

Critical Path

GAPS Cohort Fall 2020

Critical Path

“Critical path is the longest path in your project’s schedule network diagram and is the SHORTEST possible duration for the project.”

Du Pont identified a critical path in their neoprene production and was able to change a 125 hour process to 78 hours, producing an additional million pounds of product in a year

Presentation

1. Building a simple example for toy train set
2. Examples from research
3. Tools for analyzing critical path
4. Example for preparing a manuscript

Critical Path Example: Building Toy Trainset

<https://www.pmexamsmartnotes.com/how-to-calculate-critical-path-float-and-early-and-late-starts-and-finishes/>

Step 1: Find Activities

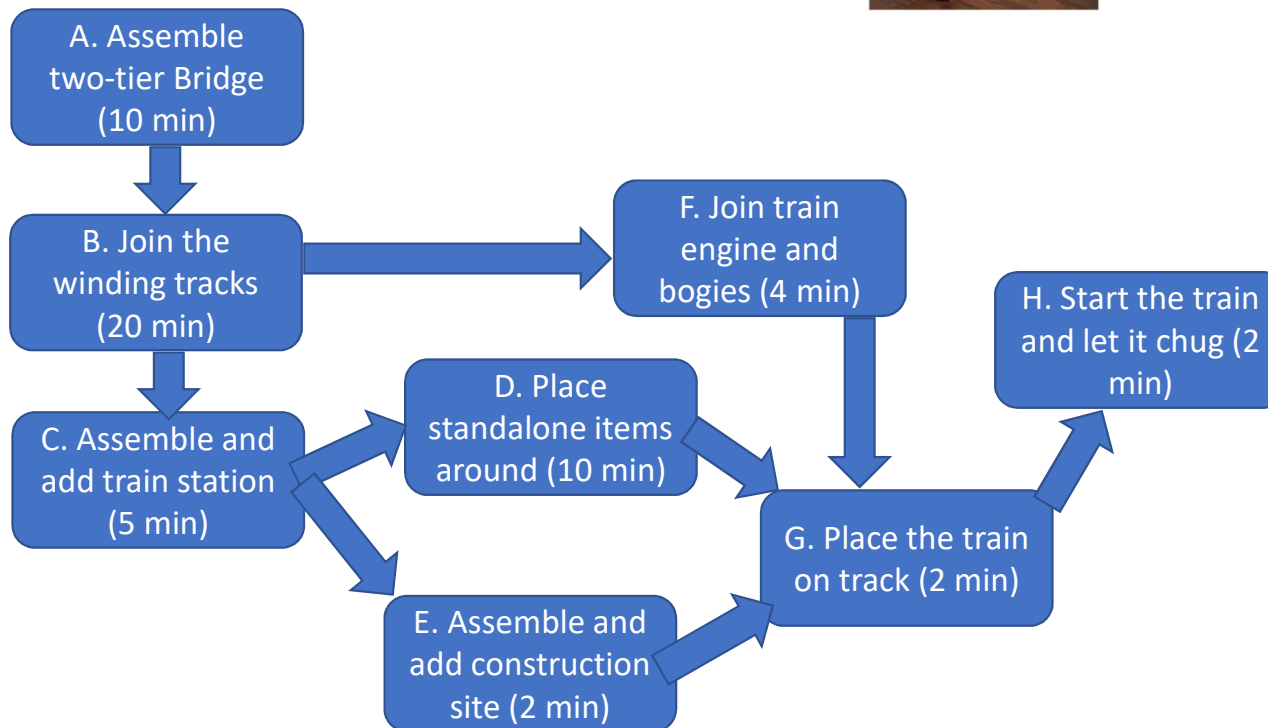
- A. Assemble two-tier bridge
- B. Join winding tracks
- C. Assemble and add train station
- D. Place standalone items around
- E. Assemble and add construction site
- F. Join train engine and bogies
- G. Place the train on the track
- H. Start the engine and let it chug!



