Università di Roma Tor Vergata

MASTER OF SCIENCE IN BUSINESS ADMINISTRATION

PROJECT MANAGEMENT

Exercises

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Exercise n°1

- A company is considering two projects, project A and project B. The relevant information for net present value analysis is given below:

	Project A	Project B
Investment required	€190.000	€210.000
Annual Cash Inflow	€100.000	€120.000

- Assumed is a discount rate of 5% per year. Looking at the present values of the benefits of these projects in the first 2 years, what is true?

a) Both projects are equally attractive.
b) Only the project A is profitable.
c) Only the project B is profitable.
d) The project B has a Net Present Value equal to the project A.

Solution Exercise n°1

- NPV of Project A = -190.000 + 100.000/1,05 + 100.000/1,05^2 = -4.059€
- Project A is not profitable.

- NPV of Project B = -210.000 + 120.000/1,05 + 120.000/1,05^2 = 13.129 €
- Project B is profitable.

- What is true?
  a) Both projects are equally attractive.
  b) Only the project A is profitable.
  c) Only the project B is profitable.
  d) The project B has a Net Present Value equal to the project A.

Exercise n°2

- A company has to make a choice between two projects, because the available resources in money and kind are not sufficient to run both at the same time. Each project would take 1 year and would cost 120.000 €.
- The first project would be the development of a new product which could produce the following net profits after the end of the project:

1. year: 15.000 €
2. year: 35.000 €
3. year: 65.000 €
4. year: 140.000 €

- The second project is a process optimization which would result in a cost reduction of 65.000 € per year. This benefit would be achieved immediately after the end of the project.
- The discount rate of the company is 6%. Looking at the benefits of these projects in the first 4 years, which one of the following sentences is true?

a) The first project has a payback lower than 2 years.

b) The first project has a payback lower than 3 years.

c) Looking at the present values of the benefits of these projects, the second project is more attractive by app. 14%.

d) Looking at the present values of the benefits of these projects, the second project is more attractive by app. 16%.

Solution Exercise n°2

- Project 1: At the end of third year, 115.000€ will have been recovered, still not enough to repay the initial investment.
- NPV of Project 1 = $-120.000 + 15.000/1,06 + 35.000/1,06^2 + 65.000/1,06^3 + 140.000/1,06^4 = 90.769$ €
- NPV of Project 2 = $-120.000 + 65.000/1,06 + 65.000/1,06^2 + 65.000/1,06^3 + 65.000/1,06^4 = 105.232$ €
- % of attractiveness for Project 2 = (105.232 - 90.769) * 100 / 90.769 = 15,9%
- What is true?
  a) The first project has a payback lower than 2 years.
  b) The first project has a payback lower than 3 years.
  c) Looking at the present values of the benefits of these projects the second project is more attractive by app. 14%.
  d) Looking at the present values of the benefits of these projects the second project is more attractive by app. 16%.

Exercise n°3

- A company is trying to choose the best investment project from two alternative projects. Information about the two alternatives is given below:

	Project A	Project B
Investment required	200.000	200.000
Annual cash inflows (1st - 5th year)	80.000	10.000
Annual cash inflow (6th year)	80.000	450.000

- The discount rate of the company is 5%. Which one of the following sentences is true?

a) Both projects are equally profitable.
b) Project A is the more profitable and the less risky.
c) Project B is the more profitable and the less risky.
d) Project B is the more profitable but the more risky.

Solution Exercise n°3

- NPV of Project A = -200.000 + 80.000/1,05 + 80.000/$1,05^2$ + 80.000/$1,05^3$ + 80.000/$1,05^4$ + 80.000/$1,05^5$+ 80.000/$1,05^6$ = 206.055 €

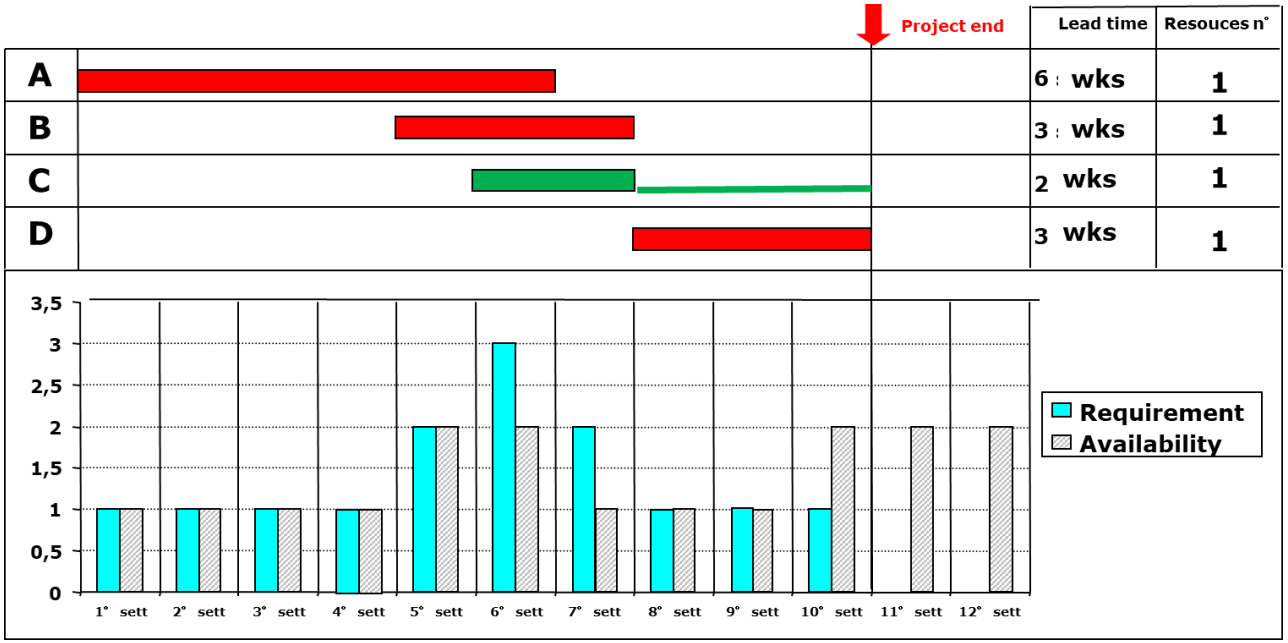
- NPV of Project B = -200.000 + 10.000/1,05 + 10.000/$1,05^2$ + 10.000/$1,05^3$ + 10.000/$1,05^4$ + 10.000/$1,05^5$+ 450.000/$1,05^6$ = 179.092 €

