

Alternative Criteria for Decision-Making Under Uncertainty

1. Maximax

This is for optimists. Examine only the best possible outcome for each alternative. Choose that alternative with the best possible outcome.

2. Maximin (or Minimax)

This is for pessimists. Examine only the worst possible outcome for each alternative. Choose that alternative having the best of the worst possible outcomes.

3. Minimax Regret

This is also for pessimists. Figure out what your maximum "regret" could be for each alternative. That is, for each alternative, figure out how much worse, at most, the outcome can be for that alternative compared to the other alternatives. Choose that alternative with the minimum regret.

4. Coefficient of Optimism Criterion (Hurwicz Rule)

This allows you to choose how much of an optimist or pessimist you want to be. Choose a number (r) between 0 (pure pessimist) and 1 (pure optimist). For each alternative compute a weighted average of the best and worst outcomes for that alternative:

$$\text{weighted average} = r(\text{best outcome}) + (1-r)(\text{worst outcome})$$

Choose the alternative that has the highest weighted average.

5. Maximize Average Payoff (Likelihood Criterion)

Average all the possible outcomes for each alternative. Choose the alternative that has the best average.

6. Maximize Expected Value

This requires knowing the probability of each chance outcome (state of nature). Some people refer to this situation as decision-making under risk.

This is the criterion used in analyzing decision trees. Compute the expected value of each alternative by multiplying, for each outcome, the probability times the payoff, and summing them all. Choose the alternative with the highest expected value.

Prisoner's Dilemma

Prisoner B

		Prisoner B	
		Keep Quiet	Confess
Prisoner A	Keep Quiet	1 yr. \ 1 yr.	20 yrs. \ 0 yrs.
	Confess	0 yrs. \ 20 yrs.	5 yrs. \ 5 yrs.

A \ B

Payoff Matrix for A:

		B	
		KQ	C
A	KQ	1	20
	C	0	5

Payoff Matrix for B:

		B	
		KQ	C
A	KQ	1	0
	C	20	5

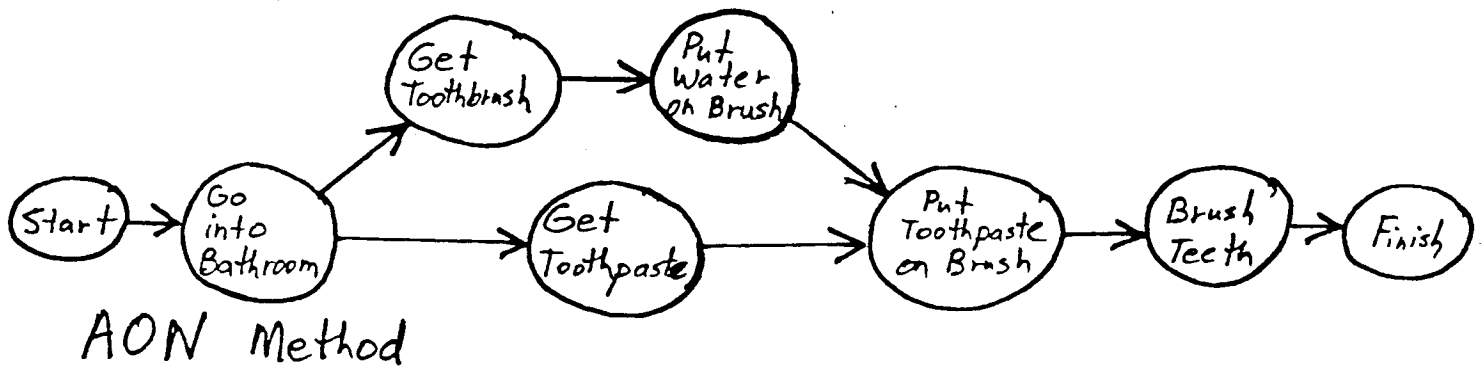
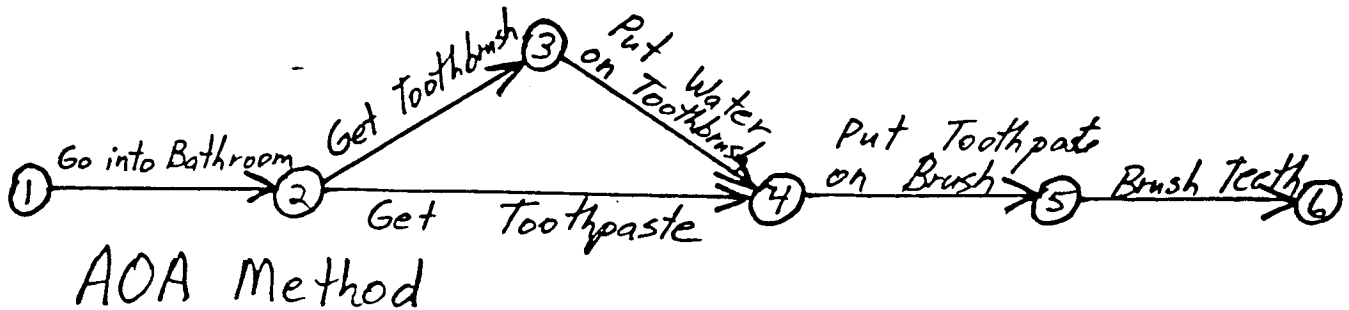
You are prisoner:

- ☐ A
☐ B

You decide to:

- ☐ Keep Quiet
☐ Confess

AOA vs. AON PERT Diagrams



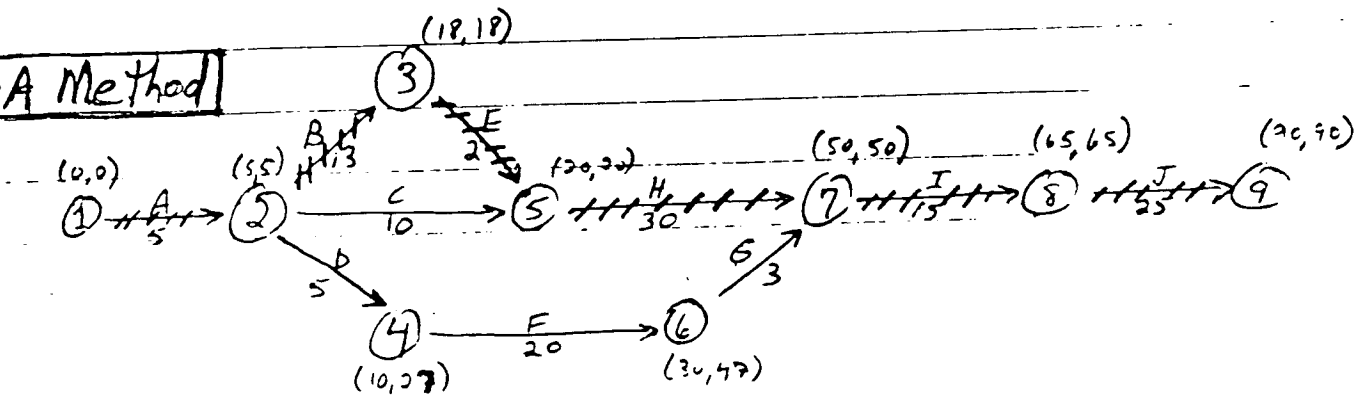
Note: Letters are often used to represent activities.

