
Project Management Fundamentals

Student Workbook



Version 0.5

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About This Workbook

This student workbook is intended as a companion to the Project Management Fundamentals textbook (see christiansonjs.com for details and download options).

This workbook is intended to be used by students to:

1. Take notes while reading the text and watching videos.
2. To check their knowledge of the material with quizzes and exercise.

This workbook is organized by chapter sections.

Note: The slides decks from the videos in the Project Management Fundamentals are freely available for download on speaker deck (<https://speakerdeck.com/jscottmo>).



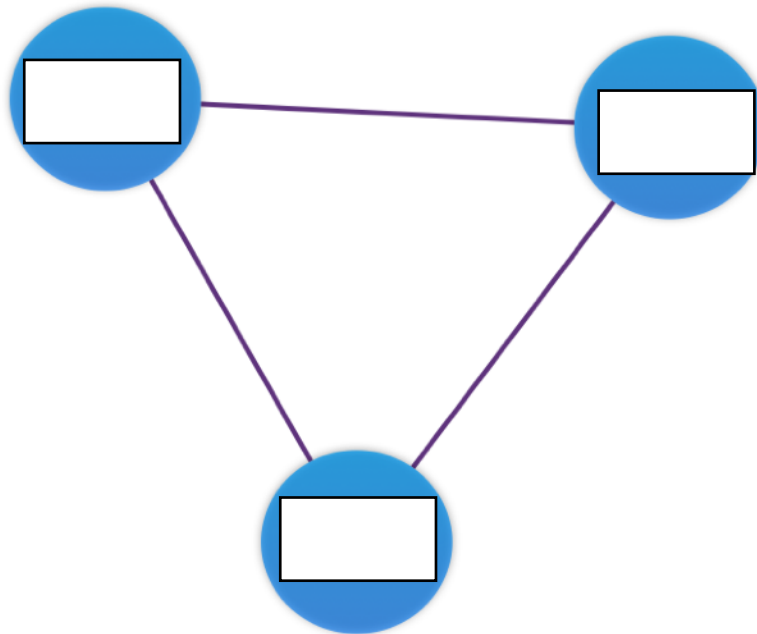
Chapter 1: Project Management Defined

Section 1 Notes: Project Definitions

Video 1.1: What is a Project

The six defining characteristics of a project:

1. Is _____ with a definite _____ and _____.
2. Has a _____ objective.
3. Has _____ or _____.
4. Has _____, such as _____, _____ and _____.



5. Has _____ for success.
6. Includes some amount of _____.

Traditional vs. Agile

Traditional Project Management Methods are Best Used for:

Agile Project Management Methods are Best Used for:

Video 1.2: Scope Triangle and the Project Priority Matrix

Complete the table below as you watch the video, filling in the cells to indicate what a selection in that area means in regard to Time, Cost and Scope. A few have already been completed for you. Compare your answers on the next page.

	Accept	Constrain	Enhance
Time			Get done sooner if possible
Cost			
Scope	Will allow scope to be reduced		

	Accept	Constrain	Enhance
Time	Will allow project to be late	Must meet deadline	Get done sooner if possible
Cost	Will allow project to cost more	Can't spend at time more	Complete more cheaply if possible
Scope	Will allow scope to be reduced	Have to meet Specs	Increase scope if possible

Section 1 Test Your Knowledge: Project Definitions

Exercise: Identify Projects!

Use your knowledge of the definition of a project, think of two real-world projects, and use the internet to research more information about the reasons why the project was implemented, who the stakeholders were, and if it was successful. Record your answers below. See the example on the next page if you need help.

Project 1

Name:

Why was this project implemented?

Who were the stakeholders?

Was it successful?

Project 2

Name:

Why was this project implemented?

Who were the stakeholders?

Was it successful?

Example: St. Louis Gateway Arch

Why was this project implemented?

The Gateway Arch was built as a national monument to the westward expansion of the United States. St. Louis was a starting point for various stagecoach, trains and later automobile routes to the western United States.



Who were the stakeholders?

The citizens of Missouri (which provided some of the funding/bonding) for the project and the citizens of the United States through Federal Government funding.


Was it successful?

Despite delays from labor and safety issues, the Arch was constructed and still operates to this day.

Project Definition Questions

1. Which of the following is NOT a project ?
 - A. Making cookies at Ripon Good Cookies.
 - B. Constructing a new business school building.
 - C. Developing a new online store for our company.
 - D. Programming a mobile client for our company's CRM software.
2. Which of the following is a project ?
 - A. Painting a wall.
 - B. Producing bicycle tires.
 - C. Developing a new type of 3D printer.
 - D. Writing a paper about the Presidency of Calvin Coolidge.
3. Don wants to start selling his vegetables every week at the local farmer's market. Is this a project?
 - A. Yes
 - B. No
4. Joe is a member of the Experimental Aircraft Association, or EAA, and wants to build an experimental aircraft in his garage. Is this a project?
 - A. Yes
 - B. No
5. Scott is a college professor and he wants to start walking to work everyday. Is this a project?
 1. Yes
 2. No

Use the following project priority matrix to answer questions 6, 7 and 8.

	Accept	Constrain	Enhance
Time			
Cost			
Scope			

6. In this project, we don't want to have any changes to:
 - A. Time
 - B. Cost
 - C. Scope
7. In this project, we would like to increase costs.
 - A. True
 - B. False
8. In this project, we will be ok with the project getting done later if the scope of the project is met.
 - A. True
 - B. False
9. Risk can also be a constraint on a project.
 - A. True
 - B. False

Project Definition Matching

Terms

- A. Project
- B. Program
- C. Agile
- D. Risk, Quality, and Resources
- E. Scrum
- F. Operations Management
- G. Project Management
- H. Project Portfolio Management
- I. PMI



Definition/Related Statement

- ___ The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.
- ___ Standards body for project management based in North America
- ___ An Agile Project Management Method.
- ___ A series of coordinated Projects.
- ___ A Project Management Method used when the scope of work is not clear and we need a high level of customer involvement.
- ___ A temporary endeavor undertaken to create a unique product, service, or result.
- ___ Additional constraints on a project.
- ___ Management of a company's ongoing activities.
- ___ A method that helps to align project selection with organizational strategy.

Answer Key: Project Definition Questions

1. Which of the following is NOT a project ?
 - A. **Making cookies at Ripon Good Cookies.**
 - B. Constructing a new business school building.
 - C. Developing a new online store for our company.
 - D. Programming a mobile client for our company's CRM software.
2. Which of the following is a project ?
 - A. Painting a wall.
 - B. Producing bicycle tires.
 - C. **Developing a new type of 3D printer.**
 - D. Writing a paper about the Presidency of Calvin Coolidge.
3. Don wants to start selling his vegetables every week at the local farmer's market. Is this a project?
 - A. Yes
 - B. **No**
4. Joe is a member of the Experimental Aircraft Association, or EAA, and wants to build an experimental aircraft in his garage. Is this a project?
 - A. **Yes**
 - B. No
5. Scott is a college professor and he wants to start walking to work everyday. Is this a project?
 1. Yes
 2. **No**

Use the following project priority matrix to answer questions 6, 7 and 8.

	Accept	Constrain	Enhance
Time			
Cost			
Scope			

6. In this project, we don't want to have any changes to:
 - A. Time
 - B. Cost
 - C. **Scope**
7. In this project, we would like to increase costs.
 - A. True
 - B. **False**
8. In this project, we will be ok with the project getting done later if the scope of the project is met.
 - A. **True**
 - B. False
9. Risk can also be a constraint on a project.
 - A. **True**
 - B. False

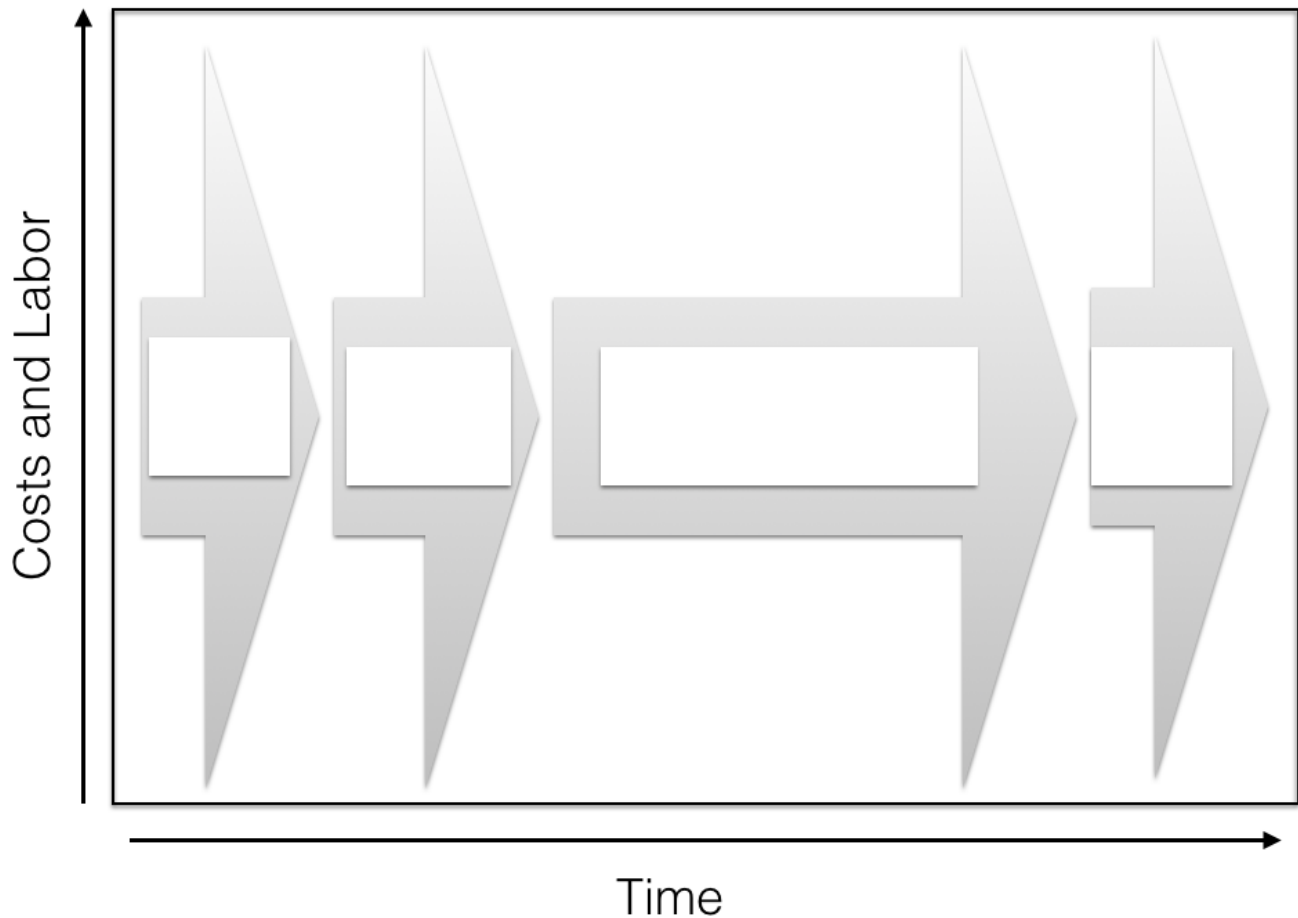
Answer Key: Project Definition Matching

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Project	_G_ The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.
B. Program	
C. Agile	_I_ Standards body for project management based in North America
D. Risk, Quality, and Resources	
E. Scrum	_E_ An Agile Project Management Method.
F. Operations Management	_B_ A series of coordinated Projects.
G. Project Management	_C_ A Project Management Method used when the scope of work is not clear and we need a high level of customer involvement.
H. Project Portfolio Management	
I. PMI	_A_ A temporary endeavor undertaken to create a unique product, service, or result.
	D Additional constraints on a project.
	F Management of a company's ongoing activities.
	H A method that helps to align project selection with organizational strategy.

Section 2 Notes: Project Management Life Cycles and Processes

PMI Project Life Cycle

1. Write in the stage of the PMI generic project management life cycle below.
2. Draw a line that represents the relative costs and labor involved during these stages.



KEYPOINTS: PROJECT LIFE CYCLES

1. Are not the same as project management processes.
2. Will vary based on industry and project.
3. Can be short or long, but have an orderly progression from the start of the project to the end.

Process Groups

Fill in the names of the process groups below.

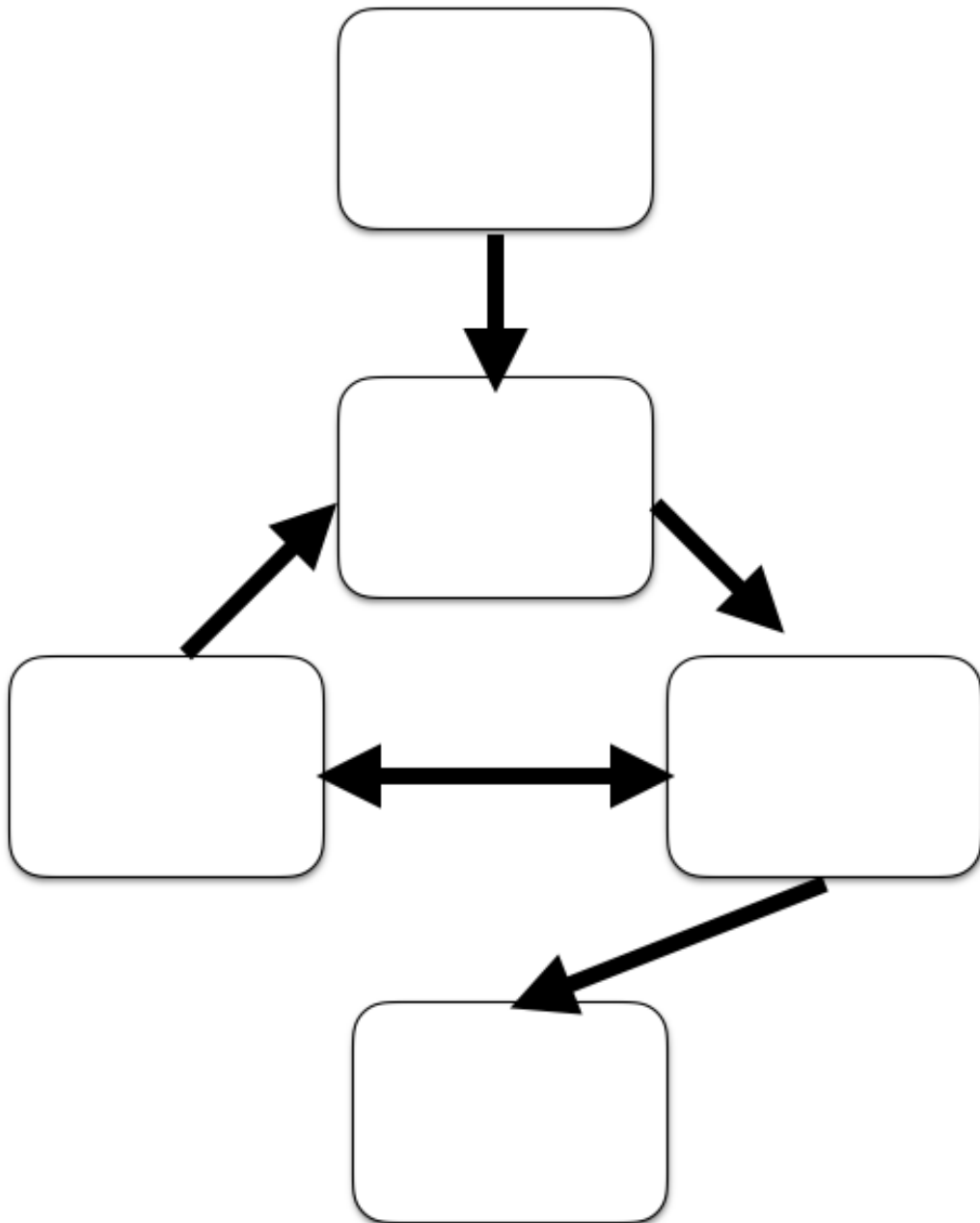


Chart of PMI Processes

Initiating	Planing	Executing	Monitoring and Controlling	Closing
Develop Project Charter.	Develop Project Management Plan	Direct and Manage Project Work	Monitor and Control Project Work	Close Project or Phase
Identify Stakeholders.	Plan Scope Management	Perform Quality Assurance	Perform Integrated Change Control	Close Procurements
	Collect Requirements	Acquire Project Team	Validate Scope	
	Define Scope	Develop Project Team	Control Scope	
	Create WBS	Manage Project Team	Control Schedule	
	Plan Schedule Management	Manage Communications	Control Costs	
	Define Activities	Conduct Procurements	Control Quality	
	Sequence Activities	Manage Stakeholder Engagement	Control Communications	
	Estimate Activity Resources		Control Risks	
	Estimate Activity Durations			
	Develop Schedule			
	Plan Cost Management			
	Estimate Costs			
	Determine Budget			
	Plan Quality Management			
	Plan Human Resource Management			
	Plan Communications Management			
	Plan Risk Management			
	Identify Risks			
	Perform Qualitative Risk Analysis			
	Perform Quantitative Risk Analysis			
	Plan Risk Responses			
	Plan Procurement Management			
	Plan Stakeholder Management			

Section 2 Test Your Knowledge: Project Management Life Cycles and Processes

Project Life Cycles and Processes Questions

1. Project failure can usually be attributed to:
- A. Failure to Plan
 - B. Failure to Execute
 - C. Failure to Launch
 - D. Failure to Close

2. Which of the following is not one of the process groups.
- A. Closing
 - B. Monitoring and Controlling
 - C. Act
 - D. Planning

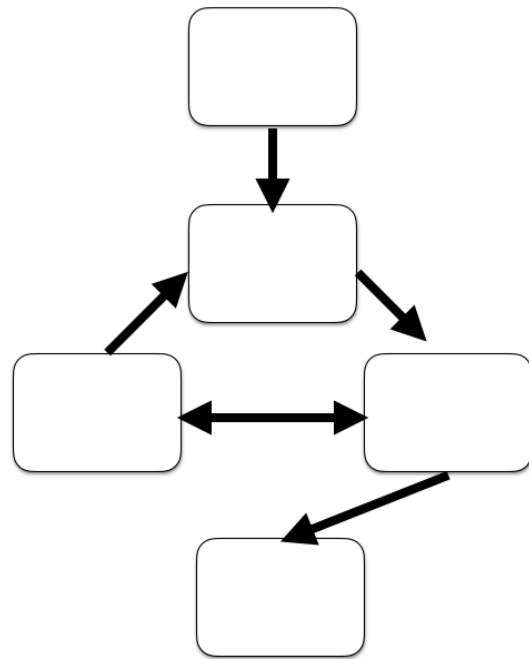
3. Identify stakeholders and develop project charter are all _____ processes.

4. Gaining final acceptance of the product, gather final lessons learned and update knowledge-base are all _____ processes.

5. Perform change control evaluate performance, and take action to control the project are all _____ processes.

6. Develop project management plans, Kickoff meeting, identify risks and develop budget are all _____ processes.

7. Complete fill in the blanks for the process groups in the diagram below:

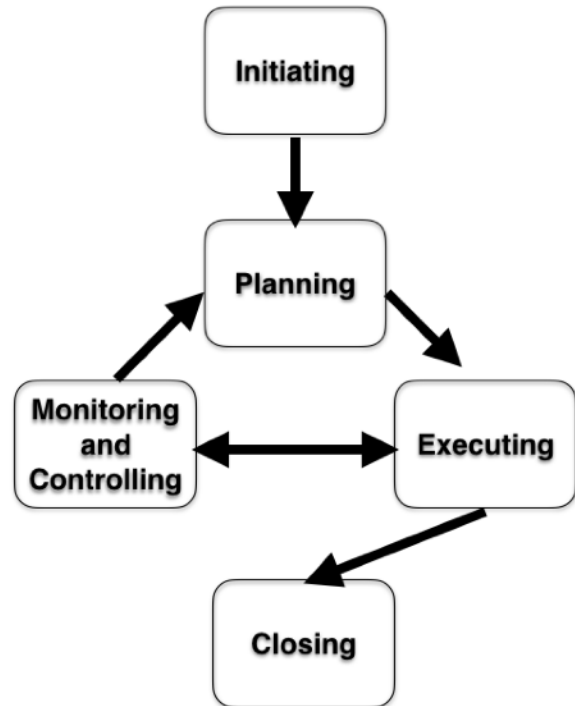


8. Project Management Life Cycles can differ by industry?
- A. True
 - B. False

Answer Key: Project Life Cycles and Processes Questions

1. Project failure can usually be attributed to:
A. Failure to Plan
B. Failure to Execute
C. Failure to Launch
D. Failure to Close
2. Which of the following is not one of the process groups.
A. Closing
B. Monitoring and Controlling
C. Act
D. Planning
3. Identify stakeholders and develop project charter are all **Initiating** processes.
4. Gaining final acceptance of the product, gather final lessons learned and update knowledge-base are all **Closing** processes.
5. Perform change control evaluate performance, and take action to control the project are all **Monitoring and Controlling** processes.
6. Develop project management plans, identify risks and develop budget are all **Planning** processes.

7. Complete fill in the blanks for the process groups in the diagram below:



8. Project Management Life Cycles can differ by industry?
A. True
B. False

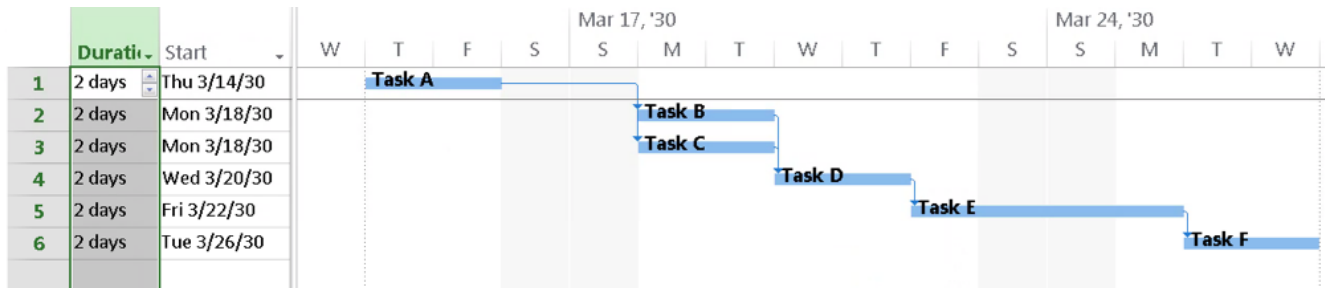
Section 3 Test Your Knowledge: Project Management Standards and Certifications

Standards and Certifications Questions

1. PMI is a governmental organization (like NIST) that is supported by tax dollars).
A. True
B. False
2. It is important for project managers to read the PMBOK guide from cover to cover if they are to be good at their work and pass the PMI Exams.
A. Yes
B. No
3. The CAPM has more rigorous prerequisites than the PMP.
A. True
B. False
4. The hours required in Project Management Education before taking the PMP and CAPM exams are contact hours or credit hours?
A. Credit
B. Contact
5. The PMBOK Guide has been recognized as a Standard by the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE).
A. True
B. False
6. PMI only conducts audits of the project management experience, prior to a person sitting for the PMP.
A. True
B. False
7. The knowledge domain "Project Procurement Management" includes processes for estimating, budgeting, financing, funding, managing, and controlling costs.
A. True
B. False

Exercise 1: Gantt Chart

Below is a Gantt Chart for a project. See if you can answer the following questions about this project just by studying the chart:



1. When should Task B be completed?
 - A. By the end of the day on Tuesday, March 19, 2030.
 - B. By the beginning of the day on Tuesday, March 19 2030.
 - C. By the end of the day on Monday, March 18, 2030.
 - D. By Wednesday, March 27, 2030.
 - E. By Wednesday, March 20, 2030.
2. What activities have to be completed before Task D can start?
 1. Task A and Task B
 2. Task A and Task C
 3. Task A, Task B, and Task C
 4. Task E
3. It is 5pm on March 25, 2030, what tasks should be **complete** if our project is on schedule.
 1. Task A and Task B
 2. Task A, Task B, Task C, Task D, and Task E
 3. Task A and Task C
 4. Task A, Task B, and Task C
 5. Task E

Exercise 2: Learn about PMI Events

Visit the Project Management Institute web site (pmi.org). What events do they have for those interested in project management? Investigate the details on a couple of the events, how much so they cost to attend and what types of things would you learn at such an event?

Exercise 3: Learn About PMI Certification

Visit the Project Management Institute web site (pmi.org). Investigate the information about the certifications that they offer.

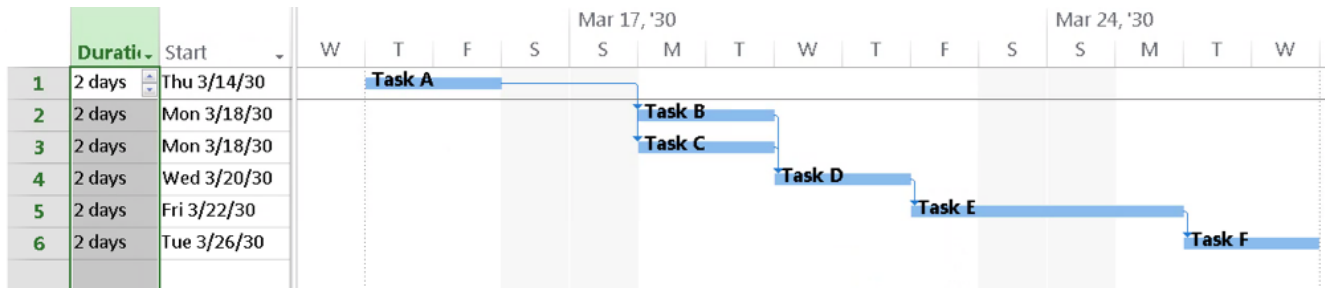
1. How many certifications does PMI offer?
2. Do they offer a certification in program management?
3. "The PMI-RMP certification recognizes demonstrated knowledge and expertise in the specialized area of assessing and identifying project risks along with plans to mitigate threats and capitalize on opportunities."- PMI
What are the prerequisites for taking the certification exam?

Answer Key: Standards and Certifications Questions

1. PMI is a governmental organization (like NIST) that is supported by tax dollars).
A. True
B. False
PMI is a non-profit organization supported by member dues.
2. It is important for project managers to read the PMBOK guide from cover to cover if they are to be good at their work and pass the PMI Exams.
A. Yes
B. No
The PMBOK is best used as a reference guide.
3. The CAPM has more rigorous prerequisites than the PMP.
A. True
B. False
4. The hours required in Project Management Education before taking the PMP and CAPM exams are contact hours or credit hours?
A. Credit
B. Contact
5. The PMBOK Guide has been recognized as a Standard by the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE).
A. True
B. False
6. PMI only conducts audits of the project management experience, prior to a person sitting for the PMP.
A. True
B. False
7. The knowledge domain "Project Procurement Management" includes processes for estimating, budgeting, financing, funding, managing, and controlling costs.
A. True
B. False

Answer Key Exercise 1: Gantt Chart

Below is a Gantt Chart for a project. See if you can answer the following questions about this project just by studying the chart:



1. When should Task B be completed?
 - A. By the end of the day on Tuesday, March 19, 2030.**
 - B. By the beginning of the day on Tuesday, March 19 2030.
 - C. By the end of the day on Monday, March 18, 2030.
 - D. By Wednesday, March 27, 2030.
 - E. By Wednesday, March 20, 2030.
2. What activities have to be completed before Task D can start?
 1. Task A and Task B
 2. Task A and Task C
 - 3. Task A, Task B, and Task C**
 4. Task E
3. It is March 25, 2030, what tasks should be **complete** if our project is on schedule.
 1. Task A and Task B
 - 2. Task A, Task B, Task C, Task D, and Task E.**
 3. Task A and Task C
 4. Task A, Task B, and Task C
 5. Task E

Answer Key: Exercise 2: Learn about PMI Events

Visit the Project Management Institute web site (pmi.org). What events do they have for those interested in project management? Investigate the details on a couple of the events, how much so they cost to attend and what types of things would you learn at such an event?

Answers will vary by student!

Answer Key: Exercise 3: Learn About PMI Certification

Visit the Project Management Institute web site (pmi.org). Investigate the information about the certifications that they offer.

1. How many certifications does PMI offer?

Eight

2. Do they offer a certification in program management?

Yes, the PgMP® Program Management Professional. " Designed for those who manage multiple, complex projects to achieve strategic and organizational results.

3. "The PMI-RMP certification recognizes demonstrated knowledge and expertise in the specialized area of assessing and identifying project risks along with plans to mitigate threats and capitalize on opportunities."- PMI
What are the prerequisites for taking the certification exam?

Secondary degree

4,500 hours project risk management experience

40 hours project risk management education

or

Four-year degree

3,000 hours project risk management experience

30 hours project risk management education

Chapter 2: Project Management Roles

Section 1 Notes: The Project Manager

Key characteristics of a project manager:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

The Project Manager as Team Leader

Think about your own experience.

Theory X: Have you ever been given a simple task to perform, but the person who asked you to do it keep telling you how to do it or wanting constant updates on progress? In other words, that person subscribed to Theory X. If so, how did that affect your motivation?

Theory Y: What about when you had a task to do, but were trusted to get the task completed? How did that affect your motivation?

Section 1 Check Your Knowledge: The Project Manager

The Project Manager Questions

1. Tom is a project manager with the ABC corporation. Each morning, and throughout the day, he checks up on his team members to make sure they are doing their job. Which theory of motivation do you think Tom's attitude best fits:
 - A. Theory X
 - B. Theory Y
 - C. Theory Z.

2. Jane is a project manager with the DEF corporation. Each morning she goes straight to her work, trusting that the project team is working on what they need to and will ask her if they need guidance. Which theory of motivation do you think Jan's attitude best fits:
 - A. Theory X
 - B. Theory Y
 - C. Theory Z.

Answer Key: The Project Manager Questions

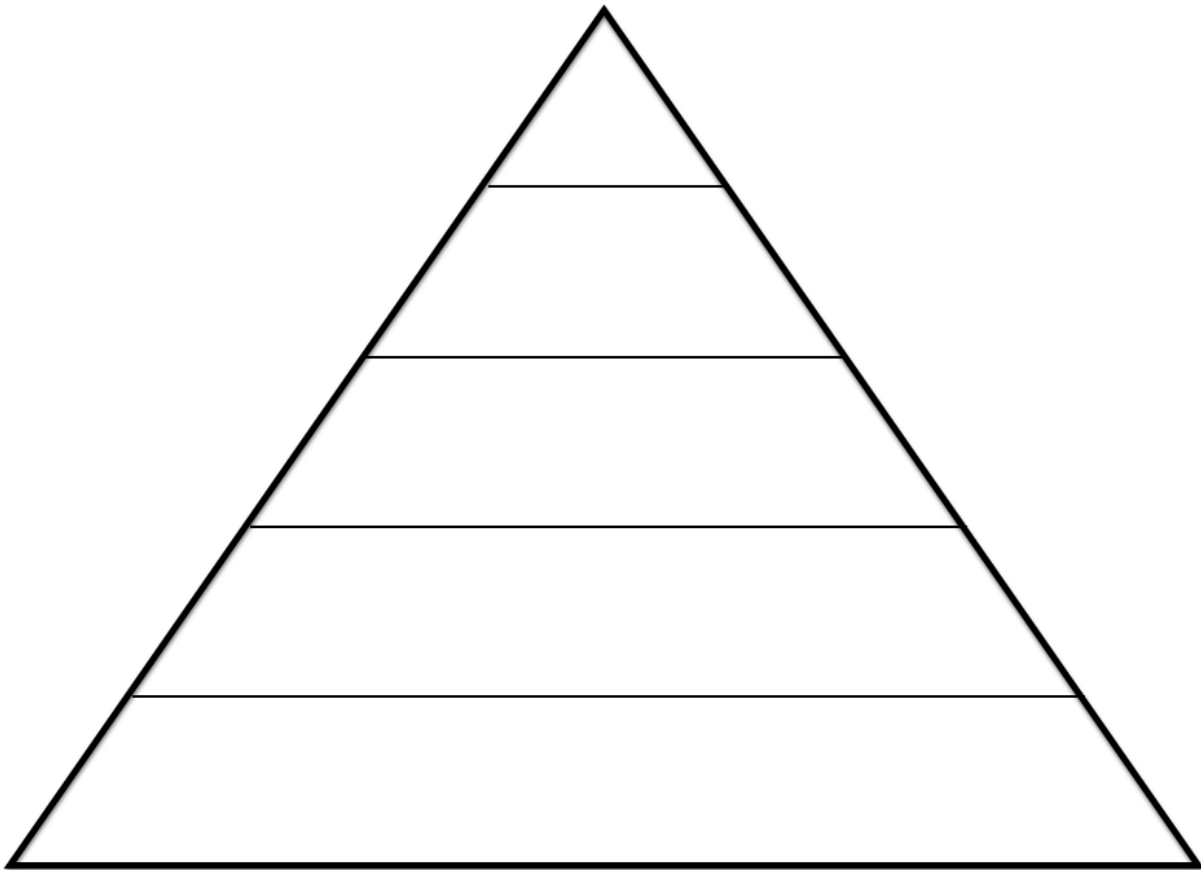
1. Tom is a project manager with the ABC corporation. Each morning, and throughout the day, he checks up on his team members to make sure they are doing their job. Which theory of motivation do you think Tom's attitude best fits:
A. Theory X
B. Theory Y
C. Theory Z.

2. Jane is a project manager with the DEF corporation. Each morning she goes straight to her work, trusting that the project team is working on what they need to and will ask her if they need guidance. Which theory of motivation do you think Jan's attitude best fits:
A. Theory X
B. Theory Y
C. Theory Z.

Section 2 Notes: The Project Team

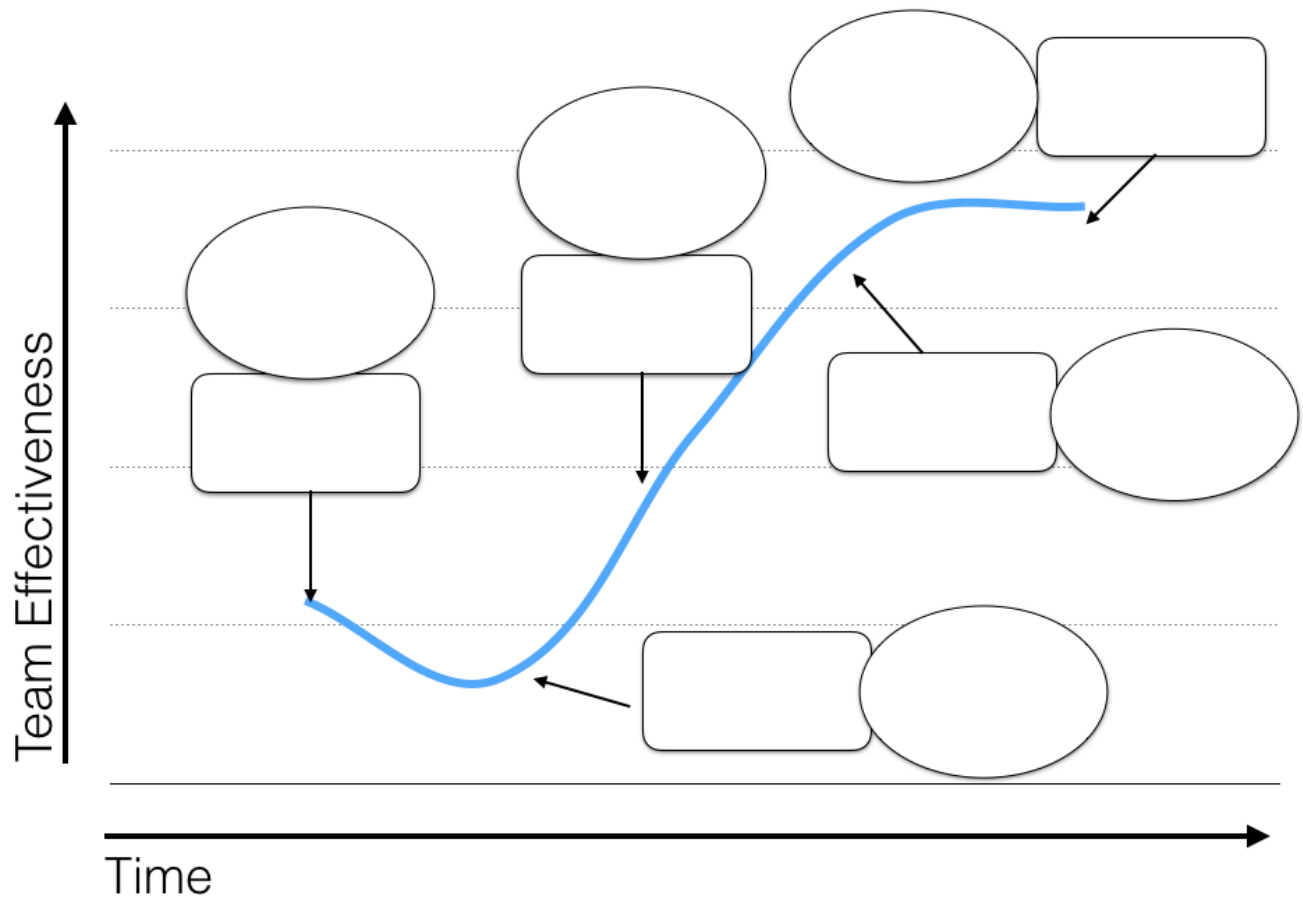
Maslow's Hierarchy of Needs.

Fill in the names of the layers in the pyramid diagram of Maslow's Hierarchy of Needs in the diagram below.



