APPENDIX CASE
ADVANCED ENERGY TECHNOLOGY DATA CENTER MIGRATION—PART B

		Time in Workdays						
	Task Name	Duration	Optimistic Dur.	Most Likely Dur.	Pessimistic Dur.	Immediate Predecessor	Critical Path	Variance
1	**AET DATA CENTER MIGRATION**	69	54	68	92			
2	Team Meeting	1	0.5	1	1.5		✓	0.028
3	Hire Contractors	7	6	7	8	2		0.111
4	Network Design	14	12	14	16	2		0.444
5	**Ventilation System**	29	23	28	39	2		
6	Order Ventilation System	22	18	21	30	2		4.000
7	Install Ventilation System	7	5	7	9	6		0.444
8	**New Racks**	36	30	35	46	2		
9	Order New Racks	15	13	14	21	2	✓	1.778
10	Install Racks	21	17	21	25	9	✓	1.778
11	**Power Supplies and Cables**	46	37	45	60	2		
12	Order Power Supplies & Cables	7	6	7	8	2		0.111
13	Install Power Supplies	6	5	5	11	16,12		1.000
14	Install Cables	8	6	8	10	16,12	✓	0.444
15	Renovation of Data Center	21	19	20	27	3,4		1.778
16	City Inspection	2	1	2	3	3,7,10	✓	0.111
17	**Switchover Meetings**	8	7	8	13	14		
18	Facilities	8	7	8	9	14		0.111
19	Operations/Systems	7	5	7	9	14		0.444
20	Operations/Telecommunications	7	6	7	8	14		0.111
21	Systems & Applications	8	7	7	13	14		1.000
22	Customer Service	7	5	6	13	14	✓	1.778
23	Power Check	1	0.5	1	1.5	14,13,15	✓	0.028
24	Install Test Servers	7	5	7	9	3,18,19,20,21,2	✓	0.444
25	Management Safety Check	2	1	2	3	23,7,24	✓	0.111
26	Primary Systems Check	2	1.5	2	2.5	25	✓	0.028
27	Set Date for Move	1	1	1	1	26	✓	0.000
28	Complete Move	2	1	2	3	27	✓	0.111

1. Probability of completing the project before T_S =
Probability that the total project time is less than T_S =
P[$T < T_S$] = P[$T < 67$] ← We need to use the Z expression to "standardize" the T value:

$$Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} = \frac{67 - 69}{\sqrt{6.639}} = \frac{-2}{2.5766} = -0.776$$

P[Z < -0.776] ≈ 0.24 ← From Table A7.2
Therefore, Probability of completing the project before T_S = 0.24

2. Using Table A7.2, a Z value of +1.5 would be required to ensure that the probability of Z being less than +1.5 equals 0.93 (or a 93% chance). That is …….
P[Z < +1.5] ≈ 0.93 ← From Table A7.2; Therefore…..

$$Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}}; \qquad T_E = T_S - Z\sqrt{\sum \sigma_{t_e}^2}$$

$$T_E = 68 - 1.5\sqrt{6.639} = 64.1 days$$

The expected project duration would have to compressed to 64 days to provide a 93% chance of completion within 68 days.

APPENDIX CASE
ADVANCED ENERGY TECHNOLOGY ACCOUNTS PAYABLE SYSTEM

		Time in Workdays							
	Task Name	Duration t_e	Optimistic Dur.	Most Likely Dur.	Pessimistic Dur.	Immediate Predecessor	Critical Path	Variance	
1	**ACCOUNTS PAYABLE SYSTEM**								
2	Planning Meeting	1	1	1	2		✓	0.028	0.028
3	Team Assignments	4	3	4	5	2	✓	0.111	0.111
4	**Program Specification**								
5	Customer Requirements	10	8	10	12	3	✓	0.444	0.444
6	Feasibility Study	5	3	5	7	5		0.444	
7	Systems Analysis	8	6	8	10	5	✓	0.444	0.444
8	Prelim Budget & Schedule	2	1	2	3	7	✓	0.111	0.111
9	Functional Specification	5	3	5	7	7	✓	0.444	0.444
10	Prelim Design	12	10	12	14	9	✓	0.444	0.444
11	Configuration & Perf Needs	4	3	4	5	10	✓	0.111	0.111
12	Hardware Requirements	6	4	6	8	11	✓	0.444	0.444
13	System Specification	7	5	7	9	10		0.444	
14	Detailed Design	14	12	14	16	12,13	✓	0.444	0.444
15	Program Specification	10	8	10	12	14	✓	0.444	0.444
16	Programming--First Phase	32	27	32	37	15	✓	2.778	2.778
17	Documentation	16	14	16	18	10		0.444	
18	**Prototype**								
19	Development	7	5	7	9	16	✓	0.444	0.444
20	User Testing & Feedback	14	12	14	16	19	✓	0.444	0.444
21	Programming--Second Phase	12	10	12	14	16		0.444	
22	Beta Testing	20	18	20	22	21		0.444	
23	Final Documentation Pkg	10	9	10	11	17,20	✓	0.111	0.111
24	Training Pkg	5	4	5	6	21SS,23	✓	0.111	0.111
25	Product Release	5	3	5	7	22,23,24	✓	0.444	0.444
	149 days==> critical path							σ^2 =	7.806

1 Probability of completing the project before 147 days =
P[T < 140] = P[T< 147] ← We need to use the Z expression to "standardize" the T value:

$$Z = \frac{T - T_E}{\sqrt{\sum \sigma_{t_e}^2}} = \frac{\mathbf{147 - 149}}{\sqrt{\mathbf{7.806}}} = \frac{\mathbf{-2}}{\mathbf{2.7939}} = \mathbf{-0.7158}$$

P[Z < -0.7158] ≈ 0.24 ← From Table A7.2
Therefore, Probability of beating the delivery date by two day (147 days) = 0.24

1. Using Table A7.2, a Z value of +2.0 would be required to ensure that the probability of Z being less than +2.0 equals 0.98 (or a 98% chance). That is ……. P[Z < +2.0] ≈ 0.98 ← From Table A7.2; Therefore…..

$$Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}}; \qquad T_E = T_S - Z\sqrt{\sum \sigma_{t_e}^2}$$

$$T_E = \mathbf{160 - 2.0\sqrt{7.806}} = \mathbf{154.4}\, days$$

The expected project duration (T_E) would have to be compressed to 154 days to provide a 98% chance of completion within 160 days.