Critical Path Example: Building Toy Trainset

<https://www.pmexamsmartnotes.com/how-to-calculate-critical-path-float-and-early-and-late-starts-and-finishes/>

Step 2: Build Schedule Network Diagram

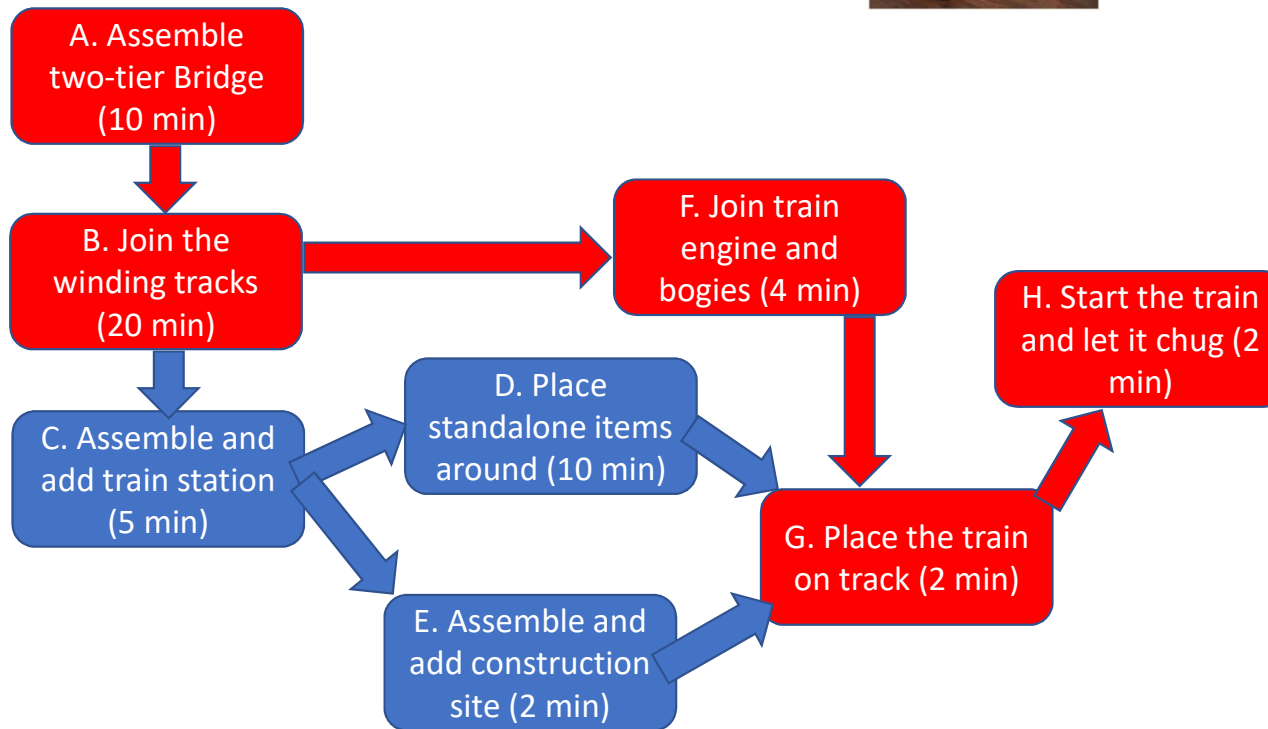


Critical Path Example: Building Toy Trainset

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Step 3: Find all possible paths

