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Learning

Crosswind Success Series:
PMP® Exam Bootcamp Manual

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Rolling Wave Planning	Rolling wave planning is a **concept that utilizes the progressive elaboration concept in planning**. It defines a low level of detail on the WBS for the immediate work being accomplished while the work to be done in the future is only at a high level of decomposition in the WBS until it is soon-to-be-started.	Know the concepts of rolling wave planning, control accounts, and planning packages.
Control Accounts	Control accounts are **specific points in the work breakdown structure (WBS) where the project scope, budget, actual cost, and schedule are combined** in order to establish performance measurements. This allows tracking progress at appropriate levels of detail throughout the work breakdown structure (WBS). See Figure 10-7: WBS Process Components in the Scope chapter.	
Planning Package	The planning package is a **piece of the work breakdown structure (WBS) above the work package.** It is used to plan work that has been scoped but lacks sufficient work package level details. See Figure 10-7: WBS Process Components in the Scope chapter.	

The source for the above text is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Pages 183-186

11.3.   Sequence Activities (Planning Process Group)

During Sequence Activities, the focus is on the order of the activities: **the arrangement of activities in the most efficient and effective order.**

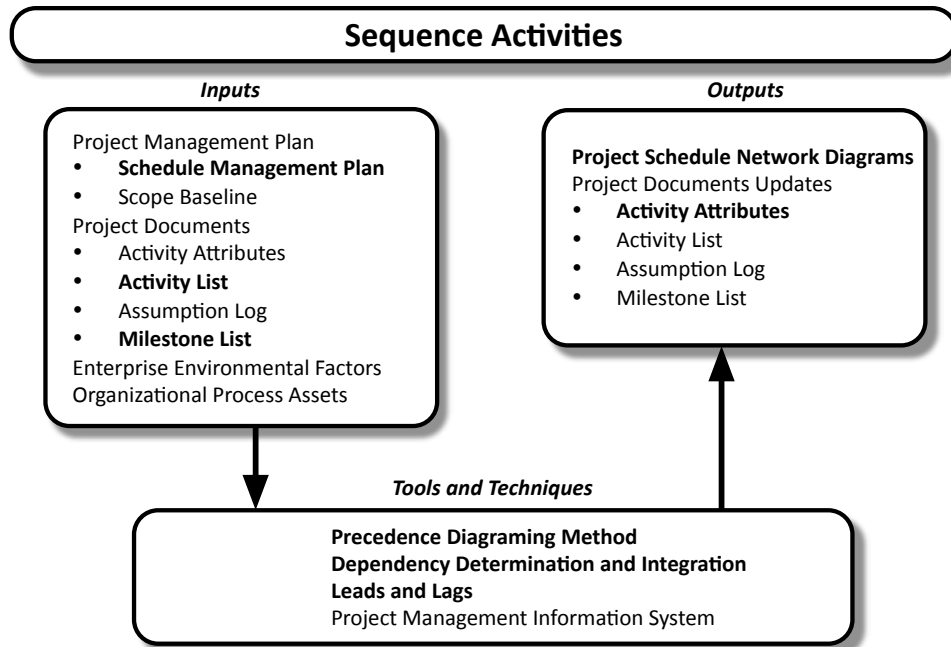Know the Key Inputs, Tools & Techniques, and Outputs for Sequence Activities.

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Sequence Activities

Inputs	Outputs

Inputs

Project Management Plan
- **Schedule Management Plan**
- Scope Baseline

Project Documents
- Activity Attributes
- **Activity List**
- Assumption Log
- **Milestone List**

Enterprise Environmental Factors
Organizational Process Assets

Outputs

Project Schedule Network Diagrams
Project Documents Updates
- **Activity Attributes**
- Activity List
- Assumption Log
- Milestone List

Tools and Techniques

Precedence Diagraming Method
Dependency Determination and Integration
Leads and Lags
Project Management Information System

Figure 11-4: Sequence Activities Data Flow Diagram
The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition,
Project Management Institute Inc., 2017, Figure 6-7, Page 187