PERT Example

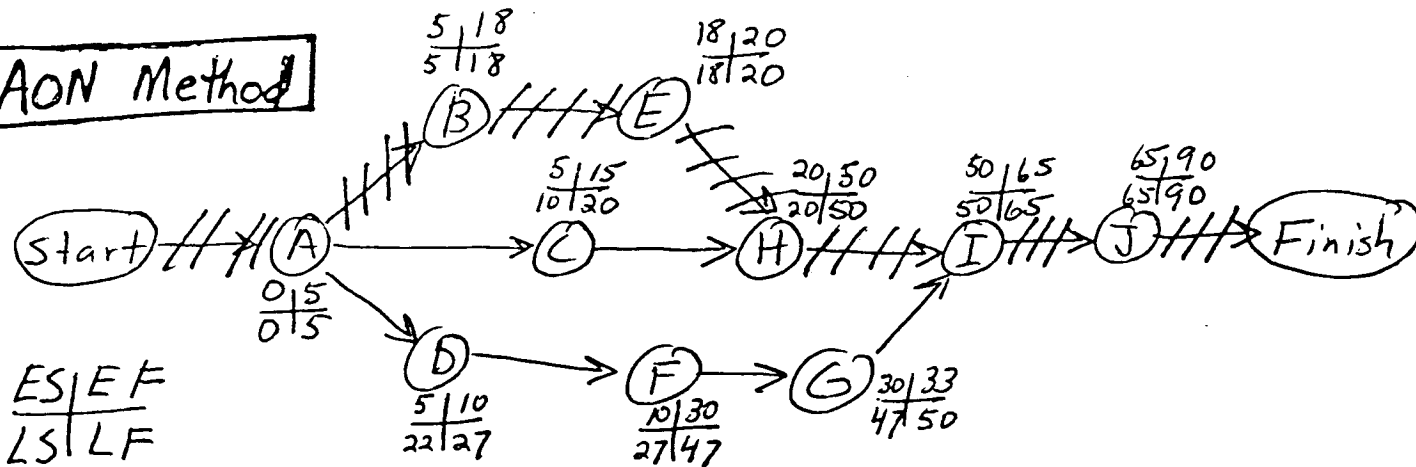
Data Collection Activity Relationships

Activity	Depends on Activity
A. Determine Data Needs	None
B. Hire Data Collectors	A
C. Prepare Questionnaires	A
D. Prepare Data Analysis Procedures	A
E. Train Data Collectors	B
F. Prepare Computer Software	D
G. Train Data Coders	F
H. Collect Data	C, E
I. Code Data for Computer Analysis	G, H
J. Conduct Analysis of the Data	I