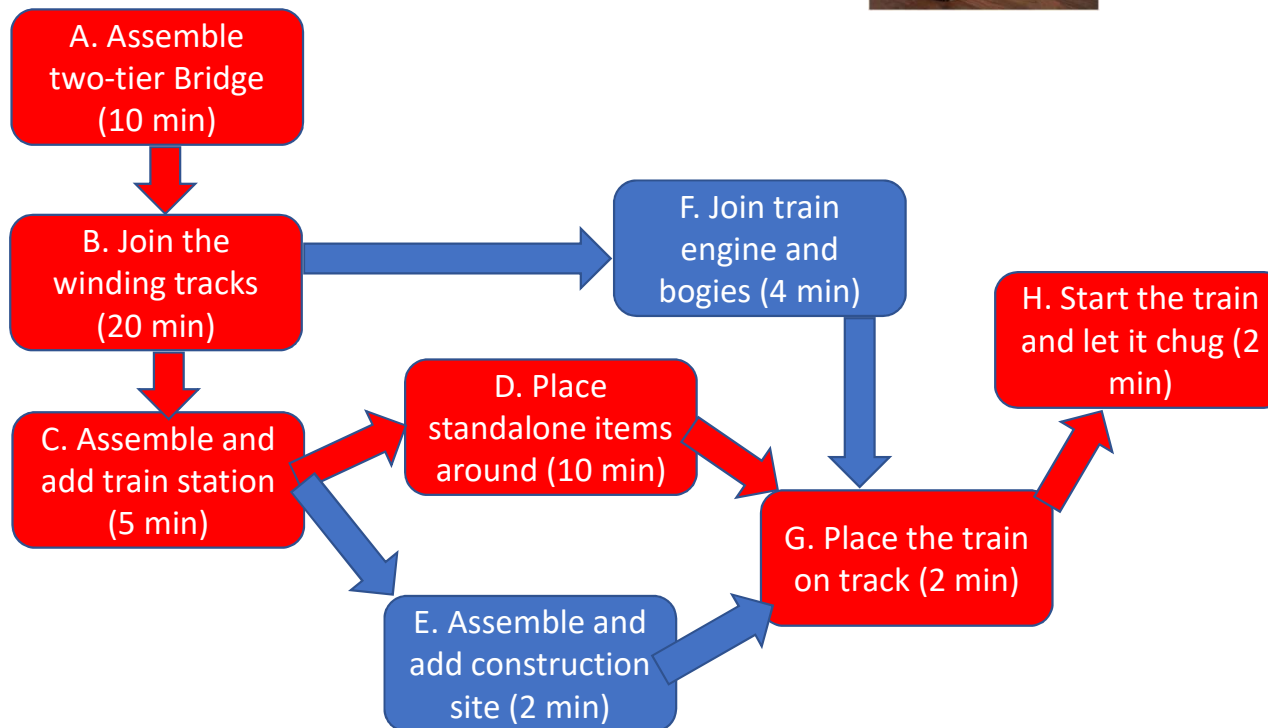


A -> B -> F -> G -> H

Critical Path Example: Building Toy Trainset

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Step 3: Find all possible paths



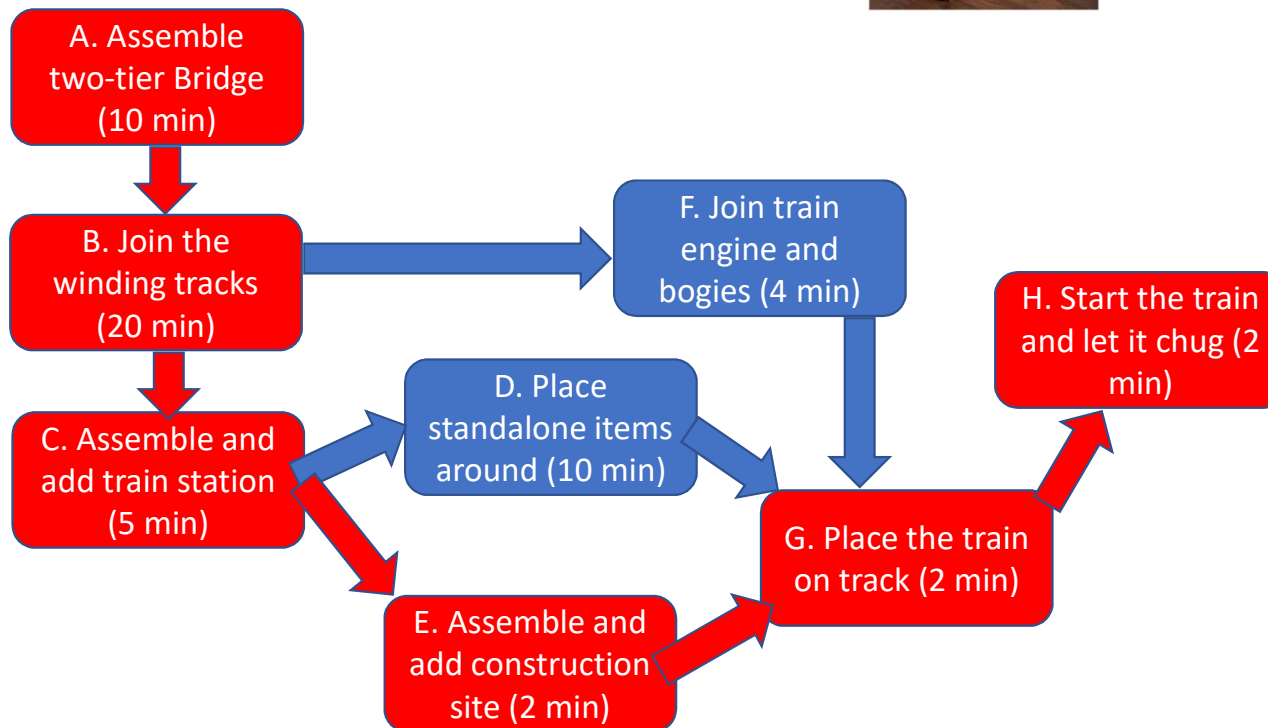
A -> B -> F -> G -> H

A -> B -> C -> D -> G -> H

Critical Path Example: Building Toy Trainset

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Step 3: Find all possible paths



