

Description

The following table defines the various activities included for the completion of a project, the dependencies and the estimated times:

Activity	Immediate Predecessor	(Optimistic) (Topt)	(Most probable) (Tprob)	(Pessimistic) (Tpess)
A	-	10	22	22
B	-	20	20	20
C	-	4	10	16
D	A	2	14	32
E	B, C	8	8	20
F	B, C	8	14	20
G	B, C	4	4	4
H	C	2	12	16
I	G, H	6	16	38
J	D, E	2	8	14

Questions

- 1) Draw the network diagram.
- 2) Identify the critical path
- 3) Calculate the overall project completion time
- 4) Assume, the project manager promised to complete the project in the fifty days. What are the chances of meeting that deadline?
- 5) What deadline are you 95% sure of finishing the project?
- 6) What are the chances of completing the project in 40 days

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

1) DRAW THE NETWORK DIAGRAM.

We calculate the Estimated Time for each activity

Activity	Immediate Predecessor	Optimistic (Topt)	Most probable (Tprob)	Pessimistic (Tpess)	Estimated Time
A		10	22	22	20
B		20	20	20	20
C		4	10	16	10
D	A	2	14	32	15
E	B,C	8	8	20	10
F	B,C	8	14	20	14
G	B,C	4	4	4	4
H	C	2	12	16	11
I	G,H	6	16	38	18
J	D,E	2	8	14	8

$$t_A = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{10 + 4 * 22 + 22}{6} = 20$$

$$t_B = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{20 + 4 * 20 + 20}{6} = 20$$

$$t_C = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{4 + 4 * 10 + 16}{6} = 10$$

$$t_D = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{2 + 4 * 14 + 32}{6} = 15$$

$$t_E = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{8 + 4 * 8 + 20}{6} = 10$$

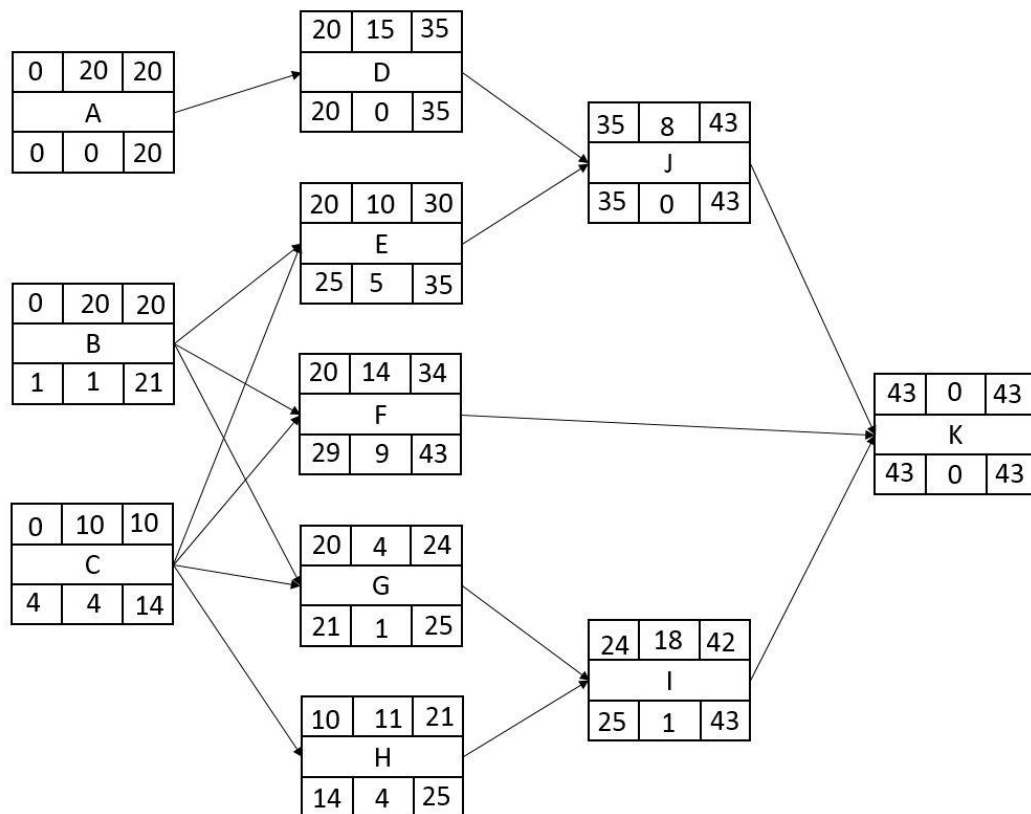
$$t_F = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{8 + 4 * 14 + 20}{6} = 14$$

$$t_G = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{4 + 4 * 4 + 4}{6} = 4$$

