

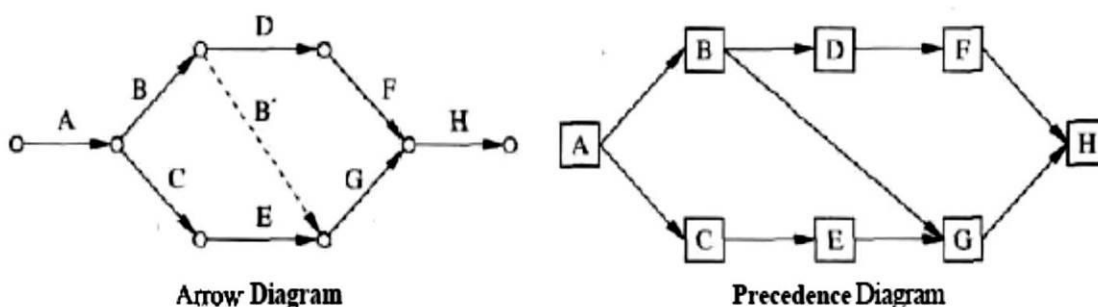
Activity – on – Arrow (A-O-A) Network Planning Technique

Drawing Project Network.

There are two ways that are commonly used to draw a network diagram for a project:

- 1. Activity on Arrow (AOA) representation.**
- 2. Activity on Node (AON) representation.**

Network -A diagram to represent the relationship of activities to complete the project. The network may be drawn as either an "arrow diagram" or a "precedence diagram", see Fig. below:

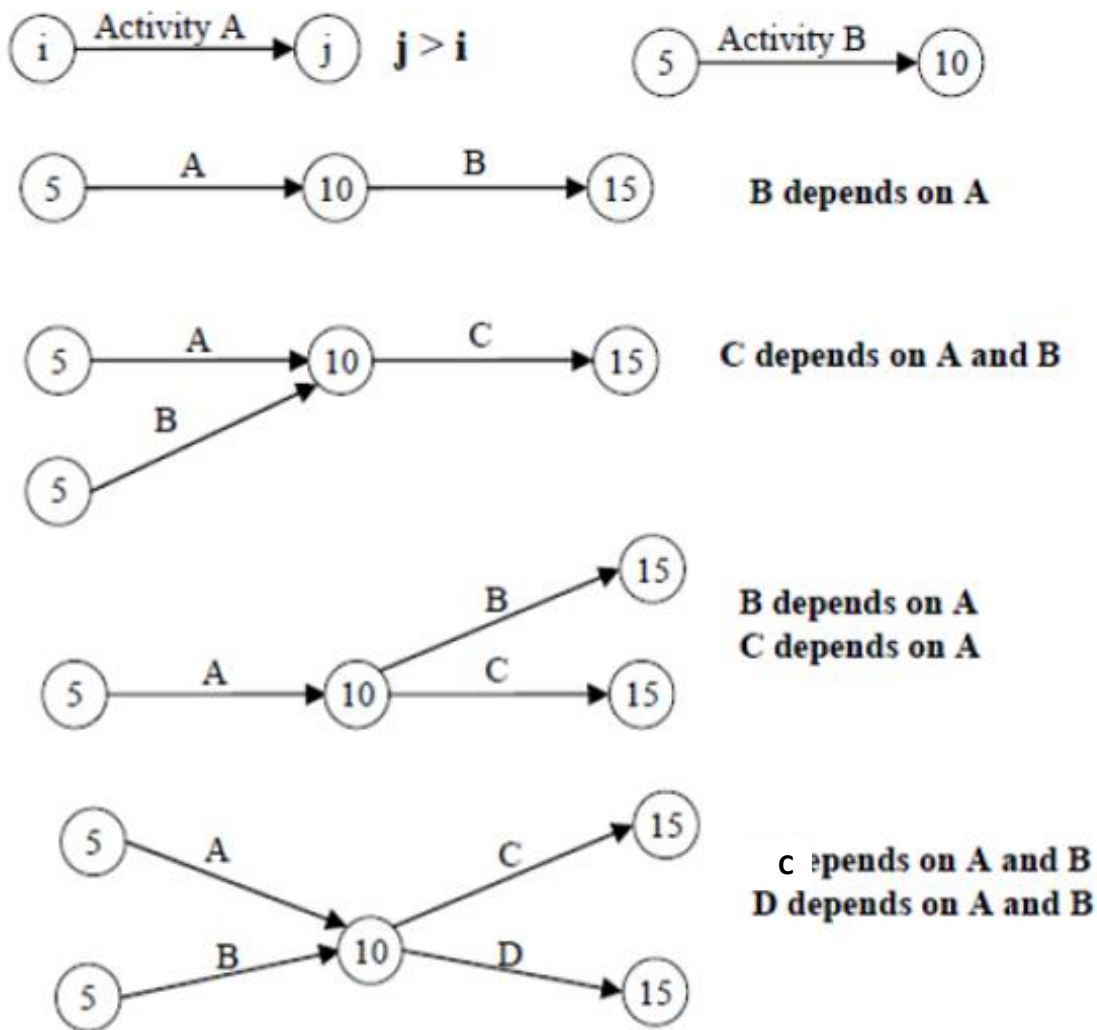


Before drawing the network, it is necessary to ensure that:

- The project has a unified starting and ending point.
- Networks should be continuous (i.e., each activity except the first and the last has both preceding and succeeding activities).

1- Activity on arrow network (AOA)

In this method, the arrows represent activities while the nodes represent the start and the end of an activity (usually named as events) (see Fig. below). The length of the arrow connecting the nodes has no significance. When one activity depends upon another, both appear on the diagram as two arrows having a common node.

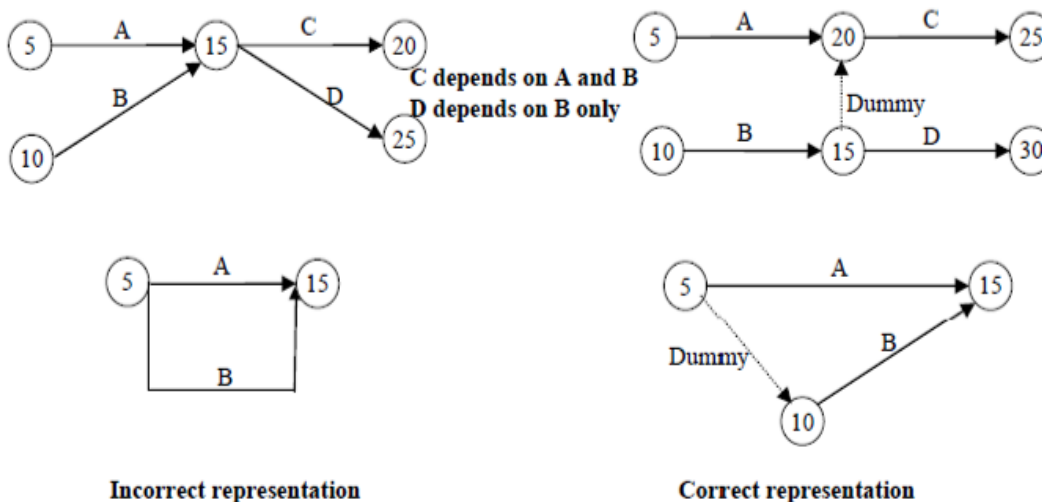


The following are some rules that need to be followed when constructing an AOA network diagram:

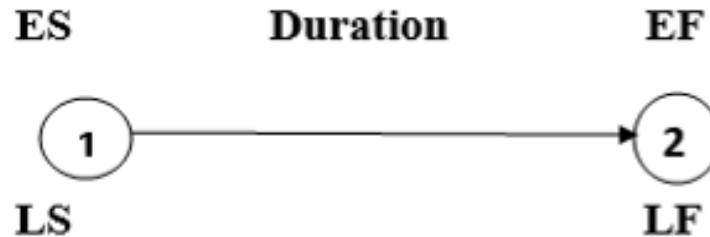
- Each activity must have a unique $i - j$ numbers, where i (the number at the tail of the arrow) is smaller than j (the number at the head of the arrow).
- It is recommended to have a gap between numbers (i.e., 5, 10, 15, etc.). This will allow for accommodation of missed activities.
- Avoid back arrows.

Dummy Activity -An activity (represented by a dotted line on the arrow network diagram) that indicates that any activity following the dummy cannot be started until the activity or activities preceding the dummy are completed. The dummy does not require any time except the following:

- When more than one arrow leaves the same node and arrives at another node.
- When one activity depends upon two preceding activities and another activity depends only upon one of these two preceding activities as shown in Fig. below.