A -> B -> F -> G -> H

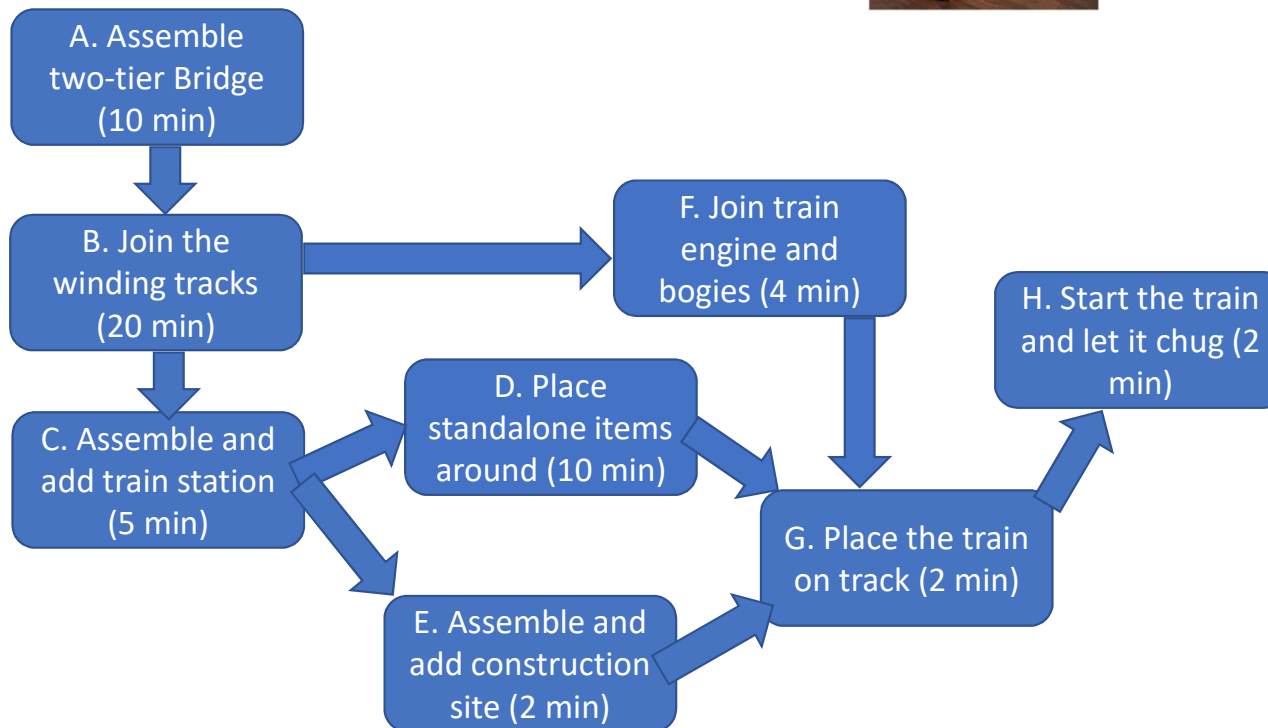
A -> B -> C -> D -> G -> H

A -> B -> C -> E -> G -> H

Critical Path Example: Building Toy Trainset

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Step 4: Calculate duration for each path