Sequence Activities (Planning)		
Key Inputs	Schedule Management Plan	The schedule management plan is a component of the project management plan that details the delineation, evolution, monitoring, and control of the schedule, including the degree of expected accuracy. It delineates scheduling methodology, wave duration for rolling wave planning, and the degree of detail required for work management.
	Activity List	The activity list enumerates the schedule activities stipulated for sequencing. Sequencing can be influenced by dependencies and other constraints. Note that the activity list is a component of the schedule, but NOT of the WBS. A rule of thumb is to break down the activity list to the point where the activities are **4-80 hours in duration**. Project managers commonly call activities "tasks," but according to Project Management Institute, Inc. standards, the term "activities" is generally more appropriate. If rolling wave planning or agile is used, the list must be reviewed regularly and updated as necessary.

Sequence Activities (Continued)		
Key Inputs (Cont.)	Milestone List	The milestone list enumerates the most consequential points or events in the project and indicates if the milestone is required or optional. **A milestone has a duration of zero**. If the milestone has been assigned a specific date, it typically impacts the manner in which activities are scheduled.
Key Tools & Techniques	Precedence Diagramming Method	The precedence diagramming method (PDM) is a schedule model construction technique used to show the sequence of activity performance. It represents activities as nodes graphically linked by one or more logical relationships, such as finish-to-start (FS), finish-to-finish (FF) start-to-start (SS) and start-to-finish (SF). Note that two activities can have two or more concurrent logical relationships. Multiple relationships are discouraged, so the relationship with the highest impact is generally represented. Closed loops are also discouraged.
	Dependency Determination and Integration	Dependencies can be mandatory or discretionary and internal or external; that is, a dependency could be mandatory and internal, mandatory and external, discretionary and internal, or discretionary and external. A mandatory dependency is required contractually, legally, or inherently (based on the nature of the work, such as a physical limitation on a construction project). A discretionary (soft logic) dependency is typically based on best practices. An external dependency describes a relationship between a project activity and a non-project activity. An internal dependency describes a relationship between a project activity and another project activity.
	Leads and Lags	A lead is the amount of time that a successor activity will be started before a predecessor activity is completed. A lag is the amount of time that a successor activity will be delayed after the predecessor activity is completed.
Key Outputs	Project Schedule Network Diagrams	Project schedule network diagrams illustrate the dependencies (logical relationships) between project schedule activities. They can be high-level or detailed and include a summary narrative delineating the basic approach to activity sequencing and detailing unusual sequences. Activities with multiple predecessor or successor activities should note a path convergence (predecessor activities), since these have greater risk.

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| Sequence Activities (Continued)		
Key Outputs (Cont.)	Activity Attributes	Activity attributes clarify an activity by identifying multiple components related to the activity. The components evolve during the project: during the initial stage, they include a singular activity identifier, a WBS identifier, and an activity label; when completed they typically include a description of the activity, predecessor and successor activities, logical relationships, leads and lags, resource needs, constraints, assumptions, and exact dates. They are used to evolve the schedule and clarify reporting.

Situational Question and Real World Application

Failure to effectively perform the Sequence Activities process can generate a variety of issues, such as the inability to start work because predecessor activities have not been completed or performing work that doesn't make logical sense in relation to the overall output of the project.

11.3.1. Dependencies

During the creation of the project schedule, dependencies must be considered. They may be flexible, causing no real impact, or inflexible, providing no options except work-arounds.

Know the characteristics of the four dependencies.
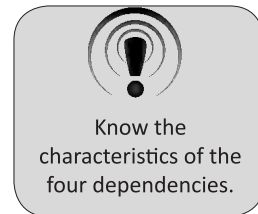
Type	Definition	Example
Mandatory (Hard Logic)	A dependency that **must** be completed before subsequent items can start	You must have the roof on before you can begin to apply shingles to it.
Discretionary (Soft Logic)	A dependency that **should** be completed but is not absolutely required to be completed before subsequent items can start	You prefer to, but do not absolutely have to, finish system testing before beginning user acceptance testing.
Internal	A mandatory or discretionary dependency that originates from **within the project or company**	You have to have electricity before you can test the computer you are designing.
External	A mandatory or discretionary dependency that originates from an entity **external** to the project team or organization	The city inspector must approve any construction before issuing a certificate of occupancy so the tenant can move in.

