2. The Global Tea and Organic Juice companies have merged.

1 Compute the expected time for each activity.

Activity	Predecessor	Opt. (a)	Ml. (m)	Pess. (b)	t_e
1	None	16	19	28	20
2	None	30	30	30	30
3	None	60	72	90	73
4	None	18	27	30	26
5	1	17	29	47	30
6	1	4	7	10	7
7	5	12	15	18	15
8	6,7	6	12	24	13
9	2	18	27	30	26
10	3	20	35	50	35
11	4	40	55	100	60
12	8	11	20	29	20
13	11	14	23	26	22
14	9,12	13	16	19	16
15	10,13,14	0	0	0	0

The weighted average activity time is computed by the following formula:

$$t_e = \frac{a + 4m + b}{6} \qquad (7.1)$$

where t_e = weighted average activity time

a = optimistic activity time (1 chance in 100 of completing the activity earlier under *normal* conditions)

b = pessimistic activity time (1 chance in 100 of completing the activity later under *normal* conditions)

m = most likely activity time

2 Compute the variance for each activity.

The variability in the activity time estimates is approximated by the following equations:

The standard deviation for the activity:

$$\sigma_{t_e} = \left(\frac{b - a}{6}\right) \quad (7.2)$$

The standard deviation for the project:

$$\sigma_{T_E} = \sqrt{\Sigma\sigma^2_{t_e}} \quad (7.3)$$

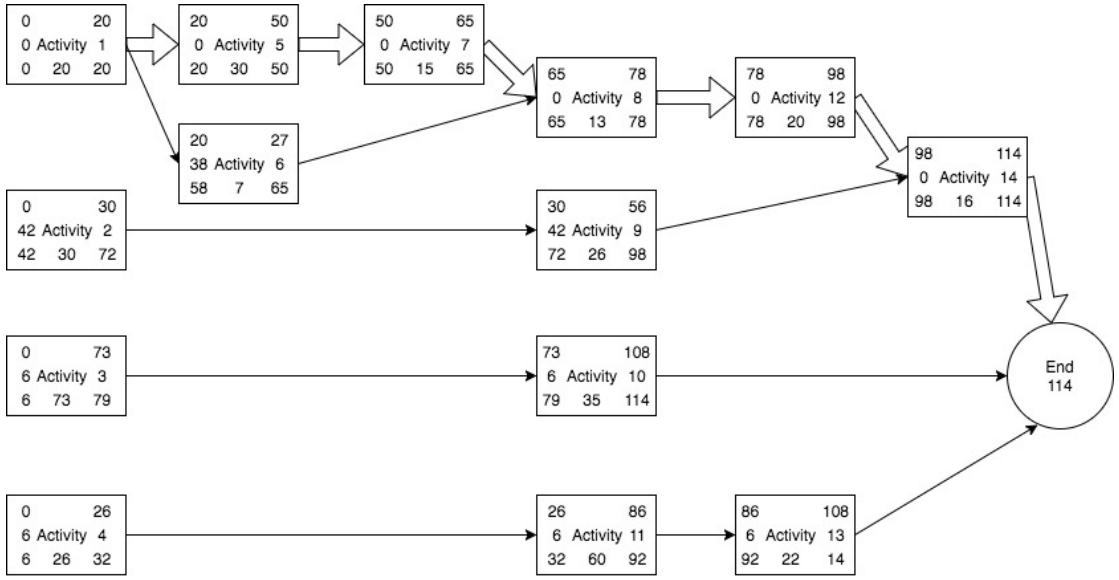
Note the standard deviation of the activity is squared in this equation; this is also called variance. This sum includes only activities on the critical path(s) or path being reviewed.

Activity	Opt. (a)	Ml. (m)	Pess. (b)	t_e	Variance $[(b - a)/6]^2$
1	16	19	28	20	4
2	30	30	30	30	0
3	60	72	90	73	25
4	18	27	30	26	4
5	17	29	47	30	25
6	4	7	10	7	1
7	12	15	18	15	1
8	6	12	24	13	9
9	18	27	30	26	4
10	20	35	50	35	25
11	40	55	100	60	100
12	11	20	29	20	9
13	14	23	26	22	4
14	13	16	19	16	1
15	0	0	0	0	0

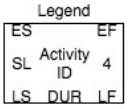
3. Compute the expected project duration.