Tuckman's Stages of Team Development

Fill in the names of the stages of team development in the rectangles below. Then in the circles, write a couple key words about how the project manager should be supporting the team during these stages (hint, see what words or phases are bolded in the text).



Section 2 Check Your Knowledge: The Project Team

The Project Team Questions

1. The first (lowest) level of Maslow's Hierarchy of Needs is:
 - A. Self-Actualization
 - B. Love and Belongingness
 - C. Pride and Prejudice
 - D. Biological and Physiological
 - E. Performing

 2. The last (highest) level of Maslow's Hierarchy of Needs is:
 - A. Self-Actualization
 - B. Love and Belongingness
 - C. Pride and Prejudice
 - D. Biological and Physiological
 - E. Performing

 3. Reflection question: Are your esteem needs being met now? If so how? If not, how could those needs be met?

 4. Reflection question: Are you Self-Actualized?
 - A. If so, describe how you are trying to be the best you that you can be?

 - B. If not, what are the needs that you are not being met for you? How does that affect your life?
-

5. Reflection question: Think about your co-workers or fellow students. Are there situations where you think some of their lower needs are not being met? If so, how does that affect their behavior?

6. During the storming stage, project managers should

- A. Delegate
- B. Provide guidance and direction
- C. Supervise all employees equally
- D. Encourage
- E. Provide support and coaching

7. At what stage should project managers try to act as facilitators for the group?

- A. Forming
- B. Storming
- C. Norming
- D. Adjusting
- E. Realigning

8. Short Answer: Name each stage of Tuckman's stages of Team Development and mention at least one characteristic of each stage.

9. Productivity of the team remains the same throughout the various stages of team development?

- A. True
- B. False

Answer Key: The Project Team Questions

1. The first (lowest) level of Maslow's Hierarchy of Needs is:
 - A. Self-Actualization
 - B. Love and Belongingness
 - C. Pride and Prejudice
 - D. Biological and Physiological**
 - E. Performing

2. The last (highest) level of Maslow's Hierarchy of Needs is:
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 - D. Biological and Physiological
 - E. Performing

3. Reflection question: Are your esteem needs being met now? If so how? If not, how could those needs be met?

Answer will vary by student

4. Reflection question: Are you Self-Actualized?
 - A. If so, describe how you are trying to be the best you that you can be?

Answer will vary by student

- B. If not, what are the needs that you are not being met for you? How does that affect your life?

Answer will vary by student

5. Reflection question: Think about your co-workers or fellow students. Are there situations where you think some of of their lower needs are not being met? If so, how does that affect their behavior?

Answer will vary by student

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- A. Delegate
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- D. Encourage
- E. Provide support and coaching**

7. At what stage should project managers try to act as facilitators for the group?

- A. Forming
- B. Storming
- C. Norming**
- D. Adjusting
- E. Realigning

8. Short Answer: Name each stage of Tuckman's stages of Team Development and mention at least one characteristic of each stage.

Stage	Possible Characteristics
Forming	orientation to project, disagreement about purpose and goals of project, trying to understand the project
Storming	team members learning to get along and what their role is, interpersonal conflict, struggles for power or attention, a clearer vision for the team
Norming	norms of behavior are worked out, consensus emerges around roles and approach to the project
Performing	work is completed efficiently, team is focused on completion of deliverables, less supervision required
Adjourning	collection of lessons learned, recognition of contributions, transition to new projects.

9. Productivity of the team remains the same throughout the various stages of team development?

- A. True
 - B. False**
-

Section 3 Check Your Knowledge: Project Stakeholders

Project Stakeholders Questions

1. Stakeholders are always internal to our organization.

A. True
B. False
2. Stakeholder interest and influence rise and fall together.

A. True
B. False
3. When conducting a stakeholder analysis, it is best to limit the number of stakeholders or stakeholder groups to 10.

A. True
B. False
4. The project team is also considered a stakeholder.

A. True
B. False
5. Stakeholders who have little interest in our project can be safely ignored.

A. True
B. False

Exercise 1: Stakeholder Register

Consider the "project" of an undergraduate student completing his or her plan of study and graduating with a degree. Who are the major stakeholders in this project, what are their concerns, what is their importance to the success of the project, and their interest in seeing this student graduate. Calculate a score for each stakeholder and see if the ranking from high to low reveals which stakeholders need to be managed closely.

Name	Major Concerns	Import. (1-5)	Interest (1-5)	Score

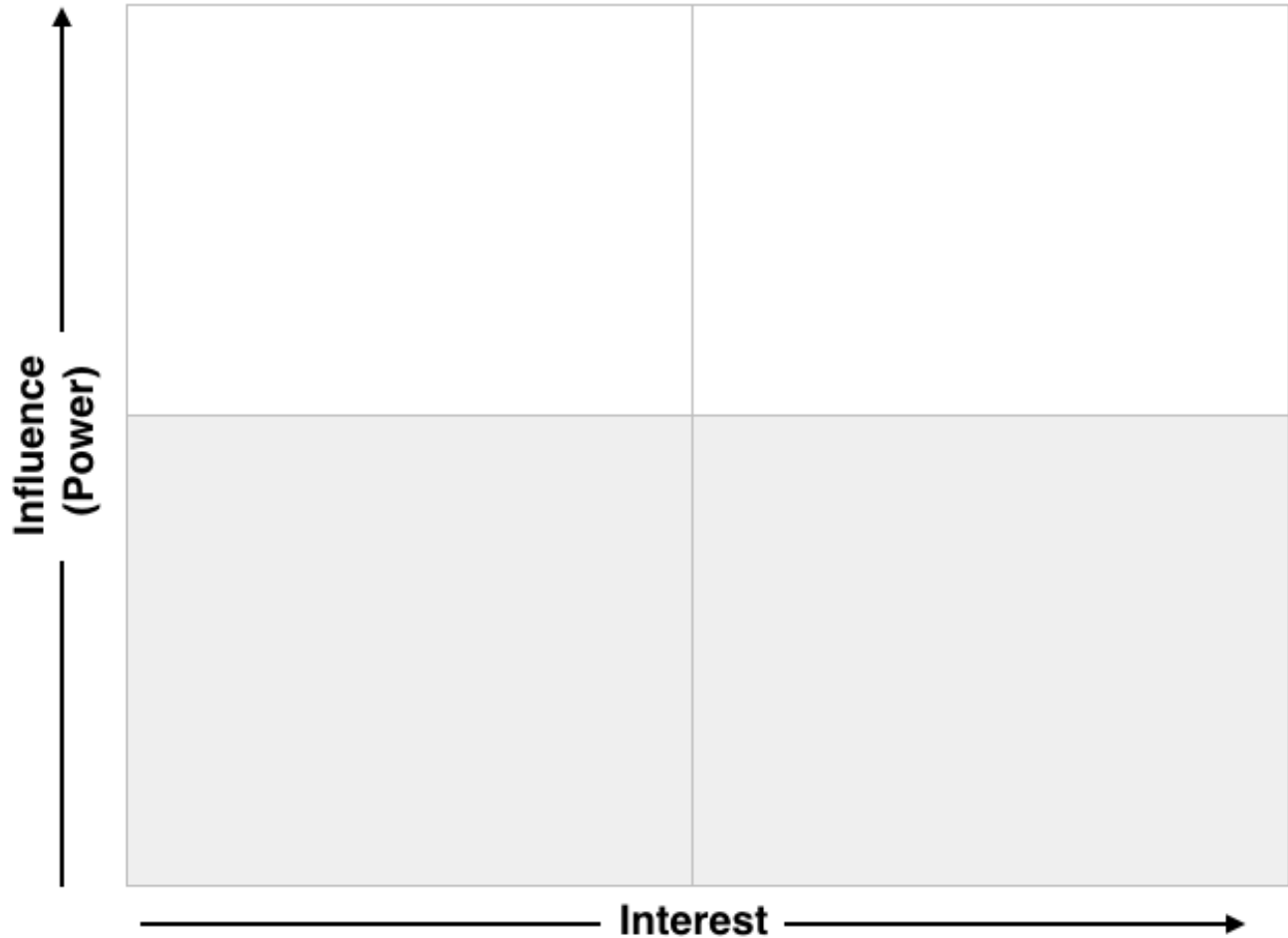
Exercise 2: Stakeholder Register

Consider the project of upgrading the wireless network at your college or organization. Who are the major stakeholders in this project, what are their concerns, what is their importance to the success of the project, and their interest. Calculate a score for each stakeholder and see if the ranking from high to low reveals which stakeholders need to be managed closely.

Name	Major Concerns	Import. (1-5)	Interest (1-5)	Score

Exercise 3: Stakeholder Map

Consider the project of creating a promotional video for your college or organization. Use the stakeholder map below to place the stakeholders in relation to their influence and interest.



Answer Key: Project Stakeholders Questions

1. Stakeholders are always internal to our organization.

A. True
B. False
2. Stakeholder interest and influence rise and fall together.

A. True
B. False
3. When conducting a stakeholder analysis, it is best to limit the number of stakeholders or stakeholder groups to 10.

A. True
B. False
4. The project team is also considered a stakeholder.

A. True
B. False
5. Stakeholders who have little interest in our project can be safely ignored.

A. True
B. False

Chapter 3, Project Management Organizations

Section 1 Notes: Organizational Structures

Types of Organizational Structures

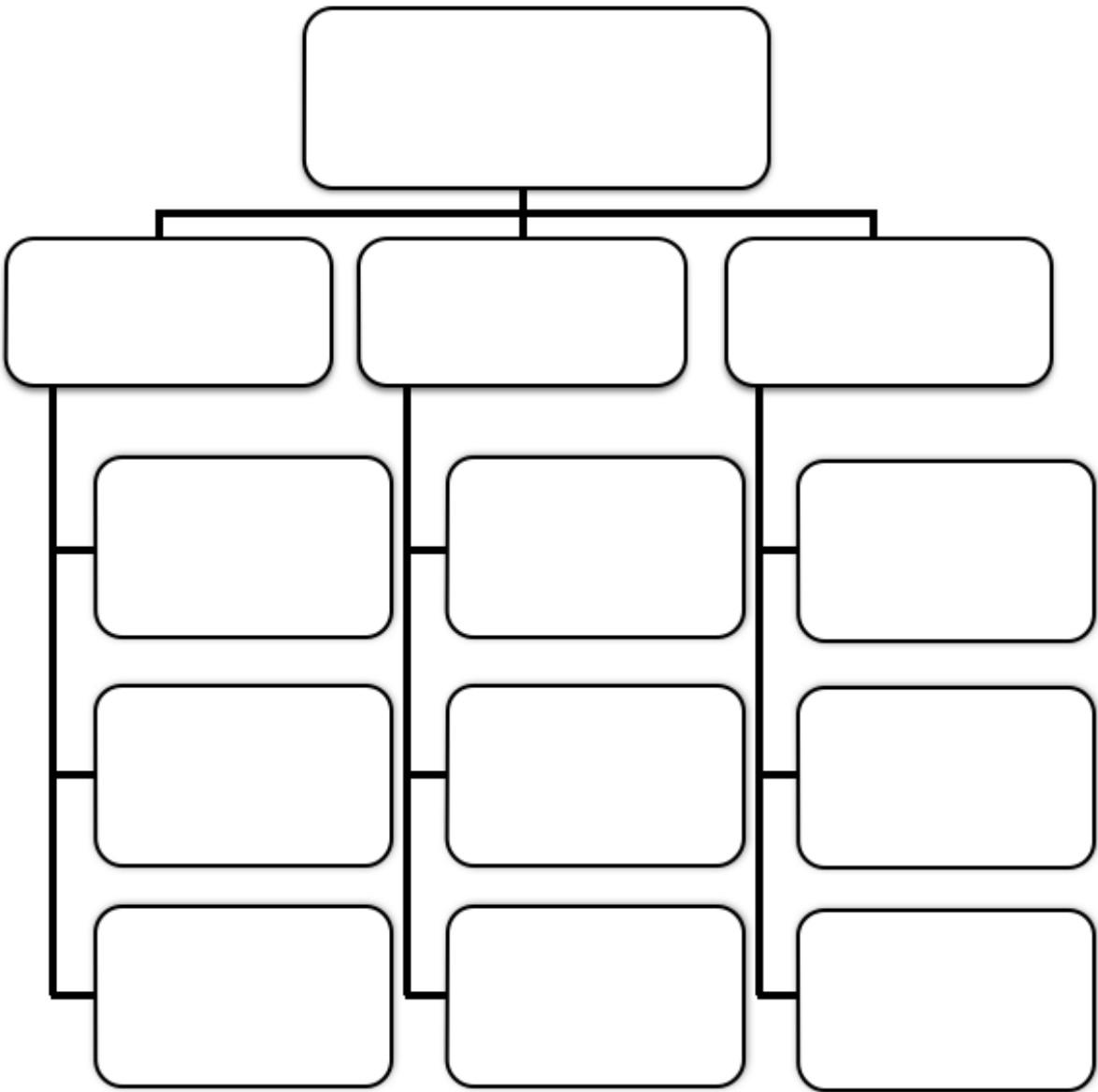
Fill in the boxes in the figure below using the figure in the book as your guide. Fill in "Project Manager" or "Functional Manager" in the blanks to select the relative strength of the managers authority in the various structures.

The diagram shows a hierarchy of boxes. On the left is a single large box. To its right is a horizontal row of three smaller boxes, all contained within a single larger rounded rectangle. To the right of this row is another single large box, matching the size of the first one. This structure represents a project manager at the top with three functional managers reporting to them.



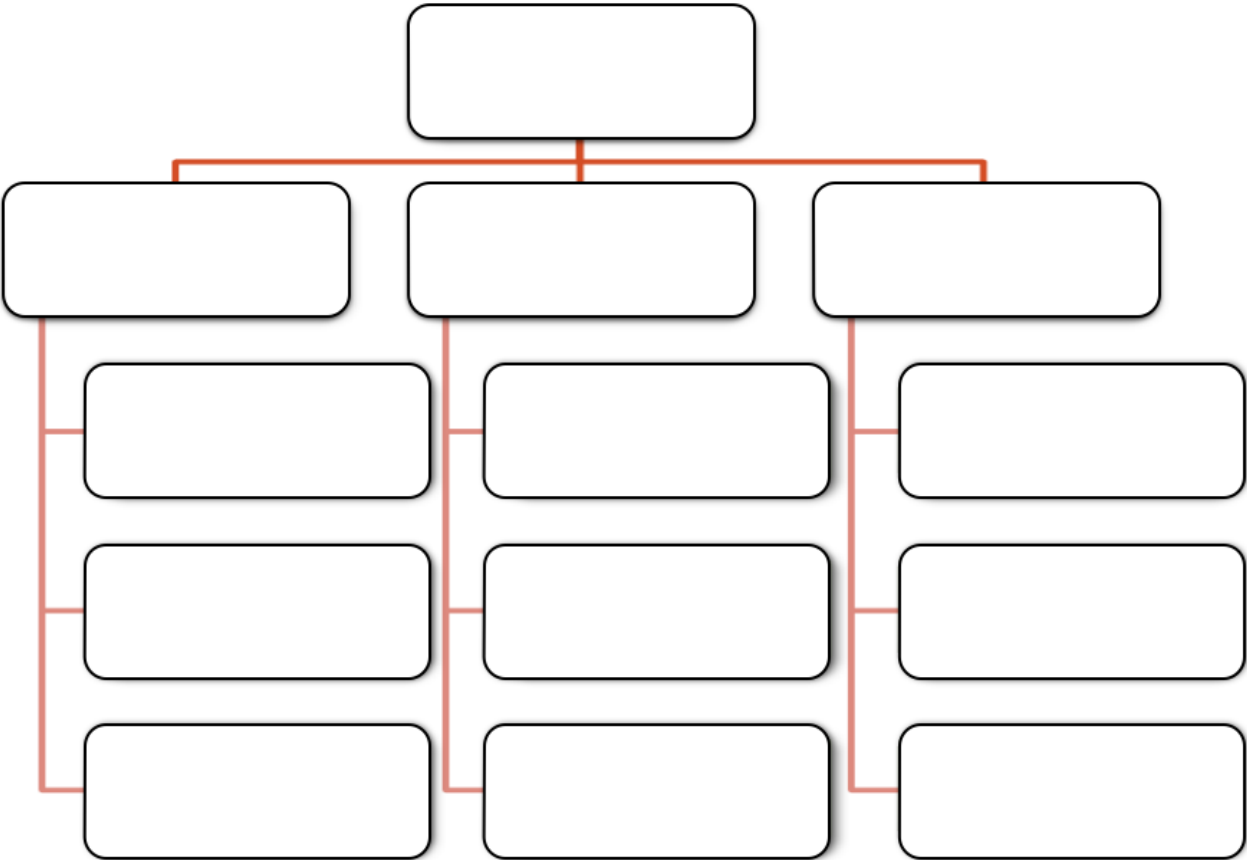
Functional Organizations

Fill in the boxes in the figure below using the figure in the book as your guide.



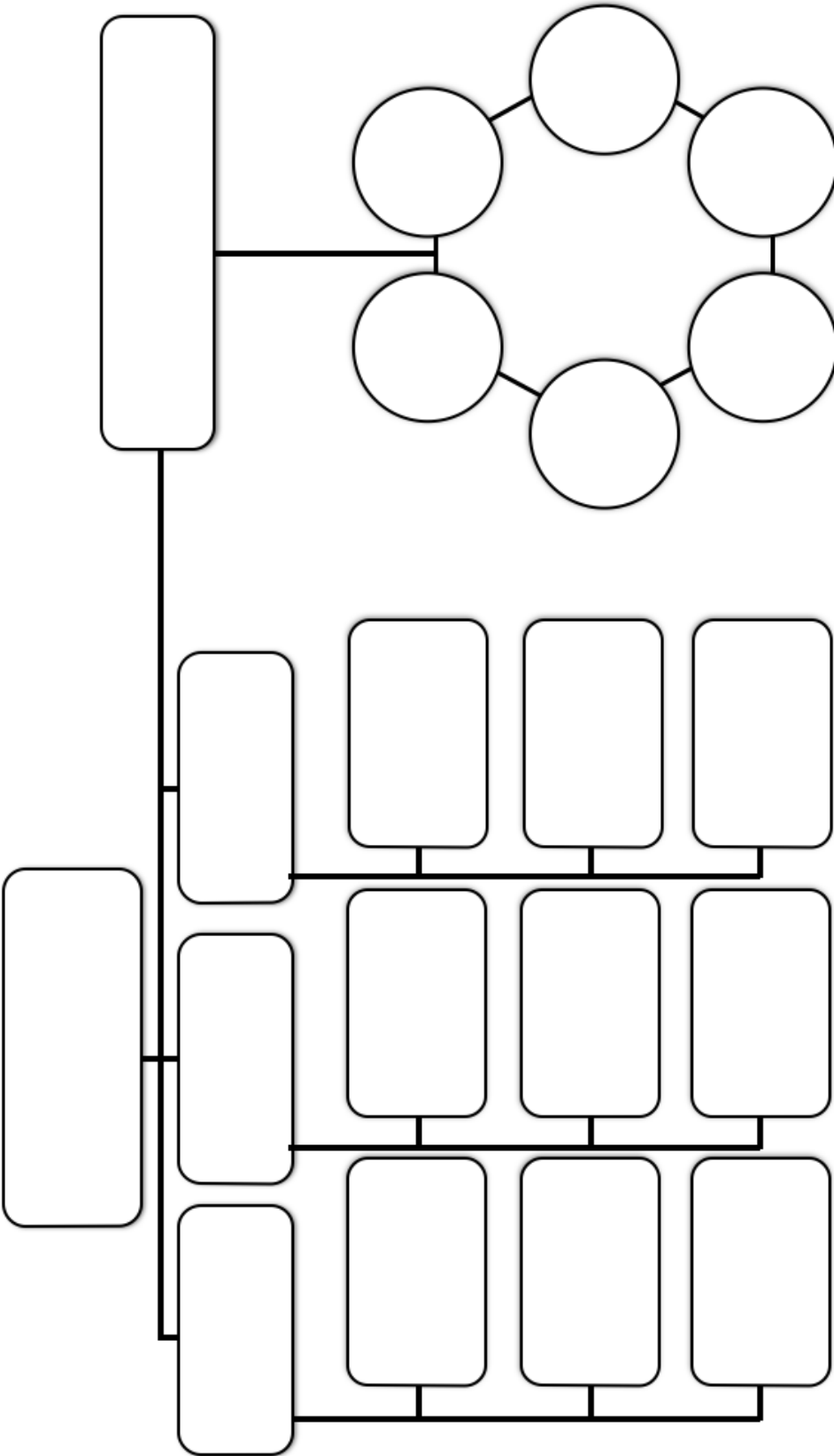
Projectized Organizations

Fill in the boxes in the figure below using the figure in the book as your guide.



Project Team

Fill in the boxes in the figure below using the figure in the book as your guide.



Section 1 Check Your Knowledge: Organizational Structures

Project Management Organizations Questions

1. The list of advantages and disadvantages shown below best describes:

1. Weak Matrix Organizational structure
2. Functional Organizational structure
3. Dedicated Project Team Organizational structure
4. Strong Matrix Organizational structure
5. Compounded Organizational structure

Advantages	Disadvantages
<ul style="list-style-type: none">• Subject matter experts are well organized and have support of peers in their department.• Maximize efficiency in terms of on-going operations.	<ul style="list-style-type: none">• Not focused on the project goals• Inefficient use of time and money in regards to project goals.• Lack of responsibility or ownership of the project.

2. One advantage to the balanced matrix organization for project management is:

1. Each employee has two supervisors.
2. Successful project completion and maintenance of ongoing operations are given equal weight.
3. Staff must decide between the demands of a project and the job in their functional unit.
4. Lots of time is spent on figuring out how to share resources.

Fill in the Blank: Organization Structures: Advantages and Disadvantages

Complete the following table listing the advantages and disadvantages of the functional, matrix and dedicated project team organizations?

	Advantages	Disadvantages
Functional		
Matrix		
Dedicated Project Team		

Fill in the Blank: Matrix Organizations

Fill in the types of Matrix organizations in the diagram below and indicate the relative strength of the functional and project manager's authorities.

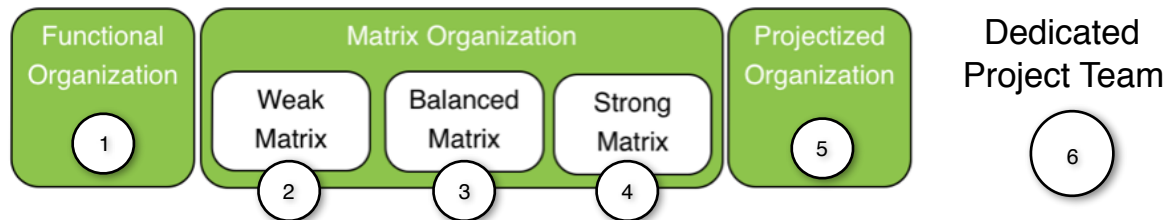


Functional Manager Authority

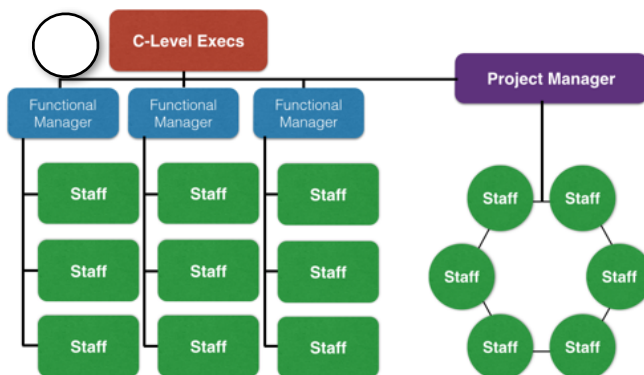
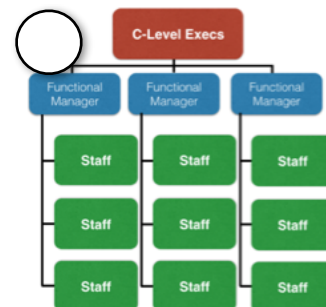
Project Manager Authority

Matching: Know Your Organization

Fill in the number that corresponds to the correct organization type.



- Recognizing the benefits that the projectized organization has by giving authority to the project manager, functional organizations often organize ____ where a project manager can have authority over the staff assigned to that particular project.
- The most typical problem with a ____ structure is that communication within the company can be rather rigid, making the organization slow and inflexible. Communication in organizations with these structures can be rigid because of the standardized ways of operation and the high degree of formalization.
- Project Manager's Authority is Little or None in a ____ or ____.
- A project manager is primarily responsible for the project. Functional managers provide technical expertise and assign resources as needed in a ____.
- In a ____ power is shared equally between the project manager and the functional managers. It brings the best aspects of functional and projectized organizations. However, this is the most difficult system to maintain as the sharing of power is a delicate proposition.
- Among all three matrix organizations, the project manager's authority is the weakest in a ____.
- Among all three matrix organizations, the functional manager's authority is the weakest in a ____.
- On the figures below, fill in the circle with the number that corresponds to the correct organizational structure.



Answer Key: Project Management Organizations Questions

1. The list of advantages and disadvantages shown below best describes:

1. Weak Matrix Organizational structure
- 2. Functional Organizational structure**
3. Dedicated Project Team Organizational structure
4. Strong Matrix Organizational structure
5. Compounded Organizational structure

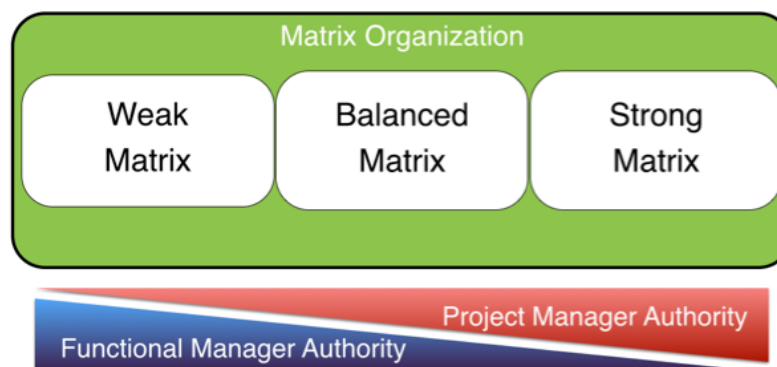
Advantages	Disadvantages
<ul style="list-style-type: none">• Subject matter experts are well organized and have support of peers in their department.• Maximize efficiency in terms of on-going operations.	<ul style="list-style-type: none">• Not focused on the project goals• Inefficient use of time and money in regards to project goals.• Lack of responsibility or ownership of the project.

2. One advantage to the balanced matrix organization for project management is:

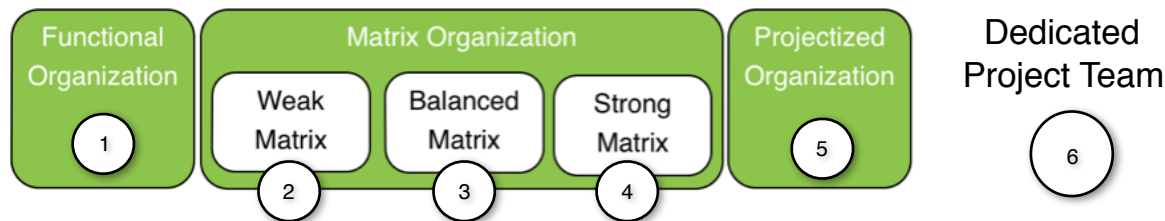
1. Each employee has two supervisors.
- 2. Successful project completion and maintenance of ongoing operations are given equal weight.**
3. Staff must decide between the demands of a project and the job in their functional unit.
4. Lots of time is spent on figuring out how to share resources.

Complete the following table listing the advantages and disadvantages of the functional, matrix and dedicated project team organizations?

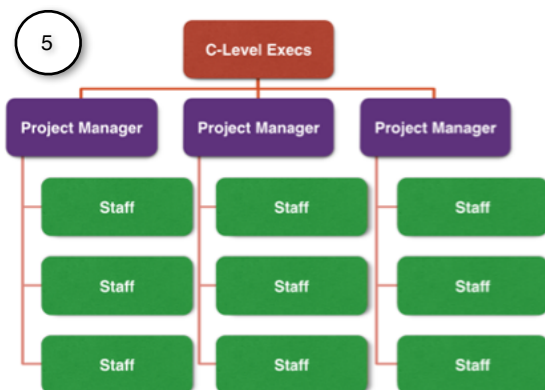
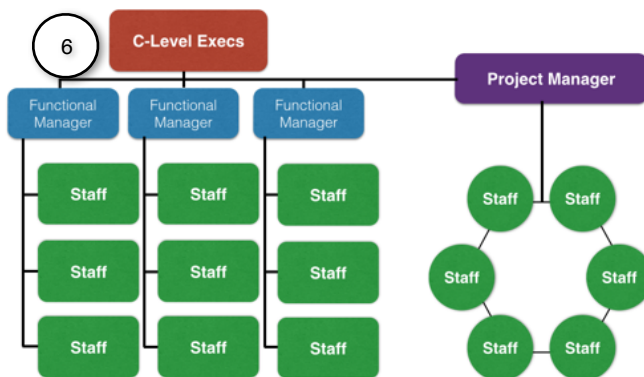
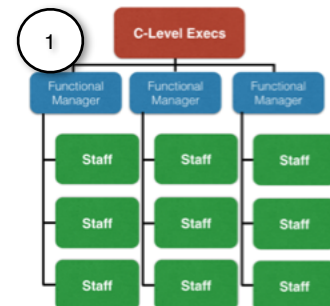
	Advantages	Disadvantages
Functional	<ul style="list-style-type: none">• Subject matter experts are well organized and have support of peers in their department.• Maximize efficiency in terms of on-going operations.	<ul style="list-style-type: none">• Not focused on the project goals• Inefficient use of time and money in regards to project goals.• Lack of responsibility or ownership of the project.
Matrix	<ul style="list-style-type: none">• Project is made a priority (more focus on the project).• Staff don't leave their functional groups• Resources can be balanced between functional and project goals.	<ul style="list-style-type: none">• Violates the "chain of command" with employees reporting to two different managers• High level of cooperation and communication required between functional and project managers.
Dedicated Project Team	<ul style="list-style-type: none">• Organizations can maintain functional organization overall, while still having high performing teams.• Intense focus on the project• Excellent use of time and money.	<ul style="list-style-type: none">• Where does staff go after the project is over?• Lack of support from functional organizations (harder to tap into that knowledge base).• Antagonistic relations with functional operations can emerge.



Answers: Know Your Organization



- Recognizing the benefits that the project has by giving authority to the project manager, functional organizations often organize **6** where a project manager can have authority over the staff assigned to that particular project.
- The most typical problem with a **1** structure is that communication within the company can be rather rigid, making the organization slow and inflexible. Communication in organizations with these structures can be rigid because of the standardized ways of operation and the high degree of formalization.
- Project Manager's Authority is Little or None in a **1** or **2**.
- A project manager is primarily responsible for the project. Functional managers provide technical expertise and assign resources as needed in a **4**.
- In a **3** power is shared equally between the project manager and the functional managers. It brings the best aspects of functional and projectized organizations. However, this is the most difficult system to maintain as the sharing of power is a delicate proposition.
- Among all three matrix organizations, the project manager's authority is the weakest in a **2**.
- Among all three matrix organizations, the functional manager's authority is the weakest in a **4**.
- On the figures below, fill in the circle with the number that corresponds to the correct organizational structure.



Chapter 4: Project Charter

Section 1 Notes: Project Charter

Sections and Questions

Complete as you read through this section. Fill in the ten sections that a project charter should include and write down a couple of the questions that should be answered in each section. Compare your notes with the notes on the following pages.

Section 1: Background

Questions Answered:

Section 2: Business Case

Questions Answered:

Section 3: Goals

Questions Answered:

Section 4: Key stakeholders

Questions Answered:

Section 5: Major milestones

Questions Answered:

Section 6: Project budget
Questions Answered:

Section 7: Constraints
Questions Answered:

Section 8: Assumptions
Questions Answered:

Section 9: Risks
Questions Answered:

Section 10 Project authorization
Questions Answered:

Completed: Sections and Questions

Compare your notes with the notes below

Section 1: Background

Questions Answered:

- What is the purpose of the project?
- Where did the project originate?
- Have we conducted similar projects in the past?
- Who is the project manager and what level of authority will the project manager have?

Section 2: Business Case

Questions Answered:

- Why was this project selected to move forward (project justification)?
- What selection criteria were used?
- What problems is this project solving or what opportunities is it creating?
- What are the high-level requirements?

Section 3: Goals

Questions Answered:

- What are the broad goals of this project?
- How will we know if the project is a success (what are our metrics for success)?
- Are there industry standards that we are trying to meet or benchmarks for performance that we want this project to attain?

Section 4: Key stakeholders

Questions Answered:

- Who are the key stakeholders and what is their interest in our project?

Section 5: Major milestones

Questions Answered:

- When are the major deliverables expected to be completed?
- Are we receiving progress payments for our work and, if so, what milestones are tied to payments?

Section 6: Project budget

Questions Answered:

- What is the initial budget for this project?
- How was that budget developed?

-
- Are the numbers used for budgeting rough estimates based on top-down estimation techniques, such as analogous or parametric estimating, or are they hard constraints?
 - What contingency fund have been allocated?

Section 7: Constraints

Questions Answered:

- What are the constraints on our project or final product?
- Are there regulatory constraints that our product must meet?
- Are there other limitations that we need to consider in terms of our scope of work?

Section 8: Assumptions

Questions Answered:

- What assumptions are we making about this project or the environment in which we are operating?

Section 9: Risks

Questions Answered:

- What risks can be identified?

Section 10 Project authorization

Questions Answered:

Are we authorized to proceed with the project?

Section 1 Check Your Knowledge: Project Charter

Project Charter Questions

1. A project charter should provide:
 - A. Detailed breakdown of all the work in the project
 - B. Mitigation strategies for potential risks
 - C. Background and description of the project
 - D. Project Network and a list of schedule compression options.
2. A project charter is an optional addition to a project
 - A. True
 - B. False
3. A project charter can be drafted at any time of the project
 - A. True
 - B. False
4. A project charter will often have a place for a sign-off to authorize the project manager to move forward.
 - A. True
 - B. False

For questions below, please download and review the project charter that can be found at <http://pmf.video/charter1> before answering.

5. You are the project manager for the Website Redesign project. One of the team members working on the web re-design wants to update the site at <http://gsli.uoguelph.ca>. You should:

-
6. You are a web developer on the Website Redesign project. Your friend tells you that Joomla! is the best content management system for the new site. You should:
- A. Do your own research and figure out what CMS to use.
 - B. Start Developing on Joomla! immediately.
 - C. Use the Drupal CMS.
7. One of the benefits of this project will be more duplication of content on the site.
- A. True
 - B. False

Answer Key: Project Charter Questions

1. A project charter should provide:
 - A. Detailed breakdown of all the work in the project
 - B. Mitigation strategies for potential risks
 - C. Background and description of the project**
 - D. Project Network and a list of schedule compression options.
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 - A. True
 - B. False**
3. A project charter can be drafted at any time of the project
 - A. True
 - B. False**
4. A project charter will often have a place for a sign-off to authorize the project manager to move forward.
 - C. True**
 - D. False

For questions below, please download and review the project charter that can be found at <http://pmf.video/charter1> before answering.

5. You are the project manager for the Website Redesign project. One of the team members working on the web re-design wants to update the site at <http://gsli.uoguelph.ca>. You should:

Tell him/her that such work is specifically outside of the scope of work as described in the project charter and as them to focus on sites/content that is within the scope of work.

-
6. You are a web developer on the Website Redesign project. Your friend tells you that Joomla! is the best content management system for the new site. You should:
- A. Do your own research and figure out what CMS to use.
 - B. Start Developing on Joomla! immediately.
 - C. Use the Drupal CMS.**
7. One of the benefits of this project will be more duplication of content on the site.
- A. True
 - B. False**

Chapter 5: Project Selection Methods

Section 1 Notes: Choosing a Project

Types of Projects

Fill in the names of the project types below as you are reading the text.

Types of Projects

GET SMART

Fill in the names of the SMART project criteria below as you are reading the text.

S_____ M_____ A_____ R_____ T_____ - _____

The Five Ws

A specific project goal will answer the five "W" questions below? What are those questions?

- 1.
- 2.
- 3.
- 4.
- 5.

Section 1 Check Your Knowledge: Choosing a Project

Choosing a Project Matching

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Constrained Optimization Methods	_____ projects allow us to create something new and innovative.
B. Operations	_____ projects improve our current operations.
C. Project Costs	_____ projects must be done in order to comply with an industry or governmental regulation or standard.
D. Sunk Costs	_____ Direct costs, such as materials, labor, and equipment + Indirect costs, such as insurance and project manager labor + Contingency funds and budgetary reserves.
E. Salvage Value	_____ the loss of potential gain from other alternatives when one alternative is chosen
F. Total Costs of Ownership	_____ the estimated resale value of an asset at the end of its useful life.
G. Sacred Cow	_____ a cost that has already been incurred and cannot be recovered
H. Opportunity Costs	_____ a financial estimate of the project and operating costs over the lifetime of a product.
I. Murder board.	_____ a project considered (perhaps unreasonably) immune from question or criticism
J. Compliance	_____ A group of experts review a project proposal by pointing out its flaws and weaknesses.
K. Strategic	_____ mathematically intensive means of analyzing a series of projects and are not easily generalized

Answers: Choosing a Project Matching

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Constrained Optimization Methods	_K_ Strategic projects allow us to create something new and innovative.
B. Operations	_B_ Operations projects improve our current operations.
C. Project Costs	_J_ Compliance projects must be done in order to comply with an industry or governmental regulation or standard.
D. Sunk Costs	_C_ Direct costs, such as materials, labor, and equipment + Indirect costs, such as insurance and project manager labor + Contingency funds and budgetary reserves.
E. Salvage Value	_H_ the loss of potential gain from other alternatives when one alternative is chosen
F. Total Costs of Ownership	_E_ the estimated resale value of an asset at the end of its useful life.
G. Sacred Cow	_D_ a cost that has already been incurred and cannot be recovered
H. Opportunity Costs	_F_ a financial estimate of the project and operating costs over the lifetime of a product.
I. Murder board.	_G_ a project considered (perhaps unreasonably) immune from question or criticism
J. Compliance	_I_ A group of experts review a project proposal by pointing out its flaws and weaknesses.
K. Strategic	_A_ mathematically intensive means of analyzing a series of projects and are not easily generalized

Section 3 Notes: Economic Scoring Models

Economic Model Comparison Tables

Fill in the following tables as you read through the chapter.

