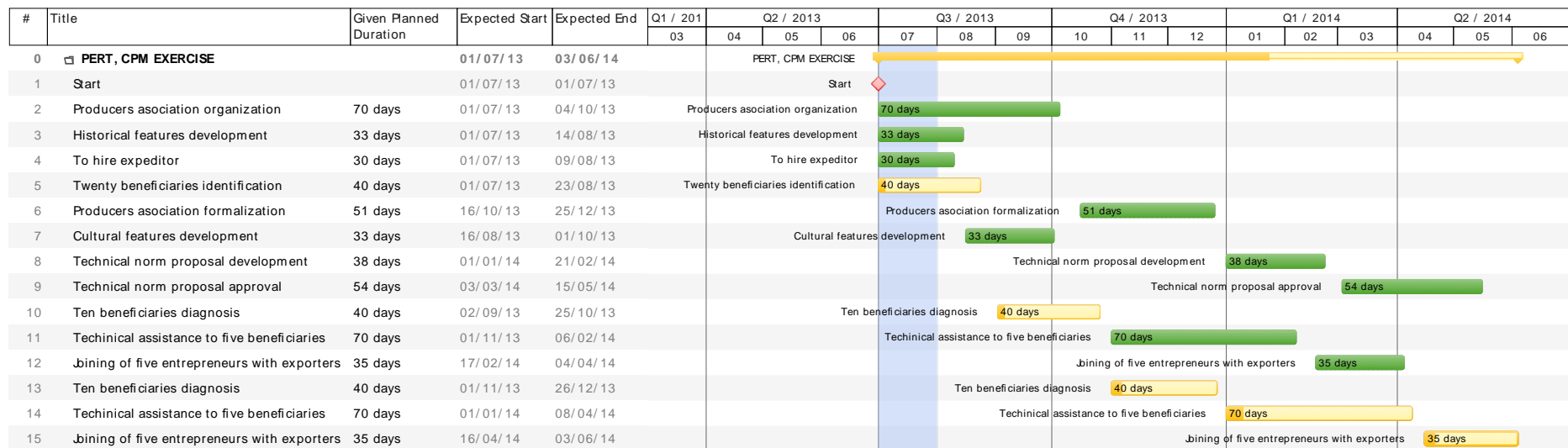


NETWORKS, PERT AND CPM EXERCISE SOLUTION

DESCRIPTION

This document summarizes the answers to the exercise so that students can evaluate their work by comparing their answers to the ones in this document.

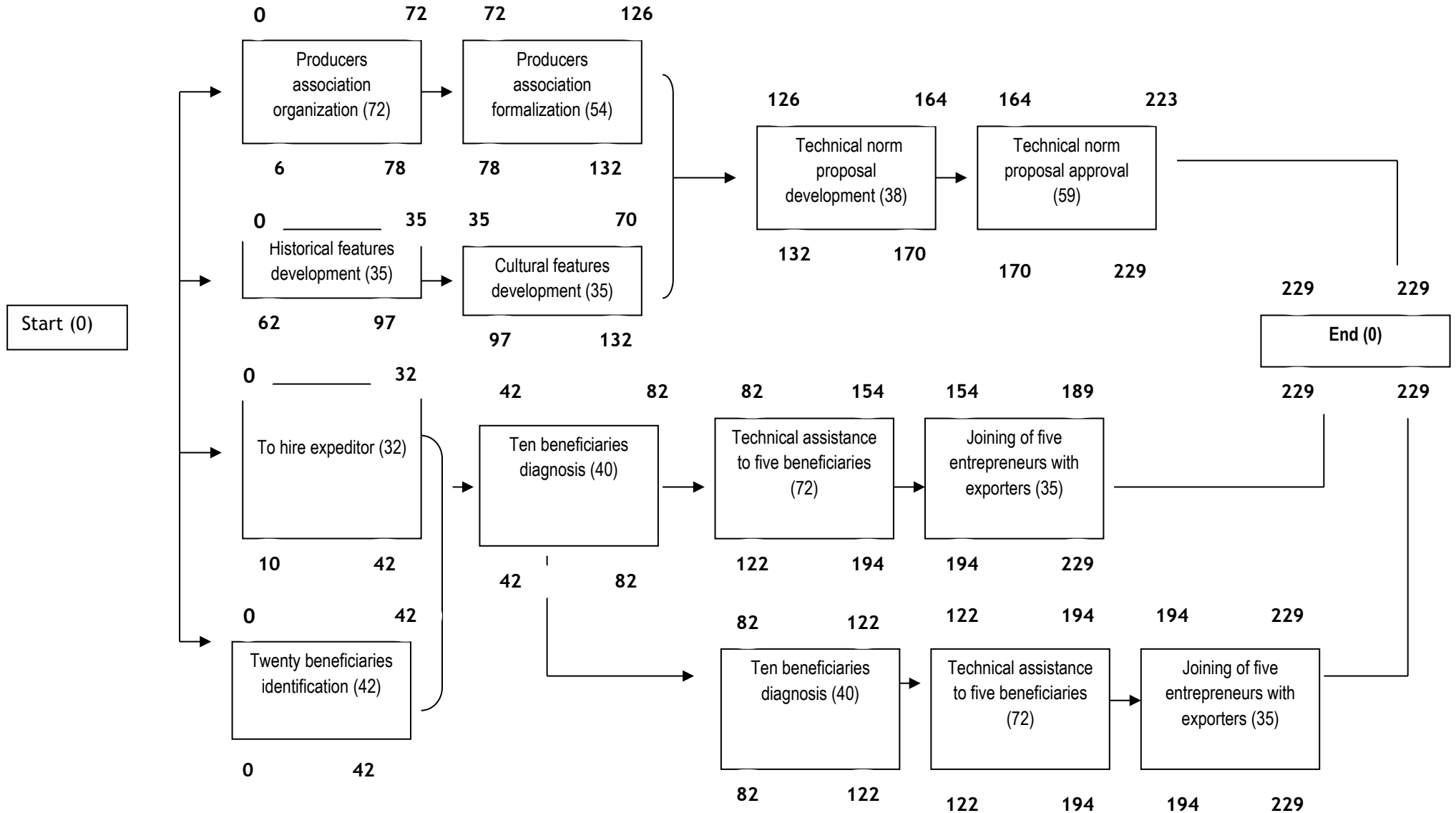
1. Gantt diagram (notice that there are no dependencies shown on a Gantt diagram)