A -> B -> F -> G -> H
38 min

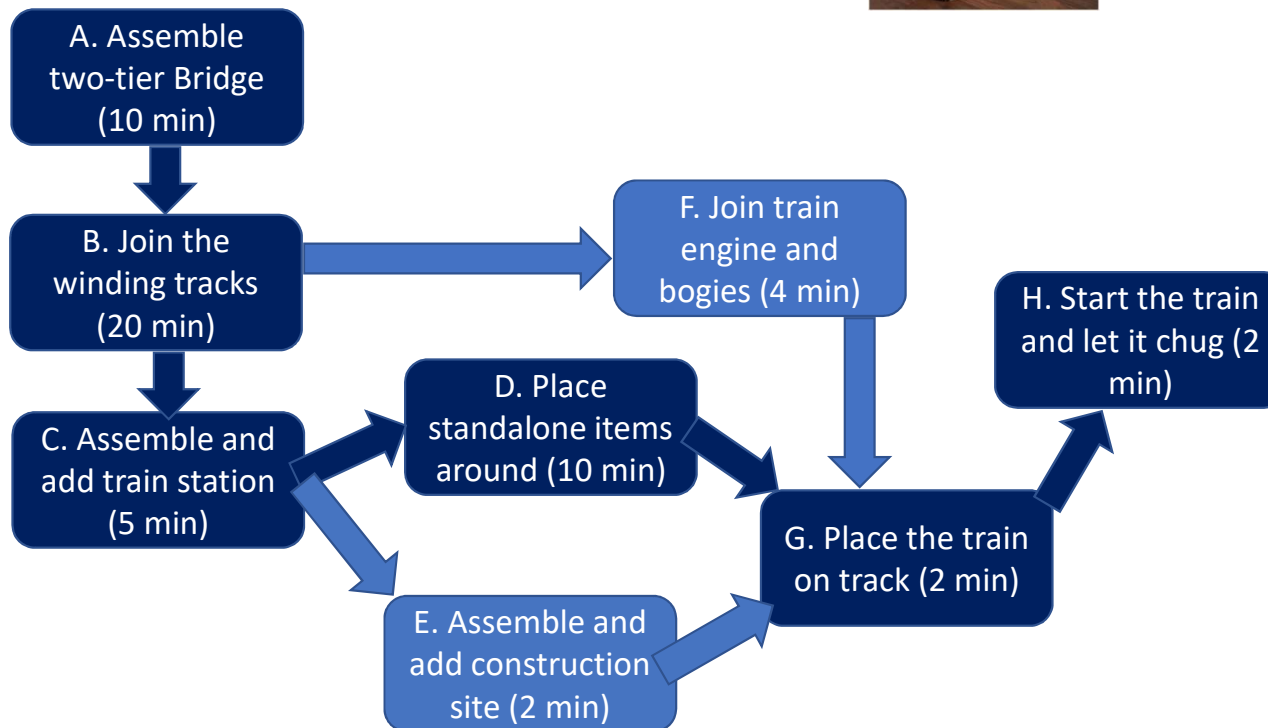
A -> B -> C -> D -> G -> H
49 min

A -> B -> C -> E -> G -> H
41 min

Critical Path Example: Building Toy Trainset

<https://www.pmexamsmartnotes.com/how-to-calculate-critical-path-float-and-early-and-late-starts-and-finishes/>