Payback	
Formula for Calculating	
How is result of formula expressed?	
Advantages	
Disadvantages	
Notes	

Net Present Value

Formula for Calculating	
How is result of formula expressed?	
Advantages	
Disadvantages	
Notes	

Internal Rate of Return	
Formula for Calculating	
How is result of formula expressed?	
Advantages	
Disadvantages	
Notes	

Benefit to Cost Ratio

Formula for Calculating	
How is result of formula expressed?	
Advantages	
Disadvantages	
Notes	

Completed: Economic Model Comparison Tables

Payback	
Formula for Calculating	$\text{Payback} = \frac{\text{Cost of Project}}{\text{Annual Profit/Savings}}$
How is result of formula expressed.	<ul style="list-style-type: none">• In years or months.
Advantages	<ul style="list-style-type: none">• Easy to understand and communicate.• Easy to calculate.• Can be used to quickly evaluate projects that are very similar in scope.
Disadvantages	<ul style="list-style-type: none">• Does NOT account for the time value of money.• Does NOT reflect the size of the investment in the project.
Notes	<ul style="list-style-type: none">• Probably a good way to do an initial assessment of a project; deeper analysis can be done later if the project seems viable.

Net Present Value (NPV)

Formula for Calculating

$$NPV = \sum_{t=0}^N \frac{R_t}{(1+i)^t}$$

How is result of formula expressed.

- Dollars
 - The Higher the number, the better the project in terms of NPV.
 - Projects with a negative NPV are probably rejected.

Advantages

- Accounts for the time value of money.
- Shows the relative amount of dollars that will be earned or lost over the life of the project.

Disadvantages

- Slightly harder to calculate.

Notes

- Modern Spreadsheets make it easy to calculate NPV and even have built-in functions for NPV.

Internal Rate of Return (IRR)

Formula for Calculating	<p>Can vary by organization, but can use the following for a basic calculation:</p> $NPV = \sum_{t=0}^N \frac{C_n}{(1+r)^t} = 0$
How is result of formula expressed.	<ul style="list-style-type: none">• Percentage that represents the return that we can expect on our capital investment in the project.• Higher numbers are better.
Advantages	<ul style="list-style-type: none">• Accounts for the time value of money.• Can take into account a number of internal factors about the organization and project.
Disadvantages	<ul style="list-style-type: none">• Harder to calculate.• Does NOT reflect the size of the investment in the project.
Notes	<ul style="list-style-type: none">• Modern Spreadsheets and financial calculators will have a function to help with basic IRR calculations.

Benefit to Cost Ratio (BCR)

Formula for Calculating

$$\text{BCR} = \frac{\text{Discounted Value of Benefits}}{\text{Discounted Value of Costs}}$$

How is result of formula expressed.

- Ratio.
- Ratio greater than 1 is good.
- Ratio less than 1 is bad.

Advantages

- Easy way to compare projects.

Disadvantages

- Does NOT reflect the size of the investment in the project.

Notes

Section 3 Check your knowledge: Economic Scoring Models

Economic Scoring Models Questions

1. Project A will take 9 years to complete, will cost \$430,000 and will generate \$50,000 per year in new revenue. How many years and months will it take to recover our initial investment in Project A?
 - A. 9 years, zero months.
 - B. 8 years, seven months
 - C. 3 years, 10 months
 - D. 9 years, five months.
2. Project C will cost \$30,000 and will generate \$5,000 per year in new revenue. Project D will cost \$120,000 and generate \$50,000 per year in new revenue. Which is the better project from a payback period standpoint?
 - A. Project C
 - B. Project D
3. Your company is considering entering into the making and distribution of vitamins and is considering the project listed in the table below. Assume a discount rate of 9 percent. Which, from an NPV standpoint, which is the best project?
 - A. Project Vitamin D
 - B. Project Vitamin C
 - C. Project Vitamin A
 - D. Project Vitamin E

Project	Capital Costs	Ongoing Costs Per Year	Revenue Per Year	Number of Years of Operation
Vitamin D	\$45,000	10,000	33,500	5
Vitamin C	\$37,900	10,000	25,000	5
Vitamin A	\$23,000	12,000	23,000	5
Vitamin E	\$51,500	10,000	37,600	5

-
4. Your accounting department has just completed an Internal Rate of Return analysis for Project Alpha and found that the IRR is 13%. What is the total amount of money that the company will make from this project?
 1. Over 1 million dollars
 2. Over 10 thousand dollars
 3. Over 13 million dollars
 4. Not enough data to answer.
 5. Which of the following projects looks most attractive from a financial perspective?
 - A. Project A with a BCR of 1.3
 - B. Project B with a BCR of .07
 - C. Project C with a BCR of .99
 - D. Project D with a BCR of 1.99
 6. To calculate NPV, what information do you need?
 - A. IRR, Capital Costs, Payback
 - B. Discount Rate, Capital Costs, Annual Cash inflows
 - C. Capital Costs, Cost of project, Annual cash inflows
 - D. Discount Rate, Capital Costs, Annual Cash outflows
 7. Which of the following project looks most attractive from a financial perspective?
 - A. Project A with an IRR of -1%
 - B. Project B with an IRR of 1%
 - C. Project C with an IRR of 5%
 - D. Project D with an IRR of 8%
 8. How is IRR presented or expressed?
 - A. As a ratio of Benefits to Costs.
 - B. As percentage representing a Rate of Return
 - C. As an amount of Dollars that the project will generate in terms of present day values.
 - D. As the number of years until the project makes as much as it costs.
 9. How is NPV presented or expressed?
 - A. As a ratio of Benefits to Costs
 - B. As percentage representing a Rate of Return.
 - C. As an amount of dollars that the project will generate in terms of present day value.
 - D. As the number of years until the project makes as much as it costs.
-

10. How is Payback presented or expressed?

- A. As a ratio of Benefits to Costs.
- B. As percentage representing a Rate of Return.
- C. As an amount of dollars that the project will generate in terms of present day value.
- D. As the number of years until the project makes as much as it costs.

11. How is BCR presented or expressed?

- A. As a ratio of Benefits to Costs.
- B. As percentage representing a Rate of Return.
- C. As an amount of dollars that the project will generate in terms of present day value.
- D. As the number of years until the project makes as much as it costs.

Answers: Economic Scoring Models Questions

1. Project A will take 9 years to complete, will cost \$430,000 and will generate \$50,000 per year in new revenue. How many years and months will it take to recover our initial investment in Project A?
A. 9 years, zero months.
B. 8 years, seven months
C. 3 years, 10 months
D. 9 years, five months.
2. Project C will cost \$30,000 and will generate \$5,000 per year in new revenue. Project D will cost \$120,000 and generate \$50,000 per year in new revenue. Which is the better project from a payback period standpoint?
A. Project C
B. Project D
3. Your company is considering entering into the making and distribution of vitamins and is considering the project listed in the table below. Assume a discount rate of 9 percent. Which, from an NPV standpoint, which is the best project?
A. Project Vitamin D
B. Project Vitamin C
C. Project Vitamin A
D. Project Vitamin E See calculations on next page

Project	Capital Costs	Ongoing Costs Per Year	Revenue Per Year	Number of Years of Operation
Vitamin D	\$45,000	10,000	33,500	5
Vitamin C	\$37,900	10,000	25,000	5
Vitamin A	\$23,000	12,000	23,000	5
Vitamin E	\$51,500	10,000	37,600	5

NPV Calculations are as follows:

Vitamin D Project				
Discount Rate	9%			
Year	Capital Costs	Annual Savings (non discounted)	Annual Savings (Discounted)	Return on Investment
0	-\$45,000	-\$45,000	-\$45,000	
1		\$23,500.00	\$21,559.63	-\$23,440.37
2		\$23,500.00	\$19,779.48	-\$3,660.89
3		\$23,500.00	\$18,146.31	\$14,485.42
4		\$23,500.00	\$16,647.99	\$31,133.42
5		\$23,500.00	\$15,273.39	\$46,406.80

Vitamin C Project				
Discount Rate	9%			
Year	Capital Costs	Annual Savings (non discounted)	Annual Savings (Discounted)	Return on Investment
0	-\$37,500	-\$37,500	-\$37,500	
1		\$15,000.00	\$13,761.47	-\$23,738.53
2		\$15,000.00	\$12,625.20	-\$11,113.33
3		\$15,000.00	\$11,582.75	\$469.42
4		\$15,000.00	\$10,626.38	\$11,095.80
5		\$15,000.00	\$9,748.97	\$20,844.77

Vitamin A Project				
Discount Rate	9%			
Year	Capital Costs	Annual Savings (non discounted)	Annual Savings (Discounted)	Return on Investment
0	-\$23,000	-\$23,000	-\$23,000	
1		\$11,000.00	\$10,091.74	-\$12,908.26
2		\$11,000.00	\$9,258.48	-\$3,649.78
3		\$11,000.00	\$8,494.02	\$4,844.24
4		\$11,000.00	\$7,792.68	\$12,636.92
5		\$11,000.00	\$7,149.25	\$19,786.16

Vitamin E Project				
Discount Rate	9%			
Year	Capital Costs	Annual Savings (non discounted)	Annual Savings (Discounted)	Return on Investment
0	-\$51,500	-\$51,500	-\$51,500	
1		\$27,600.00	\$25,321.10	-\$26,178.90
2		\$27,600.00	\$23,230.37	-\$2,948.53
3		\$27,600.00	\$21,312.26	\$18,363.73
4		\$27,600.00	\$19,552.54	\$37,916.27
5		\$27,600.00	\$17,938.11	\$55,854.37

-
4. Your accounting department has just completed an Internal Rate of Return analysis for Project Alpha and found that the IRR is 13%. What is the total amount of money that the company will make from this project?
1. Over 1 million dollars
 2. Over 10 thousand dollars
 3. Over 13 million dollars
 4. **Not enough data to answer.**
5. Which of the following projects looks most attractive from a financial perspective?
- A. Project A with a BCR of 1.3
 - B. Project B with a BCR of .07
 - C. Project C with a BCR of .99
 - D. **Project D with a BCR of 1.99**
6. To calculate NPV, what information do you need?
- A. IRR, Capital Costs, Payback
 - B. **Discount Rate, Capital Costs, Annual Cash inflows**
 - C. Capital Costs, Cost of project, Annual cash inflows
 - D. Discount Rate, Capital Costs, Annual return rates
7. Which of the following project looks most attractive from a financial perspective?
- A. Project A with an IRR of -1%
 - B. Project B with an IRR of 1%
 - C. Project C with an IRR of 5%
 - D. **Project D with an IRR of 8%**
8. How is IRR presented or expressed?
- A. As a ratio of Benefits to Costs.
 - B. **As percentage representing a Rate of Return**
 - C. As an amount of Dollars that the project will generate in terms of present day values.
 - D. As the number of years until the project makes as much as it costs.
9. How is NPV presented or expressed?
- A. As a ratio of Benefits to Costs.
 - B. As percentage representing a Rate of Return.
 - C. **As an amount of dollars that the project will generate in terms of present day value.**
 - D. As the number of years until the project makes as much as it costs.
-

10. How is Payback presented or expressed?

- A. As a ratio of Benefits to Costs.
- B. As percentage representing a Rate of Return.
- C. As an amount of dollars that the project will generate in terms of present day value.
- D. As the number of years until the project makes as much as it costs.**

11. How is BCR presented or expressed?

- A. As a ratio of Benefits to Costs.**
- B. As percentage representing a Rate of Return.
- C. As an amount of dollars that the project will generate in terms of present day value.
- D. As the number of years until the project makes as much as it costs.

Chapter 6: Project Scope and Work Breakdown Structure

Section 1 Check Your Knowledge: Project Scope

Project Scope Matching

Terms

Definition/Related Statement

- | | |
|----------------------------|--|
| A. Product Scope | _____ focuses on the work that will be done in order to complete the project. |
| B. Grade | _____ focuses on the features of the final product. |
| C. Project Scope Statement | _____ type of material that is used in a project |
| D. Scope creep | _____ may also be referred to as the statement of work (SOW) |
| E. Gold plating | _____ the gradual expansion of scope as the project is executed |
| F. Project Scope | _____ occurs when people working on the project add features, upgrade materials, or add work to the project without the customer requesting the upgrade or extra work. |
| G. Quality | _____ meeting the specifications of the project. |

Answers: Project Scope Matching

Terms

Definition/Related Statement

A. Product Scope	_F_ focuses on the work that will be done in order to complete the project.
B. Grade	_A_ focuses on the features of the final product.
C. Project Scope Statement	_B_ type of material that is used in a project
D. Scope creep	_C_ may also be referred to as the statement of work (SOW)
E. Gold plating	_D_ the gradual expansion of scope as the project is executed
F. Project Scope	_E_ occurs when people working on the project add features, upgrade materials, or add work to the project without the customer requesting the upgrade or extra work.
G. Quality	_G_ meeting the specifications of the project.

Section 2 Check Your Knowledge: Work Breakdown Structure (WBS)

WBS Questions

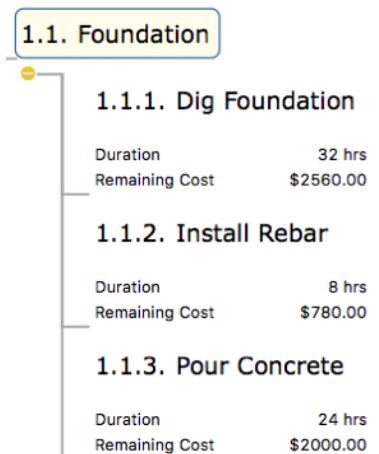
1. The process used to create a WBS is called?
 - A. Defenestration
 - B. Deposition
 - C. Decomplete
 - D. Decomposition

2. Deliverables are assignable units of work.
 - A. TRUE
 - B. FALSE

3. The cost of a deliverable is the sum of all of its related sub-deliverables.
 - A. TRUE
 - B. FALSE

4. The WBS represents the order in which the work will actually be performed..
 - A. TRUE
 - B. FALSE

5. Using the diagram on the right, what is the cost of the foundation?



Answers: WBS Questions

1. The process used to create a WBS is called?
 - A. Defenestration
 - B. Deposition
 - C. Decomplete
 - D. Decomposition**

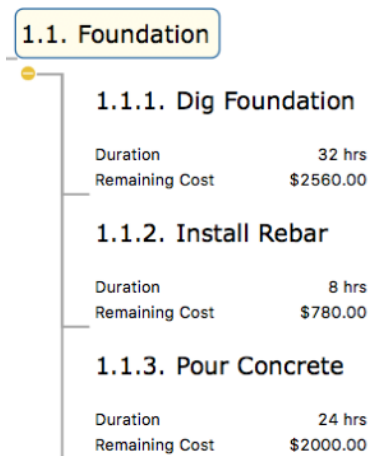
2. Deliverables are assignable units of work.
 - A. TRUE
 - B. FALSE**

3. The cost of a deliverable is the sum of all of its related sub-deliverables.
 - A. TRUE**
 - B. FALSE

4. The WBS represents the order in which the work will actually be performed..
 - A. TRUE
 - B. FALSE**

5. Using the diagram on the right, what is the cost of the foundation?

\$5,340



Decomposition Exercises

Follow the steps below to decompose the project into major deliverables, sub-deliverables and activities/work packages.

Step 1: List the highest level requirements/deliverables.

Step 2: Break up each high level requirement into sub-deliverables. (Hint: deliverables and sub-deliverables will be nouns). Keep breaking down sub-deliverables until you are at the lowest level that still makes sense.

Step 3: Break down each of the lowest sub-deliverables into work packages or activities.

Step 4: Review work packages and WBS to make sure the project is complete. Ask yourself, if you "add up" all the work packages, sub-deliverables, and deliverables would your project be complete? If not, then you are missing a deliverable or work package.

Exercise 1: Making a Bike

Create a WBS for the production of a bicycle. Try to break down to lowest sub-deliverable.

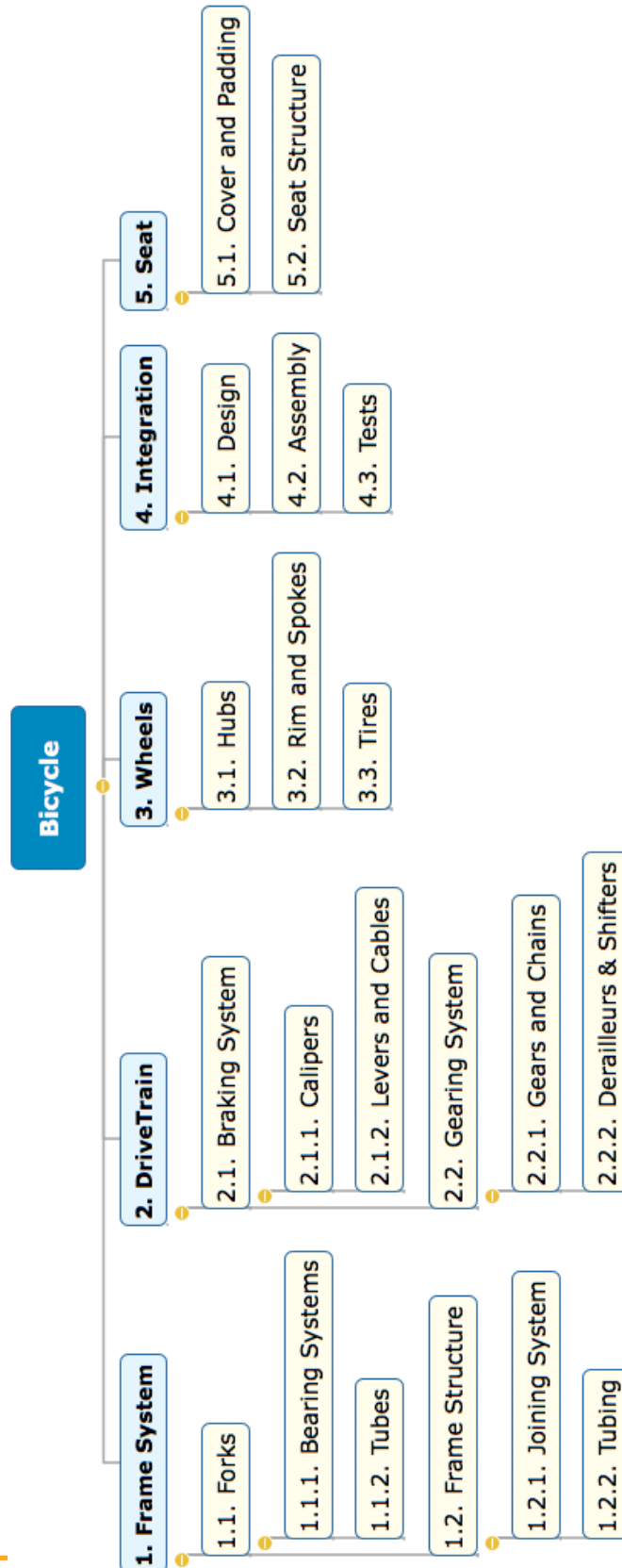


Exercise 2: Thanksgiving Dinner

Create a WBS for a Thanksgiving Day Dinner

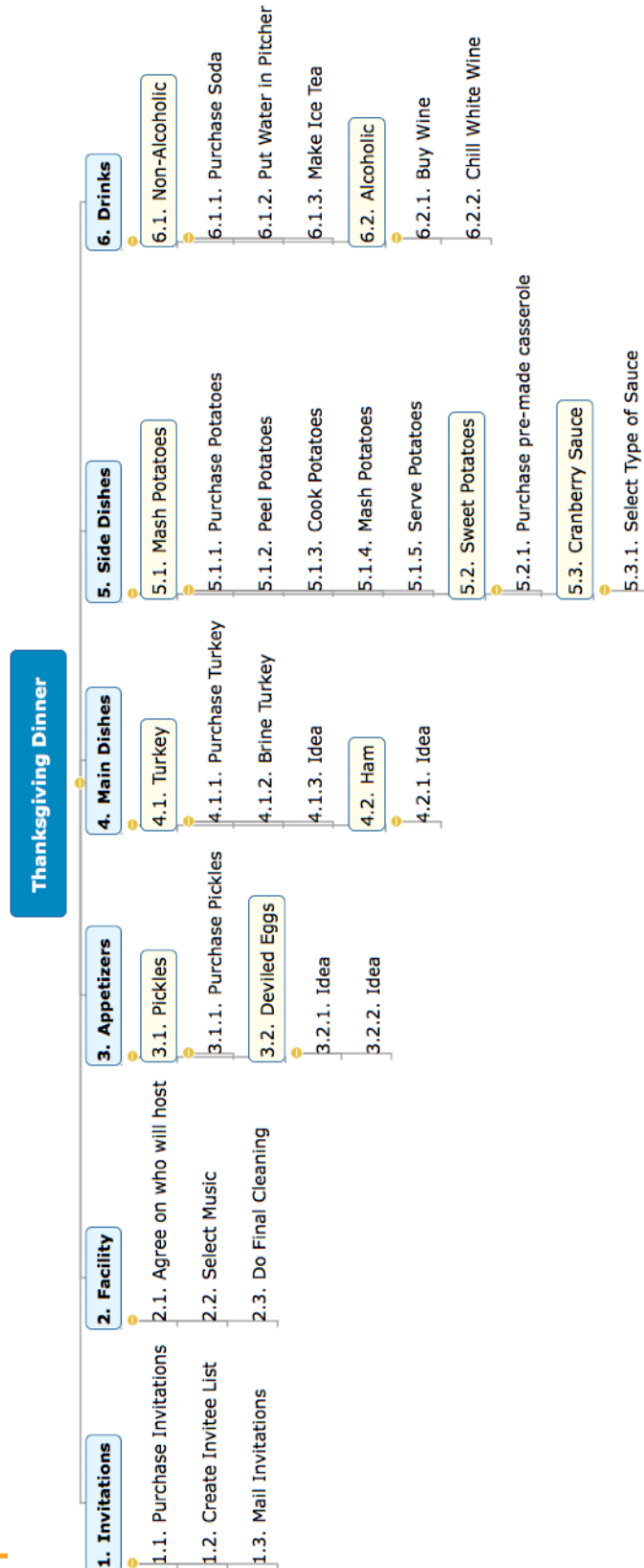
Completed Exercise 1: Making a Bike

Answers will vary by student, but below is an example.



Completed Exercise 2: Thanksgiving Dinner

Answers will vary by student, but below is an example.



Chapter 7, Time and Resource Estimation

Section 1 Notes: Resource Estimation

Video 7.1: Project Estimates

Fill in the blanks as you watch Video 7.1

Time and resource estimates are used to:

1. Make _____.
2. _____ our work.
3. Determine how long a project _____.
4. Determine much the project _____.
5. Determine if the project is _____.
6. Develop _____ needs.
7. Develop _____.

Top-Down Methods

Analogous estimating

Describe the method:

Parametric estimating

Describe the method:

Learning Curves

Describe the method:

Function Point Analysis

Describe the method:

Guidelines for Bottom-up estimation

Fill in the blanks below as you read.

1. Have people _____ with the tasks make the estimate.
2. Use _____ people to make estimates.
3. Base estimates on _____ conditions, _____ methods, and a _____ level of resources.
4. Estimators should not make _____ for _____.

Bottom-Up Methods

Single Point estimate

Describe the method:

Three-Point estimate (simple average and T_e)

Describe the method:

Multiple Estimators: Simple Average

Describe the method:

Multiple Estimators: T_e Average

Describe the method:

Multiple Estimators: Delphi Technique

Describe the method:

Section 1 Check Your Knowledge: Resource Estimation

Resource Estimation Questions

1. Which of the following is an example of a parametric estimate?
 - A. We are contracted to build 400 small ships as part of a Navy contract. Based on our previous experience, we estimate that the time to construct ships 100-199 will be 94% of time to complete ships 1-99.
 - B. A 20,000 square foot hospital addition will cost \$4.2 million based on an industry average of \$210 per square foot for this type of facility.
 - C. Three estimators provide their estimates of time and materials cost for a deliverable for our project. Those estimates (and the rationale behind them) are shared with the estimators anonymously for several rounds until the estimates converge.
 - D. It cost \$6,000 to get a small e-commerce site up and running previously, so we will budget \$6,000 for construction of another site.
 2. The variability of estimates increases as the project progresses.
 - A. True
 - B. False
 3. Definitive estimates are generated during project initiation and can be +/- 50 percent from the actual or final costs.
 - A. True
 - B. False
 4. Estimators should always pad their estimates by 10 to 20 percent in order to deal with unknown risks.
 - A. True
 - B. False
-

5. Three point estimates provide three estimates: the metric estimate, the english estimate and the decimal estimate.

A. True

B. False

6. The delphi technique involves calculation of delta using a beta distribution.

A. True

B. False

7. Visit this page (<http://pmf.video/link6>) and answer the following questions:

A. What are three of the areas for which construction cost data is available?

B. Pick one of these areas and view the sample data. What type of rate information is available?

C. How much would it cost to purchase the "2016 Global Industrial / Commercial Repair & Maintenance Construction Yearbook" as a loose leaf binder?

Time and Resource Estimation Matching

Terms may be used multiple times or not at all.

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Function Point	_____ made at initiation of project, +/- 50 percent from the actual or final costs
B. Analogous Estimating	_____ are the result of workers improving the processes they are using to complete their tasks.
C. Budget Estimate	_____ Deliberately padding your estimate so that you look good when the activity or project gets done sooner than estimated.
D. T_e	_____ uses information from a previous project to estimate the cost of completing a similar project in the future.
E. Rough Order of Magnitude Estimate	_____ used in project planning, -10 to +25 percent from the actual or final costs
F. Parametric Estimates	_____ a project manager can solicit estimates from multiple estimators and then try to get those estimators to come to a consensus using _____
G. Learning Curves	_____ works well when "comparing apples to apples."
H. Definitive Estimate.	_____ are made by multiplying the size of a project, by an established cost per unit.
I. Delphi technique	_____ Each time production doubles, a _____ can be calculated.
J. Scotty Factor	_____ -5 to +10 percent from the actual or final cost.
	_____ a measure of the functionality that is programmed into an information system
	_____ is a weighted average that weights the most likely estimate more heavily.

Answers: Resource Estimation Questions

1. Which of the following is an example of a parametric estimate?
 - A. We are contracted to build 400 small ships as part of a Navy contract. Based on our previous experience, we estimate that the time to construct ships 100-199 will be 94% of time to complete ships 1-99.
 - B. A 20,000 square foot hospital addition will cost \$4.2 million based on an industry average of \$210 per square foot for this type of facility.**
 - C. Three estimators provide their estimates of time and materials cost for a deliverable for our project. Those estimates (and the rationale behind them) are shared with the estimators anonymously for several rounds until the estimates converge.
 - D. It cost \$6,000 to get a small e-commerce site up and running previously, so we will budget \$6,000 for construction of another site.
2. The variability of estimates increases as the project progresses.
 - A. True
 - B. False**
3. Definitive estimates are generated during project initiation and can be +/- 50 percent from the actual or final costs.
 - A. True
 - B. False**
4. Estimators should always pad their estimates by 10 to 20 percent in order to deal with unknown risks.
 - A. True
 - B. False**

5. Three point estimates provide three estimates: the metric estimate, the english estimate and the decimal estimate.

A. True

B. False

6. The delphi technique involves calculation of delta using a beta distribution.

A. True

B. False

7. Visit this page (<http://pmf.video/link6>) and answer the following questions:

A. What are three of the areas for which construction cost data is available?

Answers will vary by student

B. Pick one of these areas and view the sample data. What type of rate and cost information is available?

Answers will vary by student

C. How much would it cost to purchase the "2016 Global Industrial / Commercial Repair & Maintenance Construction Yearbook" as a loose leaf binder?

\$345.00 + Shipping & Handling (Physical)

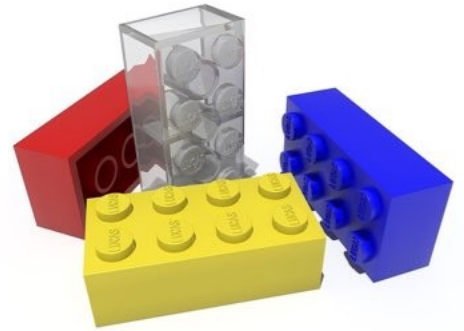
Answers: Time and Resource Estimation Matching

Terms may be used multiple times or not at all.

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Function Point	_E_ made at initiation of project, +/- 50 percent from the actual or final costs
B. Analogous Estimating	_G_ are the result of workers improving the processes they are using to complete their tasks.
C. Budget Estimate	
D. T_e	_J_ Deliberately padding your estimate so that you look good when the activity or project gets done sooner than estimated.
E. Rough Order of Magnitude Estimate	_B_ uses information from a previous project to estimate the cost of completing a similar project in the future.
F. Parametric Estimates	_C_ used in project planning, -10 to +25 percent from the actual or final costs
G. Learning Curves	
H. Definitive Estimate.	_I_ a project manager can solicit estimates from multiple estimators and then try to get those estimators to come to a consensus using _____
I. Delphi technique	
J. Scotty Factor	_B_ works well when "comparing apples to apples." _F_ are made by multiplying the size of a project, by an established cost per unit. _G_ Each time production doubles, a _____ can be calculated. _H_ -5 to +10 percent from the actual or final cost. _A_ a measure of the functionality that is programmed into an information system _D_ is a weighted average that weights the most likely estimate more heavily.

Learning Curve Exercise 1: Master Builders

The following exercise can be done individually or in teams. This exercise is adapted from Paxton, John (2003), "A Short Simple Learning Curve Classroom Exercise," *Decision Sciences Journal of Innovative Education*, 1 (2), 303–307.



Learning Curve Instructions

Obtain a small Lego model that includes directions for assembly. You or someone from your team will assemble this model a total of four times in order to determine the learning curve involved with lego assembly. Note: I strongly recommend the smallest model possible. A model with “only” 200 pieces might take 40 minutes to assemble; apparently seven year-olds have a lot of time on their hands.

Determine the Learning Curve

1. Assemble the model four times, recording the length of time required for each assembly. Completely disassemble the model completely between each run.
2. Record times as minutes and tenths of a minute. **Divide the number of seconds by 60 to convert to decimal.** For example, 2 minutes 20 seconds is 2.33 minutes.
3. **Be careful not to lose any of the parts;** they're small and will get away from you unless you're careful.
4. Graph the performance (run number on the horizontal axis, time for that run on the vertical axis) using the graph on the next page.
5. Complete the calculations on the next page, and calculate your average learning curve percentage.

Calculations

Record assembly times below,
and graph using the chart on the
right (provide your own time scale
for the Y axis):

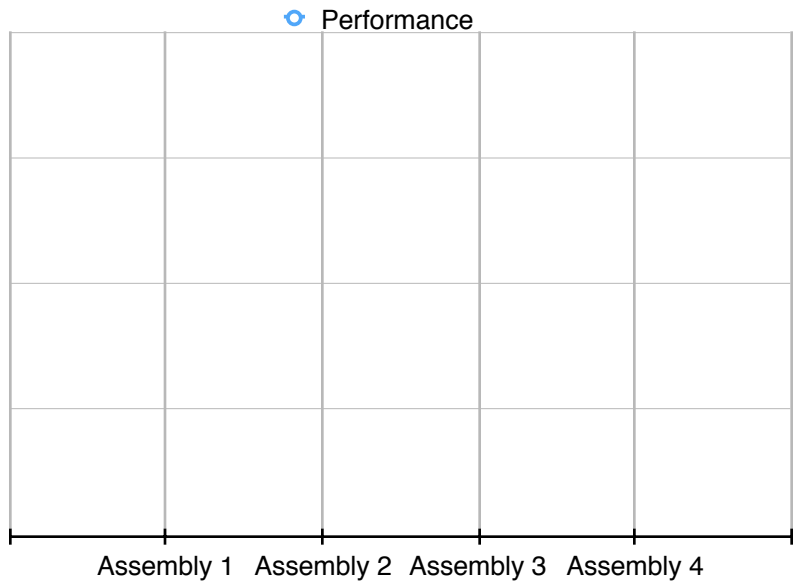
Assembly 1: _____

Assembly 2: _____

Assembly 3: _____

Assembly 4: _____

Time



Calculate Average Learning Curve

Divide Assembly Time 2 by Assembly Time 1 _____ / _____ = _____

Divide Assembly Time 4 by Assembly Time 2 _____ / _____ = _____

Add Answer 1 to Answer 2 and Divide by Two _____ + _____ / 2 = _____
to calculate the average decrease in time due to learning.

Using this data

Assume that the average learning curve you just discovered holds true for future projects.
You are asked to assemble 4 "Life on Mars" vehicle lego kits. During the testing of the kit, it
took 16 hours to assemble the kit. Estimate much time will it take to assemble the 2th and 4th
kits

2nd: _____ hours

4th: _____ hours

Note on Completing this exercise in teams

If you are completing this exercise in a team, I recommend that the following roles be used. You can add additional disassemblers and time keepers as needed.

Title: Master Builder

Job Description: You are the only one on your team who can join one piece with another. Your job is to assemble the model as efficiently as possible, but you must complete it as designed.

Title: Assistant Builder

Job Description: You can help the Master Builder in any way as long as you do not join or disassemble pieces.

Title: Quality Control

Job Description: You are responsible for insuring that your team's model has no errors. Random inspections will be made by President Business (instructor).

Title: Disassembler

Job Description: You are responsible for disassembly of the model between assembly rounds.

Title: Time Keeper

Job Description: You are responsible for timing the assembly times of the Master Builder and recording calculations.

Section 2 Check Your Knowledge: PERT Analysis

PERT Questions

1. PERT uses three time estimates, what are they?
2. How is T_e calculated?
3. What does a PERT analysis determine?

Answers: PERT Questions

1. PERT uses three time estimates, what are they?

1. An optimistic time estimate (if all goes well, what is the shortest time period one could realistically expect for the completion of this activity?). This will be designated in calculations as **a**.
2. The most likely time estimate (if all goes normally, what is the average time one would expect it would take for an activity to be completed?). This will be designated in calculations as **m**.
3. A pessimistic time time estimate (if work goes poorly, what is the longest time period one could realistically expect for the completion of this activity). This will be designated in calculations as **b**.

2. How is T_e calculated?

$$T_e = \frac{a + 4m + b}{6}$$

3. What does a PERT Analysis determine?

The probability that a project will be completed within a give time period.

PERT Exercise 1: Tutorial

The goal of this exercise is to learn how to estimate the probability of a project being completed within a certain duration.

Download this spreadsheet (<http://pmf.video/link7>), and then watch this video (<http://pmf.video/video38>) that will walk you through a PERT analysis for the following network:

ID	Description	a	m	b	T_e	Predecessor
A	External Specs	6	8	12		None
B	Review Design Features	2	2	5		A
C	Document new features	2	3	5		A
D	Write Software	50	60	90		A
E	Program and test	50	60	90		B
F	Edit and publish notes	2	2	4		C
G	Review Manual	2	2	4		D
H	Alpha Site	16	20	30		E,F
I	Print Manual	9	10	15		G
J	Beta Site	7	10	18		H,I
K	Manufacture	8	12	20		J
L	Release and Ship	2	3	5		K

For Your Reference: The following steps will be used in this exercise to conduct a PERT Analysis:

1. Calculate T_e duration values for each task in an excel spreadsheet
2. Enter T_e duration values into MSProject or other project management information system and determine critical path. Note: One could also create a network diagram to determine the critical path.
3. Enter the values for the tasks on the critical path into the PERT calculator spreadsheet in order to determine estimate variances.
4. Estimate probabilities that our project will complete within a given time period.

PERT Exercise 1: Complete on Your Own

Conduct a PERT Analysis on the following project and answer the questions below.

ID	Description	O	M	P	T_e	Predecessor
A	Survey	4	5	7		None
B	Soils Report	17	20	25		A
C	Traffic design	25	30	40		A
D	Lot Layout	5	5	7		A
E	Approve Design	75	80	90		B,C,D
F	Illumination	12	15	15		E
G	Drainage	20	30	45		E
H	Landscape	20	25	50		E
I	Signing	18	20	22		E
J	Bid Proposal	8	10	12		F,G,H,I

Answer the following questions about the project.

- What is the project duration based on T_e ?
- What is the chance that the project will be completed in the duration of our current critical path?
- What time should the project manager estimate if he or she wants to be 95% sure that the project will be completed within that time period?
- What is the buffer time that should be added to a project's critical tasks in order to be 95% sure that the project completes on time.

Completed: PERT Exercise

- What is the project duration based on T_e ?

158 Days.

- What is the chance that the project will be completed in the duration of our current critical path?

52.40 Percent.

- What time should the project manager estimate if he or she wants to be 95% sure that the project will be completed within that time period?

167 Days.

- What is the buffer time that should be add to a project's critical tasks in order to be 95% sure that the project completes on time.

