

# Course: Project Management and Research Methodologies

## Assignment 4: Network analysis

**Issued:** Saturday, 28/1/2018

**Due:** Monday, 12/2/2018

### Exercise 1

The following table defines the various activities in a small project:

Activity	Completion time (weeks)
1	1
2	4
3	2
4	6
5	2
6	5
7	3
8	6
9	1

The immediate precedence relationships are:

Activity Number		Activity Number
1	must be finished before	3 can start
2	must be finished before	4,5,6
3	must be finished before	5,6
4	must be finished before	7
5	must be finished before	8
6,7	must be finished before	9

### Questions

- 1) Draw the network diagram.
- 2) Calculate a) the overall project completion time, b) the total float times for each activity and c) the critical activities and the critical path of your project.
- 3) How would the overall project completion time be affected if the following were to happen (**Note:** you should take each of the situations below separately, do not try and estimate the effect if they both happen):
  - ✓ the completion time for activity 6 increased from 5 weeks to 7 weeks?
  - ✓ the completion time for activity 8 was reduced from 6 weeks to 4 weeks?

- 4) One of your colleagues is arguing that if the completion time for activity 4 (**a critical activity**) could be cut by 3 weeks then the time taken to complete the entire project could also be cut by 3 weeks. Do you agree? If not what effect would have if we reduce the completion time for activity 4 by 3 weeks?
- 5) Comment on the progress of the project if (ignoring the changes in completion times given above), at the end of 8 weeks, the status of the activities is as follows:
  - ✓ Finished - 1,2,3
  - ✓ In progress - 4 (1 week to completion)
  - ✓ In progress - 5 (1 week to completion)
  - ✓ In progress - 6 (4 weeks to completion)

**HINT:** For point 5) redraw the network diagram of the non-completed activities and estimate the minimum required time for the completion of the resulting new project. Then estimate the required time of the total project.

## Exercise 2

The Pan Cretan Cooperative Bank has decided to develop an Information System to support the functioning of all its activities and divisions. The project was undertaken by PYRAMIS S.A., a company with significant expertise in the implementation of large SW development projects. The analysts of PYRAMIS believe that the project is faced with a number of uncertainties, due to a number of complex issues such as security and data protection related issues, concurrency of data processing, data distribution issues, etc, which required that a prototypical design is undertaken. For these reasons the technical department of PYRAMIS have decided that the planning for this project should be done on the basis of three (3) estimates regarding the duration of each activity of the project.

The following table shows the activities of the project, their expected duration (a=optimistic estimate, b=pessimistic estimate, m=most probable estimate) and their interdependencies.

Activities	Preceding Activities	Duration		
		a	m	b
1	-	3	5	7
2	-	1	5	9
3	1	1	3	5
4	1	3	5	7
5	1	3	5	13
6	2	1	4	7
7	2	1	3	5
8	3	1	4	7

9	4, 6	1	3	5
10	7	1	4	7
11	7	3	5	13
12	8	1	4	7
13	5, 8, 9, 10	3	4	5

It is given that the critical path is formed by activities: 1- 4 - 9 - 13

## Questions

- 1) Calculate the total duration of the project, using PERT
- 2) What is the probability for the this project not to have completed within 18 weeks?
- 3) If we want to reduce our probability to fail to 5%, what do you estimate the planned duration of project should be?
- 4) Some analysts from PYRAMIS report that “with the help of simulation methods and other statistical methods it has been calculated that the "true" (statistically) average duration of projects with a comparable complexity as their present project is about 40% higher than the time estimated through PERT”. Consider whether this "true" average duration gives a good estimator of the expected duration of the project and draw conclusions about the value of network analysis techniques with uncertainty over time durations.

# Tables of the Normal Distribution



## Probability Content from $-\infty$ to Z

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990