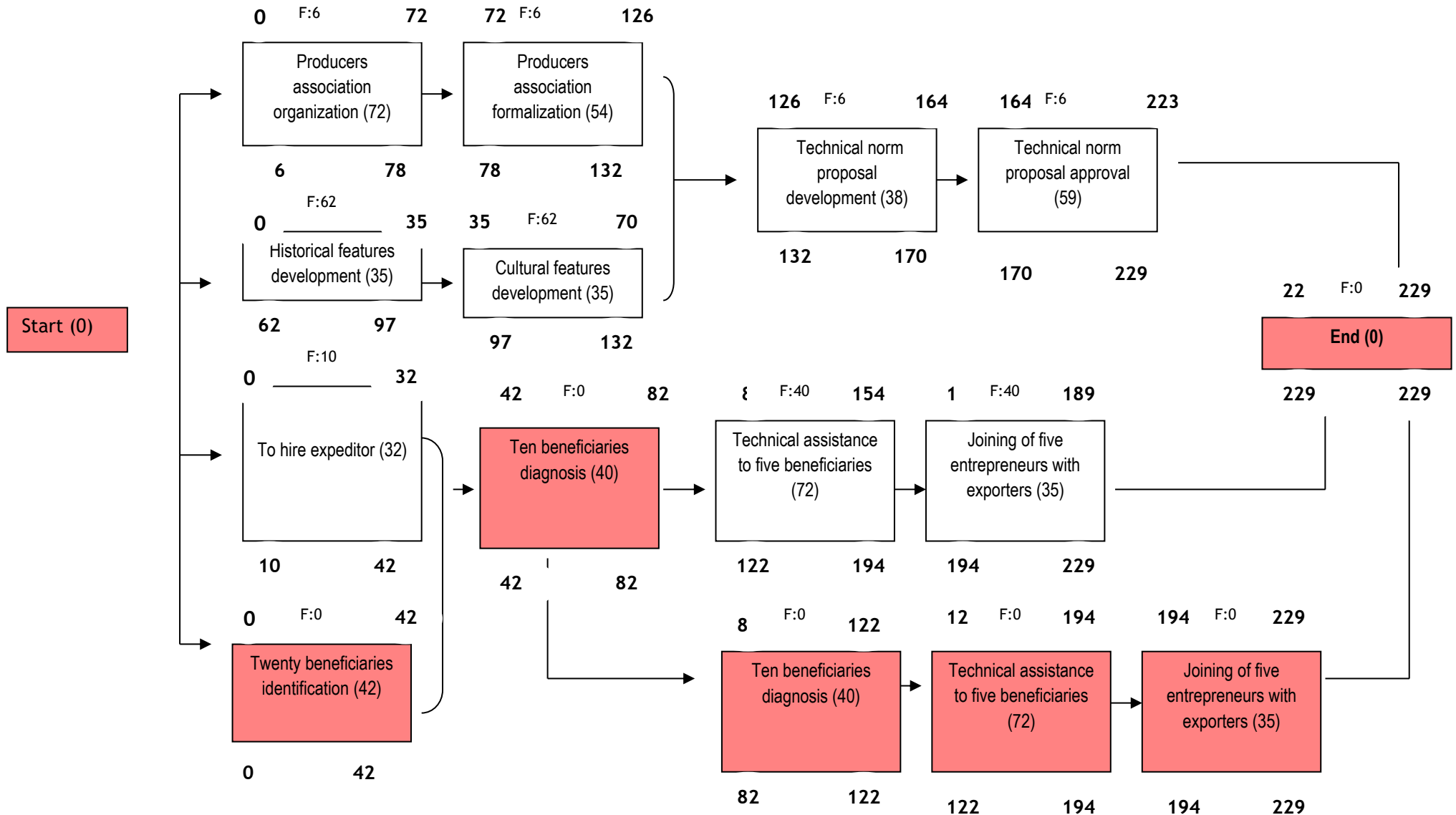
2. In the following table, the three-point estimating technique is used to calculate the expected duration (tE) for each activity as $tE = (tO + 4tM + tP) / 6$.