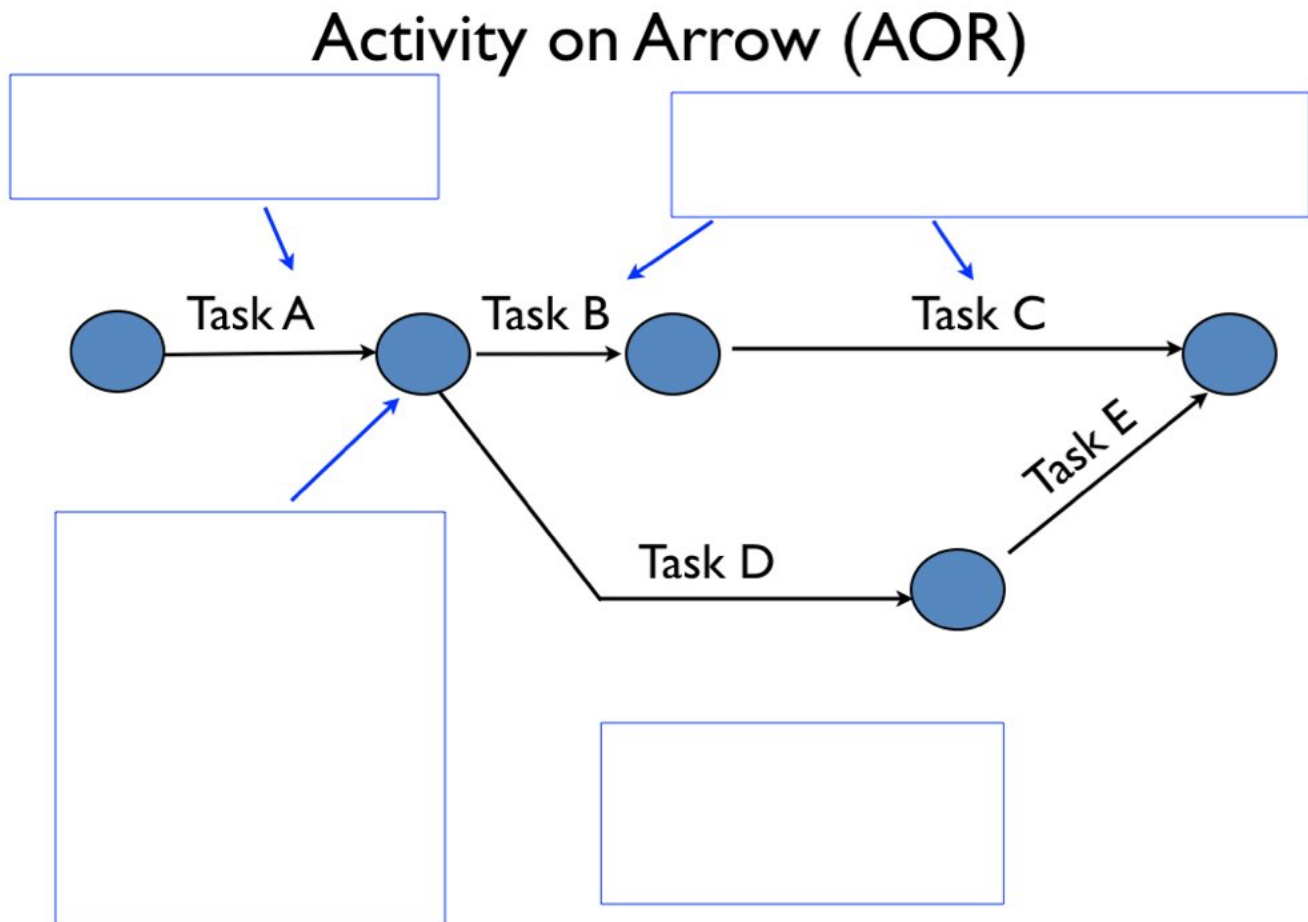
9 - 10 days.

Chapter 8, Project Networks

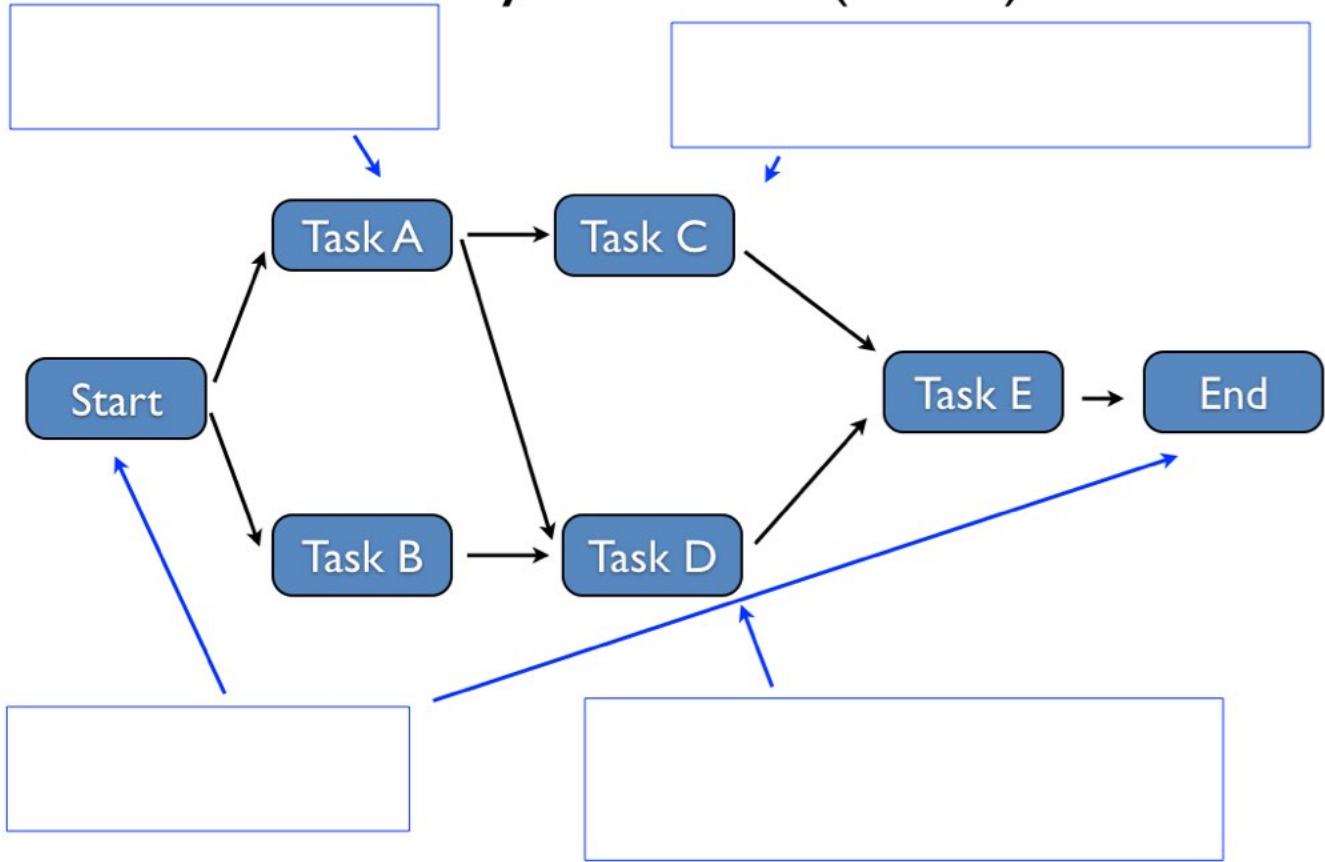
Section 1 Notes: Create the Project Network Diagram

Video 8.1: Project Networks.

Fill in the diagrams below as you watch the video on Project Networks.



Activity on Node (AON)



Fill in the terms below as you watch the portion of the video about terminology.

_____ : an element of the project that requires time.

_____ (or _____) activities: Activities that can occur independently and, if desired, at the same time.

_____ activity: an activity that has two or more preceding activities on which it depends.

_____ activity: an activity that has more than one activity immediately following it (more than one dependency arrow flowing from it).

_____ : a point in time when an activity is started or completed. It does not consume time.

Fill in the blanks below as you watch the section on the critical path.

The Critical Path defines _____ the project ends.

Any delay of a task on critical path will delay the _____ project

Video 8.2: The forward and backward pass

Fill in the blanks below as you watch the video.

The formula for the forward pass is: _____ + _____ = _____

Always Take _____ Number on Forward Pass

The formula for the backward pass is: _____ - _____ = _____

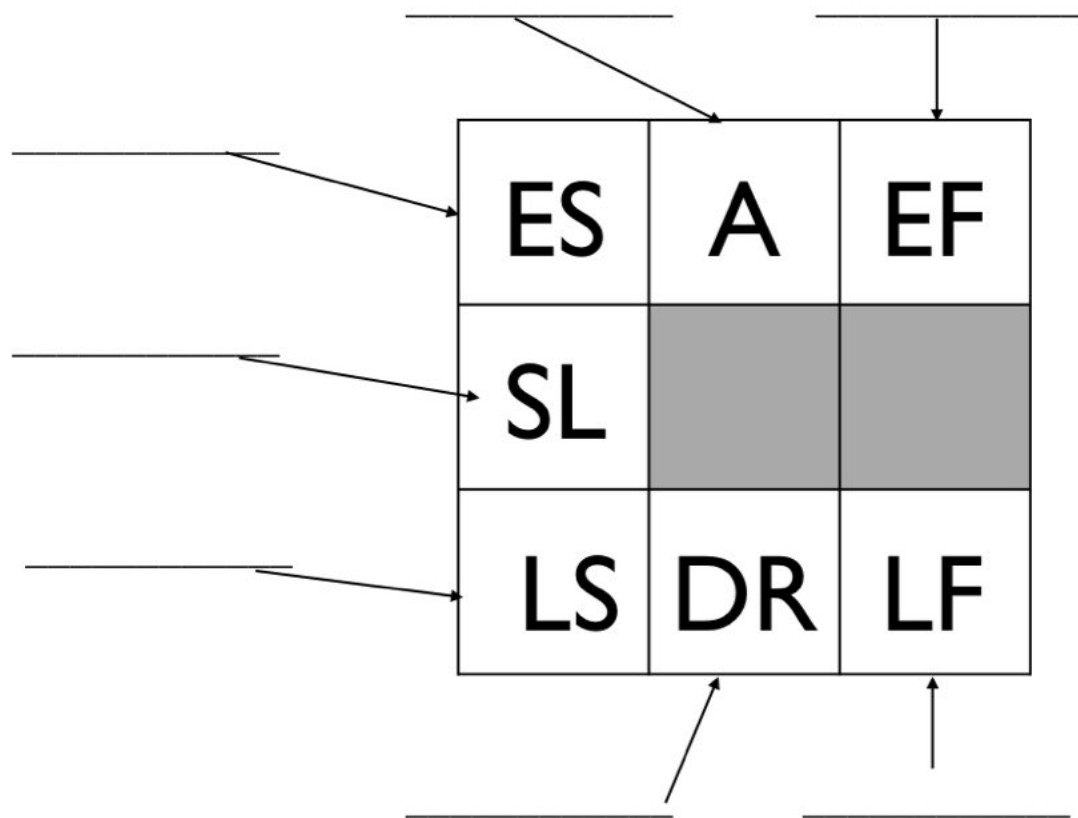
Always Take _____ Number on Backward Pass

Slack or Float = _____ - _____

Section 1 Check Your Knowledge: Create the Project Network Diagram

Questions: Project Networks Questions

1. Project Network Rules for Activity on Node diagrams include all of the following EXCEPT:
 1. Networks typically flow from left to right.
 2. Looping is not allowed.
 3. Conditional statements are allowed.
 4. Identify each activity with a unique identifier; this identifier must increment (1.2.3, A,B,C, etc.) as the network proceeds.
2. Fill in the labels on the diagram below for a network activity.

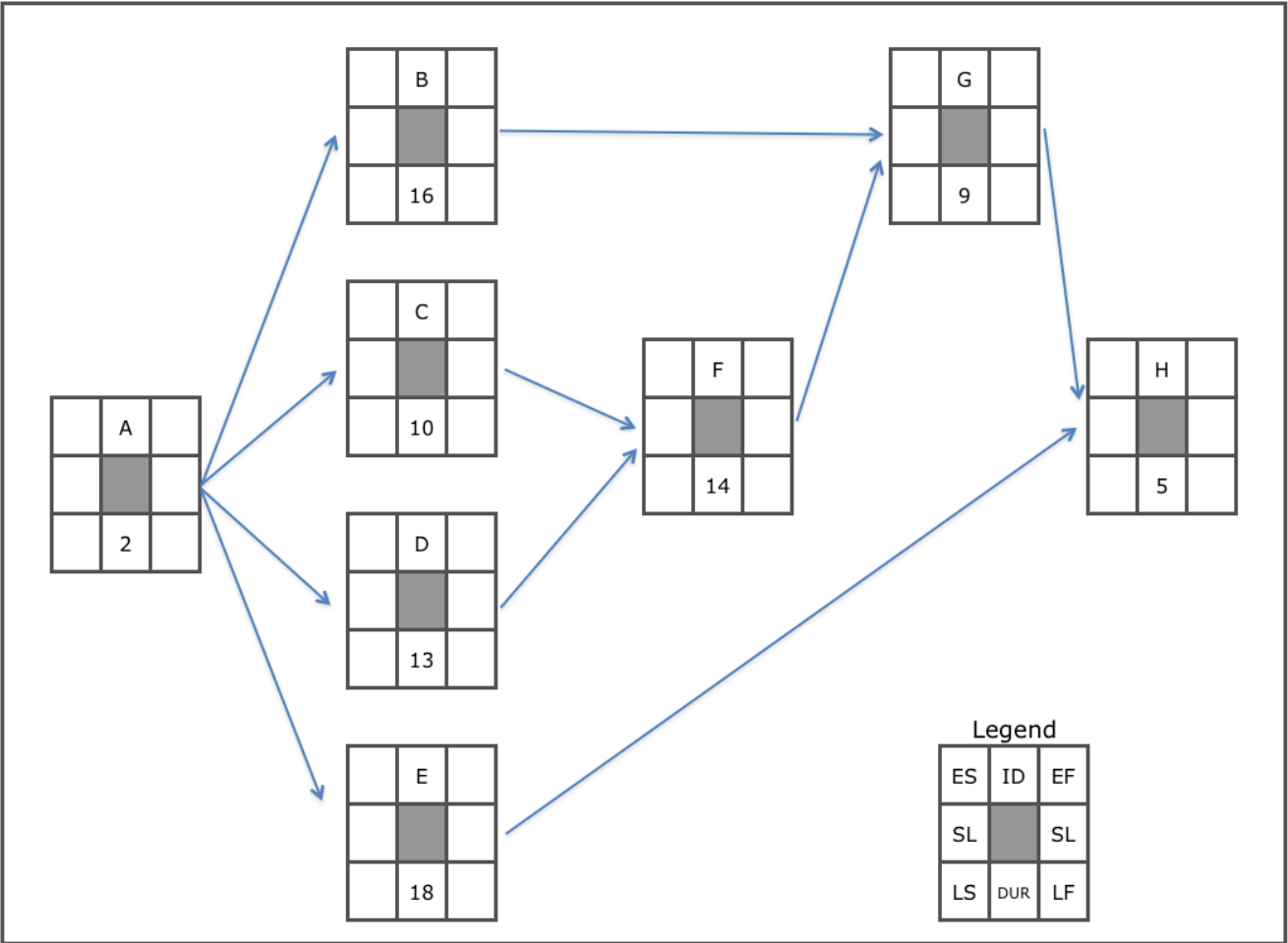


3. The critical path is the Longest or Shortest (circle one) path through the network?

-
4. In the Activity on Arrow (AOR) method, The starting node for an activity is the activity's " _____," the ending node is the " _____".
1. Early Start, Late Start
 2. I-node, J-node
 3. Task A, Task Z
 4. Task I, Task J
5. The Forward Pass determines:
1. Early Start, Early Finish
 2. Late Start, Late Finish
 3. Slack
 4. Early Start, Late Start
6. The Backward pass determines. Circle all that apply. ?
1. Slack or Float
 2. Late Finish
 3. Late Start
 4. Early Finish
 5. Early Start
 6. Milestones
7. An activity that has more than one activity immediately following it is called:
1. Merge Activity
 2. Burst Activity
 3. Milestone
 4. Parallel Activity
-

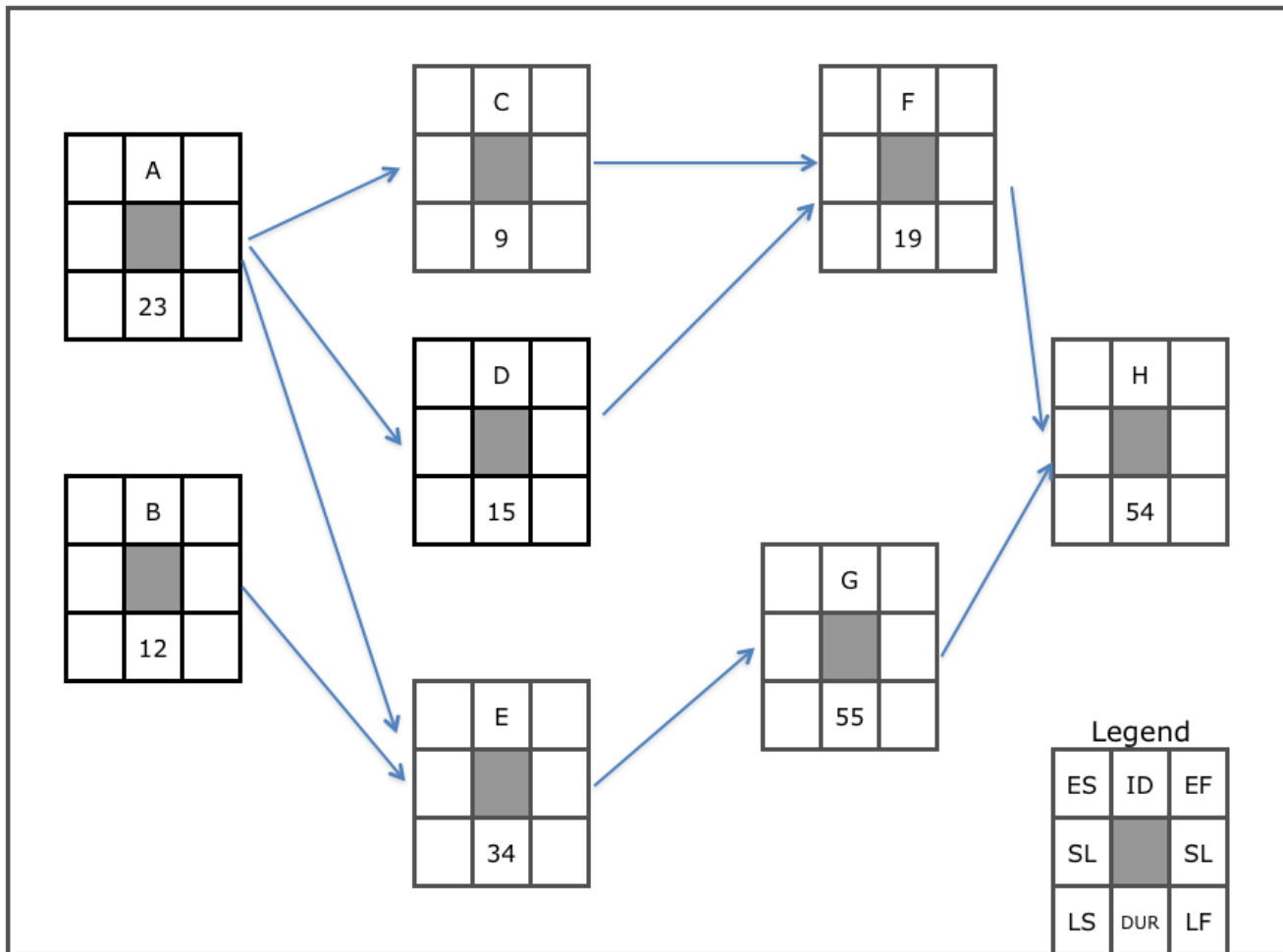
Project Network Exercise 1

Complete the forward and backward pass for the network below



Project Network Exercise 2

Complete the forward and backward pass for the network below, and answer the question(s).

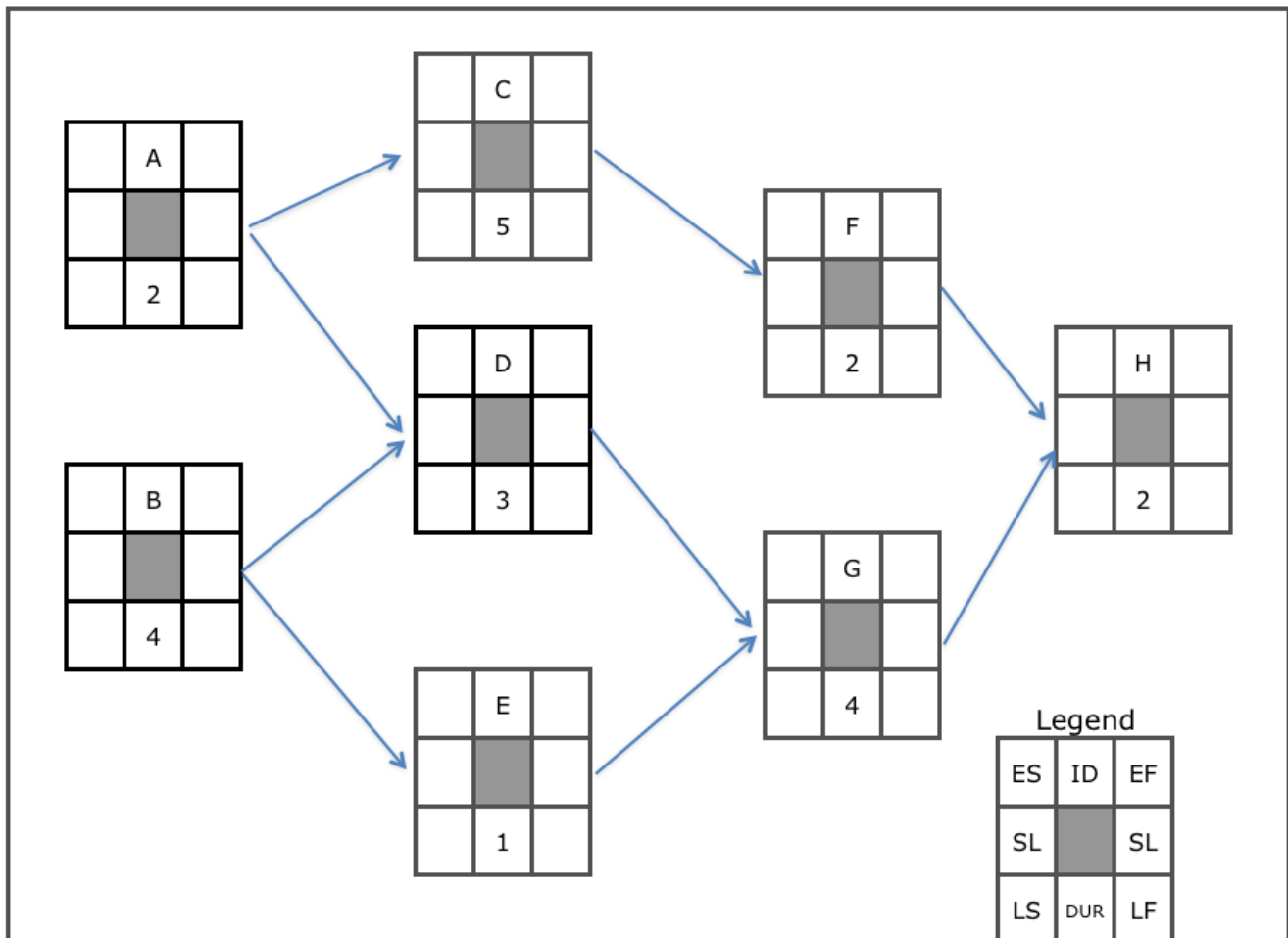


What is the critical path for the network diagram shown above?

1. A→B→C→D→E→F→G→H
2. B→E→G→H
3. A→E→G→H
4. A→(D&C)→F→H
5. A→C→F→H

Project Network Exercise 3

Complete the forward and backward pass for the network below, and answer the question(s).



In the diagram above, which statement is true regarding Task G. Check all that apply.

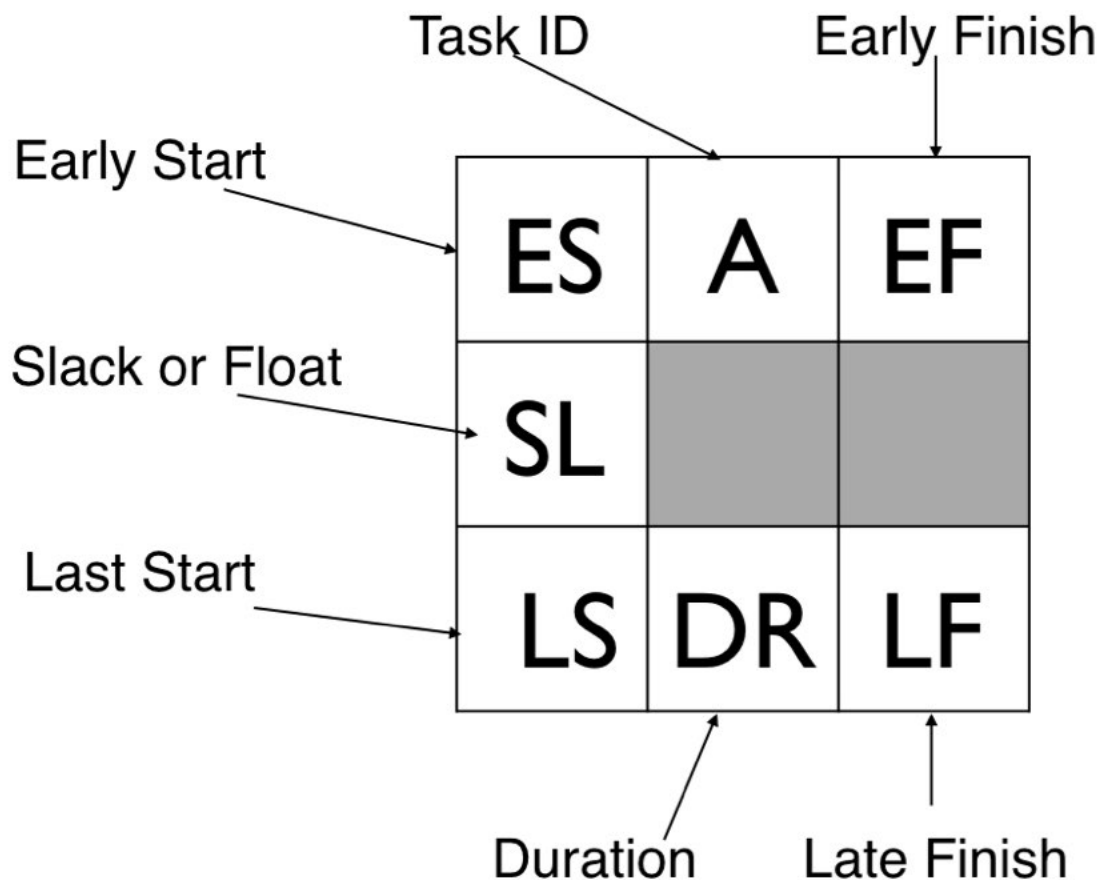
1. It has zero total slack and zero free slack
2. It's Early Start is 57 time units.
3. It's Early Start is 112 time units.
4. It's Free Slack is 57 time units and total slack is zero time units

In the diagram above, assume that Task B started 4 days late. How will this impact the scheduled completion date of our project ?

1. It will not.
2. The project will be 4 days late.
3. The project will be 4 days early.
4. The project will be 16 days late (4 days times the 4 tasks on the critical path)

Answers: Project Networks

1. Project Network Rules for Activity on Node diagrams include all of the following EXCEPT:
 1. Networks typically flow from left to right.
 2. Looping is not allowed.
 - 3. Conditional statements are allowed.**
 4. Identify each activity with a unique identifier; this identifier must increment (1.2.3, A,B,C, etc.) as the network proceeds.
2. Fill in the labels on the digram below for a network activity.

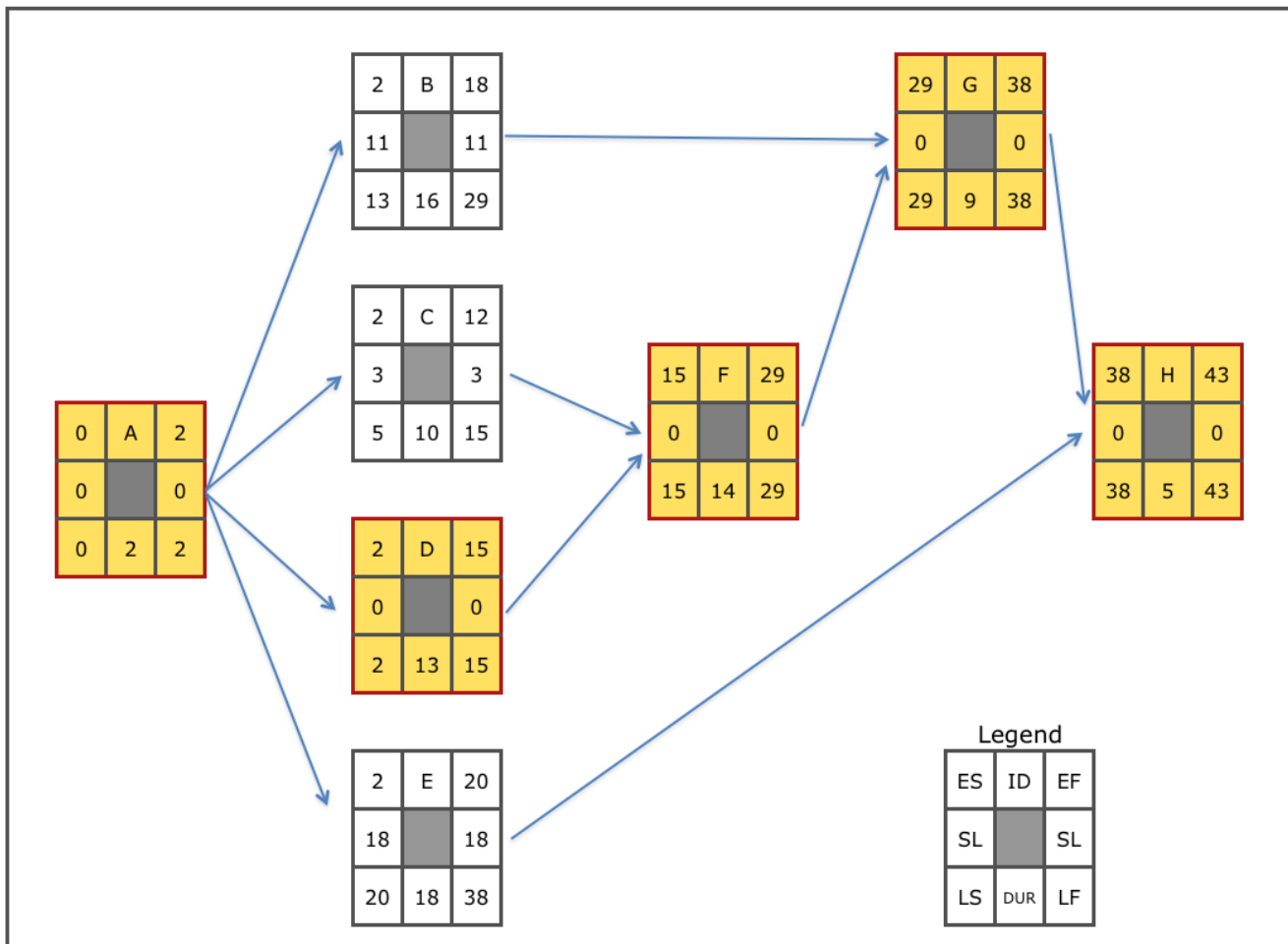


3. The critical path is the **Longest** or Shortest (circle one) path through the network?

-
4. In the Activity on Arrow (AOR) method, The starting node for an activity is the activity's " _____," the ending node is the " _____".
1. Early Start, Late Start
 - 2. I-node, J-node**
 3. Task A, Task Z
 4. Task I, Task J
5. The Forward Pass determines:
- 1. Early Start, Early Finish**
 2. Late Start, Late Finish
 3. Slack
 4. Early Start, Late Start
6. The Backward pass determines. Circle all that apply. ?
- 1. Slack or Float**
 - 2. Late Finish**
 - 3. Late Start**
 4. Early Finish
 5. Early Start
 6. Milestones
7. An activity that has more than one activity immediately following it is called:
1. Merge Activity
 - 2. Burst Activity**
 3. Milestone
 4. Parallel Activity

Project Network Exercise 1

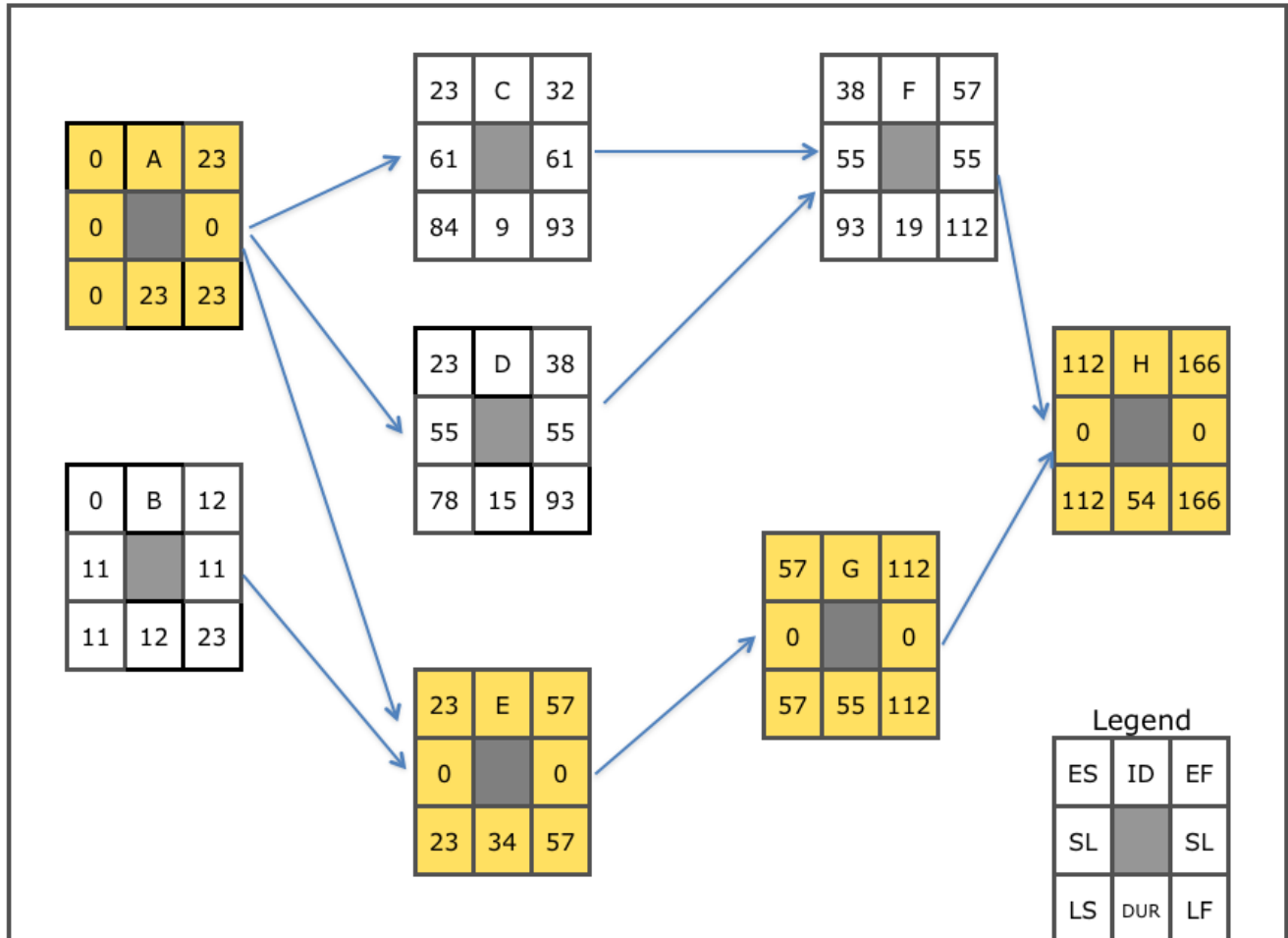
Complete the forward and backward pass for the network below



Critical Path is Highlighted in Yellow

Project Network Exercise 2

Complete the forward and backward pass for the network below, and answer the question(s).