11.3.2. Network Diagram

The network diagram is a schematic of project activities. It shows how the various activities are connected as a result of Sequence Activities. This diagram provides a visual representation of the project work flow. It is also a **tool that can be used to evaluate schedule compression techniques** such as **crashing** and **fast tracking.**

Know the principles of a network diagram, how to draw a diagram based on a word problem, and how to analyze a diagram from a pop-up screen as either precedence diagramming method (PDM) or arrow diagramming method (ADM).
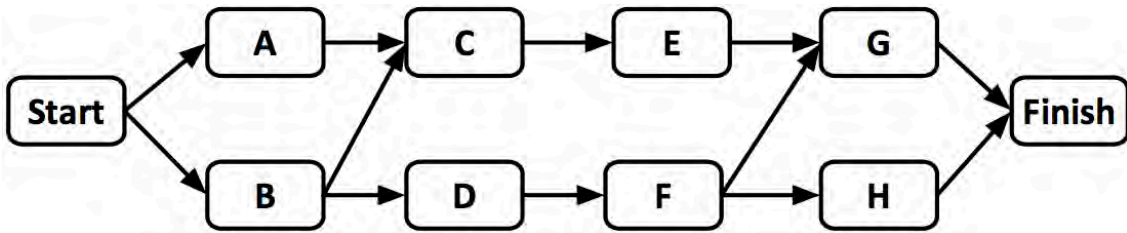
Figure 11-5: Network Diagram Sample
The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Figure 6-11, Page 193

11.3.3. Diagramming Types

The main differences between the diagramming methods are delineated in the following table, which should be memorized for the exam.

Know the differences between PDM and ADM.

Full Name	Acronym	Predecessor Types	Special Diagram Types and Characteristics	Application	Graphic Appearance
Precedence Diagramming Method Activity-on-node	PDM AON	Finish-to-start Start-to-start Finish-to-finish Start-to-finish	No dummies allowed	Most modern project scheduling software	Figure 11-6
Arrow Diagramming Method Activity-on-arrow Activity-on-line	ADM AOA AOL	Finish-to-start	Dummies allowed	Outdated manually drawn mostly	Figure 11-7

The **precedence diagramming method (PDM)** is typically used with modern project management scheduling software. This method depicts each activity in a box (node) and connects the activities by arrows. It is sometimes called activity-on-node (AON).
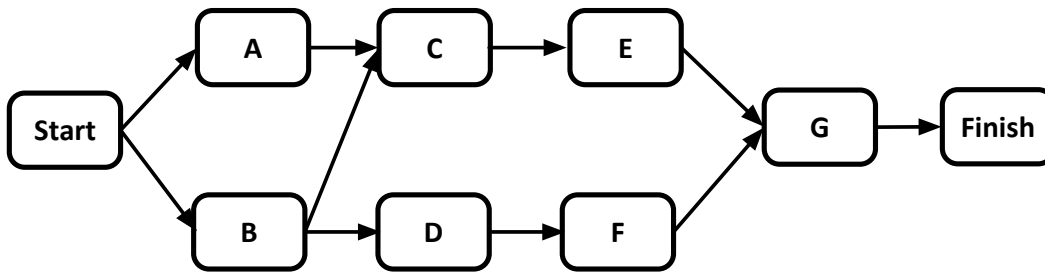

Figure 11-6: Precedence Diagramming Method Sample
The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Figure 6-11, Page 193

The **arrow diagramming method (ADM)** is typically used for manual drawing. This method depicts each activity on an arrow or line, and activities are connected by a circle or box and is sometimes called activity-on-arrow (AOA).

A dummy may also be used with ADM. A dummy is a dashed line that connects two activities where a relationship exists, but is not directly connected.   **The dummy is not an activity and has a zero duration.** The dummy "H" has been added to Figure 11-7: Arrow Diagramming Method Sample to show the dependency between activities B and C.