Step 4: Calculate duration for each path

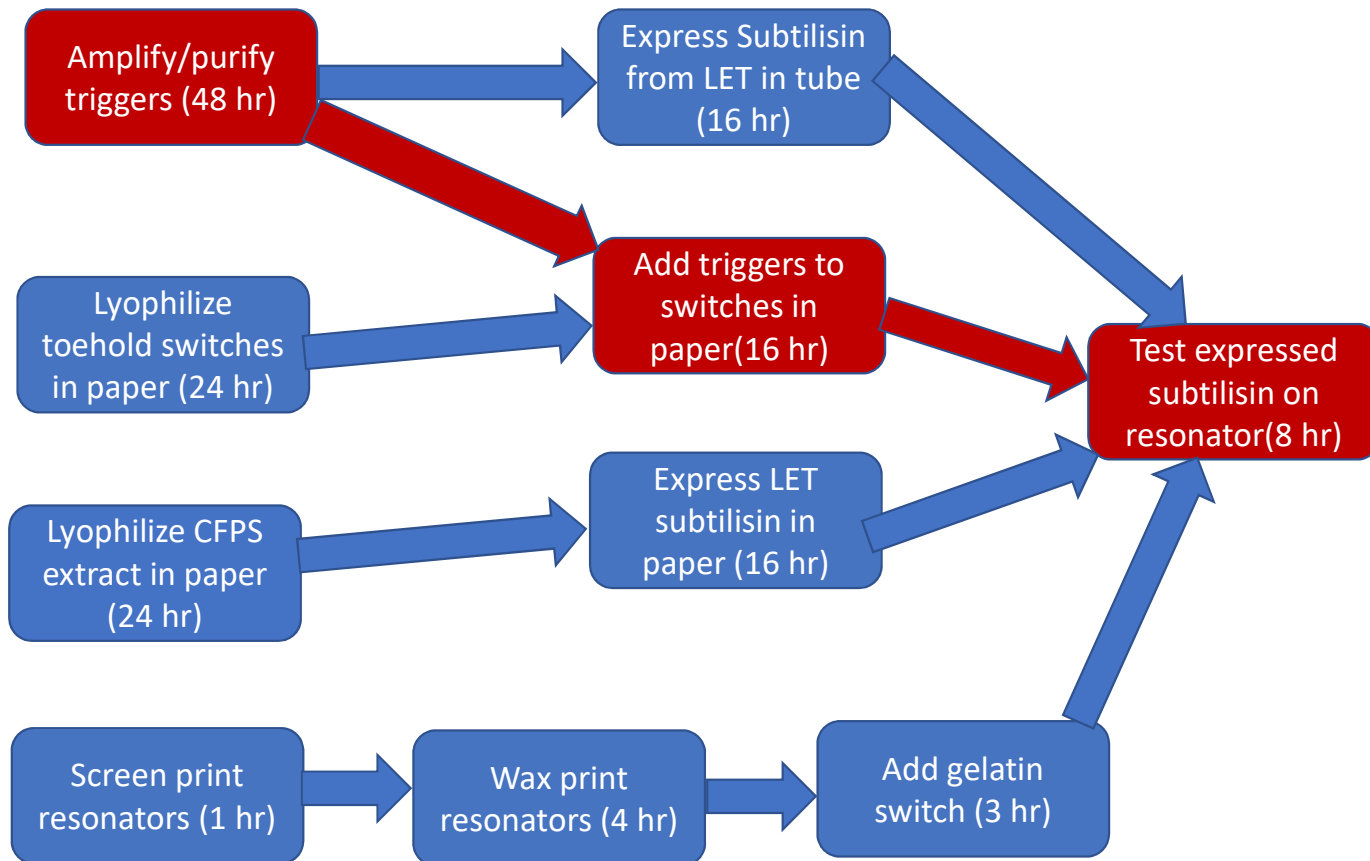


A -> B -> F -> G -> H
38 min

**A -> B -> C -> D -> G -> H
49 min**

A -> B -> C -> E -> G -> H
41 min

Critical Path Example: COVID-19 Sensor



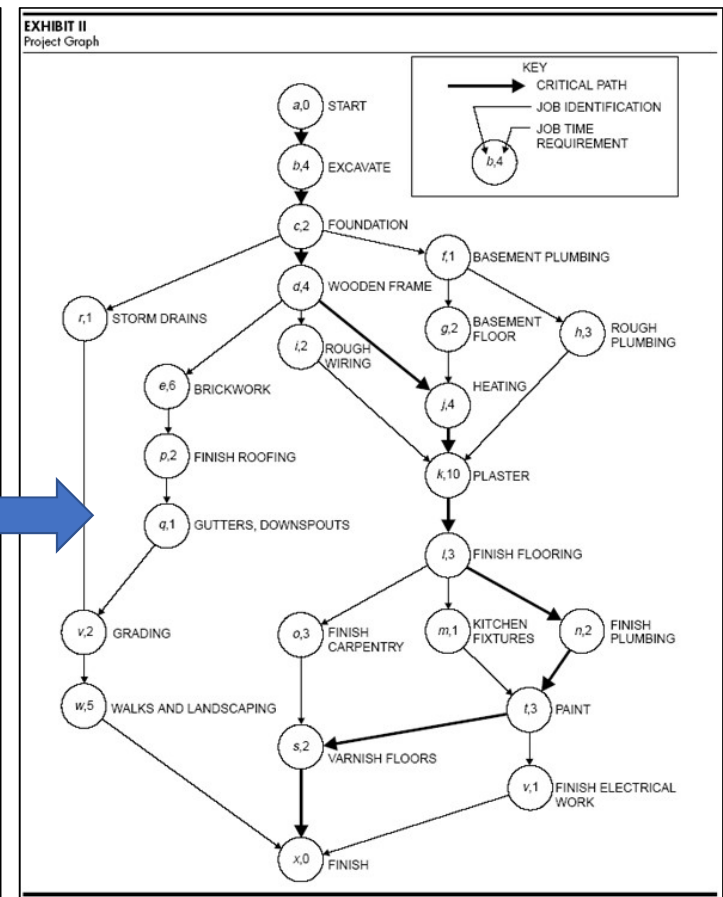
Critical Path:
72 hours

Critical Path – Planning Tools

- Critical path is an *analysis* method for an already existing set of tasks and times
- Old-school method: Hand-draw nodes in a plot and trace out critical path