ID	Description	Predecessor	Optimistic duration	Most likely duration	Pesimistic duration	Expected duration
1	Start	NA	0	0	0	0
2	Producers Association Organization	1	59	70	93	72
3	Historical Features Development	1	22	33	56	35
4	To Hire Expeditor	1	22	30	50	32
5	Twenty Beneficiaries Identification	1	31	40	61	42
6	Producers Association Formalization	2	30	51	90	54
7	Cultural Features Development	3	22	33	56	35
8	Technical Norm Proposal Development	6,7	25	38	51	38
9	Technical Norm Proposal Approval	8	36	54	102	59
10	Ten Beneficiaries Diagnosis	4,5	25	40	55	40
11	Technical Assistance To Five Beneficiaries	10	59	70	93	72
12	Joining Of Five Entrepreneurs With Exporters	11	25	35	45	35
13	Ten Beneficiaries Diagnosis	10	25	40	55	40
14	Technical Assistance To Five Beneficiaries	13	59	70	93	72
15	Joining Of Five Entrepreneurs With Exporters	14	25	35	45	35

3- Network diagram and project duration (229 days)



4 - Critical path (shown in red and calculated based on the pass forward and backward in order to determine float (F))



5 – Critical path duration with a probability of 84%

Once the critical path is identified (see Section 4), the variance is calculated using the formula, $\sigma^2 = ((tP - tO) / 6)^2$ for each activity on the critical path.

Once the variances for each critical path activity are calculated, they are added up to obtain the critical path variance and finally the standard deviation is calculated using the formula, $\sigma = \sqrt{\sigma^2}$.

To calculate the 84% probability, we just need to add one standard deviation to the critical path duration (229 days + 10.87 days = 239.87 days).

ID	Description	Predecessor	Optimistic ² duration	Most likely ² duration	Pessimistic ² duration	Expected ² duration	Variance
1	Start	NA	0	0	0	0	0,00
2	Producers Association Organization	1	59	70	93	72	32,11
3	Historical Features Development	1	22	33	56	35	32,11
4	To Hire Expeditor	1	22	30	50	32	21,78
5	Twenty Beneficiaries Identification ²	1	31	40	61	42	25,00
6	Producers Association Formalization	2	30	51	90	54	100,00
7	Cultural Features Development	3	22	33	56	35	32,11
8	Technical Norm Proposal Development	6,7	25	38	51	38	18,78
9	Technical Norm Proposal Approval	8	36	54	102	59	121,00
10	Ten Beneficiaries Diagnosis	4,5	25	40	55	40	25,00
11	Technical Assistance To Five Beneficiaries	10	59	70	93	72	32,11
12	Joining Of Five Entrepreneurs With Exporters	11	25	35	45	35	11,11
13	Ten Beneficiaries Diagnosis	10	25	40	55	40	25,00
14	Technical Assistance To Five Beneficiaries	13	59	70	93	72	32,11
15	Joining Of Five Entrepreneurs With Exporters	14	25	35	45	35	11,11
						Critical path ² variance	118,22
						Critical path ² standard deviation	10,87

6 - Other considerations regarding the exercise

Through the network diagram we can determine the critical and non-critical paths based on the activities sequences. Notice that the number indicated corresponds to the activity ID.

Critical path (CP): 1 – 5 – 10 – 13 – 14 – 15 – End

Non-critical paths (NC): 1 – 2 – 6 – 8 – 9 – End

 1 – 3 – 7 – 8 – 9 – End

 1 – 4 – 10 – 11 – 12 – End

 1 – 4 – 10 – 13 – 14 – 15 – End

 1 – 4 – 10 – 11 – 12 – End

The critical path variance was already calculated in Section 5. If the variance for another path needs to be calculated, we just need to add up the variances of each one of the activities in the sequence. For example, for the non-critical path 1 – 2 – 6 – 8 – 9 – End, the sum of variances adds up to 271.88. Then we calculate the square root of the total variance and the result is 16.49 days which corresponds to the non-critical path standard deviation.