Activities may also be depicted in another format resulting in a diagram with an appearance closer to the PDM diagram. This format represents activities as "Start-A," "A-C," and "H-Finish."
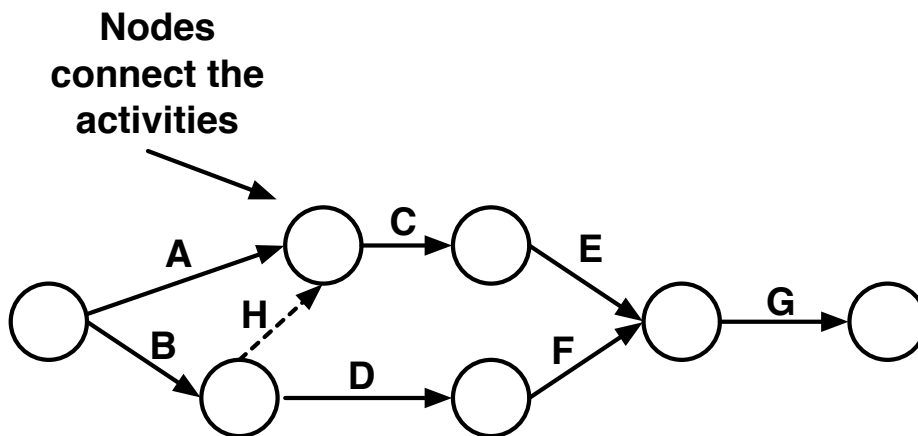

Figure 11-7: Arrow Diagramming Method Sample

GERT (Graphical Evaluation Review Technique)

GERT is a diagramming technique that uses **feedback loops** or multiple passes through a diagram as iterations are completed.

A practical use of GERT is software testing where multiple passes usually have to be made through the routine until testing is complete.

In the exam, GERT is typically only the correct answer if the question references a technique with a feedback loop.

Know the concepts of the GERT diagramming method.
Know that GERT stands for Graphical Evaluation Review Technique.
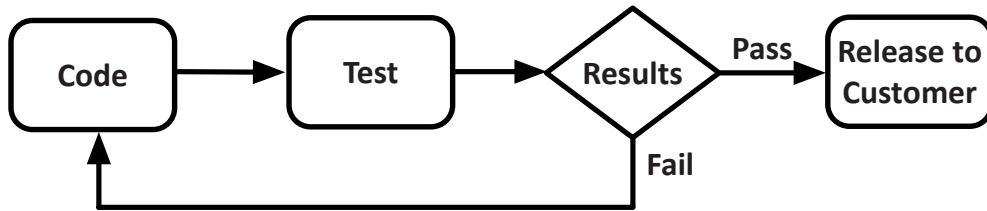
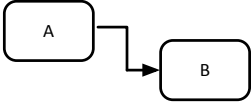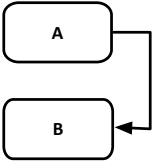**Figure 11-8: GERT Diagramming Sample**

11.3.4. Predecessors

During the creation of the project schedule, predecessors are used to establish the sequencing of activities.

The following table delineates the characteristics of the four predecessor types.

Know the four predecessor types.

Predecessor		Diagram
Finish-to-start (FS)	The finish-to-start predecessor indicates that Activity A must be completed before Activity B begins.	
	This predecessor is usually the default type for most modern project scheduling software and is usable in the activity-on-arrow (AOA) and activity-on-node (AON) diagramming techniques. The other types (start-to-start, finish-to-finish, and start-to-finish) are used only on the activity-on-node (AON) diagram.	
Finish-to-finish (FF)	The finish-to-finish predecessor indicates that Activity B cannot finish until Activity A is finished.	
	This predecessor is typically used when multiple activities must finish at the same time.	

Predecessor		Diagram
Start-to-start (SS)	The start-to-start predecessor indicates that Activity B can start when Activity A starts. This predecessor is used when multiple activities can start simultaneously.	
Start-to-finish (SF)	The start-to-finish predecessor indicates that Activity A must start before Activity B finishes. The start-to-finish predecessor is typically used in situations where a new system must start before an existing system is shut down (finished). Start-to-finish is considered unusual because it is so seldom used.	

11.3.5. Lead and Lag

A lead is the time period in which an activity can be started before its predecessor has been completed.