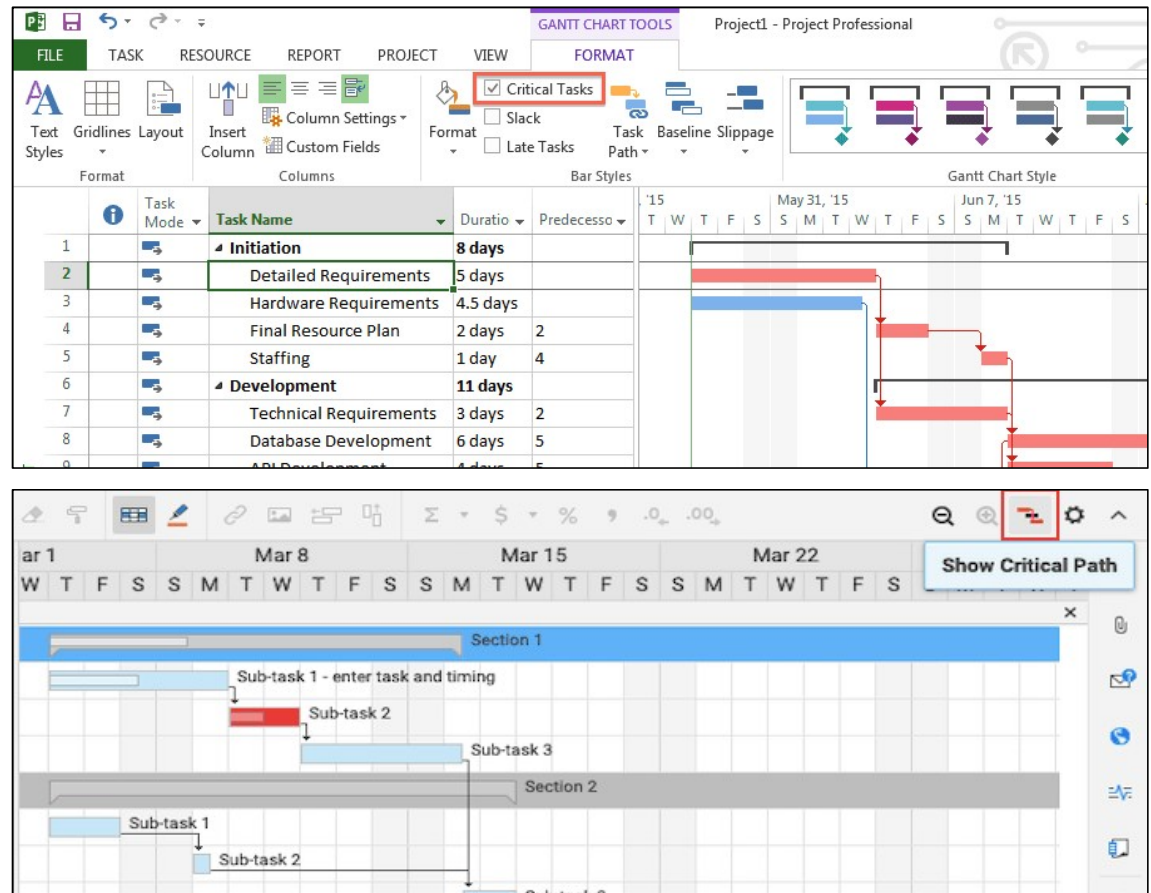
EXHIBIT I
Sequence and Time Requirements of Jobs

Job No.	Description	Immediate predecessors	Normal time (days)
a	Start		0
b	Excavate and pour footers	a	4
c	Pour concrete foundation	b	2
d	Erect wooden frame including rough roof	c	4
e	Lay brickwork	d	6
f	Install basement drains and plumbing	c	1
g	Pour basement floor	f	2
h	Install rough plumbing	f	3
i	Install rough wiring	d	2
j	Install heating and ventilating	d,g	4
k	Fasten plaster board and plaster (including drying)	i,j,h	
l	Lay finish flooring	k	3
m	Install kitchen fixtures	l	1
n	Install finish plumbing	l	2
o	Finish carpentry	l	3
p	Finish roofing and flashing	e	2
q	Fasten gutters and downspouts	p	1
r	Lay storm drains for rain water	c	1
s	Sand and varnish flooring	o,t	2
t	Paint	m,n	3
u	Finish electrical work	t	1
v	Finish grading	q,r	2



