 Introducing critical paths

Making a meal

Note: The scenario used in this activity comes from NESA’s Mathematics Standard 2 Network Topic Guidance.

The following tasks are required to make a curry for dinner for a family of 4:

* A = Chop vegetables
* B = Mix spices
* C = Cook curry
* D = Cook papadums
* E = Place papadums and chutney on table
* F = Cook rice
* G = Put curry and rice on plates
* H = Put plates on table.

The tasks and their prerequisites are represented on a weighted network diagram:



Questions

The critical path:

* What is the shortest time you could take to make and serve the meal?
* How do you know this?
* Which tasks lie on this path?
* What would happen to the total time it takes to prepare and serve the meal if the rice took 24 minutes instead of 20 minutes?

The critical path is the sequence of network activities which combine to have the longest overall duration so as to determine the shortest possible time needed to complete a project.

The length of the critical path is the critical time which gives the minimum time for completion of the project.

Each activity on the critical path is called a critical step.

* What will happen if a critical step is delayed?

Earliest start time (EST):

* What is the earliest time you could start activity C?
* What is the earliest time you could start activity E?
* What is the earliest time you could start activity G?
* Explain how you know this.

The earliest starting time is the earliest time that any activity can be started after all prior activities have been completed.

Latest start time (LST):

* What is the latest time you could start activity C without delaying the serving of the meal?
* What is the latest time you could start activity E without delaying the serving of the meal?
* What is the latest time you could start activity G without delaying the serving of the meal?
* Explain how you know this.

The latest starting time is the latest time an activity may be started after all prior activities have been completed and without delaying the project.

Float time:

* What is the maximum time you could delay activity C without delaying the meal?
* What is the maximum time you could delay activity E without delaying the meal?
* What is the maximum time you could delay activity G without delaying the meal?
* How could you use the LST and EST to calculate these?

Float time is the amount of time that a task in a project network can be delayed without causing a delay to subsequent tasks.

* Is B, E or G on the critical path?
* What can you conclude about the float time of tasks which lie on the critical path?
* What is the relationship between the LST and EST for tasks on the critical path?

Earliest finish time (EFT):

* What is the earliest time you could finish activity B?

The earliest time an activity can be finished after all the prerequisite activities have also been finished.

Latest finish time (LFT):

* What is the latest time you could finish activity B without delaying serving the meal?
* What is the latest time you could finish activity D without delaying serving the meal?

The latest time an activity can be finished after all the prerequisite activities have also been finished, and with the project still running on time.

Sample answers

Note: The sample answers have been made assuming the start time is time zero.

The critical path:

* What is the shortest time you could take to make and serve the meal?

23 minutes

* How do you know this?

This is the longest path from the start to the finish.

* Which tasks lie on this path?

F, G and H.

* What would happen to the serving time of the meal if the rice took 24 minutes instead of 20 minutes?

The meal would be served 4 minutes late (it would be delayed by 4 minutes). The total time would rise from 23 to 27 minutes.

The critical path is the sequence of network activities which combine to have the longest overall duration so as to determine the shortest possible time needed to complete a project.

The length of the critical path is the critical time which gives the minimum time for completion of the project.

Each activity on the critical path is called a critical step.

* What will happen if a critical step is delayed?

If a critical step is delayed then the whole project is delayed by this amount of time.

Earliest start time (EST):

* What is the earliest time you could start activity C?

6 minutes

* What is the earliest time you could start activity E?

4 minutes

* What is the earliest time you could start activity G?

20 minutes

* Explain how you know this.

The earliest time their prerequisites can be finished.

The earliest starting time is the earliest time that any activity can be started after all prior activities have been completed.

Latest start time (LST):

* What is the latest time you could start activity C without delaying the serving of the meal?

10 minutes

* What is the latest time you could start activity E without delaying the serving of the meal?

21 minutes

* What is the latest time you could start activity G without delaying the serving of the meal?

20 minutes

* Explain how you know this.

The latest time they could be started without delaying the meal. This is the time you need to start so that this activity and all subsequent activities can be completed in 23 minutes.

The latest starting time is the latest time an activity may be started after all prior activities have been completed and without delaying the project.

Float time:

* What is the maximum time you could delay activity C without delaying the meal?

4 minutes

* What is the maximum time you could delay activity E without delaying the meal?

17 minutes

* What is the maximum time you could delay activity G without delaying the meal?

0 minutes, you cannot delay G without delaying the project.

* How could you use the LST and EST to calculate these?

LST – EST, the difference between them.

Float time is the amount of time that a task in a project network can be delayed without causing a delay to subsequent tasks.

* Is B, E or G on the critical path? G
* What can you conclude about the float time of tasks which lie on the critical path?

Their float times are zero. They cannot be delayed without delaying the project.

* What is the relationship between the LST and EST for tasks on the critical path?

The LST and EST are equal.

Earliest finish time (EFT):

* What is the earliest time you could finish activity B?

6 minutes

The earliest time an activity can be finished after all the prerequisite activities have also been finished.

Latest finish time (LFT):

* What is the latest time you could finish activity B without delaying serving the meal?

10 minutes

* What is the latest time you could finish activity D without delaying serving the meal?

19 minutes

The latest time an activity can be finished after all the prerequisite activities have also been finished, and with the project still running on time.