# Description

The following table defines the various activities included for the competition 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 -oo 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** |

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

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

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

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

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

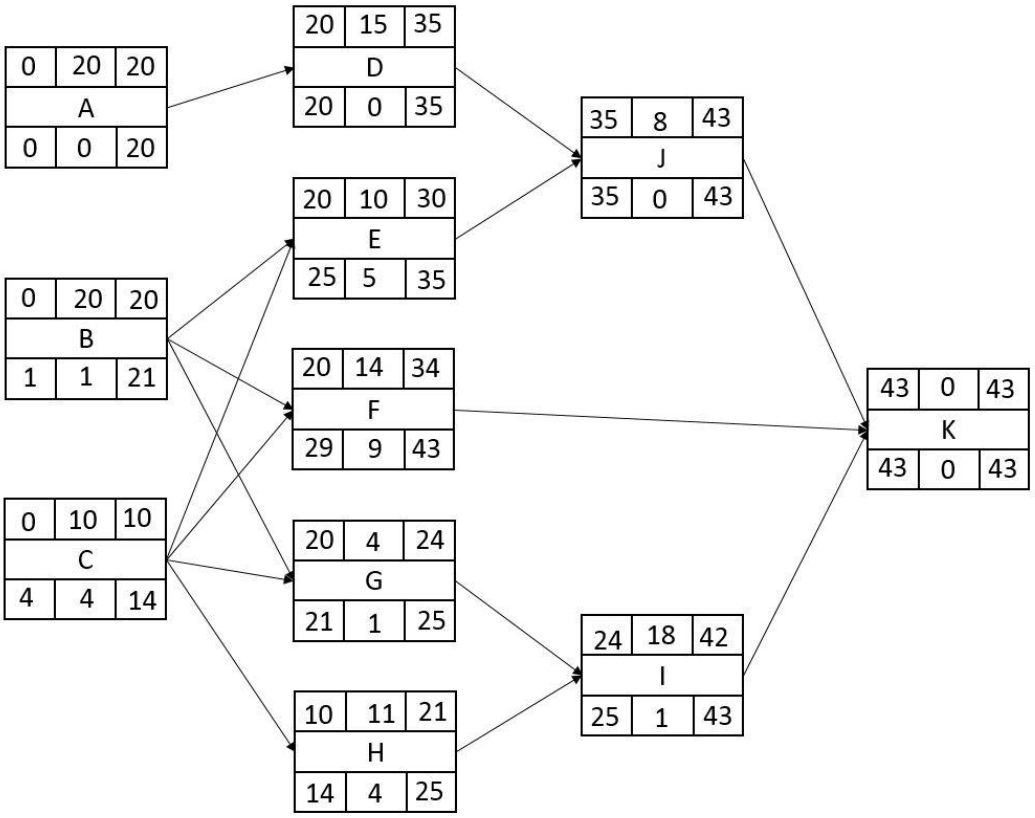
$$t_F = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{8 + 4 * 14 + 20}{6} = 14$$

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

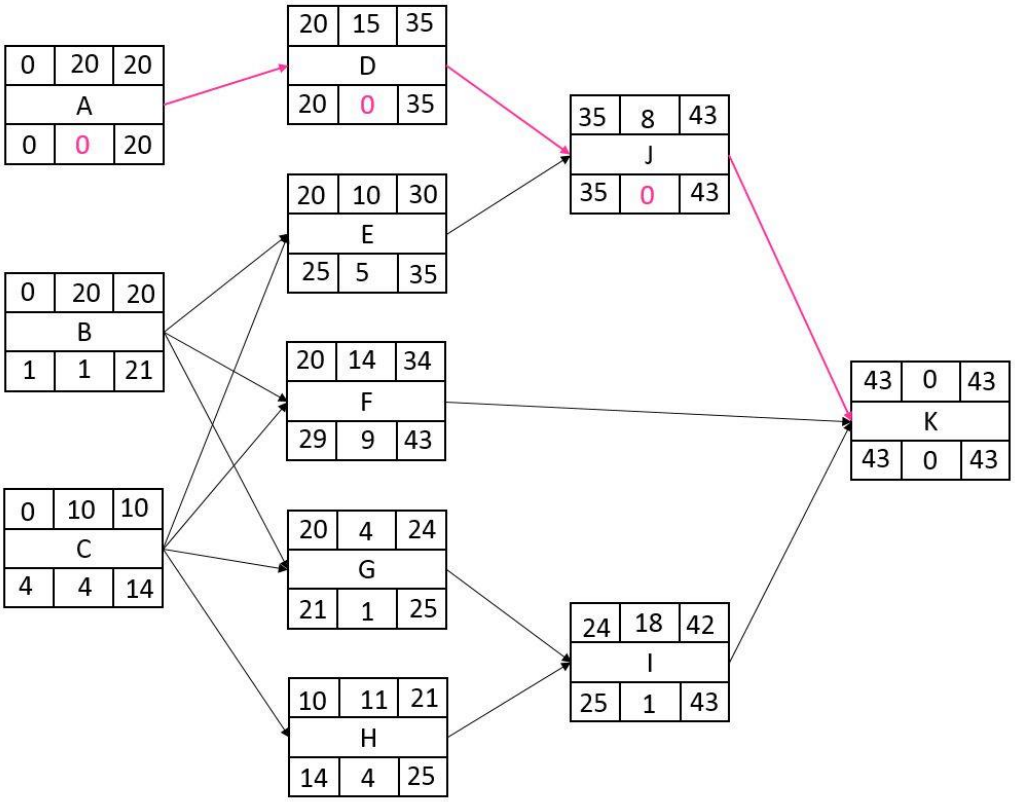
$$t_H = \frac{T_{opt} + 4 * T_{prob} + T_{pess}}{6} = \frac{2 + 4 * 12 + 16}{6} = 11$$

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

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



### 2) IDENTIFY THE CRITICAL PATH




Critical tasks are: A, D, J

### 3) CALCULATE THE OVERALL PROJECT COMPLETION TIME

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

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

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

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

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

$$V_{total} = V_A + V_D + V_j = 4 + 25 + 4 = 33$$

Standard Deviation:

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

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

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

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

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

$$Due\ Date - 43 = 1.65 * 5.7445$$

$$Due\ Date - 43 = 9.4785$$

$$Due\ Date = 9.4785 + 43$$

$$Due\ Date = 53\ days$$

### 6) What are the chances of completing the project in 40 days

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

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

$$z = -0.52223$$

According to the Normal Distribution Table the probability 0.6985

P(x≤40)=1-0.6985=0.3015

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