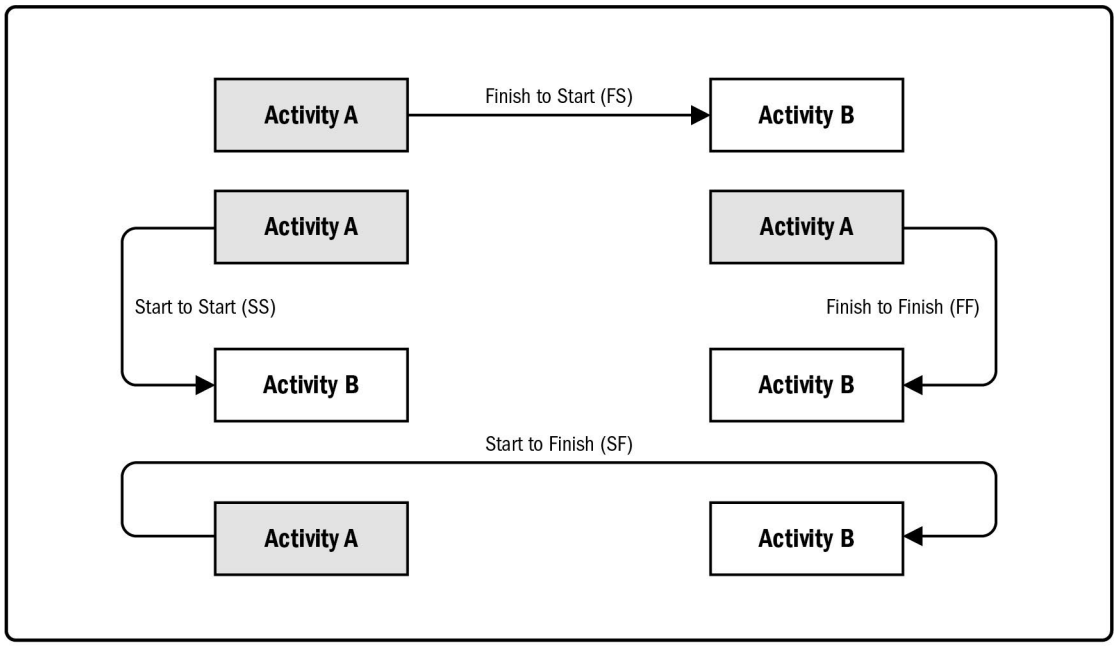
Sequence Activities: Tools and Techniques

The first tool and technique in the sequence activities process is the [1]precedence diagramming method (PDM), which is a technique used for constructing a schedule model in which activities are represented by nodes (boxes) and are graphically linked by one or more logical relationships or dependencies (arrows) to show the sequence in which the activities are to be performed. [1]Activity-on-node (AON) is one method of representing a precedence diagram. While creating the AON network diagram, four types of dependencies or logical relationships are used:

- [1]Finish-to-start (FS): A logical relationship where a successor activity cannot start until a predecessor has finished. For example, a car needs to finish being washed before you can start to dry it.
- [1]Finish-to-finish (FF): A successor activity can't finish until a predecessor activity has finished. For example, writing a book needs to finish before you can finish editing it.
- [1]Start-to-start (SS): A logical relationship in which a successor activity cannot start until a predecessor activity has started. For example, level concrete can't start until pour foundation begins.
- [1]Start-to-finish (SF): A successor activity can't finish until a predecessor activity has started. For example, a security guard on morning shift has to start before the night shift guard can finish.

This figure shows you what each of the different relationships/dependencies look like in a network diagram:



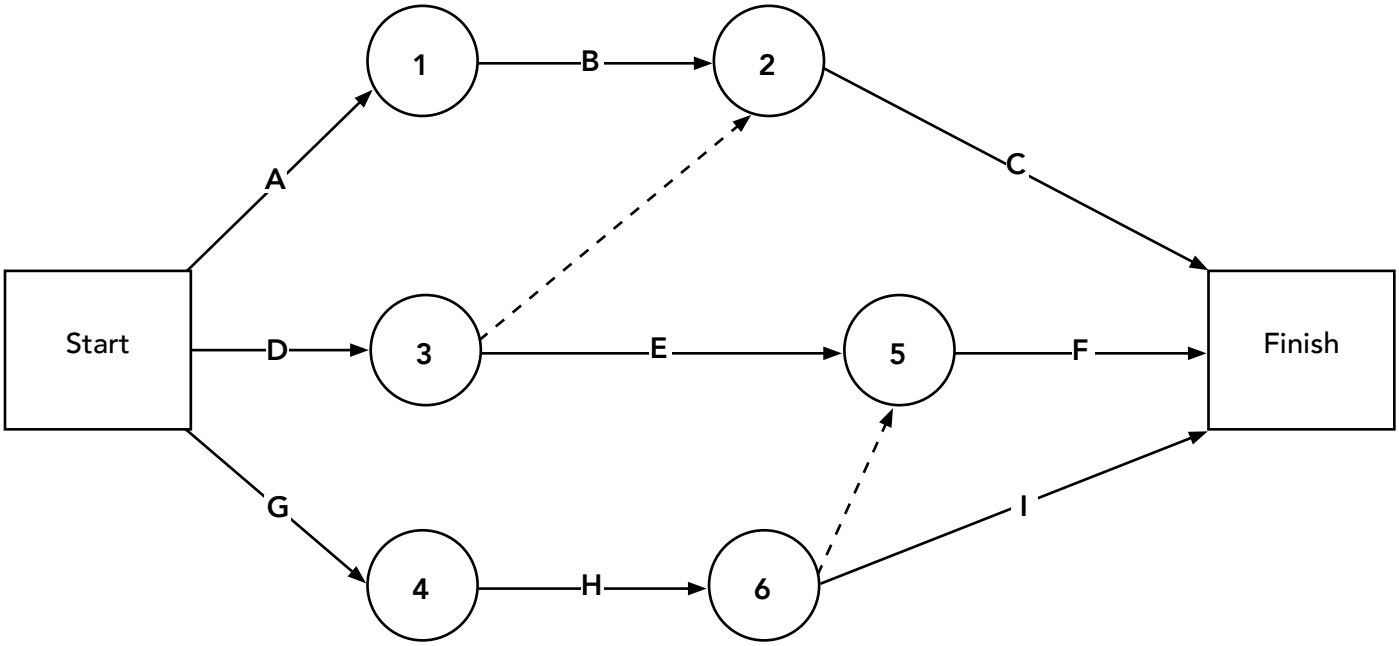
[2] **Figure 6-9 (Guide).** Precedence Diagramming Method (PDM) Relationship Types