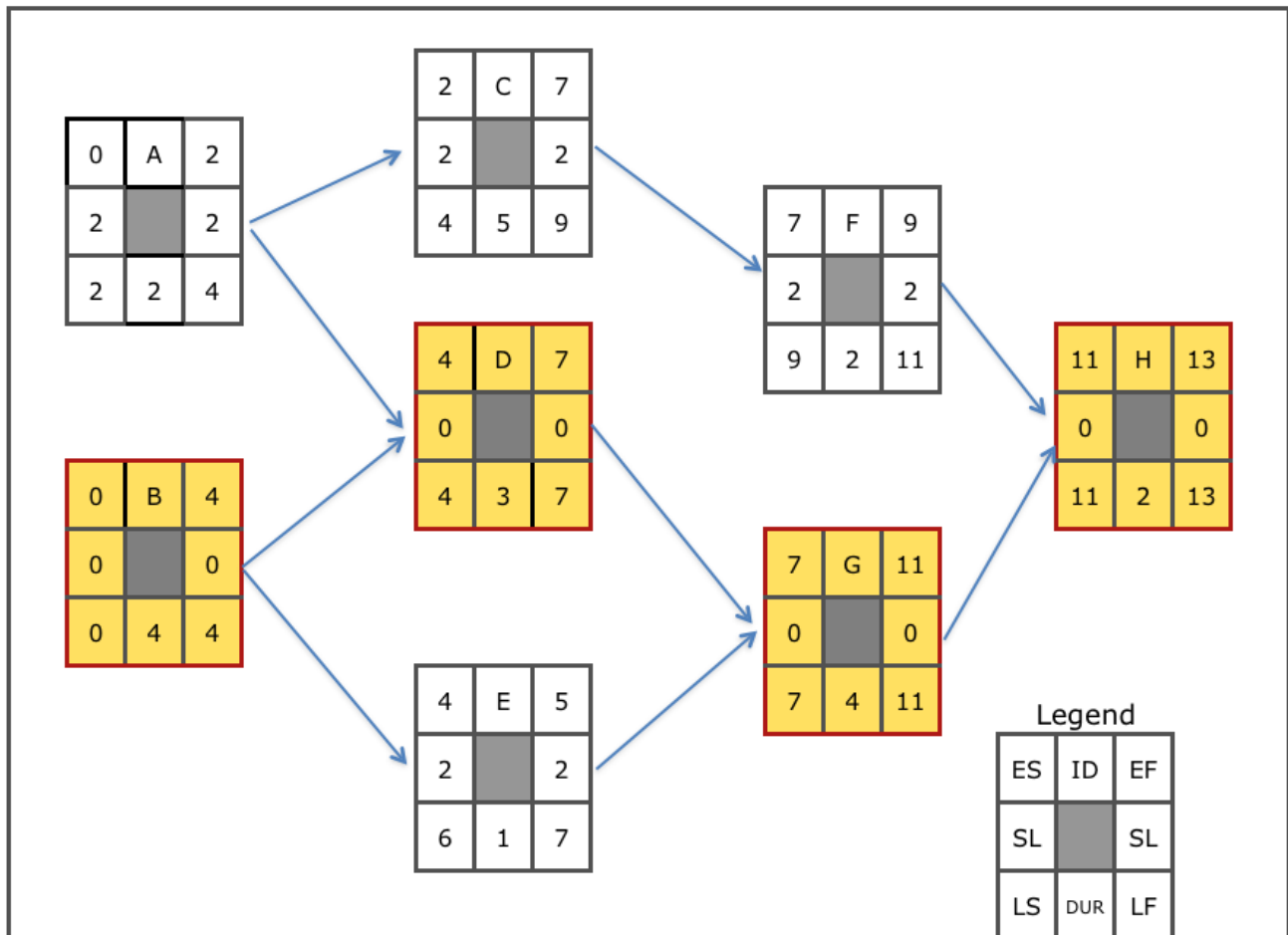
Critical Path is Highlighted in Yellow

What is the critical path for the network diagram shown above?

1. A→B→C→D→E→F→G→H
2. B→E→G→H
3. **A→E→G→H**
4. A→(D&C)→F→H
5. A→C→F→H

Project Network Exercise 3

Complete the forward and backward pass for the network below, and answer the question(s).



Critical Path is Highlighted in Yellow

In the diagram above, which statement is true regarding Task G. Check all that apply.

5. It has zero slack.
6. It's Early Start is 57 time units.
7. It's Early Start is 112 time units.
8. It's Free Slack is 57 time units and total slack is zero time units

In the diagram above, assume that Task B started 4 days late. How will this impact the scheduled completion date of our project ?

1. It will not.
2. The project will be 4 days late.
3. The project will be 4 days early.
4. The project will be 16 days late (4 days times the 4 tasks on the critical path)

Section 2 Notes: Advanced Network Diagrams

Video 8.2: Task Relationships and Lags.

Draw the lines between the tasks in the relationships below as you watch the video.

Finish to Start

	A	
	4	

	B	
	8	

Task B cannot start until A is finished

Start to Start

	A	
	4	

	B	
	8	

Task B cannot start until Task A is started

Start to Finish

	A	
	4	

	B	
	8	

Task B cannot finish until Task A is started

Finish to Finish

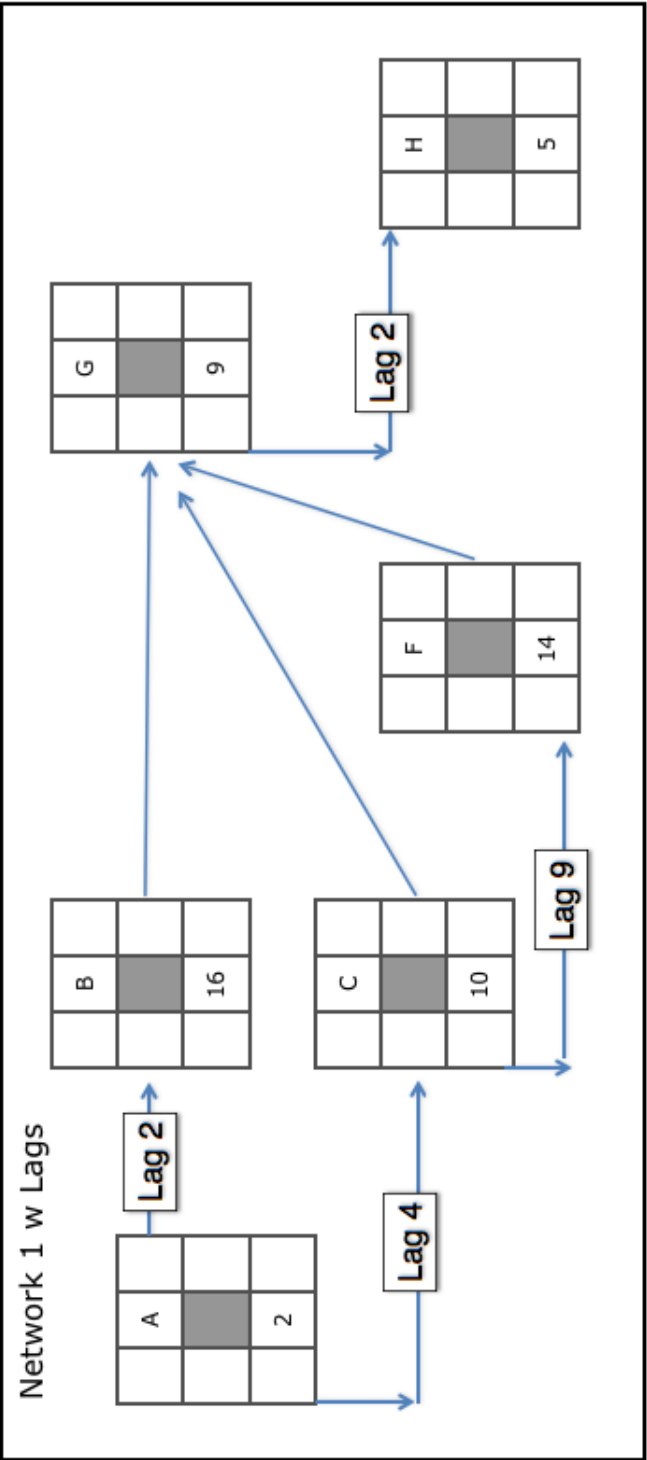
	A	
	4	

	B	
	8	

Task B cannot finish until Task A is finished

Video 8.4 Network w Lags

Complete the network diagram below as you watch the solution in the text.



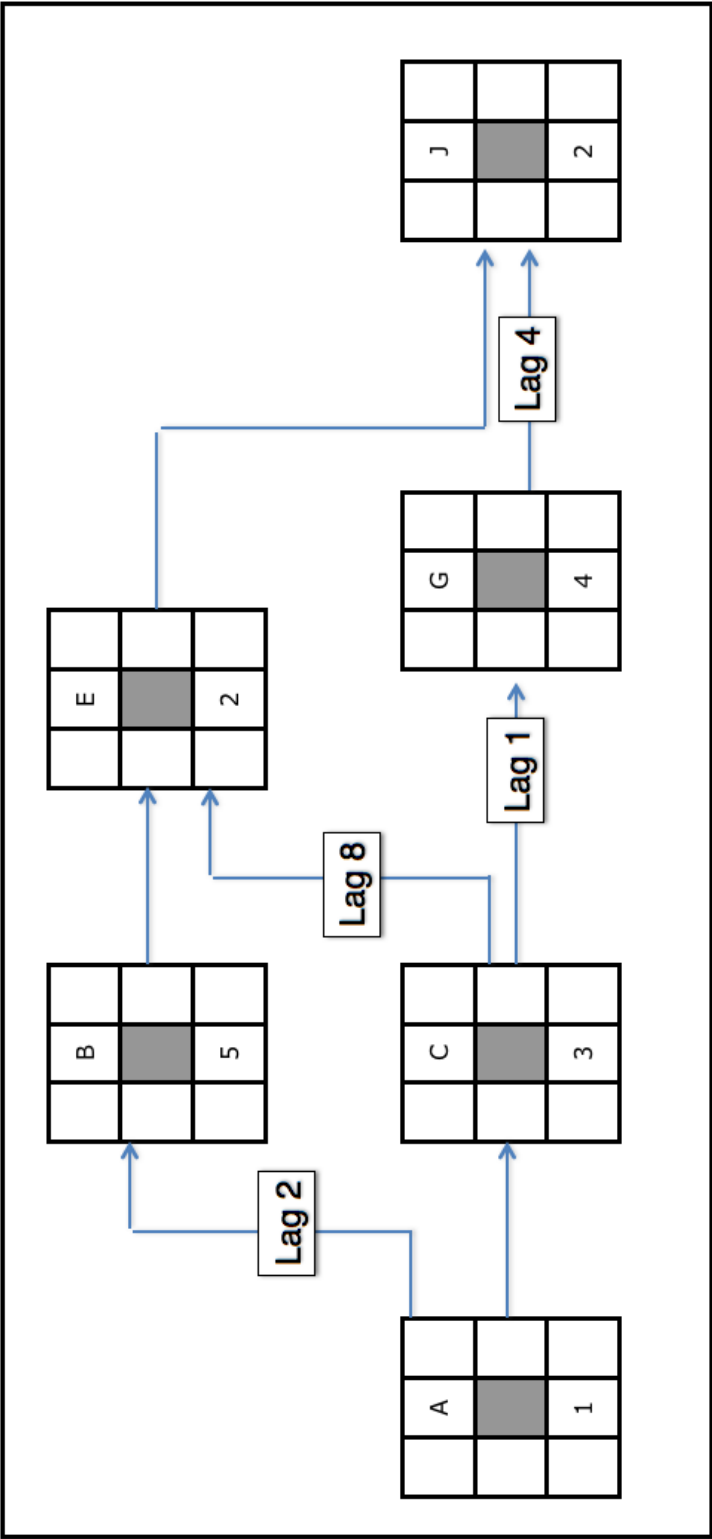
Section 2 Check Your Knowledge: Advanced Project Networks

Advanced Project Networks Matching

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Total Slack	_____ the finish time of one task is dependent on another task finishing.
B. Free Slack	
C. Lags	_____ the amount of time that a task in a project network can be delayed without causing a delay to subsequent tasks.
D. Positive Slack	
E. Negative Slack	_____ the start of one task is dependent on another task finishing.
F. Milestones	_____ the amount of time that a task in a project network can be delayed without causing a delay to the project completion date.
G. Finish to Start	
H. Start to Start	_____ the finish of one task is dependent on another task starting.
I. Finish to Finish	
J. Start to Finish	_____ Doesn't use up resources and doesn't add any direct costs to our project. Adds time to forward pass calculations.
	_____ Our project is ahead of schedule.
	_____ the start of one task is dependent on another task starting.
	_____ Our project is behind schedule.
	_____ Doesn't use up resources or time, and doesn't add any direct costs to our project. Used to mark important events.

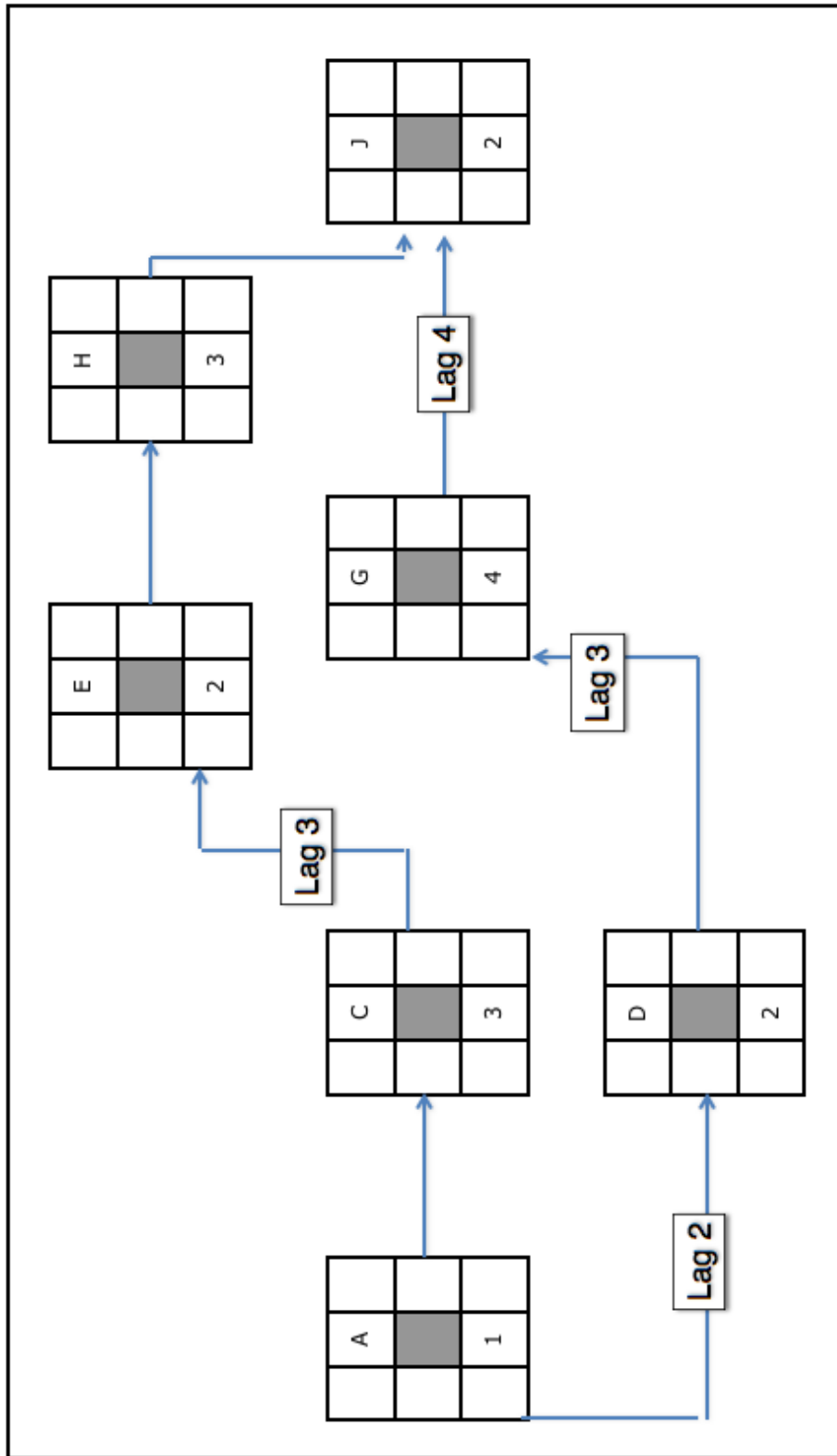
Advanced Project Network Exercise 1

Complete the forward and backward pass for the network below,.



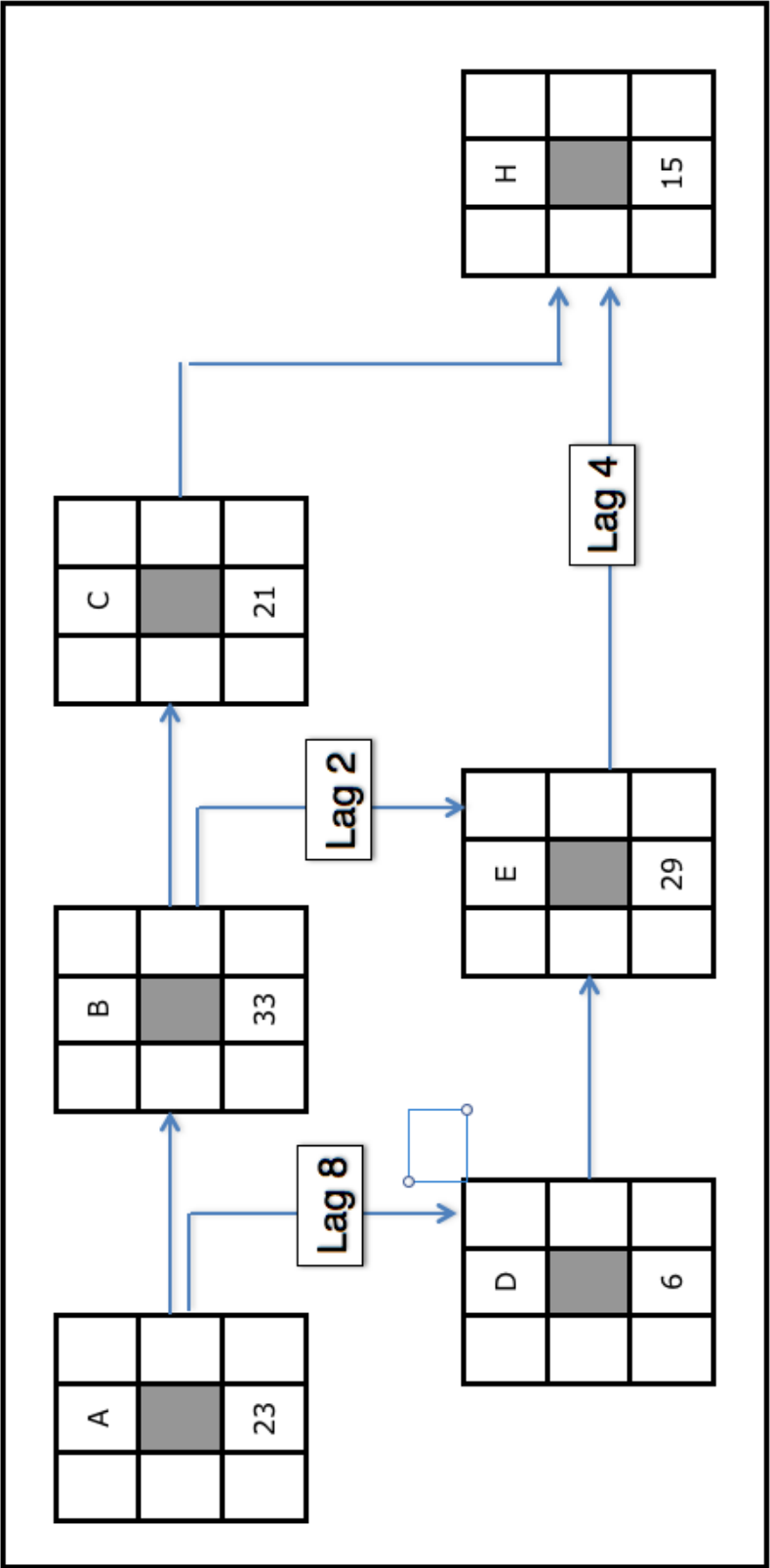
Advanced Project Network Exercise 2

Complete the forward and backward pass for the network below, and answer the question(s).



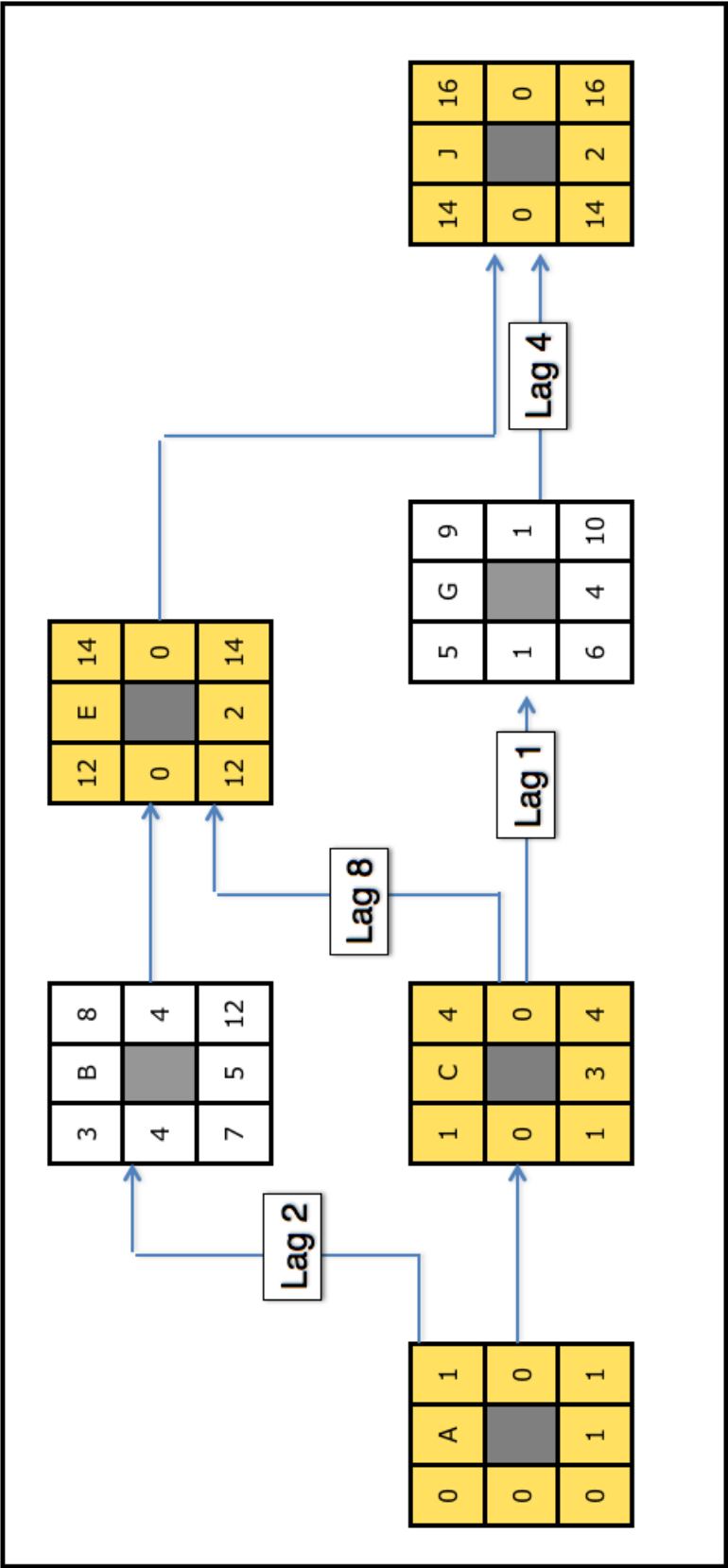
Advanced Project Network Exercise 3

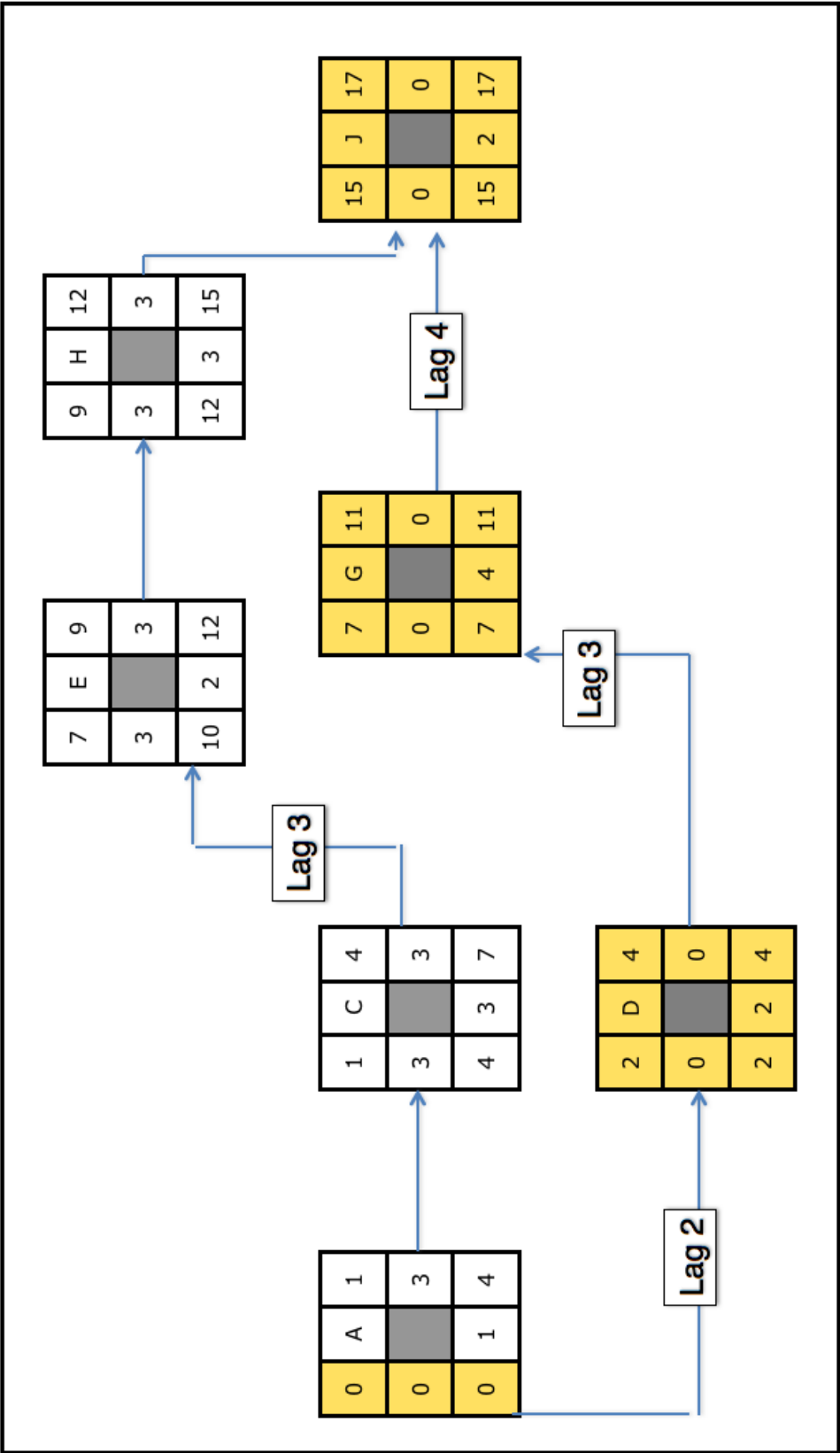
Complete the forward and backward pass for the network below.

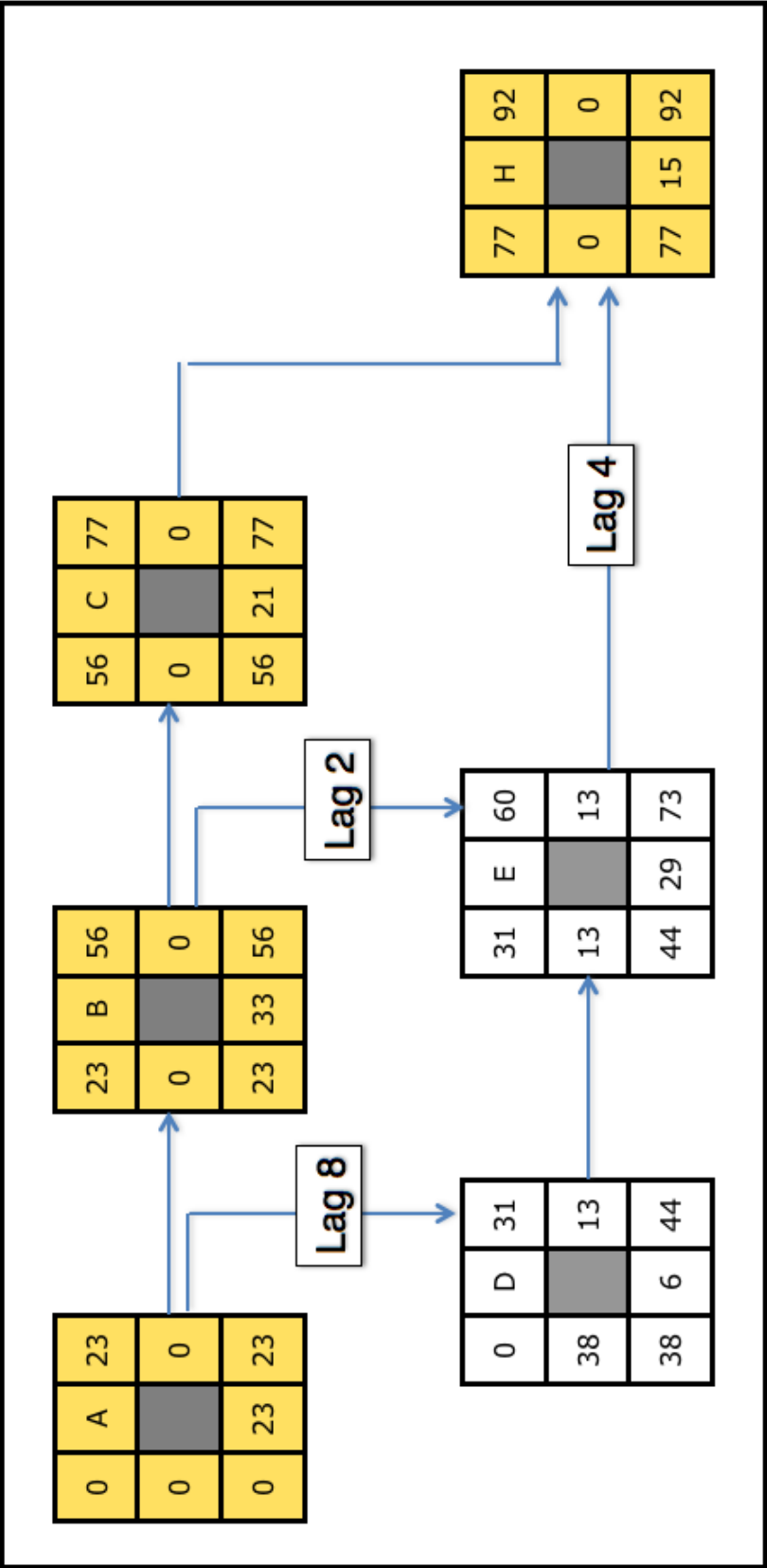


Answers: Advanced Project Networks Matching

<u>Terms</u>	<u>Definition/Related Statement</u>
A. Total Slack	_I_ the finish time of one task is dependent on another task finishing.
B. Free Slack	_B_ the amount of time that a task in a project network can be delayed without causing a delay to subsequent tasks.
C. Lags	_G_ the start of one task is dependent on another task finishing.
D. Positive Slack	_A_ the amount of time that a task in a project network can be delayed without causing a delay to the project completion date.
E. Negative Slack	_J_ the finish of one task is dependent on another task starting.
F. Milestones	_C_ Doesn't use up resources and doesn't add any direct costs to our project. Adds time to forward pass calculations.
G. Finish to Start	_D_ Our project is ahead of schedule.
H. Start to Start	_H_ the start of one task is dependent on another task starting.
I. Finish to Finish	_E_ Our project is behind schedule.
J. Start to Finish	_F_ Doesn't use up resources or time, and doesn't add any direct costs to our project. Used to mark important events.







Chapter 9, Reducing Project Duration

Section 1 Notes: Reducing Project Duration

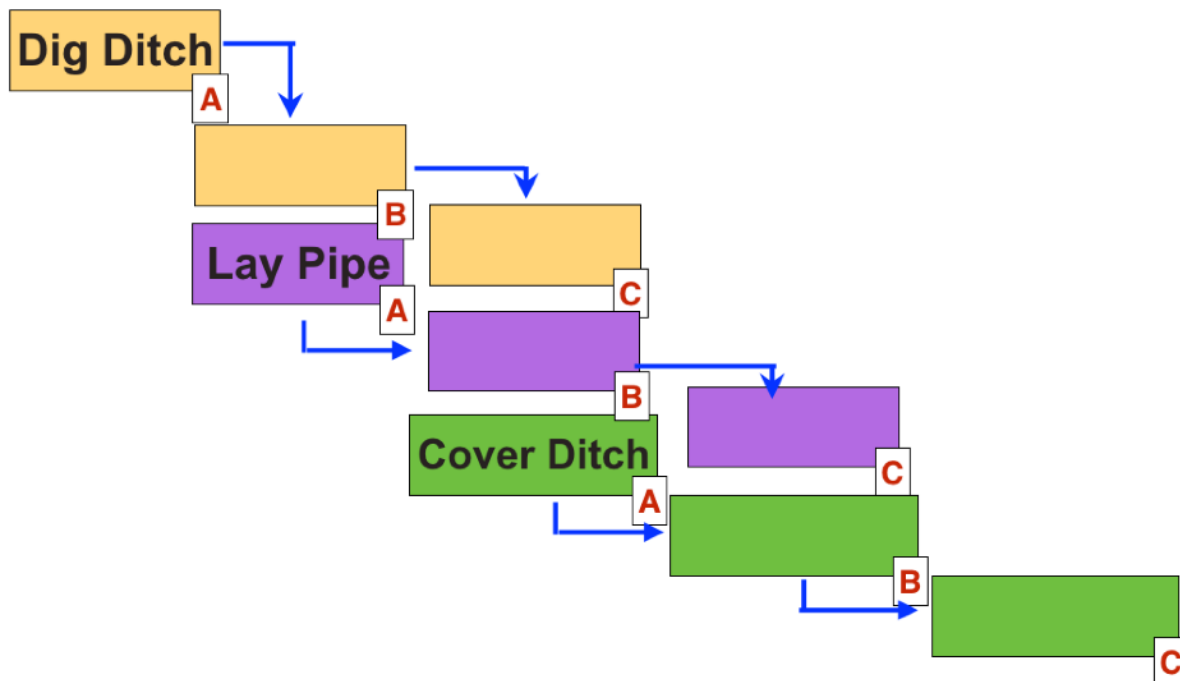
Video 9.1: Fast Tracking.

Fill in the blanks below as you watch the video on Fast Tracking.

1. Fast Tracking involves changing the relationship of our tasks from **finish to start** into _____ to _____.
2. Fast Tracking reduces project time with no extra _____.
3. However, fast tracking increases _____, will push more tasks onto the critical path making our project more _____.

Video 9.2: Laddering.

Fill in the missing task names below after watching the video on Laddering.



Assuming the time for all tasks are 1 week (Dig Ditch A, Dig Ditch B, Cover Ditch A, etc) and if laddering was not used, the project would take 9 weeks. With laddering, how long does it take?

Video 9.3: Crashing

Fill in the blanks below as you watch the end of the video on Crashing.

1. Crashing reduces project time so that we can find an _____ project time, especially when we consider deadlines we consider _____, _____ costs.
2. Crashing always increases _____ costs and the amount of time spent on management. Therefore, it might also increase our risk.

Section 1 Check Your Knowledge: Reducing Project Duration

Reducing Project Duration Questions

1. The normal time for a critical path task is 30 days and the normal cost is \$4500. We can crash this task to a maximum of 20 days at a total cost of \$6500 (\$4500 plus \$2000 of overtime). What is the slope?
 - A. \$200 per day
 - B. \$325 per day
 - C. \$450 per day
 - D. \$550 per day
 2. Amy wants to crash her project. She should start by crashing tasks that:
 - A. Are on the critical path
 - B. Have the most slack
 - C. Are the least expensive to crash
 - D. Are the most expensive to crash
 - E. A and C
 - F. B and C
 3. If the profit from incentives or cost savings from reducing indirect costs are greater than the cost of crashing, then it is generally a good idea to crash a project.
 - A. True
 - B. False
 4. Laddering and Fast Tracking always increases direct costs.
 - A. True
 - B. False
 5. Fast Tracking involves using resources in order to complete the task in less time.
 - A. True
 - B. False
-

Answers: Reducing Project Duration Questions

1. The normal time for a critical path task is 30 days and the normal cost is \$4500. We can crash this task to a maximum of 20 days at a total cost of \$6500 (\$4500 plus \$2000 of overtime). What is the slope?

A. \$200 per day
B. \$325 per day
C. \$450 per day
D. \$550 per day

2. Amy wants to crash her project. She should start by crashing tasks that:

A. Are on the critical path
B. Have the most slack
C. Are the least expensive to crash
D. Are the most expensive to crash
E. A and C
F. B and C

3. If the profit from incentives or cost savings from reducing indirect costs are greater than the cost of crashing, then it is generally a good idea to crash a project.

A. True
B. False

4. Laddering and Fast Tracking always increases direct costs.

A. True
B. False

5. Fast Tracking involves using resources in order to complete the task in less time.

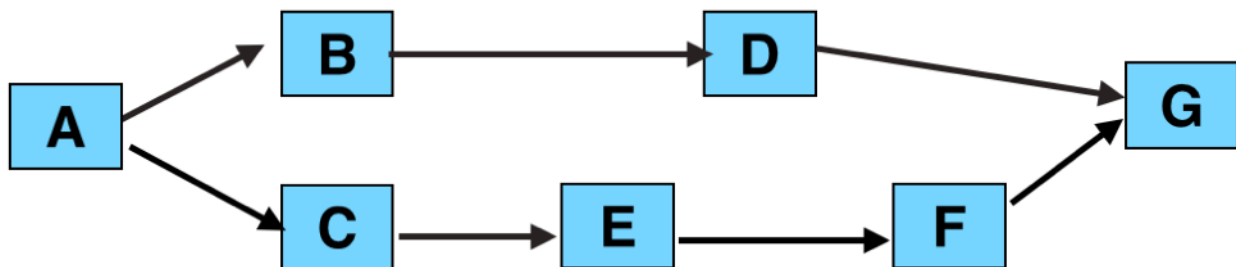
A. True
B. False

Crashing Exercise 1

You are given the following data about project tasks, network, and crash times/costs.