AOA Method

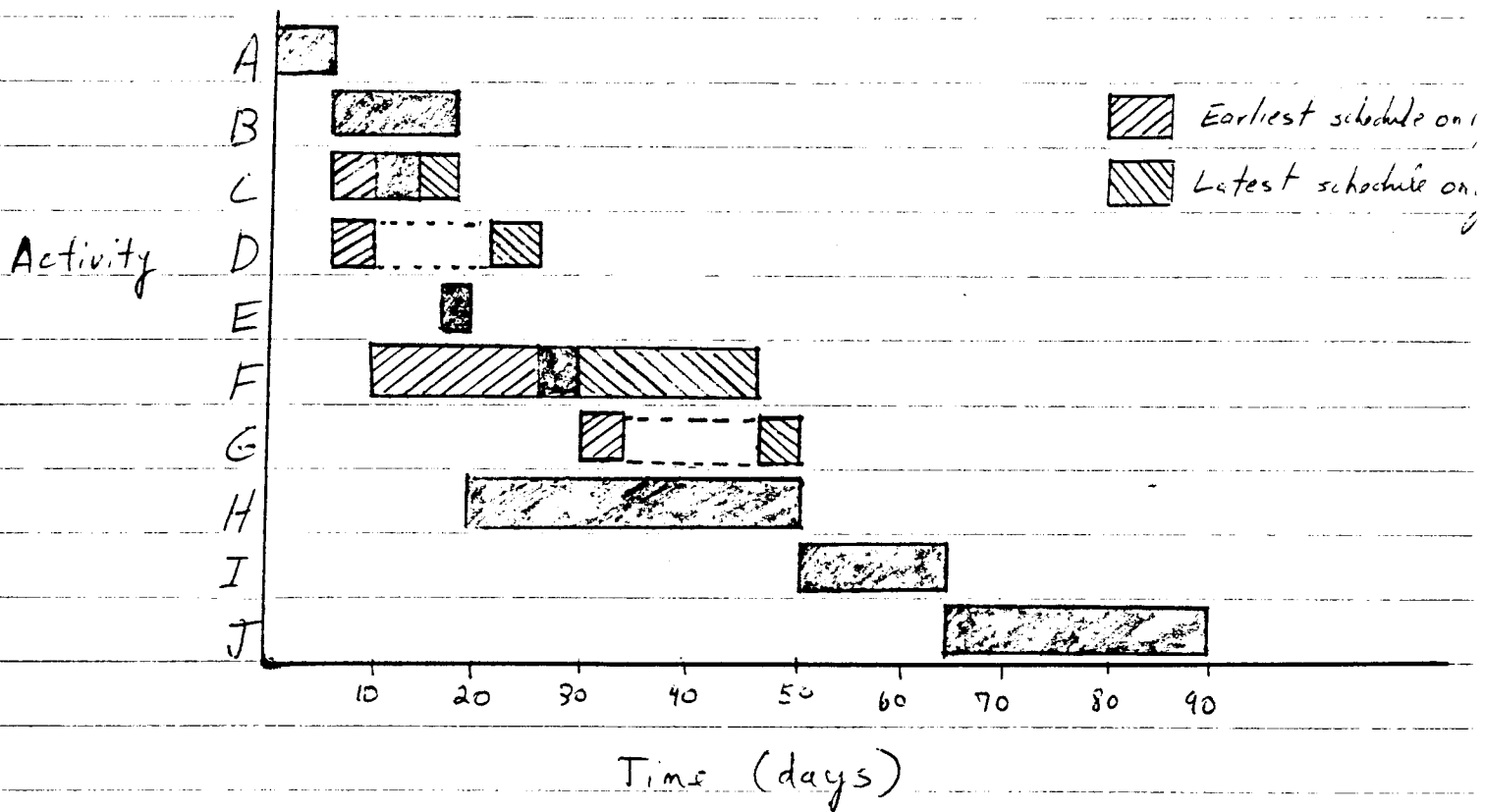


AON Method



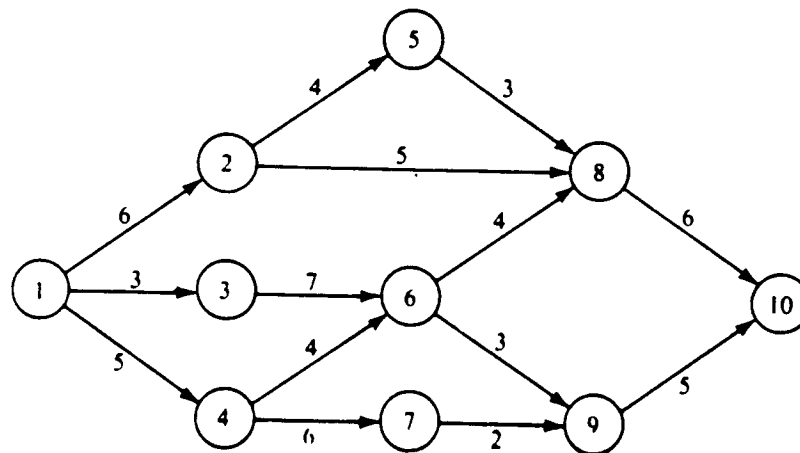
Example of Gantt Chart

Chart showing scheduling alternatives for the data collection example:



PERT/CPM Homework Problem

AOA Method



For the above PERT project network, enter the earliest and latest time for each event, and identify the critical path.

PERT/CPM Homework Problem

A city parks and recreation department is beginning the construction of a series of playgrounds around the city. Since the work is to be repeated several times, the department director wants to develop as efficient a work schedule as possible, allowing construction to be completed in a short time. The following activities are required in the construction of each playground:

<u>Activity</u>	<u>Depends on Activity</u>	<u>Estimated Time (hrs.)</u>
A. General Preparation and Work Assignments	none	4
B. Procure Necessary Materials for Ground Preparation from the City Physical Plant	A	2
C. Clear Playground Site	B	10
D. Grade Playground Area	C	6
E. Prepare and Set Drainage	D	5
F. Prepare Foundation for Playground Equipment	D	6
G. Procure Playground Equipment from Physical Plant	D	1
H. Place Playground Equipment	F,G	8
I. Place Safety Guards for Dangerous Conditions	H	2
J. Prepare Surface Areas Around Each Piece of Equipment	H	4
K. Provide Landscaping	E,J	6
L. Final Clean-up	I,K	3

- 1) Draw the PERT project network, labelling each of the activities, and entering the activity time estimates.
- 2) For each event, enter the estimates for the earliest time and the latest time.
- 3) Determine the critical path, and identify it on the network diagram.
- 4) Construct a chart showing the scheduling times and slack for the different activities.

Product of Operations Research Analysis