Duration = 114 days

Activity	Opt. (a)	Ml. (m)	Pess. (b)	t_e	Variance $[(b - a)/6]^2$	Critical?
1	16	19	28	**20**	4	x
2	30	30	30	**30**	0	
3	60	72	90	**73**	25	
4	18	27	30	**26**	4	
5	17	29	47	**30**	25	x
6	4	7	10	**7**	1	
7	12	15	18	**15**	1	x
8	6	12	24	**13**	9	x
9	18	27	30	**26**	4	
10	20	35	50	**35**	25	
11	40	55	100	**60**	100	
12	11	20	29	**20**	9	x
13	14	23	26	**22**	4	
14	13	16	19	**16**	1	x
15	0	0	0	**0**	0	


0 20
0 Activity 1
0 20 20
20 50
0 Activity 5
20 30 50
50 65
0 Activity 7
50 15 65
20 27
38 Activity 6
58 7 65
65 78
0 Activity 8
65 13 78
78 98
0 Activity 12
78 20 98
98 114
0 Activity 14
98 16 114
0 30
42 Activity 2
42 30 72
30 56
42 Activity 9
72 26 98
0 73
6 Activity 3
6 73 79
73 108
6 Activity 10
79 35 114
End
114
0 26
6 Activity 4
6 26 32
26 86
6 Activity 11
32 60 92
86 108
6 Activity 13
92 22 14

Legend


ES
EF
SL
Activity ID
4
LS
DUR
LF

4. What is the probability of completing the project by day 112?

The equation below is used to compute the 'Z' value found in statistical tables (Z = number of standard deviations from the mean), which in turn tells the probability of completing the project in the time specified.

$$Z = \frac{T_S - T_E}{\sqrt{\Sigma \sigma_{t_e}^2}} \qquad (7.4)$$

where T_E = critical path duration
T_S = scheduled project duration
Z = probability (of meeting scheduled duration)

$$\frac{T_S - T_E}{\sqrt{\Sigma \sigma_{t_e}^2}} = \frac{112 - 114}{\sqrt{4+25+1+9+9+1}} = \frac{-2}{\sqrt{49}} = \frac{-2}{7} = -.28$$ **P = 0.3897**

P ≈ .39

Activity	Variance $[(b - a)/ 6]^2$
1	4
2	0
3	25
4	4
5	25
6	1
7	1
8	9
9	4
10	25
11	100
12	9
13	4
14	1
15	0

Within 116 days?

$$\frac{T_S - T_E}{\sqrt{\Sigma \sigma_{t_e}^2}} = \frac{116 - 114}{\sqrt{4+25+1+9+9+1}} = \frac{+2}{\sqrt{49}} = \frac{+2}{7} = +.28$$ **P=0.6103**

P ≈ .61

5. What is the probability of completing activity 11 by day 90?

Critical path duration = 86 days

$$\frac{T_S - T_E}{\sqrt{\Sigma \sigma_{t_e}^2}} = \frac{90 - 86}{\sqrt{4 + 100}} = \frac{+4}{\sqrt{104}} = \frac{+4}{10} = +.40$$

Probability of within 90 days ≈ .65

Activity	Variance $[(b - a)/ 6]^2$
1	4
2	0
3	25
4	4
5	25
6	1
7	1
8	9
9	4
10	25
11	100
12	9
13	4
14	1
15	0

Standard Normal Probabilities

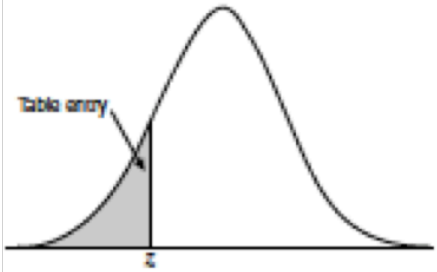


Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641