Figure 11-9, Lead, represents a one-day lead before completing installation of the electric outlets and starting the installation of the cabinets.
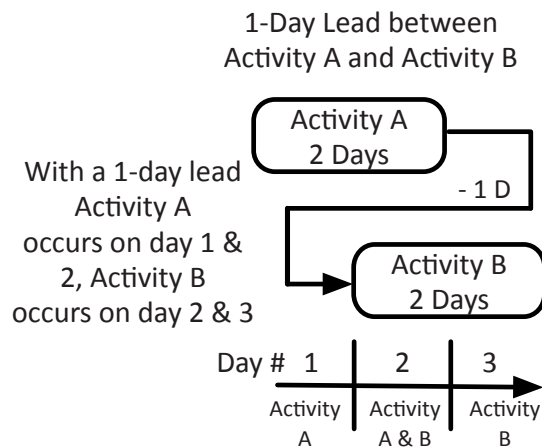
> Know the definitions for leads and lags.

1-Day Lead between Activity A and Activity B

With a 1-day lead Activity A occurs on day 1 & 2, Activity B occurs on day 2 & 3

Figure 11-9: Lead
The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Figure 6-10, Page 192

A lag is a delay between activities. Figure 11-10, Lag, represents a two-day lag between completing the wall texture and painting the walls.
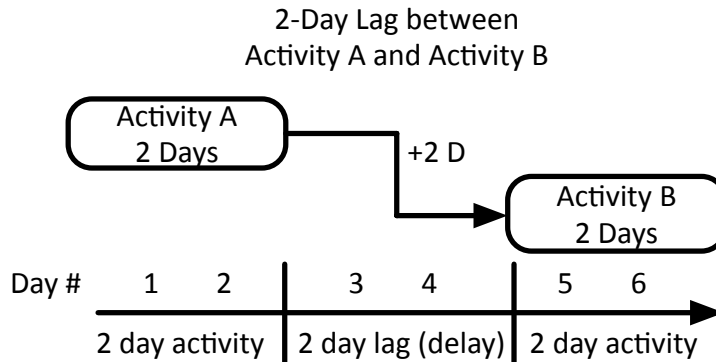

2-Day Lag between
Activity A and Activity B

Figure 11-10: Lag
The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Figure 6-10, Page 192

Figure 11-11, Lead and Lag Displayed in Network Diagram, represents both a lead of five days and a lag of two days.
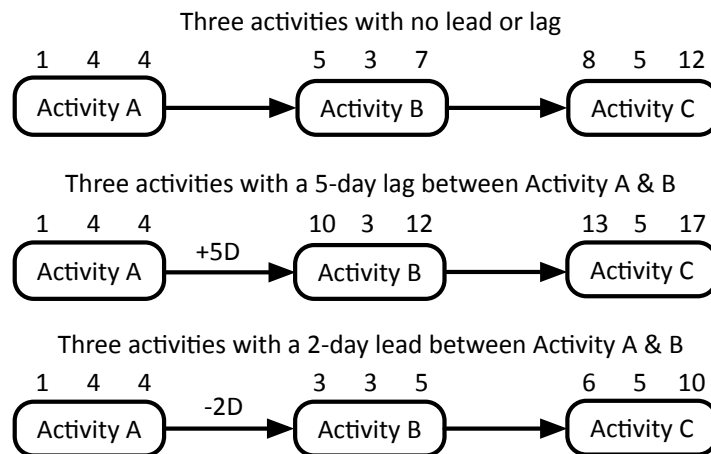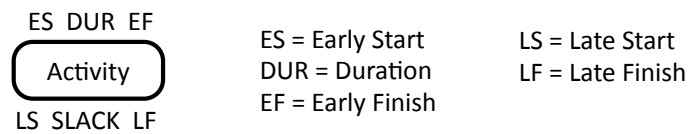

Figure 11-11: Lead and Lag Displayed in Network Diagram
The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Figure 6-10, Page 192

Section 11.5.9 in the Crosswind manual references how to apply the early start (ES) and early finish (EF) dates to the activities.

The source for the above text is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Pages 187-194