Calculate the cost of the project at all time durations **until you can no longer crash the project**. All times are in days.

ID	Direct costs				Slope	Maximum Crash Time
	Normal		Crash			
	Time	Cost	Time	Cost		
A	5	\$500	4	\$600	\$100	1
B	10	\$1200	6	\$2000	\$200	4
C	13	\$3600	11	\$4800	\$600	2
D	13	\$300	11	\$600	\$150	2
E	5	\$1000	4	\$1400	\$400	1
F	10	\$2400	8	\$5400	\$1500	2
G	5	\$700	5	\$700	\$0	0



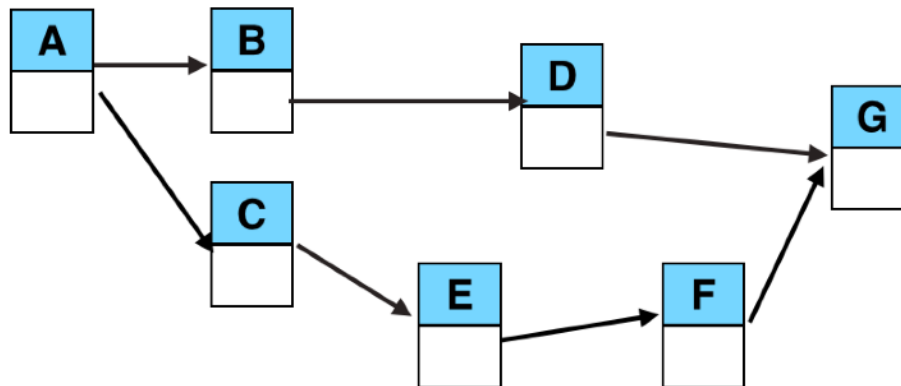
Exercise 1: Initial Network

Calculate the critical path(s) and the direct costs of this project:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Total Direct Costs: _____



Exercise 1: Crashing

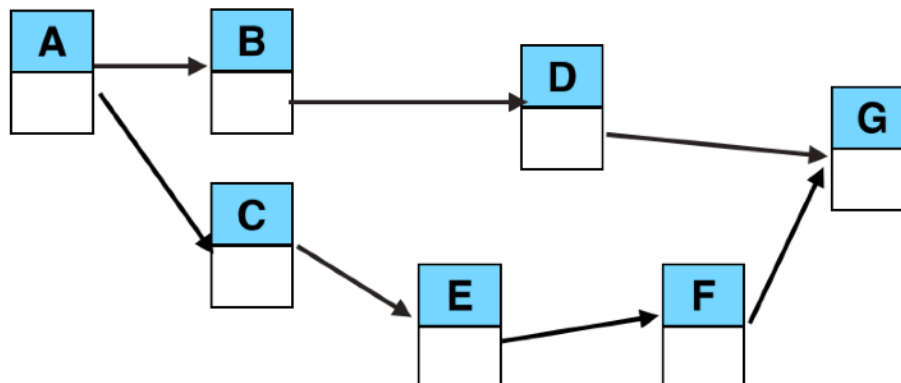
If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____

Total Cost at this time period: \$ _____



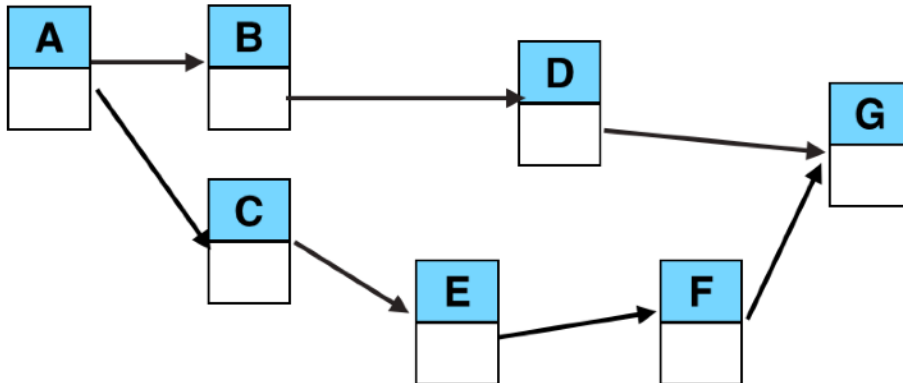
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____
(This time period and previous time period)

Total Cost at this time period: \$ _____



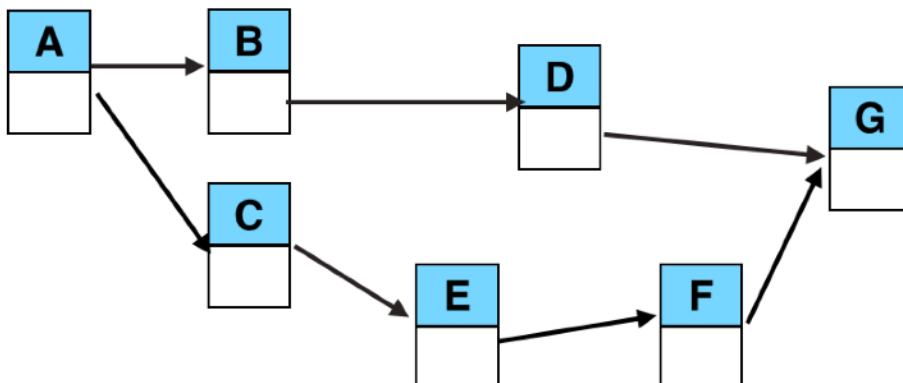
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____
(This time period and previous time period)

Total Cost at this time period: \$ _____



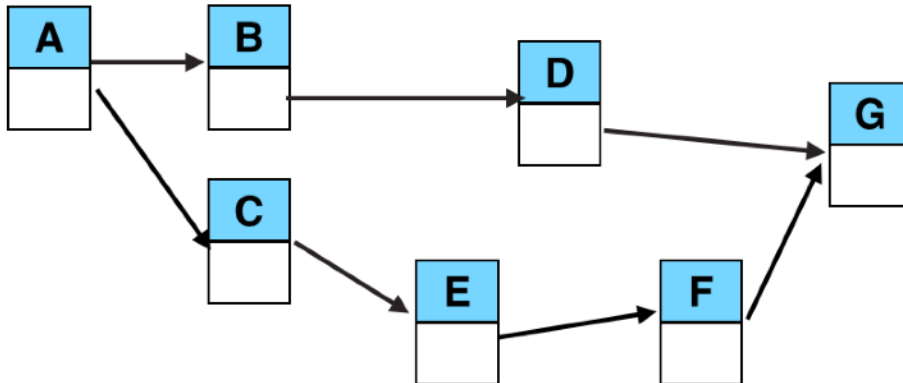
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____
(This time period and previous time period)

Total Cost at this time period: \$ _____



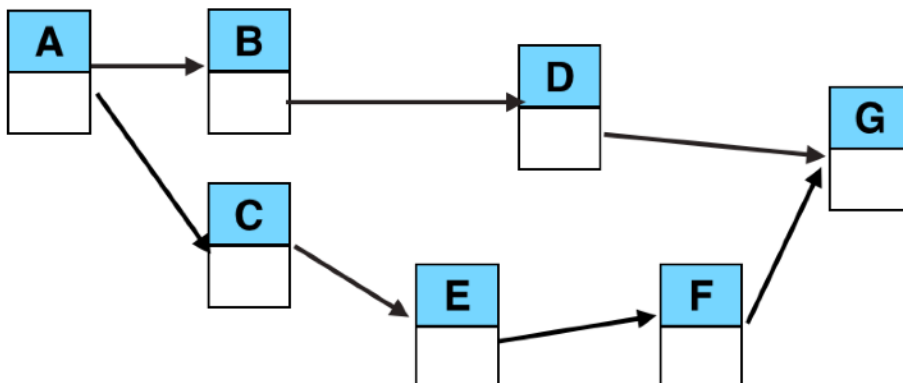
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____
(This time period and previous time period)

Total Cost at this time period: \$ _____



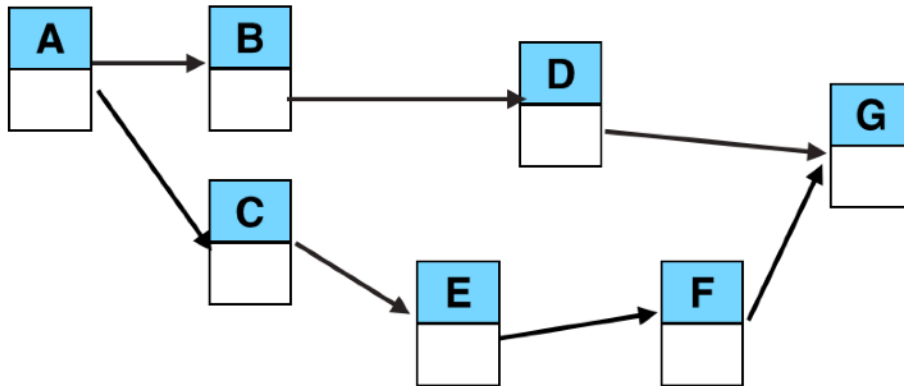
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Path 1: _____ Duration: _____ Project Dur: _____

Path 2: _____ Duration: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____
(This time period and previous time period)

Total Cost at this time period: \$ _____



Exercise 1, Part D.

Record the direct costs that you calculated at each duration in the table below. Calculate the total project costs (figuring in the \$500 per day incentive to finish early) at the various time periods.

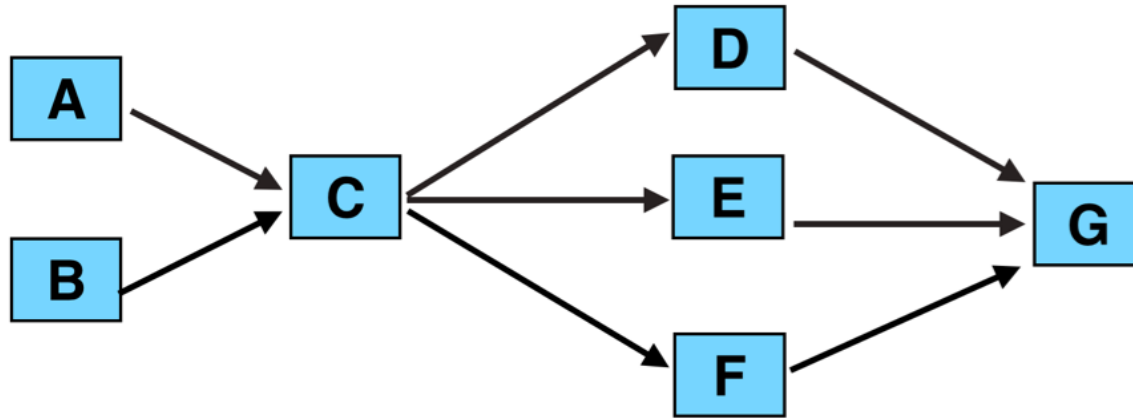
	Initial Dur	-1	-2	-3	-4	-5	-6	-7
Project Duration								
Total Direct Costs								
Incentives (\$500 per day that project is delivered early)	—							
TOTAL PROJECT COSTS								

Circle the optimum time period in terms of total cost.

Crashing Exercise 2

You are given the following data about the project tasks, network, and crash times/costs.

Calculate the cost of the project at all time durations until you can no longer crash the project.



ID	Direct costs				Slope	Maximum Crash Time
	Normal		Crash			
	Time	Cost	Time	Cost		
A	10	\$5000	10	\$5000	\$0	0
B	12	\$1200	11	\$1300	\$100	1
C	11	\$3600	9	\$4800	\$600	2
D	5	\$300	4	\$600	\$300	1
E	8	\$1000	6	\$2000	\$500	2
F	9	\$2400	7	\$5400	\$1500	2
G	8	\$700	7	\$1000	\$300	1

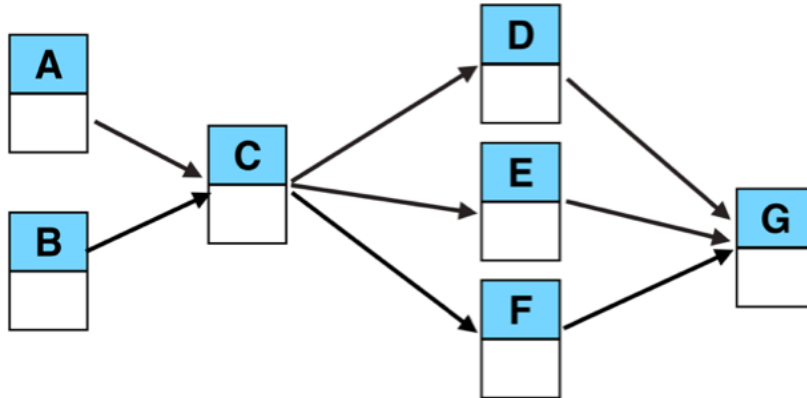
Exercise 2: Initial Network

Calculate the critical path(s) and the direct costs of this project:

Critical Path (s) _____

Project Dur: _____

Total Direct Costs: _____



Exercise 2, Crashing

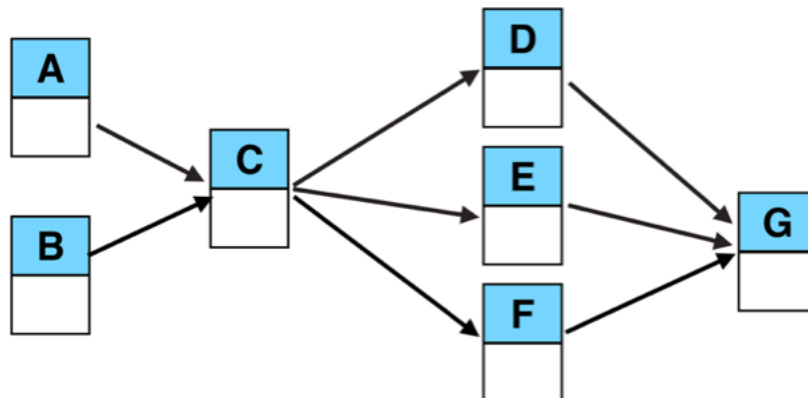
If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

Critical Path (s) _____

Project Dur: _____

Normal Duration Direct Costs: \$ _____ Additional Costs of Crashing: \$ _____
(This time period and previous time period)

Total Cost at this time period: \$ _____



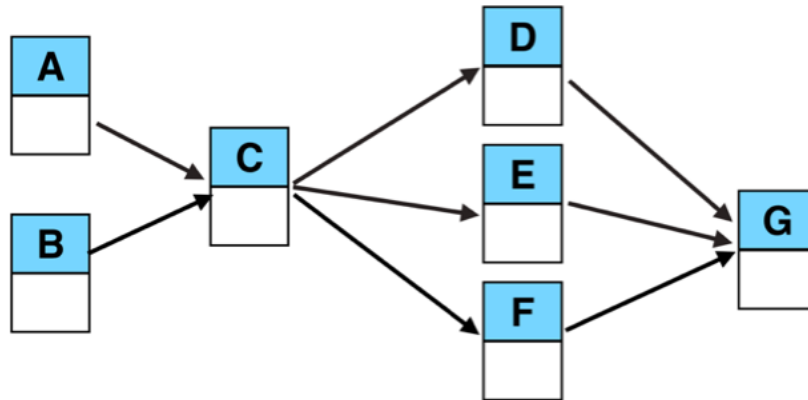
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Critical Path (s) _____

Project Dur: _____

Normal Duration Direct Costs: \$_____ Additional Costs of Crashing: \$_____
(This time period and previous time period)

Total Cost at this time period: \$_____



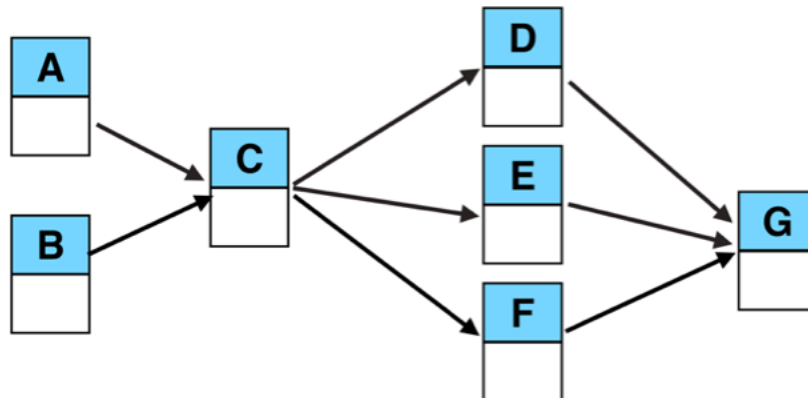
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Critical Path (s) _____

Project Dur: _____

Normal Duration Direct Costs: \$_____ Additional Costs of Crashing: \$_____
(This time period and previous time period)

Total Cost at this time period: \$_____



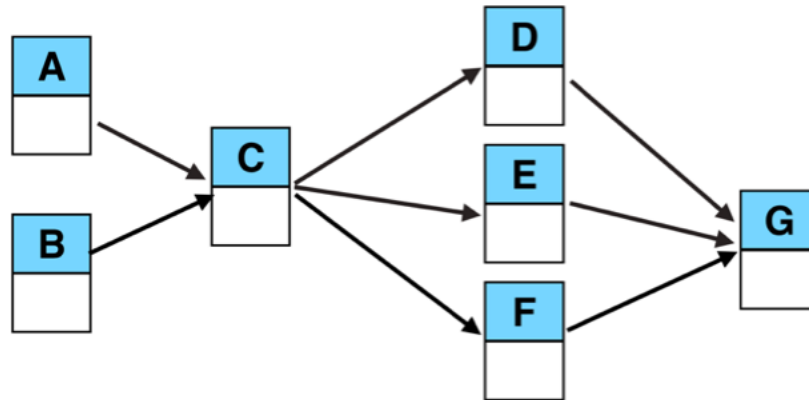
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Critical Path (s) _____

Project Dur: _____

Normal Duration Direct Costs: \$_____ Additional Costs of Crashing: \$_____
(This time period and previous time period)

Total Cost at this time period: \$_____



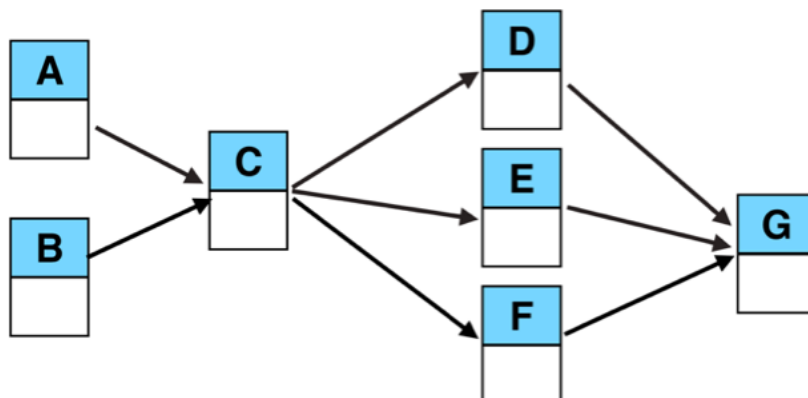
If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Critical Path (s) _____

Project Dur: _____

Normal Duration Direct Costs: \$_____ Additional Costs of Crashing: \$_____
(This time period and previous time period)

Total Cost at this time period: \$_____



If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Critical Path (s) _____

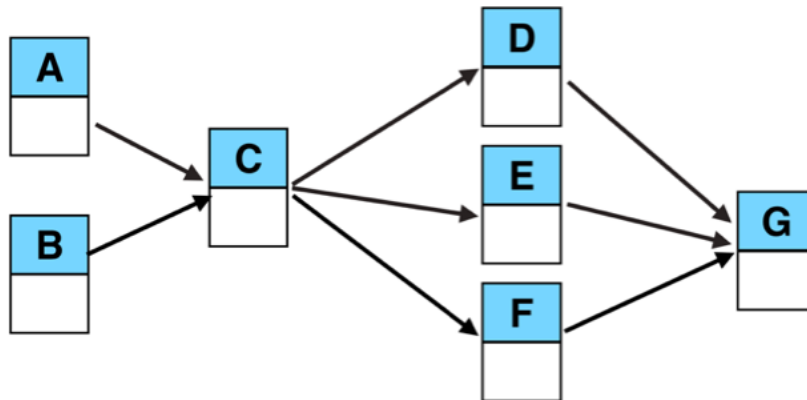
Project Dur: _____

Normal Duration Direct Costs: \$ _____

Additional Costs of Crashing: \$ _____

(This time period and previous time period)

Total Cost at this time period: \$ _____



If possible, calculate the critical path(s) and the costs of crashing this project by 1 more day:

Critical Path (s) _____

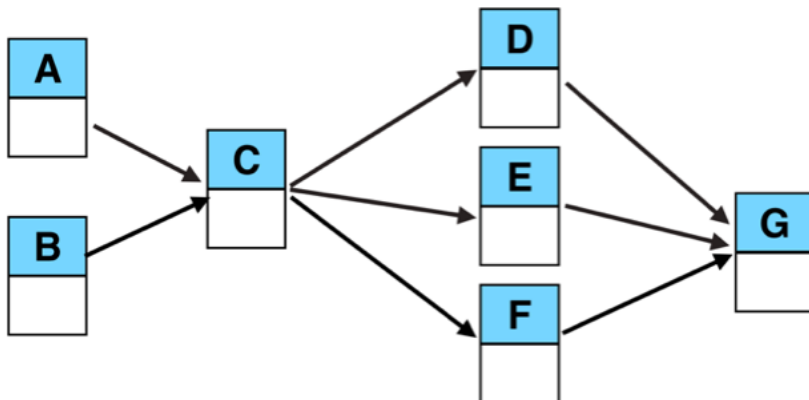
Project Dur: _____

Normal Duration Direct Costs: \$ _____

Additional Costs of Crashing: \$ _____

(This time period and previous time period)

Total Cost at this time period: \$ _____



Exercise 2, Part D.

Record the direct costs that you calculated at each duration in the table below. Calculate the total project costs (figuring in indirect costs) at the various time periods.

	Initial Dur	-1	-2	-3	-4	-5	-6	-7
Project Duration								
Total Direct Costs								
Indirect <u>Costs</u>	\$3000	\$2500	\$2000	\$1500	\$1000	\$500	\$250	\$0
TOTAL COSTS								

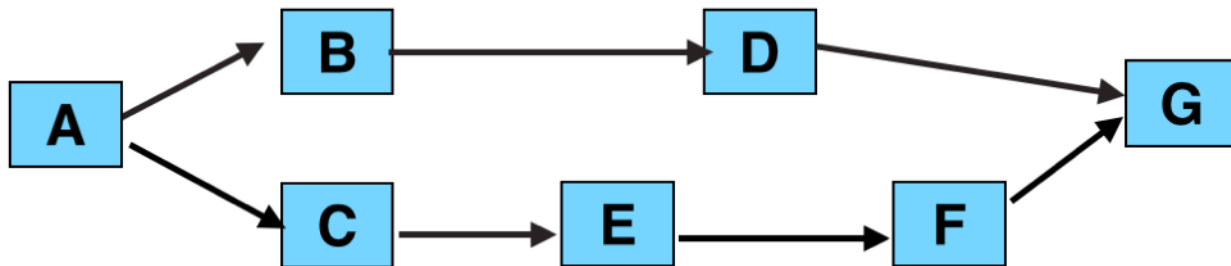
Circle the optimum time period in terms of total cost.

Crashing Exercise 1 Solution

You are given the following data about the project tasks, network, and crash times/costs.

Calculate the cost of the project at all time durations until you can no longer crash the project.

ID	Direct costs				Slope	Maximum Crash Time
	Normal		Crash			
	Time	Cost	Time	Cost		
A	5	\$500	4	\$600	\$100	1
B	10	\$1200	6	\$2000	\$200	4
C	13	\$3600	11	\$4800	\$600	2
D	13	\$300	11	\$600	\$150	2
E	5	\$1000	4	\$1400	\$400	1
F	10	\$2400	8	\$5400	\$1500	2
G	5	\$700	5	\$700	\$0	0
\$9700						



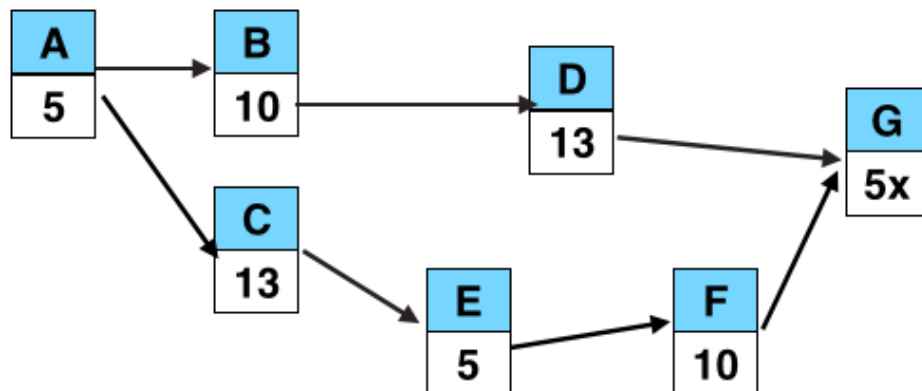
Exercise 1, Part B: Initial Network

Calculate the critical path(s) and the direct costs of this project:

Path 1: A->B->D->G Duration: 33 Project Dur: 38

Path 2: A->C->E->F->G Duration: 38

Total Direct Costs: \$9700



Exercise 1, Part C.

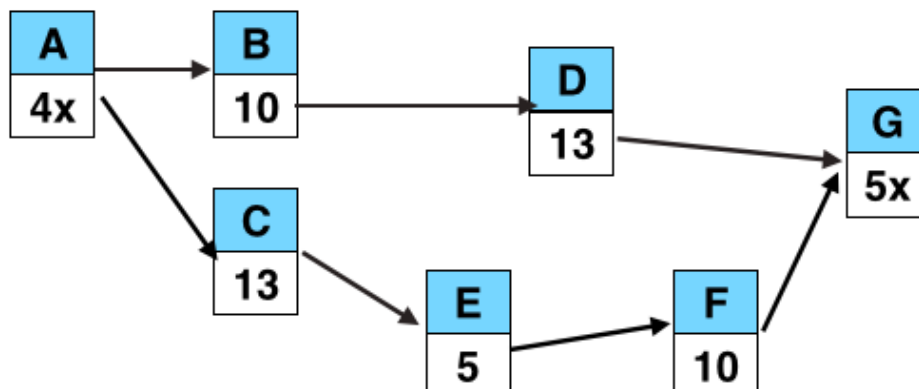
If possible, calculate the critical path(s), and the additional costs of crashing this project by 1 more day:

Path 1: A->B->D->G Duration: 32 Project Dur: 37

Path 2: A->C->E->F->G Duration: 37

Normal Duration Direct Costs: \$9700 Additional Costs of Crashing: \$100 (A)

Total Cost at this time period: **\$9800**



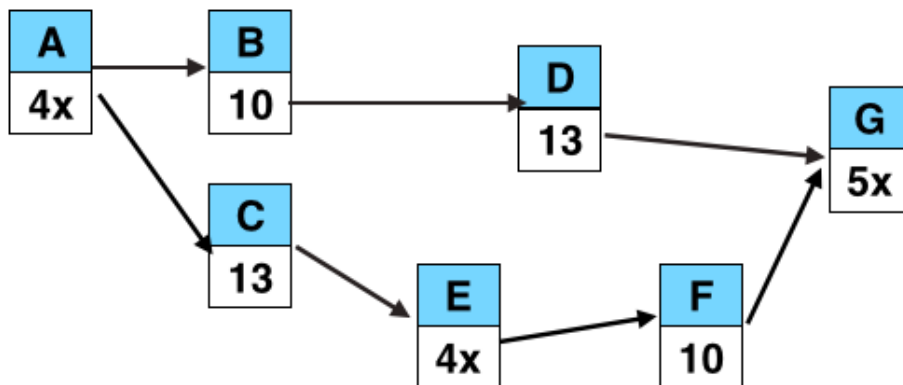
If possible, calculate the critical path(s), and the additional costs of crashing this project by 1 more day:

Path 1: A->B->D->G Duration: 32 Project Dur: 36

Path 2: A->C->E->F->G Duration: 36

Normal Duration Direct Costs: \$9700 Additional Costs of Crashing: \$100 (A)+ \$400 (E)

Total Cost at this time period: **\$10,200**



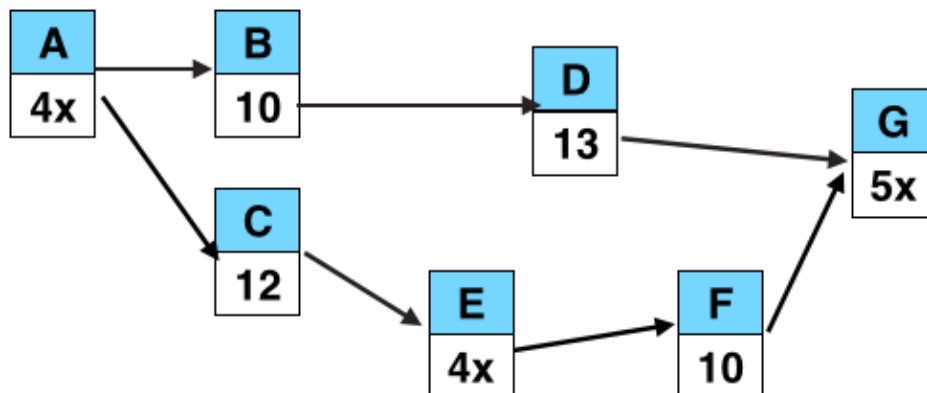
If possible, calculate the critical path(s), and the additional costs of crashing this project by 1 more day:

Path 1: A->B->D->G Duration: 32 Project Dur: 35

Path 2: A->C->E->F->G Duration: 35

Normal Duration Direct Costs: \$9700 Additional Costs of Crashing: \$100 (A)+ \$400 (E) + \$600 (C)

Total Cost at this time period: **\$10,800**



If possible, calculate the critical path(s), and the additional costs of crashing this project by 1 more day:

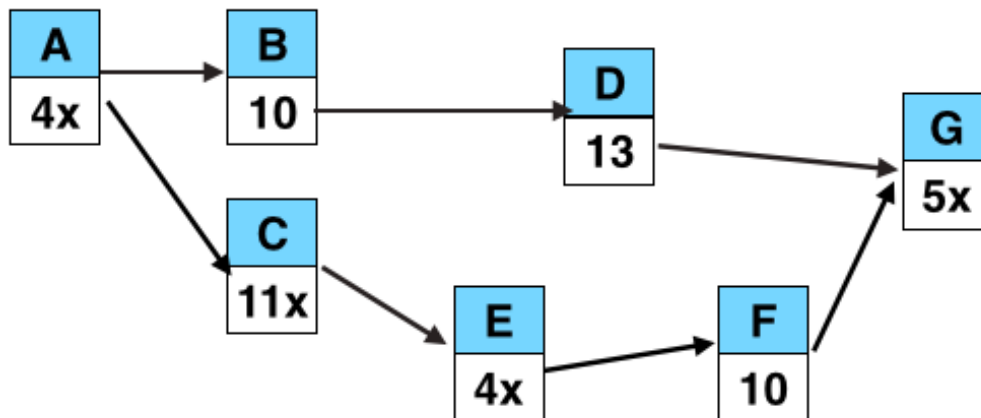
Path 1: A->B->D->G Duration: 32 Project Dur: 34

Path 2: A->C->E->F->G Duration: 34

Normal Duration Direct Costs: \$9700

Additional Costs of Crashing: \$100 (A) + \$400 (E) + \$600 (C) + \$600 (C)

Total Cost at this time period: **\$11,400**



If possible, calculate the critical path(s), and the additional costs of crashing this project by 1 more day:

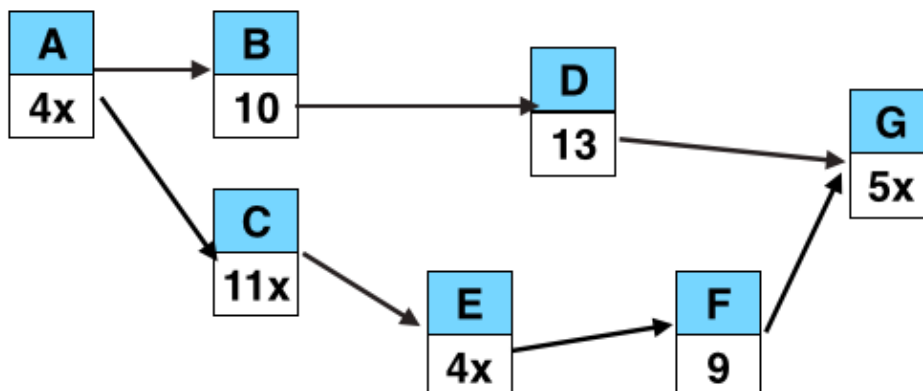
Path 1: A->B->D->G Duration: 32 Project Dur: 33

Path 2: A->C->E->F->G Duration: 33

Normal Duration Direct Costs: \$9700

Additional Costs of Crashing: \$100 (A) + \$400 (E) + \$600 (C) + \$600 (C) + 1500 (F)

Total Cost at this time period: **\$12,900**



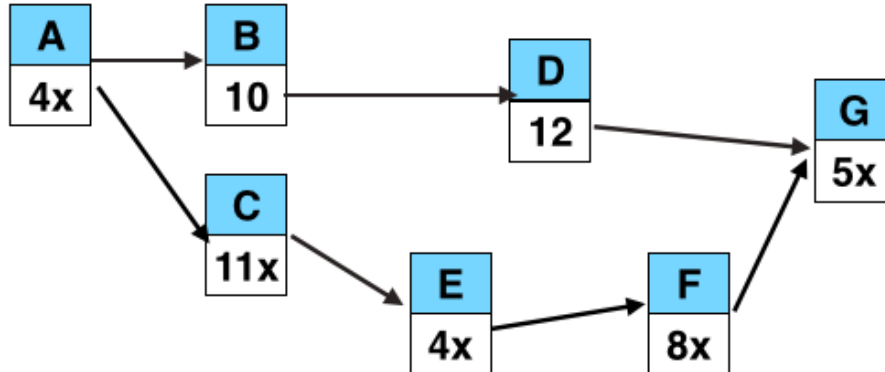
If possible, calculate the critical path(s), and the additional costs of crashing this project by another 1 more day::

Path 1: A->B->D->G Duration: 32 Project Dur: 32

Path 2: A->C->E->F->G Duration: 32

Normal Duration Direct Costs: \$9700

Additional Costs of Crashing: \$100(A)+ \$400(E) + \$600(C) + \$600(C) + 1500(F) + 1500(F)



Total Cost at this time period: **\$14400**

Exercise 1, Part D.

Record the direct costs that you calculated at each duration in the table below. Calculate the total project costs (figuring in indirect costs) at the various time periods.

	Initial Dur	-1	-2	-3	-4	-5	-6	-7
Project Duration	38	37	36	35	34	33	32	NA
Total Direct Costs	\$9,700	\$9,800	\$10,200	\$10,800	\$11,400	\$12,900	\$14,400	NA
Incentives (\$500 per day beyond initial duration)	—	\$500	\$1,000	\$1,500	\$2,000	\$2,500	\$3,000	\$2500
TOTAL PROJECT COSTS	\$9,700	\$9,300	\$9,200	\$9,300	\$9,400	\$10,400	\$11,400	NA

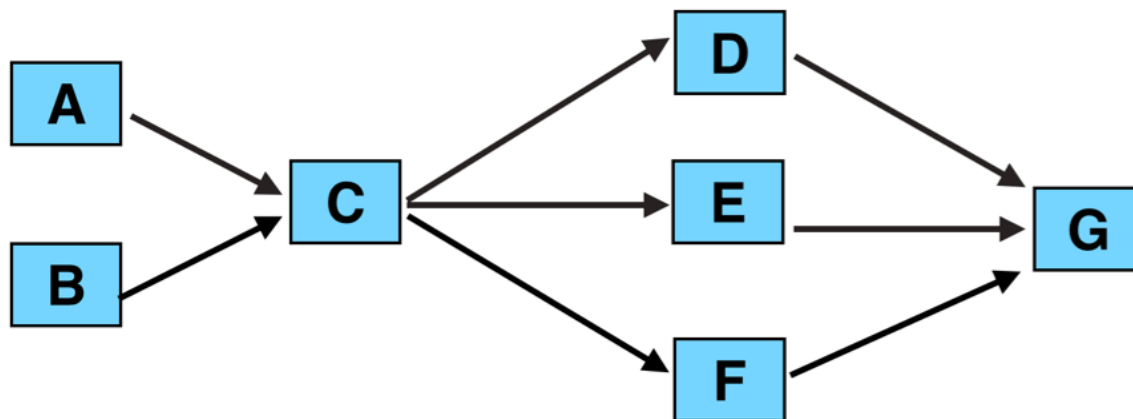
Circle the optimum time period in terms of total cost.

Crashing Exercise 2 Solution

You are given the following data about the project tasks, network, and crash times/costs.

Calculate the cost of the project at all time durations until you can no longer crash the project.