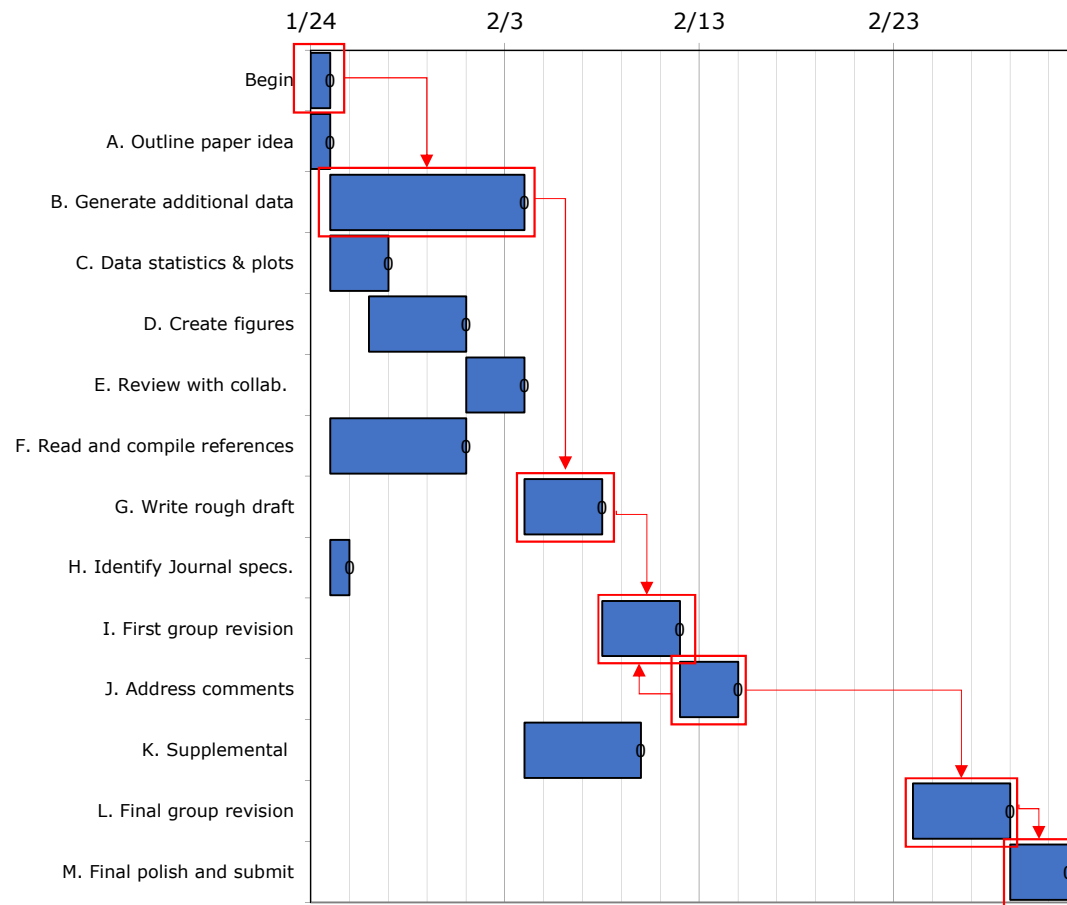
Critical Path – Planning Tools

- Modern project management software integrates critical path analysis into their Gantt Chart development
- Microsoft Projects and Smartsheet are two popular examples
- Lucidcharts and many other project display tools



Example – Paper Planning

Task	Dependency	Timeline
A. Outline paper idea		1
B. Generate additional data	A	16
C. Data statistics & plots	A	3
D. Create figures	C	5
E. Review with collab.	D, A	3
F. Read and compile references	A	14
G. Write rough draft	F, E, B	4
H. Identify Journal specs.	A	1
I. First group revision	G	4
J. Address comments	I	3
K. Supplemental	E	6
L. Final group revision	J	5
M. Final polish and submit	L	3



Final Notes

- Concept of “Slack/float”: How much extra time is there on the non-critical paths before they become critical?
- How to estimate timelines: $\text{time} = \frac{\text{minimum} + 3 * \text{ideal} + \text{maximum}}{5}$
 - Can weight differently based on personal experience
- Adjust critical path as needed: Identify criticality or near-criticality

Conclusions

- Critical path is an analysis tool for identifying the shortest time to complete a project or process
- Useful for identifying a timeline and keeping on task
- Adding dependencies to Gantt chart creation tools (Excel, Project, Smartsheets) lets you identify criticality on your timeline