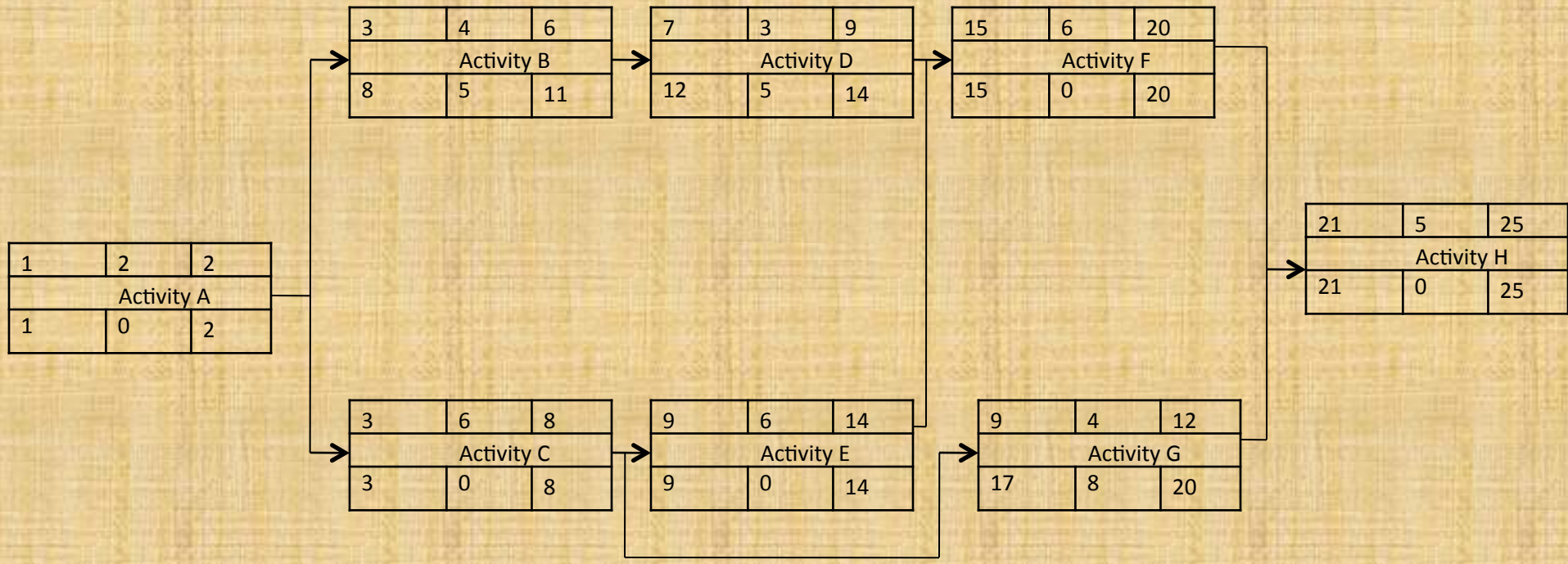
Completed Network Diagram



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Sample Questions

- What is Dur / ES / LS / EF / LF / Float of Activity A?
- What is the duration of the critical path?
- Which activities are on the critical path?
  - ABC
  - ACEF
- If duration of Activity C = 10, which activities are now on the critical path?

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Review

- Network Diagram is a graphical representation of your project schedule
- Helps determine the critical path
- Created through application of
  - Forward pass
  - Backward pass
  - Calculation of ES, EF, LS, LF & Float
- Must be able to calculate a network diagram with a pen & paper

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