ID	Direct costs				Slope	Maximum Crash Time
	Normal		Crash			
	Time	Cost	Time	Cost		
A	10	\$5000	10	\$5000	\$0	0
B	12	\$1200	11	\$1300	\$100	1
C	11	\$3600	9	\$4800	\$600	2
D	5	\$300	4	\$600	\$300	1
E	8	\$1000	6	\$2000	\$500	2
F	9	\$2400	7	\$5400	\$1500	2
G	8	\$700	7	\$1000	\$300	1
\$14200						



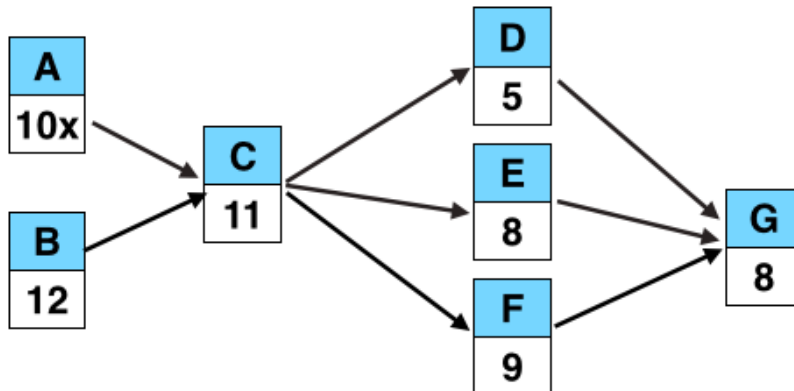
Exercise 2, Part B: Initial Network

Calculate the critical path(s) and the direct costs of this project:

Critical Path: B->C->F->G

Project Dur: **40**

Total Direct Costs: **\$14,200**



Exercise 2, Part C.

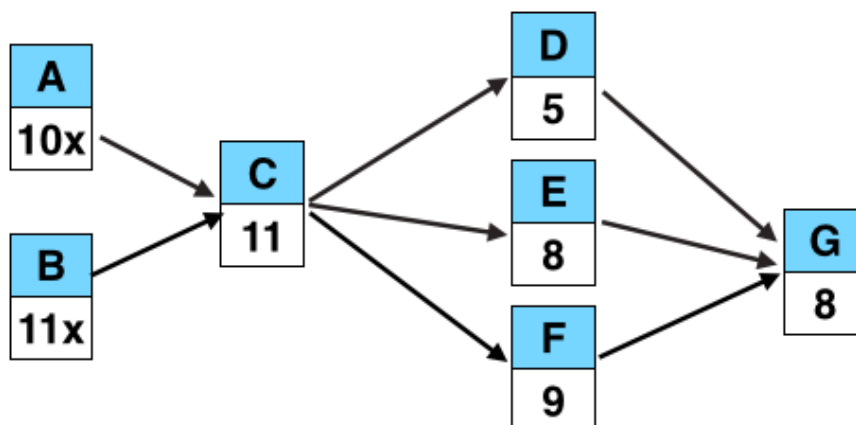
If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

Critical Path: B->C->F->G

Project Dur: **39**

Normal Duration Direct Costs: \$14,200 Additional Costs of Crashing: **\$100(B)**

Total Cost at this time period: **\$14,300**



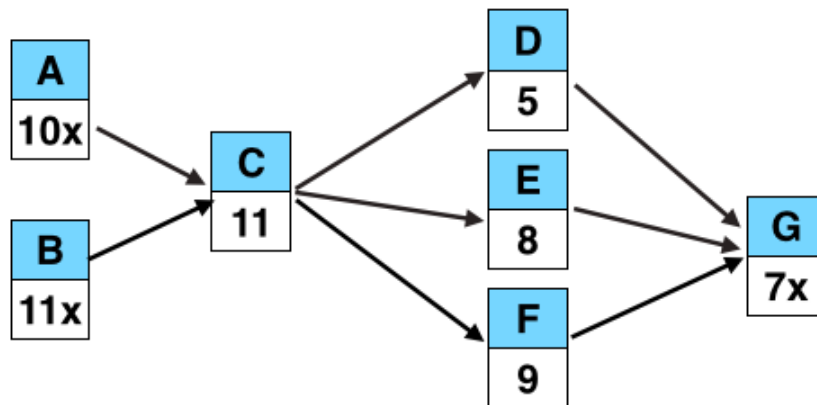
If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

Critical Path: B->C->F->G

Project Dur: **38**

Normal Duration Direct Costs: \$14,200 Additional Costs of Crashing: \$100(B) + \$300 (G)

Total Cost at this time period: **\$14,600**



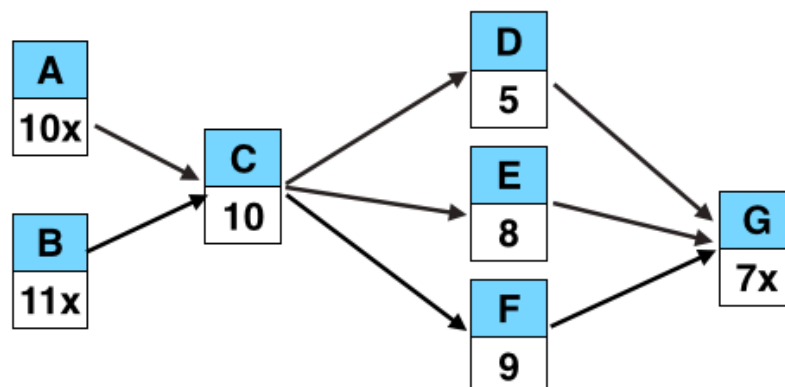
If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

Critical Path: B->C->F->G

Project Dur: **37**

Normal Duration Direct Costs: \$14,200 Additional Costs of Crashing: \$100(B) + \$300(G) + \$600(C)

Total Cost at this time period: **\$15,200**



If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

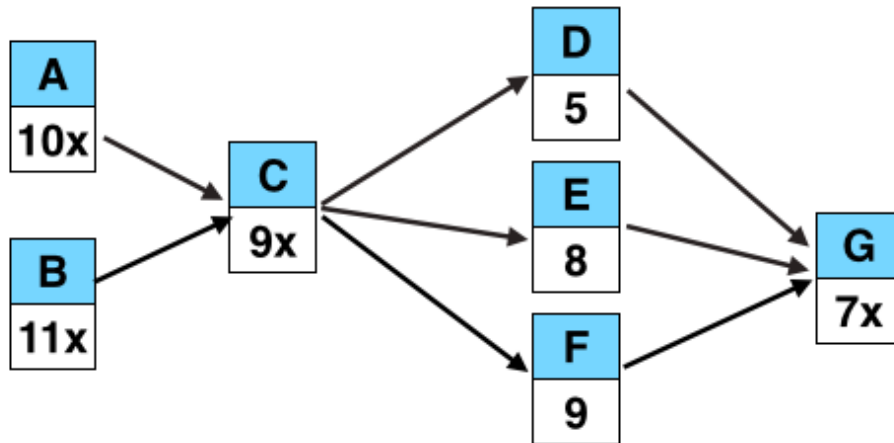
Critical Path: B->C->F->G

Project Dur: **36**

Normal Duration Direct Costs: \$14,200

Additional Costs of Crashing: $\$100(B) + \$300(G) + \$600(C) + \mathbf{\$600(C)}$

Total Cost at this time period: **\$15,800**



If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

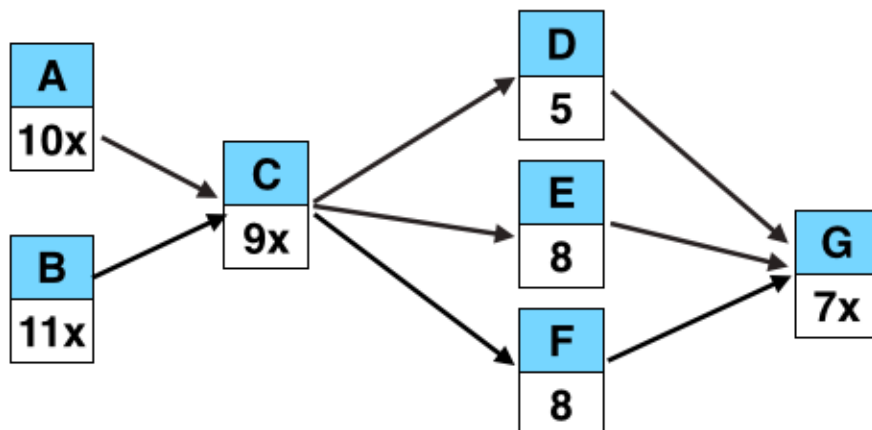
Critical Path: B->C->F->G + B->C->E->G

Project Dur: **35**

Normal Duration Direct Costs: \$14,200

Additional Costs of Crashing: $\$100(B) + \$300(G) + \$600(C) + \$600(C) + \mathbf{\$1500(F)}$

Total Cost at this time period: **\$17,300**



If possible, calculate the critical path(s) and the costs of crashing this project by 1 day:

Critical Path: B->C->F->G + B->C->E->G

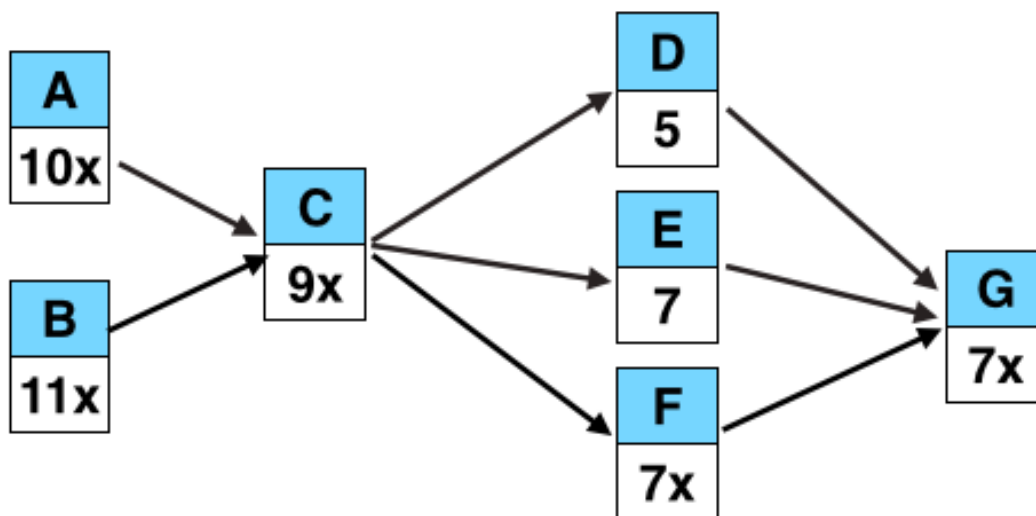
Project Dur: **34**

Normal Duration Direct Costs: \$14,200

Additional Costs of Crashing: $\$100(B) + \$300(G) + \$600(C) + \$600(C) + \$1500(F) + \$1500(F) +$

\$500(E)

Total Cost at this time period: **\$19,300**



Project cannot be crashed to any shorter duration.

Exercise 2, Part D.

Record the direct costs that you calculated at each duration in the table below. Calculate the total project costs (figuring in indirect costs) at the various time periods.

	Initial Dur	-1	-2	-3	-4	-5	-6	-7
Project Duration	40	39	38	37	36	35	34	33
Total Direct Costs	\$14,200	\$14,300	\$14,600	\$15,200	\$15,800	\$17,300	\$19,300	NA
Indirect Costs	\$3,000	\$2,500	\$2,000	\$1,500	\$1,000	\$500	\$250	\$0
TOTAL COSTS	\$17,200	\$16,800	\$16,600	\$16,700	\$16,800	\$17,800	\$19,550	NA

Circle the optimum time period in terms of total cost.

Chapter 10: Earned Value Management

Section 1 Notes: Earned Value Inputs

Complete the Earned Value Input Table
As you read this section, write the definition for the term and how it is calculated

Earned Value Basic Inputs		
Term	Description	Calculation
PV		
BAC		
AC		
EV		

Complete the Earning Rules Table
As you read this section, write the definition for the term and how it is calculated

Estimating Work Complete Methods	
Term	Description/Calculation
Professional Estimator	
0/100 Rule	
50/50 Rule	
25/75 Rule	
20/80 Rule	

Completed Earned Value Inputs and Earning Rules Tables

Earned Value Basic Inputs		
Term	Description	Calculation
PV	Planned Value (Also known as BCWS – Budgeted Cost of the Work Scheduled)	PV = Planned value of the work that is scheduled in our current baseline.
BAC	Budgeted cost at completion.	BAC=TOTAL PV for Project
AC	Actual Costs (Also know as ACWP – Actual cost of the work performed)	AC= Actual Costs (Total of all invoices, labor, parts, etc).
EV	Earned Value (Also know as BCWP – Budgeted cost of the work performed)	EV= Total Planned Value of Activity or Project * % Complete.

Estimating Work Complete Methods	
Term	Description/Calculation
Professional Estimator	Used when activity is long (80-90 days) or very complex.
0/100 Rule	No earned value is counted for an activity until it is 100% complete.
50/50 Rule	Percent complete calculated at fifty percent when activity starts. Remaining 50% is calculated when activity is complete.
25/75 Rule	Percent complete calculated at twenty-five percent when activity starts. Remaining 75% is calculated when activity is complete.
20/80 Rule	Percent complete calculated at twenty percent when activity starts. Remaining 80% is calculated when activity is complete.

Section 1 Check Your Knowledge: Earned Value Inputs

Earned Value Inputs Questions

1. The total planned value for Activity A is \$19,500. Activity A is 40% complete. What is the EV for Activity A?
 - A. \$7,800
 - B. \$8,700
 - C. \$0.00
 - D. \$19,500

2. The total planned value for Activity B is \$17,000. Activity B has not started yet. What is the EV for Activity B for EV?
 - A. \$7,800
 - B. \$8,700
 - C. \$0.00
 - D. \$19,500

3. What is the source of AC values for our project or activity?
 - A. Accounting Department
 - B. Professional Estimator or An Earning Rule
 - C. Time-Phased Budget
 - D. Resource Histogram.

4. What is the source of PV values for our project or activity?
 - A. Accounting Department
 - B. Professional Estimator or An Earning Rule
 - C. Time-Phased Budget
 - D. Resource Histogram.

5. What is the source of Percent Complete values for our project or activity?

- A. Accounting Department
- B. Professional Estimator or An Earning Rule
- C. Time-Phased Budget
- D. Resource Histogram.

Use the following time-phase budget for Project Ice Cream for the next questions.

Task	PV per Month							
	1	2	3	4	5	6	7	8
A	\$4,000	\$4,000						
B		\$6,000	\$6,000	\$6,000				
C			\$2,300	\$2,300	\$2,300			
D			\$5,000	\$5,000	\$5,000	\$5,000	5000	
E					\$1,000	\$1,000	\$1,000	\$1,000

6. What is the BAC for the project?

- A. \$61,900
- B. \$25,000
- C. \$0.00
- D. \$11,700

7. What is the PV at the end of Month 3 for the project?

- A. \$13,300
- B. \$15,000
- C. \$0.00
- D. \$27,300

8. What is the PV for Activity D at the end of week 5?

- A. \$15,000
- B. \$25,000
- C. \$0.00
- D. \$16,300

9. What is the Total PV for Activity D throughout the project?

- A. \$20,000
- B. \$25,000
- C. \$0.00
- D. \$15,000

Answers: Earned Value Inputs Questions

1. The total planned value for Activity A is \$19,500. Activity A is 40% complete. What is the EV for Activity A?

$$\$19,500 \times 40\% = \$7,800$$

- A. \$7,800**
- B. \$8,700
- C. \$0.00
- D. \$19,500

2. The total planned value for Activity B is \$17,000. Activity B has not started yet. What is the EV for Activity B for EV?

$$\$17,000 \times 0\% = \$0.00$$

- A. \$7,800
- B. \$8,700
- C. \$0.00**
- D. \$19,500

3. What is the source of AC values for our project or activity?

- A. Accounting Department**
- B. Professional Estimator or An Earning Rule
- C. Time-Phased Budget
- D. Resource Histogram.

4. What is the source of PV values for our project or activity?

- A. Accounting Department
- B. Professional Estimator or An Earning Rule
- C. Time-Phased Budget**
- D. Resource Histogram.

5. What is the source of Percent Complete values for our project or activity?

- A. Accounting Department
- B. Professional Estimator or An Earning Rule**
- C. Time-Phased Budget
- D. Resource Histogram.

Use the following time-phase budget for Project Ice Cream for the next questions.

Task	PV per Month							
	1	2	3	4	5	6	7	8
A	\$4,000	\$4,000						
B		\$6,000	\$6,000	\$6,000				
C			\$2,300	\$2,300	\$2,300			
D			\$5,000	\$5,000	\$5,000	\$5,000	5000	
E					\$1,000	\$1,000	\$1,000	\$1,000

6. What is the BAC for the project?

- A. \$61,900**
- B. \$25,000
- C. \$0.00
- D. \$11,700

7. What is the PV at the end of Month 3 for the project?

- A. \$13,300
- B. \$15,000
- C. \$0.00
- D. \$27,300**

8. What is the PV for Activity D at the end of week 5?

- A. \$15,000**
- B. \$25,000
- C. \$0.00
- D. \$16,300



9. What is the Total PV for Activity D throughout the project?



- A. \$20,000
- B. \$25,000**
- C. \$0.00
- D. \$15,000




Section 2 Notes: Earned Value Analysis




Complete the Earned Value Calculations Tables

As you read this section, fill in the blanks in tables below:

Cost _____	
Term	Description/Calculation
CV	Cost _____ (compares budgeted costs to the actual amount spent).
	CV = ____ - ____
	_____ number = over budget. 
	_____ number = under budget. 




Schedule _____	
Term	Description/Calculation
SV	Schedule _____ (Compares the work that should have been done at this time, to the amount actually completed).
	SV = ____ - ____ (Note: PV at this point in time, not total PV for activity.)
	_____ number = work scheduled to be complete at this time is not done. 
	_____ number = work NOT yet scheduled to be complete at this time has been done 
	Note: When a task or project is complete, it's SV will equal 0, regardless of whether the project is completed late or early. Therefore SV is useful when a task is underway or when the bulk of the project work is being performed. Project managers should also use the baseline schedule when making judgements about project schedule performance.

Cost Performance _____	
Term	Description/Calculation
CPI	Cost Performance _____. Measures how effectively we are using our budget.
	CPI = ____ / ____
	CPI ____ 1 : Over Budget 
	CPI ____ 1 : On Budget 
	CPI ____ 1 : Under Budget 

Schedule Performance _____	
Term	Description/Calculation
SPI	Schedule Performance _____. Measures how efficiently we are completing the scheduled work. *
	SPI = ____ / ____ (Note: PV at this point in time, not total PV for activity.)
	SPI ____ 1 : Behind Schedule 
	SPI ____ 1 : On Schedule 
	SPI ____ 1 : Ahead of schedule 
<p>Note: When a task or project is complete, its SPI will equal 1, regardless of whether the project is completed late or early. Therefore SPI is useful when a task is underway or when the bulk of the project work is being performed. Project Managers should also use the baseline schedule when making judgements about project schedule performance.</p>	



Forecasting	
Term	Description/Calculation
ETC *	Estimate to _____. What the remaining work will cost if our current CPI holds.
	ETC= (____ - ____) / CPI or ETC= (____ - ____) / (____ / ____)
EAC *	Estimate cost At _____. What the project will cost if our current CPI holds
	EAC = ____ + ____
VAC *	Variance At _____
	VAC = ____ - ____
<p>* If our baseline is inaccurate, or if we have reason to believe that CPI will not remain the same, ETC, EAC, and VAC may be based on revised estimates (sometimes referred to as ETC_{re}, EAC_{re}, and VAC_{re} respectively).</p>	



Percent Complete	
Term	Description/Calculation
PCIB	Percent Complete Index—_____
	PCIB = ____ / ____
	The percentage of work that is complete based on baseline budget. Use this if we trust our initial project baseline.
PCIC	Percent Complete Index—Cost
	PCIC = ____ / EAC _{re}
	The percentage of work that is complete based on revised estimate of the project costs. Used if we have to revise baseline, are using rolling wave planning, etc.




To Complete Performance Index	
Term	Description/Calculation
TCPI	To Complete Performance Index
	TCPI = (____ - ____) / (____ - ____)
	TCPI __ 1 : More Budget than Work Left 
	TCPI __ 1 : Right amount of remaining Budget for remaining work. 
	TCPI __ 1 : More Work than Budget Left 




Note on Performance Indexes and Context: When reviewing the CPI, SPI and TCPI for the project, it is important to know what percentage of the project has been completed. If TCPI is 1.5, but we have only completed 2% of the project, it might not be cause for alarm. If TCPI is 1.5 and we have completed 50% of the project, then it might be time for serious re-evaluation of both the baseline and the project.

Completed: Earned Value Calculations Tables

Cost Variance		
Term	Description/Calculation	
CV	Cost Variance (compares budgeted costs to the actual amount spent).	
	$CV = EV - AC$	
	Negative number = over budget.	
	Positive number = under budget.	




Schedule Variance		
Term	Description/Calculation	
SV	Schedule Variance (Compares the work that should have been done at this time, to the amount actually completed).	
	$SV = EV - PV$ (Note: PV at this point in time, not total PV for activity.)	
	Negative number = work scheduled to be complete at this time is not done.	
	Positive number = work NOT yet scheduled to be complete at this time has been done	
	Note: When a task or project is complete, it's SV will equal 0, regardless of whether the project is completed late or early. Therefore SV is useful when a task is underway or when the bulk of the project work is being performed. Project managers should also use the baseline schedule when making judgements about project schedule performance.	

Cost Performance Indexes	
Term	Description/Calculation
CPI	Cost Performance Index. Measures how effectively we are using our budget.
	$CPI = EV / AC$
	CPI < 1 : Over Budget 
	CPI = 1 : On Budget 
	CPI > 1 : Under Budget 

Schedule Performance Index	
Term	Description/Calculation
SPI	Schedule Performance Index. Measures how efficiently we are completing the scheduled work. *
	$SPI = EV / PV$ (Note: PV at this point in time, not total PV for activity.)
	SPI < 1 : Behind Schedule 
	SPI = 1 : On Schedule 
	SPI > 1 : Ahead of schedule 
	Note: When a task or project is complete, its SPI will equal 1, regardless of whether the project is completed late or early. Therefore SPI is useful when a task is underway or when the bulk of the project work is being performed. Project Managers should also use the baseline schedule when making judgements about project schedule performance.

Forecasting	
Term	Description/Calculation
ETC *	Estimate to Complete. What the remaining work will cost if our current CPI holds.
	$ETC = (BAC - EV) / CPI$ or $ETC = (BAC - EV) / (EV / AC)$
EAC *	Estimate cost At Completion. What the project will cost if our current CPI holds
	$EAC = AC + ETC$
VAC	Variance At Completion
	$VAC = BAC - EAC$
* If our baseline is inaccurate, or if we have reason to believe that CPI will not remain the same, ETC, EAC, and VAC may be based on revised estimates (sometimes referred to as ETC_{re} , EAC_{re} , and VAC_{re} respectively).	

Percent Complete	
Term	Description/Calculation
PCIB	Percent Complete Index—Budget
	$PCIB = EV / BAC$
	The percentage of work that is complete based on baseline budget. Use this if we trust our initial project baseline.
PCIC	Percent Complete Index—Cost
	$PCIC = AC / EAC_{re}$
	The percentage of work that is complete based on revised estimate of the project costs. Used if we have to revise baseline, are using rolling wave planning, etc.

To Complete Performance Index	
Term	Description/Calculation
TCPI	To Complete Performance Index
	$TCPI = (BAC - EV) / (BAC - AC)$
	TCPI < 1 : More Budget than Work Left 
	TCPI = 1 : Right amount of remaining Budget for remaining work. 
	TCPI > 1 : More Work than Budget Left 

Note on Performance Indexes and Context: When reviewing the CPI, SPI and TCPI for the project, it is important to know what percentage of the project has been completed. If TCPI is 1.5, but we have only completed 2% of the project, it might not be cause for alarm. If TCPI is 1.5 and we have completed 50% of the project, then it might be time for serious re-evaluation of both the baseline and the project.

Section 2 Check Your Knowledge: Earned Value Analysis

Earned Value Questions

Question 1 The project PV at this point in time is \$100,000. The Actual Costs are \$80,000, and the Earned Value is \$80,000. Calculate CV and SV and provide your assessment of the project at this point.

Question 2 The project PV at this point in time is \$100,000. The Actual Costs are \$120,000, and the Earned Value is \$130,000. Calculate CV and SV and provide your assessment of the project at this point.

Question 3 Assume Activity A takes four weeks. The work scheduled to be performed each week is \$10K.

At the end of Week 1, you are told that Activity A has cost \$8,000, but is thirty percent complete. Calculate CV and SV and provide your assessment of the activity at this point.

At the end of Week 3, you are told that Activity A has cost \$35,000, but is sixty percent complete. Calculate CV and SV and provide your assessment of the activity at this point.

Question 4: The BAC for Project Big Dog is \$175,000. If the EV at the end of Month 4 is \$60,000, and the AC is \$45,000:

A. What is the EAC?

B. What is the TCPI?

Earned Value Matching

Note: Terms maybe used multiple times or not at all.

Terms

Definition/Related Statement

A. ETC	___	Also known as Budgeted Cost of the Work Scheduled (BCWS).
B. AC	___	= PV for the Activity × Percentage Complete
C. PV	___	The total planned cost of the project.
D. EV	___	Also known as Actual Cost of the Work Performed (ACWP)
E. 50/50 Rule	___	Also known as budgeted cost of work performed (BCWP)
F. EAC	___	= EV - PV
G. CV	___	Percent complete is calculated at fifty percent when activity starts. Remaining 50% is added when activity is complete.
H. BAC	___	Need to be cautious with this performance index: It uses money to measure time!
I. 80/20 Rule	___	= EV - AC
J. SPI	___	A CPI that is _____ 1 means that the cost of completing the work is higher than planned.
K. TCPI	___	A SPI that is _____ 1 means that the project is ahead of schedule.
L. Less than	___	What our project will cost if things keep going as they have up to this point.
M. Greater than		
N. Exactly		
O. SV		

Answers: Earned Value Questions

Question 1 The project PV at this point in time is \$100,000. The Actual Costs are \$80,000, and the Earned Value is \$80,000. Calculate CV and SV and provide your assessment of the project at this point.

$$CV = EV - AC$$

$$CV = \$80,000 - \$80,000 = \$0$$

$$SV = EV - PV$$

$$SV = \$80,000 - \$100,000 = -\$20,000$$

Budget is on target and project is behind of schedule.

Question 2 The project PV at this point in time is \$100,000. The Actual Costs are \$120,000, and the Earned Value is \$130,000. Calculate CV and SV and provide your assessment of the project at this point.

$$CV = EV - AC$$

$$CV = \$130,000 - \$120,000 = \$10,000$$

$$SV = EV - PV$$

$$SV = \$130,000 - \$100,000 = \$30,000$$

Under budget and project is ahead of schedule.

Question 3 Assume Activity A takes four weeks. The work scheduled to be performed each week is \$10K.

At the end of Week 1, you are told that Activity A has cost \$8,000, but is thirty percent complete. Calculate CV and SV and provide your assessment of the activity at this point.

Week 1	Week 2	Week 3	Week 4
\$10,000	\$10,000	\$10,000	\$10,000

$$AC = \$8,000$$

$$EV = 30\% \times \text{Total PV For Activity A}$$

$$EV = 30\% \times \$40,000 = \$12,000$$

$$PV \text{ at the end of Week 1} = \$10,000$$

$$CV = \$12,000 - \$8,000 = \$4,000$$

$$SV = \$12,000 - \$10,000 = \$2,000$$

Under budget and project is ahead of schedule.

At the end of Week 3, you are told that Activity A has cost \$35,000, but is sixty percent complete. Calculate CV and SV and provide your assessment of the activity at this point.

Week 1	Week 2	Week 3	Week 4
\$10,000	\$10,000	\$10,000	\$10,000

$$AC = \$35,000$$

$$EV = 60\% \times \text{Total PV For Activity A}$$

$$EV = 60\% \times \$40,000 = \$24,000$$

$$PV \text{ at the end of Week 1} = \$30,000$$

$$CV = \$24,000 - \$35,000 = -\$11,000$$

$$SV = \$24,000 - \$30,000 = -\$6,000$$

Over budget and project is behind schedule.

Question 4: The BAC for Project Big Dog is \$175,000. If the EV at the end of Month 4 is \$60,000, and the AC is \$45,000:

A. What is the EAC?

Remember that for cost calculations we don't need to know PV at a certain time or month, so the information in the question about "at the end of Month 4" is irrelevant.

To Calculate EAC, we first need to calculate ETC:

$$ETC = (BAC - EV) / CPI \text{ or } ETC = (BAC - EV) / (EV / AC)$$

$$ETC = (\$175,000 - \$60,000) / (\$60,000 / \$45,000)$$

$$ETC = \$115,000 / 1.33 = \$86,466$$

$$EAC = ETC + AC$$

$$EAC = \$86,466 + \$45,000 = \$131,466$$

B. What is the TCPI?

FYI: Since the CPI we calculated in part one above was greater than 1 (1.33), then we know that the TCPI will be less than 1.

$$\text{TCPI} = (\text{BAC} - \text{EV}) / (\text{BAC} - \text{AC})$$

$$\text{TCPI} = (\$175,000 - \$60,000) / (\$175,000 - \$45,000)$$

$$\text{TCPI} = \$115,000 / \$130,000 = \mathbf{0.88}$$

Answers: Earned Value Matching

Note: Terms maybe used multiple times or not at all.

Terms

Definition/Related Statement

A. ETC	_C_	Also known as Budgeted Cost of the Work Scheduled (BCWS).
B. AC		
C. PV	_D_	= PV for the Activity × Percentage Complete
D. EV	_H_	The total planned cost of the project.
E. 50/50 Rule	_B_	Also known as Actual Cost of the Work Performed (ACWP)
F. EAC	_D_	Also known as budgeted cost of work performed (BCWP)
G. CV		
H. BAC	_O_	= EV - PV
I. 80/20 Rule	_E_	Percent complete is calculated at fifty percent when activity starts. Remaining 50% is added when activity is complete.
J. SPI		
K. TCPI	_J_	Need to be cautious with this performance index: It uses money to measure time!
L. Less than	_G_	= EV - AC
M. Greater than	_L_	A CPI that is _____ 1 means that the cost of completing the work is higher than planned.
N. Exactly		
O. SV	_M_	A SPI that is _____ 1 means that the project is ahead of schedule.
	F	What our project will cost if things keep going as they have up to this point.

Earned Value Exercise 1

You are responsible for calculating the project progress indicators for your project team. Below is the baseline time-phased budget for the project.

Task	Activity Budget (Total PV)	Month							
		1	2	3	4	5	6	7	8
A	\$8,000	\$4,000	\$4,000						
B	\$18,000		\$6,000	\$6,000	\$6,000				
C	\$6,900			\$2,300	\$2,300	\$2,300			
D	\$25,000			\$5,000	\$5,000	\$5,000	\$5,000	5000	
E	\$4,000					\$1,000	\$1,000	\$1,000	\$1,000
F	\$14,900					\$7,500	\$7,400		
G	\$10,000							\$5,000	\$5,000
H	\$9,000					\$4,500	\$4,500		
I	\$31,200	\$7,800	\$7,800	\$7,800	\$7,800				
J	\$11,700					\$3,900	\$3,900	\$3,900	
K	\$2,000					\$500	\$500	\$500	\$500
L	\$9,600			\$2,400	\$2,400	\$2,400	\$1,200	\$1,200	
Week Total		\$11,800	\$17,800	\$23,500	\$23,500	\$27,100	\$23,500	\$16,600	\$6,500
Cumul ative		\$11,800	\$29,600	\$53,100	\$76,600	\$103,700	\$127,200	\$143,800	\$150,300

1. What is the BAC for this project?
2. In which month will the majority of the project work be completed?
3. Which month will the least amount of work be completed?

4. At the end of Month 3, you get the following data about how work is progressing:

- Activity A is 100% complete and has cost \$8,400.
- Activity B is 50% complete and has cost \$10,000.
- Activity C is 33% complete and has cost \$2,000.
- Activity D is 20% complete and has cost \$3,500.
- Activity I is 100% complete and has cost \$35,000.
- Activity L is 10% complete and has cost \$1,000.
- None of the other tasks have started.

Use this information to complete the calculations for the Month 3 status report below and answer the related questions

Status Report: Month 3

Task	Percent Complete	End of Month 3						
		EV	AC	PV	CV	SV	CPI	SPI
A								
B								
C								
D								
I								
L								
Cumulative Totals								

Using the cumulative totals for EV, AC, and PV calculate the CPI, SPI, TCPI, and PCIB for the project.

End of Month 3	
CPI	
SPI	
TCPI	
PCIB	

How is this project doing in terms of cost?

How is this project doing in terms of schedule?

If everything keeps going as well as it has to this point in terms of cost, what will be the cost to complete the remaining work?

If everything keeps going as well as it has to this point in terms of cost, what will be the final cost of the project?

Answers: Earned Value Exercise 1

You are responsible for calculating the project progress indicators for your project team. Below is the baseline time-phased budget for the project.

Task	Activity Budget (Total PV)	Month							
		1	2	3	4	5	6	7	8
A	\$8,000	\$4,000	\$4,000						
B	\$18,000		\$6,000	\$6,000	\$6,000				
C	\$6,900			\$2,300	\$2,300	\$2,300			
D	\$25,000			\$5,000	\$5,000	\$5,000	\$5,000	5000	
E	\$4,000					\$1,000	\$1,000	\$1,000	\$1,000
F	\$14,900					\$7,500	\$7,400		
G	\$10,000							\$5,000	\$5,000
H	\$9,000					\$4,500	\$4,500		
I	\$31,200	\$7,800	\$7,800	\$7,800	\$7,800				
J	\$11,700					\$3,900	\$3,900	\$3,900	
K	\$2,000					\$500	\$500	\$500	\$500
L	\$9,600			\$2,400	\$2,400	\$2,400	\$1,200	\$1,200	
Week Total		\$11,800	\$17,800	\$23,500	\$23,500	\$27,100	\$23,500	\$16,600	\$6,500
Cumulative		\$11,800	\$29,600	\$53,100	\$76,600	\$103,700	\$127,200	\$143,800	\$150,300

1. What is the BAC for this project?

BAC is the total PV for the project, in this case \$150,300.

2. In which month will the majority of the project work be completed?

Month 5

3. Which month will the least amount of work be completed?

Month 8

4. At the end of Month 3, you get the following data about how work is progressing:

- Activity A is 100% complete and has cost \$8,400.
- Activity B is 50% complete and has cost \$10,000.
- Activity C is 33% complete and has cost \$2,000.
- Activity D is 20% complete and has cost \$3,500.
- Activity I is 100% complete and has cost \$35,000.
- Activity L is 10% complete and has cost \$1,000.
- None of the other tasks have started.

Use this information to complete the calculations for the Month 3 status report below and answer the related questions

Status Report: Month 3

Task	Percent Complete	End of Month 3						
		EV	AC	PV	CV	SV	CPI	SPI
A	100%	\$8,000	\$8,400	\$8,000	-\$400	\$0	0.95	1.00
B	50%	\$9,000	\$10,000	\$12,000	-\$1,000	-\$3,000	0.90	0.75
C	33%	\$2,277	\$2,000	\$2,300	\$277	-\$23	1.14	0.99
D	20%	\$5,000	\$3,500	\$5,000	\$1,500	\$0	1.43	1.00
I	100%	\$31,200	\$35,000	\$23,400	-\$3,800	\$7,800	0.89	1.33
L	10%	\$960	\$1,000	\$2,400	-\$40	-\$1,440	0.96	0.40
Cumulative Totals		\$56,437	\$59,900	\$53,100	-\$3,463	\$3,337		

Using the cumulative totals for EV, AC, and PV calculate the CPI, SPI, TCPI, and PCIB for the project.

End of Month 3	
CPI	0.94
SPI	1.06
TCPI	1.04
PCIB	37.55%

How is this project doing in terms of cost ?

Slightly over-budget. Several activities are over budget but some are under budget, so it appears that the entire budget has been under-estimated.

How is this project doing in terms of schedule?

Slightly ahead of schedule.