Representation of activity



E. S= Early start time an activity can start with

E.F = Early finish time that an activity can finish with

E. F=E.S+ Duration

L.S= Latest start time that an activity can be start

L.F= latest finish time that an activity can be finish

L.S= L.F - Duration

Total float time (T.F)

The float for an activity is the amount that its duration can slip without causing the project to be delayed.

$$\mathbf{T.F= L.F - E.F \quad \text{or} \quad L.S - E.S}$$

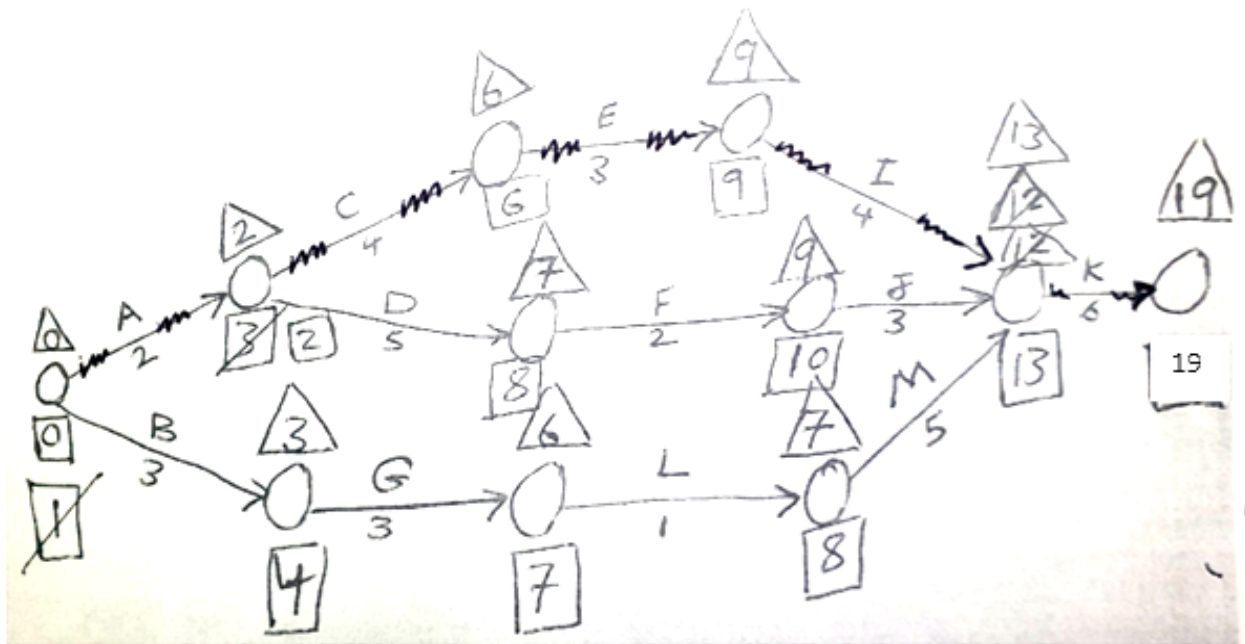
Example 1:

Find the project total duration. Use the following details to draw the A-O-A network.

Activity	A	B	C	D	G	E	F	L	I	J	M	K
Duration weeks	2	3	4	5	3	3	2	1	4	3	5	6
Following Activity	C,D	G	E	F	L	I	J	M	K	K	K	--

Solution:

△ = Forward E.S □ = Backward L.F



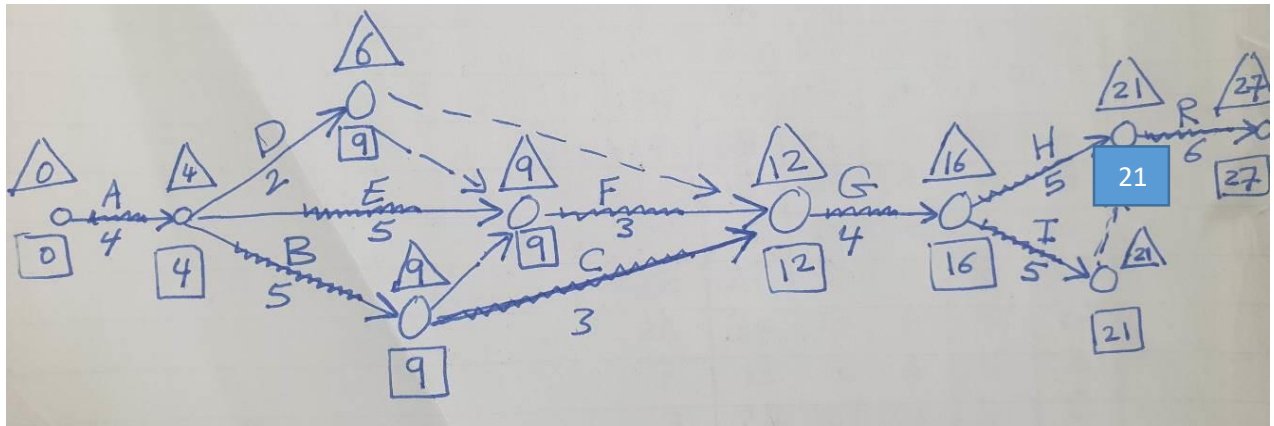
Activity	Duration Weeks, D	Early start E.S	Early Finish E.F= E.S+D	Late Finish L.F	Late start L.S= L.F - D	Total Float T.F=L.F-E.F or L.S-E.S	State Of Activity
A	2	0	2	2	0	0	critical
B	3	0	3	4	1	1	
C	4	2	6	6	2	0	critical
D	5	2	7	8	3	1	
G	3	3	6	7	4	1	
E	3	6	9	9	6	0	critical
F	2	7	9	10	8	1	
L	1	6	7	8	7	1	
I	4	9	13	13	9	0	critical
J	3	9	12	13	10	1	
M	5	7	12	13	8	1	
K	6	13	19	19	13	0	critical

Example 2:

Find the project total duration and date of completion (assume the project start date is (1/12/2019). Use the following details to draw the A-O-A network.

Activity	A	B	C	D	E	F	G	H	I	R
Duration Days	4	5	3	2	5	3	4	5	5	6
Following Activity	B,D,E	C,F	G	F,G	F	G	H,I	R	R	-- -

Solution:



Activity	Duration Days, D	Early start E.S	Early Finish E.F= E.S+D	Late Finish L.F	Late start L.S= L.F - D	Total Float T.F=L.F-E.F or L.S-E.S	State Of Activity
A	4	0	4	4	0	0	critical
B	5	4	9	9	4	0	critical
C	3	9	12	12	9	0	critical
D	2	4	6	9	7	3	
E	5	4	9	9	4	0	critical
F	3	9	12	12	9	0	critical
G	4	12	16	16	12	0	critical
H	5	16	21	21	16	0	critical
I	5	16	21	21	16	0	critical
R	6	21	27	27	21	0	critical

Total duration of project = 27 days

Date of completion is 28/12/2019

C.P=(A, B,C,G,H,R) or (A,E,F,G,I,R)

Homework No. 2 for Class A

- Q1) by using Bar chart planning technique find the following
- a- Total duration for the project
 - b- The project completion date (assume the start date is 1/3/2020).
 - c- Find critical path (C.P)

Activity	A	B	C	D	E	F	G	H	I	J
Duration days	8	5	2	8	4	6	7	4	5	6
Following Activity	B	C,D	E	F	G	H	I	J	J	---

Q2) Find the total duration and date of completion (assume the project start date is 10/6/2019) by using following data build the Gant chart.

Activity	A	B	C	D	E	F	G	H	I	J	k	M	N	R
Duration days	3	4	6	8	3	7	8	1	3	8	4	8	9	2
Following Activity	C,D, E	F	J	H	O	K	M	I	N	-	R	--	-	-

Homework No. 2 for Class B

Q1) Find the total duration of the project and critical path (assume the project start date 1/10/2019) by using flowing data to build Bar chart.

Activity	A	B	C	D	E	F	G	H	I	J
Duration days	3	5	3	2	5	3	4	5	5	6
Following Activity	B,D	C	F	E	G	H,I	H,I	--	-	--

Q2) find the total duration of project and determine the critical path. Using flowing data to build the Bar chart.

Activity	F	G	H	I	J	K	L	M
Duration days	9	8	6	7	5	6	3	5
Following Activity	H	I	J	L	K	---	M	---