The most used relationships/dependencies are finish-to-start, finish-to-finish, and start-to-start. Start-to-finish is a relationship/dependency that's used, but not very often.

Activity on arrow (AOA) is another type of precedence diagram, but it isn't used as often as the PDM. AOA is not described in the *PMBOK® Guide*, but you may see AOA on the exam, so it's important to know what it is.

Each of the project's activities are shown on the diagram as arrows with the description written on the arrow, not in the boxes as in the PDM. The arrows represent the activities along with the relationship. The numbers in the circles represent the durations of each activity. It's known for only using the finish-to-start relationship and puts in "dummy" activities to show only relationships. You can easily identify the dummy activities because the relationship is drawn as a dotted line. Here is an example of what an AOA diagram looks like:

Activity on Arrow (AOA) Diagram



9 activities and 2 dummy activities

The second tool and technique is **dependency determination**, which describes the type of dependencies for your network diagram:

- [1]**Mandatory:** These are dependencies that are legally or contractually required or inherent in the nature of the work. They often involve physical limitations, such as on a construction project, where it is impossible to erect the superstructure until after the foundation has been built. Mandatory dependencies are sometimes referred to as hard logic or hard dependencies. Mandatory dependencies are identified during the sequencing of activities.
- [1]**Discretionary:** These dependencies are sometimes referred to as preferred logic, preferential logic, or soft logic. Discretionary dependencies are established based on knowledge of best practices within a particular application area or some unusual aspect of the project where a specific sequence

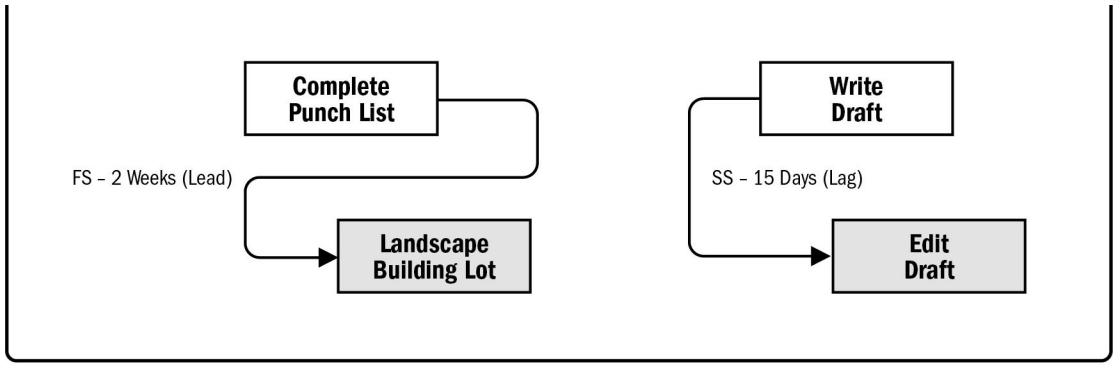
is desired, even though there may be other acceptable sequences. For example, you may prefer to have all the house painting done before installing carpet, but if the schedule is tight, you may choose to paint in parallel with laying carpet.

- [3]**Internal:** These are dependencies that involve a precedence relationship between project activities and are generally inside the project team's control. For example, if a device has to be built before it can be tested, this is an internal mandatory dependency.
- [1]**External:** These dependencies involve a relationship between project activities and non-project activities. They are usually outside the project team's control. For example, installed electrical wiring in a house needs to be inspected by county inspectors before the walls can be built around them.

The third tool and technique is leads and lags.

- [1]**Lead:** The amount of time whereby a successor activity can be advanced with respect to a predecessor activity. For example, you may decide to edit a document before it is completed. This could potentially save time in the project by starting the editing earlier. The time is usually shown as a negative value when using scheduling software.
- [1]**Lag:** The amount of time whereby a successor activity will be delayed with respect to a predecessor activity. For example, you have to wait for concrete to dry before you can start building on it.

This figure shows additional examples of what lead and lag might look like in a schedule.



[4] **Figure 6-10 (Guide).** Examples of Lead and Lag

The final tool and technique is the [1]**project management information system (PMIS)**. The PMIS includes scheduling software tools, which have the capability to help plan, organize, and adjust the sequence of the activities; insert the logical relationships and lead and lag values; and differentiate the different types of dependencies.

[1]These definitions are taken from the Glossary of Project Management Institute, A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017.

[2]Project Management Institute, A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Fig. 6-9, Page 190.

[3]Project Management Institute, A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Fig. Page 192.

[4]Project Management Institute, A Guide to the Project Management Body of Knowledge, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Fig. 6-10, Page 192.