If everything keeps going as well as it has to this point in terms of cost, what will be the cost to complete the remaining work?

$$ETC = (BAC - EV) / CPI \text{ or } ETC = (BAC - EV) / (EV / AC)$$

$$ETC = (\$150,300 - \$56,437) / 0.94$$

$$= \$93,863 / 0.94$$

$$= \$99,854$$

If everything keeps going as well as it has to this point in terms of cost, what will be the final cost of the project?





$$EAC = AC + ETC$$

$$EAC = \$59,900 + \$99,854$$

$$= \$159,754$$

Links to Videos and Slides






*Here are links to the videos (and slides used to create them)
for Project Management Fundamentals.*




Resource	URL	QR Code
<u>Chapter 1: Project Management Defined</u>		
YouTube Playlist: Chapter 1	http://pmf.video/playlist1	
Video 1.1 What is a Project		
Video	http://pmf.video/video1	
Slides	http://pmf.video/slides1	
Video 1.2 Scope Triangle and the Project Priority Matrix		
Video	http://pmf.video/video2	

Resource	URL	QR Code
Slides	http://pmf.video/slides2	
Video 1.3 A lack of risk management planning led to one of the most famous bridge collapses.		
Video	http://pmf.video/video3	
<u>Chapter 3: Project Management Organizations</u>		
YouTube Playlist: Chapter 3	http://pmf.video/playlist3	
Video 3.1 Project Management Organizational Structures		
Video	http://pmf.video/video4	
Slides	http://pmf.video/slides4	
<u>Chapter 5: Project Selection Methods</u>		

Resource	URL	QR Code
YouTube Playlist: Chapter 5	http://pmf.video/playlist5	
Video 5.1 NPV Calculations using Excel		
Video	http://pmf.video/video19	
Video 5.2 IRR Calculations using Excel		
Video	http://pmf.video/video20	
<u>Chapter 7: Time and Resource Estimation</u>		
YouTube Playlist: Chapter 7	http://pmf.video/playlist4	
Video 7.1 Project Time Estimates		
Video	http://pmf.video/video35	





Resource	URL	QR Code
Slides	http://pmf.video/slides20	
Video 7.2 Summary of Top Down estimation		
Video	http://pmf.video/video36	
Slides	http://pmf.video/slides19	
Video 7.3 Summary of Bottom Up Estimation		
Video	http://pmf.video/video37	
Slides	http://pmf.video/slides21	
<u>Chapter 8: Project Networks</u>		

Resource	URL	QR Code
YouTube Playlist: Chapter 8	http://pmf.video/playlist8	
Video 8.1 Project Networks		
Video	http://pmf.video/video5	
Slides	http://pmf.video/slides5	
Video 8.2 The forward and backward pass		
Video	http://pmf.video/video6	
Slides	http://pmf.video/slides6	
Video 8.3 Task Relationships and Lags		

Resource		URL	QR Code
	Video	http://pmf.video/video7	
	Slides	http://pmf.video/slides7	
Video 8.4 Network Solution 1 w Lags			
	Video	http://pmf.video/video8	
<u>Chapter 9: Schedule Compression</u>			
	YouTube Playlist: Chapter 9	http://pmf.video/playlist20	
Video 9.1 Fast Tracking			
	Video	http://pmf.video/video9	

Resource		URL	QR Code
	Slides	http://pmf.video/slides9	
Video 9.2 Laddering			
	Video	http://pmf.video/video10	
	Slides	http://pmf.video/slides10	
Video 9.3 Crashing a Project			
	Video	http://pmf.video/video11	
	Slides	http://pmf.video/slides11	
<u>Chapter 10: Earned Value Management</u>			

Resource	URL	QR Code
YouTube Playlist: Chapter 10	http://pmf.video/playlist12	
Video 10.1 Calculating and Understanding Cost Variance		
Video	http://pmf.video/video12	
Slides	http://pmf.video/slides12	
Video 10.2 Calculating and understanding Schedule Variance		
Video	http://pmf.video/video13	
Slides	http://pmf.video/slides13	
Video 10.3 Why measuring time with money can be problematic		

Resource	URL	QR Code
Video	http://pmf.video/video14	
Slides	http://pmf.video/slides14	
Video 10.4 Cost Performance Index		
Video	http://pmf.video/video15	
Slides	http://pmf.video/slides15	
Video 10.5 Schedule Performance Index		
Video	http://pmf.video/video16	

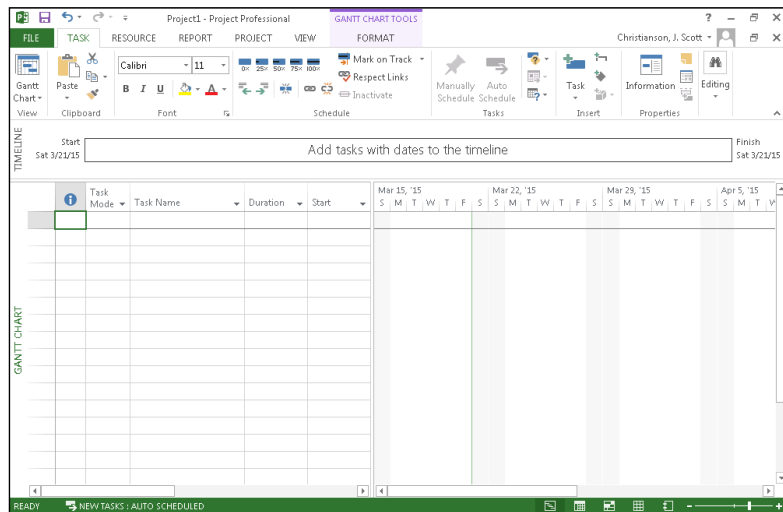
Resource		URL	QR Code
	Slides	http://pmf.video/slides16	
Video 10.6 CPI and CV, compares PV with AC			
	Video	http://pmf.video/video17	
Video 10.7 Forecasting Costs (ETC, EAC, VAC)			
	Video	http://pmf.video/video18	
	Slides	http://pmf.video/slides18	

MS Project 2013 Labs

Lab 1: Introduction to MS Project 2013

In this lab you will learn

1. How to enter tasks into a project and create a summary task.
2. Select different views for a project.
3. Make a print-out that effectively conveys information about your project with a minimum number of pages.



Section 1: Getting Started

Watch the Introduction to MS Project video at <http://pmf.video/video21> to get a basic introduction to MS Project (follow along using your own copy of MS Project if you have it). As you are watching, try to answer the following questions (answers are at the end of the exercise):

1. To display the View Bar, you would _____.
2. When entering a task, you should always enter the project dates for each task:
A. True
B. False
3. MSProject allows tasks to be manually or automatically scheduled:
A. True
B. False
4. It is important that we make sure that our tasks are set to _____ scheduled.
5. We can set the default scheduling mode for our tasks by:
_____.
6. To create a link between one task and another you would:
_____.
7. The main window (the area below the tool bars and menus) is divided into two main sections: the _____ window and the _____ window.

8. To change views in the Table window, one would:

_____ or _____.

9. To set the start date of the project:

_____.

Section 2: Create Your Project

Based on what you just learned, create a new project. Into this project we are going to enter the information about the first ever Project Management Student party.

The tasks and durations are as follows:

TASK	DURATION (DAYS)	PREDECESSOR
Planning (Figure out Food, Drinks, and Location)	2	NONE
Obtain Supplies	3	Planning
Reserve Location	1	Obtain Supplies
Mail Invitations	1	Obtain Supplies, Reserve Location

Enter this information into your project. Set the start date for the project to September 15th, 2020. Create a summary task for the project. Save the project using an appropriate naming convention; for example, "JChristiansonL1S2."

Answer the following questions:

1. When will our project be completed: _____
2. How many days will our project take in total: _____
3. Since Obtain Supplies is a predecessor for Mail Invitations, why doesn't Mail Invitations start right after the supplies are obtained?

4. What type of relationship did we setup between the various tasks in our project?

Section 3: Task Management

Watch the video on Task Management at <http://pmf.video/video22> to take a deeper look at how we can create and organize our tasks and the properties of our tasks.

Section 4: Formatting and Printing

Follow along with the Formatting and Printing video at <http://pmf.video/video23> and answer the following questions.

1. To change the scale of a Gantt chart, you would _____.
2. Both the header and the footer of our printouts can have custom information on them:
 - A. True
 - B. False

Exercise 1: Putting it All Together

Based on what you just learned, create a new project. Into this project we are going to enter the information about an upcoming project. The Tasks, Durations and Predecessors are as follows:

TASK	DURATION (DAYS)	PREDECESSOR
A	5	NONE
B	4	NONE
C	4	A
D	3	A
E	5	B
F	5	C
G	3	E
H	3	D,E,F
I	2	G,H
J	7	G
K	4	I,J
L	3	I,K
M	5	L
N	5	M

Complete the following tasks:

- Enter this information into your project.
- Set the start date for the project to October 11th, 2014.
- Create a summary task for the project.
- Enter Information in the Footer to display your name and “Lab1 Part D” in that section.
- Enter information in the Legend to display the Project Title and Date in that section.
- Print a one page Gantt chart and table showing Task Name, Duration, Start Date, Finish Date and Predecessors. Your print out should look like the image presented in the Answers Section.

Lab 1 Answers

Section 1: Getting Started

1. To display the View Bar, you would **Right Click on the Gantt Chart, Select View Bar from the view menu.**
2. When entering a task, you should always enter the project dates for each task:
A. True
B. False
3. MSProject allows tasks to be manually or automatically scheduled?
A. True
B. False
4. It is important that we make sure that our tasks are set to **auto** scheduled.
5. We can set the default scheduling mode for our tasks by: **Going to File-->Options-->Schedule-->Scheduling options for this project: Select All Projects-->Auto Scheduled.**
6. To create a link between one task and another you would: **enter the predecessor information in the table OR double click on the task and select the predecessor from the Predecessor Tab OR Drag a link between the two tasks.**
7. The main window (the area below the tool bars and menus) is divided into two main sections: **the Table window and the Graphical window.**
8. To change views in the Table window, one would: **Add and delete columns as you choose or Right click on the "tribble" and choose the predefined Table.**
9. To set the start date of the project: **open the project information dialogue box and set the project start date**

Section 2: Create Your Project

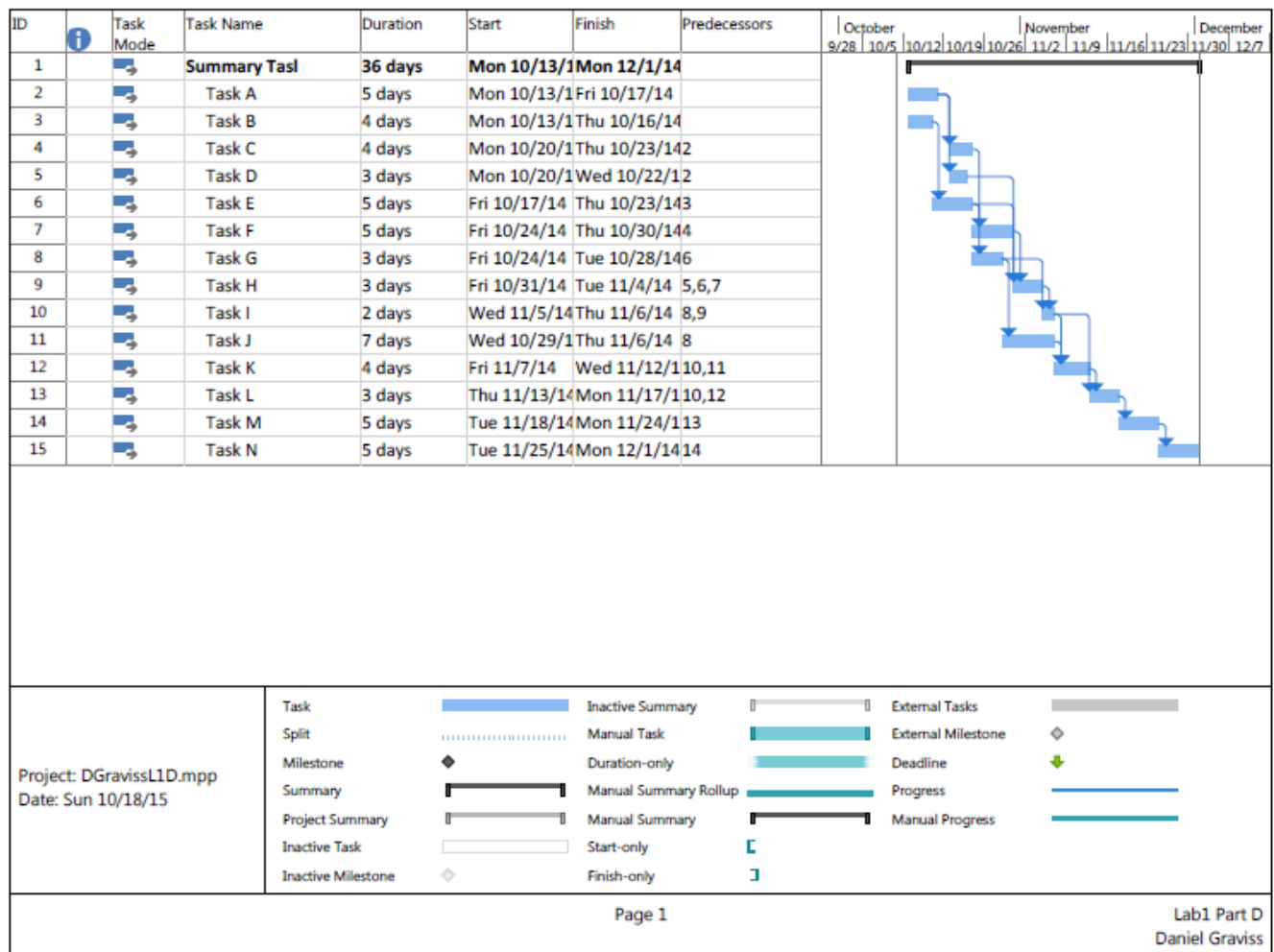
1. When will our project be completed: **9/23/2020**
 2. How many days will our project take in total: **7 working days (not including weekends/holidays)**
 3. Since Obtain Supplies is a predecessor for Mail Invitations, why doesn't Mail Invitations start right after the supplies are obtained? **Because Reserve Location is also a predecessor**
 4. What type of relationship did we setup between the various tasks in our project? **FS or Finish to Start.**
-

Section 4: Formatting and Printing

1. To change the scale of a Gantt chart, you would: **Change the Timescale**
2. Both the header and the footer of our printouts can have custom information on them:
 - A. True
 - B. False

Exercise 1: Putting it All Together

Your print out should look like this:



Lab 2: Adding Resources

In this lab you will learn

1. How to enter tasks into a project and create a summary task.
2. Select different views for a project.
3. Make a print-out that effectively conveys information about your project with a minimum number of pages.



Types of Resources

There are several types of resources that we can use in MS Project:

- **A Work Resource.** This is the cost of the time associated with someone performing work. For a work resource, we specify the cost per hour, cost of overtime, etc. (more below) To indicate that a resource is a work resource, click Work in the Type field.
- **A Material Resource.** This is the cost of materials that we will be using in our project. For example, the cost of wood for construction, nails, renting a truck, etc. For materials we specify the cost per ton, yards, pounds, per use, etc. To indicate that a resource is a material resource, click Material in the Type field.
- **A Cost Resource.** This is something that might be a cost but is not integrated or consumed like a material resource. For example, the cost of buying lunch for a meeting, etc. Think of it like petty cash for now. To indicate that a resource is a cost resource, click Cost in the Type field.

Resource Name ▾	Type ▾
Carpenter	Work
Procurement	Work
Paint	Material
Lunch	Cost

MS Project can associate Work, Material or Cost Resources with a task.

Max Units

For our work resources, we need to specify the number or quantity of each of the resources that we have available. This will aid us in finalizing the project schedule; no project schedule can be considered complete until we have dealt with any resource allocation problems.

We do this by specifying the Max Units for the resource; resource quantities are expressed as percentages in MS Project. This can be a little hard to understand at first, so let's look at a couple of examples.

Let's say that we have twelve tasks in our project that require a carpenter, four of which are scheduled to be performed at the same time. However, if we just have two carpenters, this is not going to work. The way that we specify that we only have two carpenters is by specifying a Max units of 200% for the carpenter resource.

Resource Name ▼	Type ▼	Max. ▼	Std. Rate ▼
Carpenter	Work	200%	\$45.00/hr
Procurement	Work	40%	\$50.00/hr
Paint	Material		\$45.00
Lunch	Cost		

Resource quantities are expressed as percentages in MS Project.

You can also indicate part-time help on your project. Say that you have a number of procurement tasks in your project (developing and sending RFPs, negotiating contracts, etc), but the procurement department will only give you access to one of their procurement specialists for two days a week. In that case, you enter the procurement resources at a max unit of 40% (two days is 40% of a five day week)

For material resources, MS Project assumes that you can get more materials if needed so there are no resource restrictions. For cost resources, just enter the cost; there is no need to set a Max units.

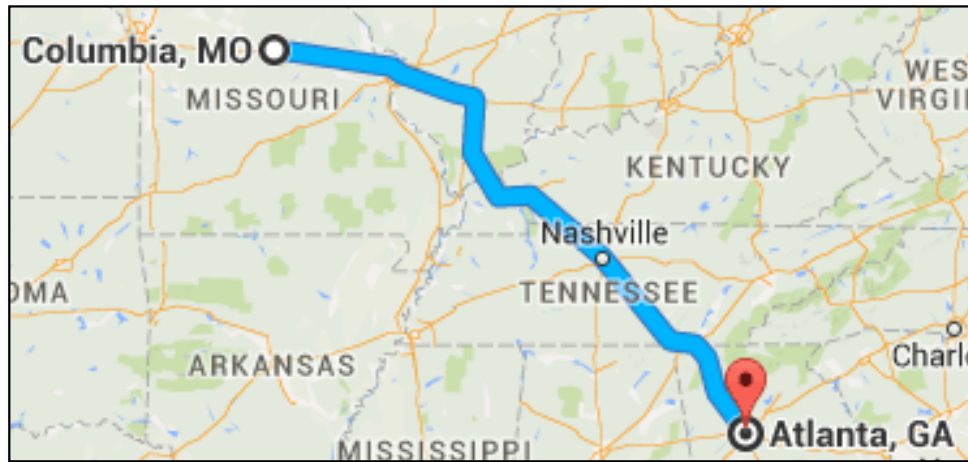
Work Rate/Costs

There are several different rates for our work resources

- **Standard Rate:** This is the standard charge per hour/day/or week for the resource. For example: \$54/hour, or \$100/day.
- **Overtime Rate:** If the resource works overtime, this is the rate they will be paid.
- **Cost/Use:** A better term for this might be setup fee. For example, if we hire a backhoe for 6 hours at \$300 per hour, but they charge \$100 to deliver the backhoe, then this is where we would include that cost (it is a fixed cost and not dependent on the number of hours that the resource is used). Material resources can also have a Cost/Use charge associated with them.

Exercise: Adding Resources to Projects

John has accepted a job in Atlanta, GA, He has to move from Columbia, MO to Atlanta and be there, ready to work, by the end of April. The company who just hired him will give him \$5,000 to help with the move. John could hire a moving company, but instead asked four of his friends if they would help him move and then he would split whatever “profit” was left over after paying for the actual costs of the move. They are planning to rent two large U-haul trucks to complete the move and will also drive John’s car down. After everything is unpacked, John’s friends will fly back to Columbia, MO (COMO).




























He has developed the following list of sub-deliverables and activities that must be accomplished in order for the move to be completed.

John’s Big Move		
ID	Activity Name/Sub-deliverable Name	Duration
1	Meeting with Friends to plan move (Deliverable)	
2	Have lunch delivered from The Sub Shop for friends that are helping	1 hr
3	Develop and Distribute Schedule	2hrs
4	Make Hotel Arrangements in Atlanta	1 hr
5	Pack Apartment (Deliverable)	
6	Have Rental Trucks at Apt	1day
7	Pack Kitchen	1day
8	Pack Living Room	1day
9	Pack Bedroom	1day

John's Big Move		
10	Pack remaining items	1day
11	Get Items to Atlanta (Deliverable)	
12	Drive Truck 1 to Atlanta	1day
13	Drive Truck 2 to Atlanta	1day
14	Drive John's car to Atlanta	1day
15	Unpack in Atlanta (Deliverable)	
16	Accommodate friends while in Atlanta and get them back to COMO (sub-deliverable)	
17	Reserve Flights back to COMO	1hr
18	Reserve Mo-X van back to their house	1hr
19	Unpack Apartment (sub-deliverable)	
20	Have Rental Trucks at Apt	1day
21	Unpack Kitchen	1day
22	Unpack Living Room	1day
23	Unpack Bedroom	1day
24	Unpack remaining items	1day

Enter these items in MS Project, so that your project looks like the screenshot on the next page. Then enter the predecessor as shown on the next page. **Note how the predecessors are listed. I am using sub-deliverables as predecessors (something we have not covered yet). This is a very good way to link the start of one set of tasks with the completion of a deliverable.**

John's Big Move

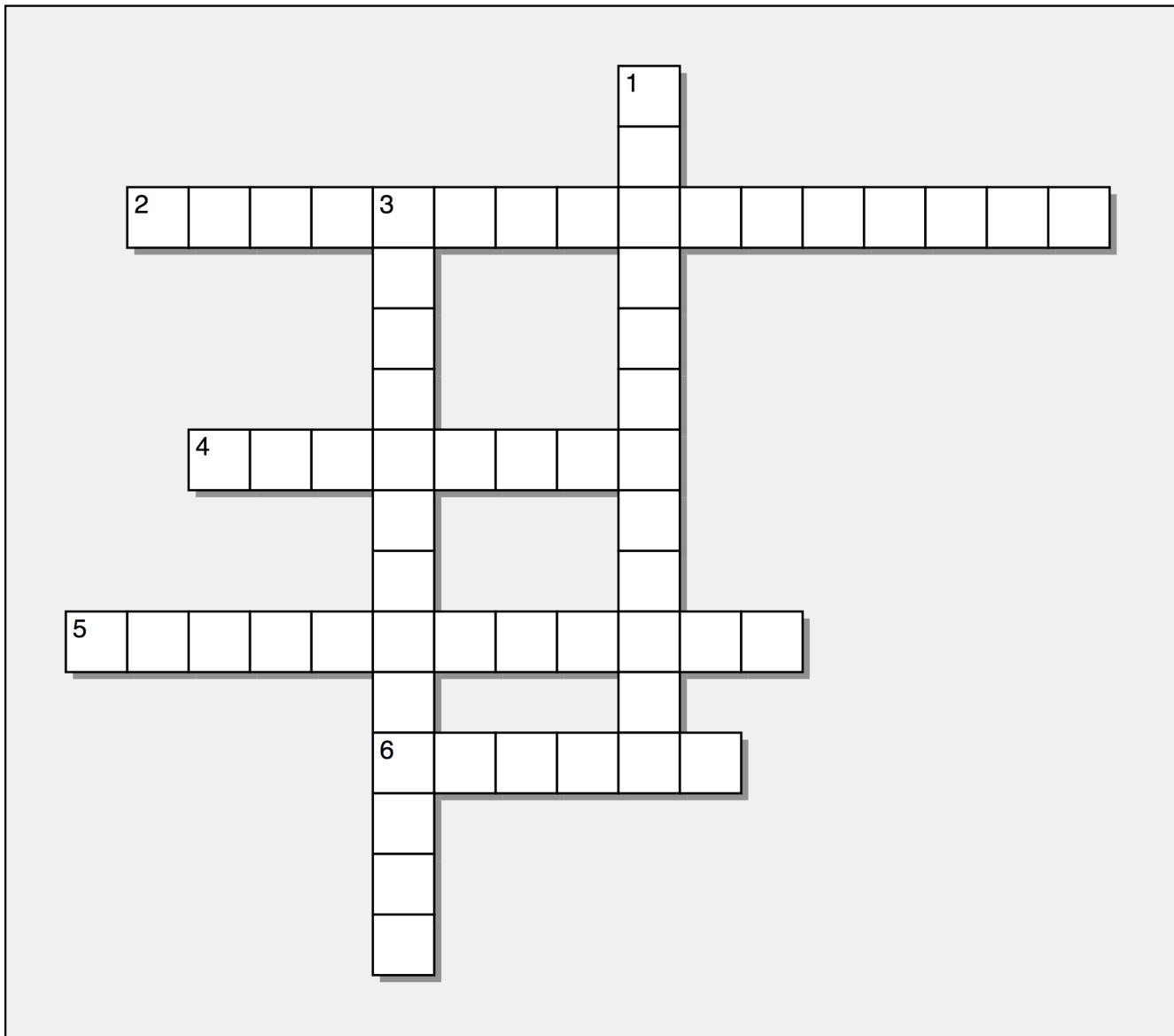
		Task Mode ▾	Task Name ▾	Start ▾	Finish ▾	Predecessor ▾
0			▾ John's Big Move	Mon 4/13/15	Thu 4/16/15	
1			▾ Meeting with Friends to plan move	Mon 4/13/15	Mon 4/13/15	
2			Have lunch delivered from The Sub Shop for friends that are helping	Mon 4/13/15	Mon 4/13/15	
3			Develop and Distribute Schedule	Mon 4/13/15	Mon 4/13/15	
4			Make Hotel Arrangements in Atlanta	Mon 4/13/15	Mon 4/13/15	3,2
5			▾ Pack Apartment	Mon 4/13/15	Tue 4/14/15	
6			Have Rental Trucks at Apt	Mon 4/13/15	Tue 4/14/15	4
7			Pack Kitchen	Mon 4/13/15	Tue 4/14/15	4
8			Pack Living Room	Mon 4/13/15	Tue 4/14/15	4
9			Pack Bedroom	Mon 4/13/15	Tue 4/14/15	4
10			Pack remaining items	Mon 4/13/15	Tue 4/14/15	4
11			▾ Get Items to Atlanta	Tue 4/14/15	Wed 4/15/15	
12			Drive Truck 1 to Atlanta	Tue 4/14/15	Wed 4/15/15	5
13			Drive Truck 2 to Atlanta	Tue 4/14/15	Wed 4/15/15	5
14			Drive John's car to Atlanta	Tue 4/14/15	Wed 4/15/15	5
15			▾ Unpack in Atlanta	Wed 4/15/15	Thu 4/16/15	
16			▾ Accommodate friends while in Atlanta and get them back to COMO	Wed 4/15/15	Wed 4/15/15	
17			Reserve Flights back to COMO	Wed 4/15/15	Wed 4/15/15	11
18			Reserve Mo-X van back to their hou	Wed 4/15/15	Wed 4/15/15	11
19			▾ Unpack Apartment	Wed 4/15/15	Thu 4/16/15	
20			Have Rental Trucks at Apt	Wed 4/15/15	Thu 4/16/15	11
21			Unpack Kitchen	Wed 4/15/15	Thu 4/16/15	11
22			UnpackPack Living Room	Wed 4/15/15	Thu 4/16/15	11
23			UnpackPack Bedroom	Wed 4/15/15	Thu 4/16/15	11
24			UnpackPack remaining items	Wed 4/15/15	Thu 4/16/15	11

Set your project to start on **April 13th, 2015**. Then watch the Video on Adding Resources to MS Project to create and add the resources to our project: <http://pmf.video/video24>

Calculating Costs

Once you have added the resources correctly, follow along as we make some changes to the schedule and look at how we can view our resource usage in the Analyzing John's Move video: <http://pmf.video/video25>

Test Your Knowledge: Crossword



Across

- 2) For example, the cost of wood for construction, nails, etc.
- 4) How we specify the number or quantity of each resources that we have available.
- 5) Think of it like petty cash
- 6) Symbol used to indicate a resources allocation program in MS Project

Down

- 1) the cost of the time associated with someone performing the work.
- 3) Allows us to view our resources in a histogram

Test Your Knowledge: Crossword Answers

ACROSS: 2) MATERIALRESOURCE; 4) MAXUNITS; 5) COSTRESOURCE

6) REDMEN.

DOWN: 1) WORKRESOURCE; 3) RESOURCEGRAPH

Lab 3: Calendars and Dates

In this lab you will learn

1. How to work with the Start, Finish and Current Dates for a Project
2. How to modify the standard calendar to add or remove non-working time and how to apply that calendar within your project

Calendars in MS Project

Calendars allow us to adjust the work days and times for our project. Custom calendars can be applied to tasks, resources, or entire project.



Project Calendars

By default, MS Project has three calendars:

Calendar	Hours	Notes
Night Shift	1PM to 3AM the next day 1 hour break 4AM to 8AM	The Night Shift runs Monday through Friday, but it gets a little odd since the Friday shift goes into Sat morning, the Monday doesn't pick up until 11PM that evening, etc.
24 Hour	12AM to 12AM	The 24 hour calendar runs 7 days a week. It is often used for machines that can work 24 hours a day (we need to rent a pump to drain a pond which will take an estimated 500 hours, but the pump can operate 24 hours a day).
Standard	8AM to 12PM 1 hour break 1PM to 5PM	The standard calendar runs Monday through Friday.

Holidays and other non-working days.

None of these calendars include information about a particular country's religious and governmental holidays. Some holidays can be easily accounted for, which others have to be entered for every year during our project.

As you watch the video on Changing Calendars (<http://pmf.video/video26>) try to answer the following questions:

1. If you set the Start date for your project, does MSPProject allow you to change the Finish date?
 1. Yes
 2. No
2. Your manager wants to begin a project on Oct 11, 2010. Where would you enter this start date for your project? _____
3. Reoccurring calendar events that fall on the same day of the week (for example a holiday that falls on the first Monday of every September) can be set to reoccur for a number of years in the future:
 1. True
 2. False.
4. Reoccurring calendar events that fall on the same day of the month (for example a holiday that falls on the 25th of every December) can be set to reoccur for a number of years in the future:
 1. True
 2. False.
5. Reoccurring events can be set to reoccur forever:
 1. True
 2. False
6. Custom Calendars can be applied to:
 1. Entire Project
 2. Tasks
 3. People (resources)
 4. All of the above

Compare your answers to the correct answers on the following page:

Answers:

1. If you set the Start date for your project, does MSPProject allow you to change the Finish date?
 1. Yes
 - 2. No**
2. Your manager wants to begin a project on Oct 11, 2010. Where would you enter this start date for your project? **Project Information Dialogue Box**
3. Reoccurring calendar events that fall on the same day of the week (for example a holiday that falls on the first Monday of every September) can be set to reoccur for a number of years in the future:
 - 1. True**
 2. False.
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 1. True
 - 2. False.**
5. Reoccurring events can be set to reoccur forever:
 1. True
 - 2. False**
6. Custom Calendars can be applied to:
 1. Entire Project
 2. Tasks
 3. People (resources)
 - 4. All of the above**

Create A Custom Holiday Calendar

Based on what you just learned, create a new project and copy the standard calendar to a new calendar called “StandardwHolidays.” Modify this calendar so that includes the following exceptions for Holidays:

- January 1st
- Memorial Day (last Monday in May)
- July 4th
- Labor Day (first Monday in September)
- Thanksgiving Day (4th Thursday in November)
- December 24 and 25th.

If a holiday falls on a Saturday, then Friday will be given as an extra day off and if it falls on a Sunday, then Monday will be given as a day off. If there are other exceptions that have to be given, then use your own judgement.

Create your calendar so that these exceptions will be observed for the next three years.

Save this project as “Holidays.” You can then use the “New from existing file” option to create your projects and they will have this calendar already built in!!

Watch this video to learn how you can save your calendar settings as part of a template for all your projects: <http://pmf.video/video27>

NOTE: if you are using a shared lab computer or virtualized computer, these setting might not be saved.

Adjust Working Time

In addition to changing a calendar’s dates we can also change the working times for any calendar that we create.

Pretend that you’ve just been assigned the project management responsibilities for the new Callaway Electric Co-op headquarters. Over the next 18 months, you will have to make sure that the new building is finished on time, within budget and within the project scope. As such, you have decided to build some slack into your schedule by making every Friday a half working day (by scheduling only four hours of work on Friday).

Create a new project and modify the standard calendar to reflect your plan for only a half day of work on Fridays. Create three tasks (A, B, C or something) and link them together via finish to start relationships. Set each task duration to 40 hrs and view the Gantt Chart to make sure that your changes to the standard calendar have taken effect.

Check your work by watching this video or follow along if you have having issues (this can be a bit tricky): <http://pmf.video/video28>

Test your Knowledge: Milestone Flashback

You need to identify when a set of tasks are complete in your project (the end of a certain phase of your project), so you create a task in the Entry Table named Milestone 1. What else do you need to do to make this task a milestone?

1. Do nothing. Naming the task with Milestone in its name is all you need to do. MSProject will do the rest.
2. Right-click on the task id number in the Gantt Chart and choose Mark Task As Milestone.
3. In the Task Information dialog box for the task, from the Advanced tab, select the Mark Task Milestone check box.
4. Change the duration of the task to zero days
5. Both 3 and 4 are correct.

Compare your answers to the correct answers on the following page.

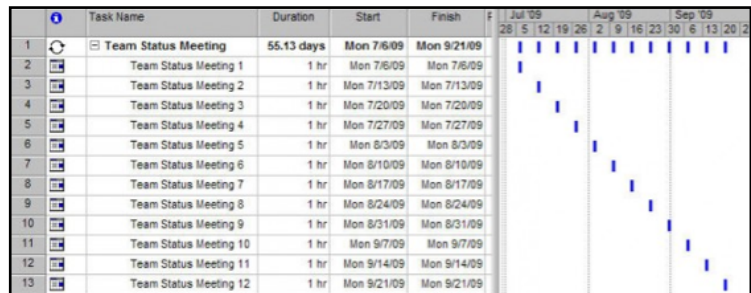
Test your Knowledge: Milestone Flashback Answers

You need to identify when a set of tasks are complete in your project (the end of a certain phase of your project), so you create a task in the Entry Table named Milestone 1. What else do you need to do to make this task a milestone?

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4. Change the duration of the task to zero days
5. **Both 3 and 4 are correct.**

Lab 4: Task Details and Features

The goal of this short lab is to learn several new tips and techniques for entering tasks into a project and understanding how altering the linkages between tasks changes our project schedule.



Linking Tasks

Using MSPProject, Watch and follow with this video on Ways to Link Tasks: <http://pmf.video/video29>

Activity/Task Durations

Using MSPProject, Watch and follow with this video on Task Durations: <http://pmf.video/video30>

Deadlines

As our project progresses, we will want some means to keep track of our progress and compare it to our original schedule. Also, outside events or stakeholders can generate deadlines for completion of certain tasks. We'll talk about some of the more sophisticated ways to keep track of our progress in later labs, but we should not overlook the fact that simple tracking of deadlines can be very effective and a feature that is built into MS Project.

Using MSPProject, Watch and follow with this video on MS Project Deadlines: <http://pmf.video/video31>

Changing Task Relationships

Watch this video to learn more about the relationship between tasks: <http://pmf.video/video32>

You might even want to follow along in MS Project!

A Special Type of Task

While looping is not allowed in project management networks, there are times where we will have a task that we have to repeat many times during our project. Watch this video to learn about a special type of task that can help us with repeating tasks: <http://pmf.video/video33>

Check Your Knowledge Lags and Leads

Create a new project with a start date of Oct 11, 2015 and enter the tasks above, linking them using finish to start relationships.

ID	Task	Duration	Predecessor
1	Remove Furniture	4 day	none
2	Prep Walls for Painting	4 days	1
3	Paint Walls	8 day	2
4	Replace Furniture	5 day	3

1. **How many days does this project take?** _____

After reviewing the project schedule, you realize that you cannot paint the walls immediately after the prep work has completed. If repair work, such as filling holes, needs to be completed then you will need to allow time for the spackle to dry. Add one day of lag time to the link between the Prep Walls for Painting task and the Paint Walls task.

To make up time, you decide that Prep Walls for Painting can begin when half of the furniture has been cleared (Remove Furniture). Enter a lead time into your project to give Prep Walls a head start. (Hints: Remember that lead times are really negative lag times; you can enter leads and lags as percentages rather than just days).

Finally, you cannot load the furniture back into the room until the paint has fully dried. Enter a two day lag time to account for this.

2. **What is the total project duration now?** _____.

Set a deadline of November 1st, 2015 for getting the replace furniture task completed.

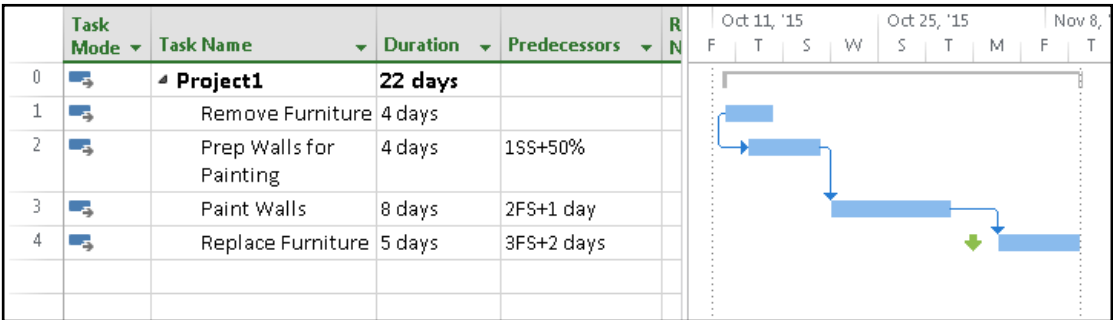
3. **Did this affect the end date of the project?** _____

Compare your answers to the correct answers on the following page.

Answers Check Your Knowledge Lags and Leads

- 1. How many days does this project take? **21 Days**
- 2. What is the total project duration now? **22 Days**
- 3. Did this affect the end date of the project? **No**

Solution



Advanced Task Management Quiz

1. A negative lag time is known as a _____ time.
 1. Lead
 2. Tuple
 3. nlag
 4. reverse lag
2. You want to be reminded of a task's due date but are reluctant to put an actual finish date on the task. How can you create a reminder for a task's finish date without affecting the scheduling of this task?
 1. Apply a flexible constraint on the task
 2. Apply a deadline to the task.
 3. Delete all constraints applied to the task
 4. Apply a moderately flexible constraint on the task
3. What dependency type should you apply when the predecessor task must finish before the successor task starts?
 1. Finish to Start
 2. Finish to Finish
 3. Start to Finish
 4. Start to Start
4. The project stakeholders have asked for a status meeting every two weeks throughout the life-cycle of the project. How can you account for this meeting in our project schedule?
 1. Check the Repeat Task in the Advanced Tab in the Task Info Dialog box.
 2. Create one task and then duplicate it for each time it needs to be repeated.
 3. Use a Recurring Task
 4. Insert a Task Loop
5. Alice is in charge of editing a book. The author has not started to write it yet, but as soon as he does Alice can start editing the text he has written. What is the relationship between Edit Text and Write Text?
 1. Finish to Finish
 2. Start to Start
 3. Start to Finish
 4. Finish to Start

-
6. George just entered a new task of a duration of 15 days. He wants this task to ignore the standard calendar and have work on the task occur on the weekend. The easiest solution for George is to:
1. click on "work weekends" in the task information dialog box.
 2. enter the duration as 1 emonth.
 3. create a new calendar called "wo weekends" and make the weekends working time.
 4. enter the duration as 15 edays
7. George is in charge of finishing the user documentation for a new software program. However he can't finish his documentation until the software is finished. That type of relationship does User Documentation have with Program Software?
1. Finish to Finish
 2. Finish to Start
 3. Start to Start
 4. Start to Finish

Answers: Advanced Task Management Quiz

1. A negative lag time is known as a _____ time.
 1. **Lead**
 2. Tuple
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 2. You want to be reminded of a task's due date but are reluctant to put an actual finish date on the task. How can you create a reminder for a task's finish date without affecting the scheduling of this task?
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END