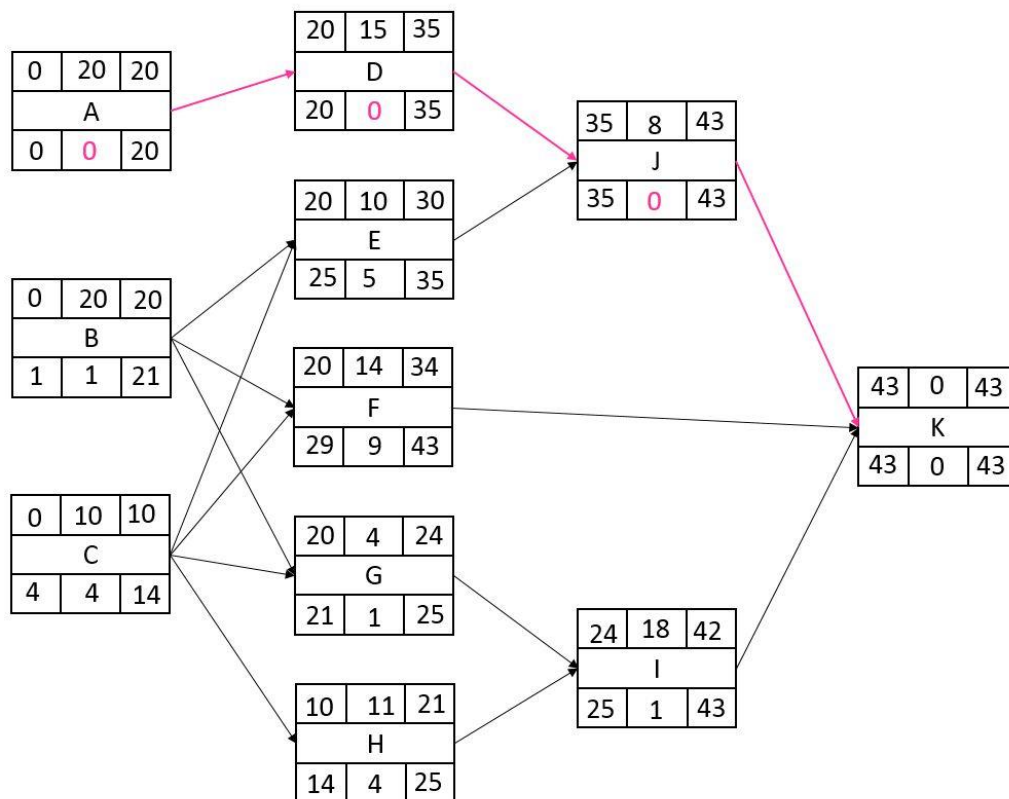
$$t_H = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{2 + 4 * 12 + 16}{6} = 11$$

$$t_I = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{6 + 4 * 16 + 38}{6} = 18$$

$$t_J = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{2 + 4 * 8 + 14}{6} = 8$$



2) IDENTIFY THE CRITICAL PATH



Critical tasks are: A, D, J

3) CALCULATE THE OVERALL PROJECT COMPLETION TIME

$$\text{Project Completion Time} = t_A + t_D + t_J = 20 + 15 + 8 = 43 \text{ days}$$

4) ASSUME, THE PROJECT MANAGER PROMISED TO COMPLETE THE PROJECT IN THE FIFTY DAYS. WHAT ARE THE CHANCES OF MEETING THAT DEADLINE?

$$V_A = \frac{(T_{\text{pess}} - T_{\text{opt}})^2}{6^2} = \frac{(22 - 10)^2}{6^2} = \frac{144}{36} = 4$$

$$V_D = \frac{(T_{\text{pess}} - T_{\text{opt}})^2}{6^2} = \frac{(32 - 2)^2}{6^2} = \frac{900}{36} = 25$$

$$V_J = \frac{(T_{\text{pess}} - T_{\text{opt}})^2}{6^2} = \frac{(14 - 2)^2}{6^2} = \frac{144}{36} = 4$$

$$V_{\text{total}} = V_A + V_D + V_J = 4 + 25 + 4 = 33$$

Standard Deviation:

$$\sigma = \sqrt{V_{\text{total}}} = \sqrt{33} = 5.7445$$

$$z = \frac{(\text{Due Date} - \text{Expected Date})}{\sigma} = \frac{50 - 43}{5.7445} = 1.22$$

According to the Normal distribution table the probability is 88.88%

5) WHAT DEADLINE ARE YOU 95% SURE OF FINISHING THE PROJECT?

95% probability corresponds according to the Normal Distribution Table $z=1.65$

$$z = \frac{(\text{Due Date} - \text{Expected Date})}{\sigma}$$

$$1.65 = \frac{\text{Due Date} - 43}{5.7445}$$

$$\text{Due Date} - 43 = 1.65 * 5.7445$$

$$\text{Due Date} - 43 = 9.4785$$

$$\text{Due Date} = 9.4785 + 43$$

$$\text{Due Date} = 53 \text{ days}$$

6) WHAT ARE THE CHANCES OF COMPLETING THE PROJECT IN 40 DAYS

$$z = \frac{(\text{Due Date} - \text{Expected Date})}{\sigma}$$

$$z = \frac{40 - 43}{5.7445}$$

$$z = -0.52223$$

According to the Normal Distribution Table the probability 0.6985

$$P(x \leq 40) = 1 - 0.6985 = 0.3015$$

30.15% is the probability to complete the project in 40 days.