- Project A is more profitable and less risky.

- Which one of the following sentences is true?
  - a) Both projects are equally profitable.
  - **b) Project A is the more profitable and the less risky.**
  - c) Project B is the more profitable and the less risky.
  - d) Project B is the more profitable but the more risky.

Exercise n°4

- A company is attempting to eliminate overloads in the resources required for a project. The initial situation is described by the figure below.



- Which one of the following sentences is true?

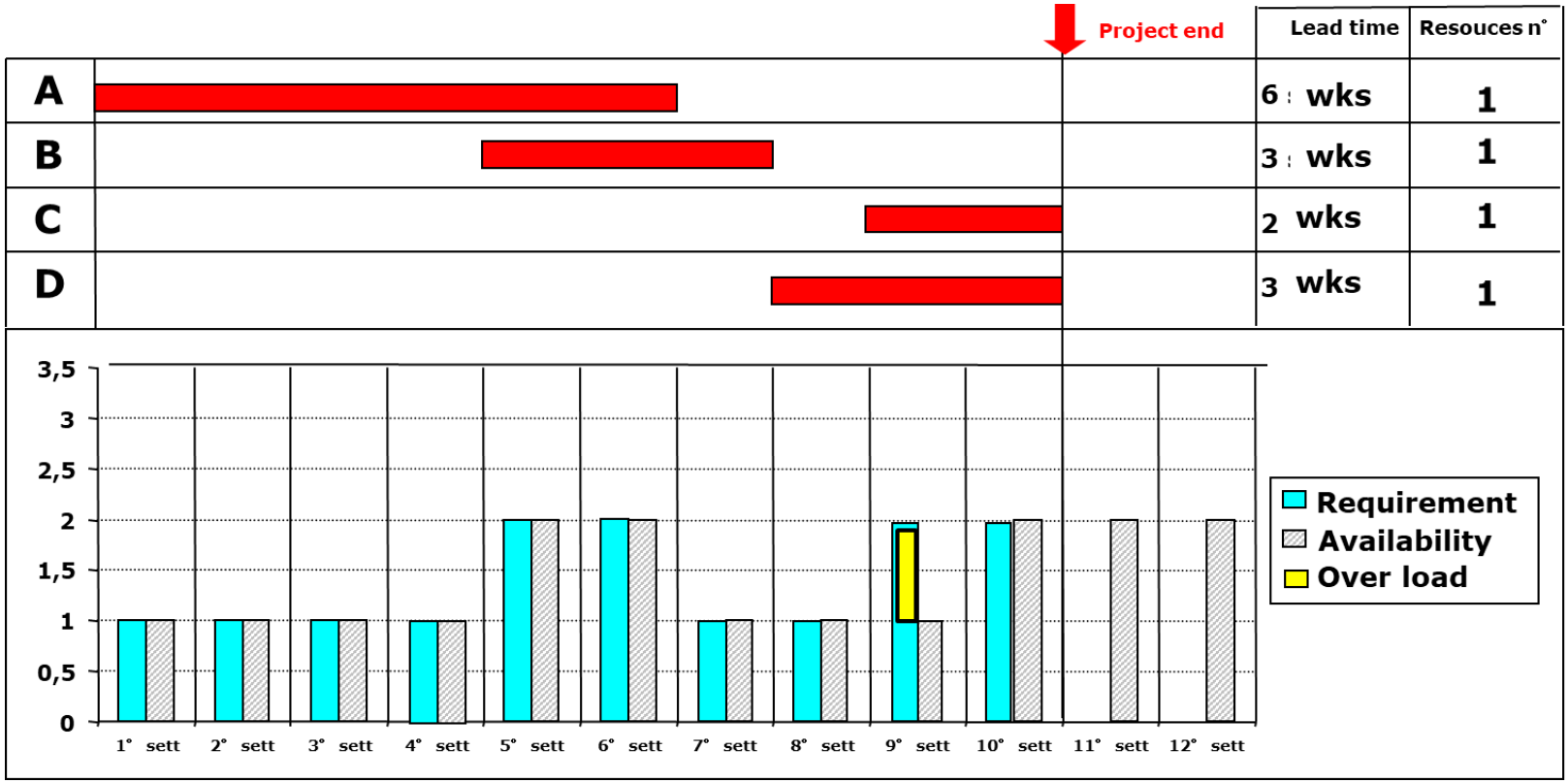
a) It is possible to apply the resource smoothing technique and guarantee the project end without requiring changes in the availability of the resources.

b) Using the resource leveling technique the new project end will be 12 weeks.

c) Using the resource leveling technique the new project end will be 10 weeks.

d) Using the resource leveling technique the new project end will be 11 weeks.

Solution Exercise n°4

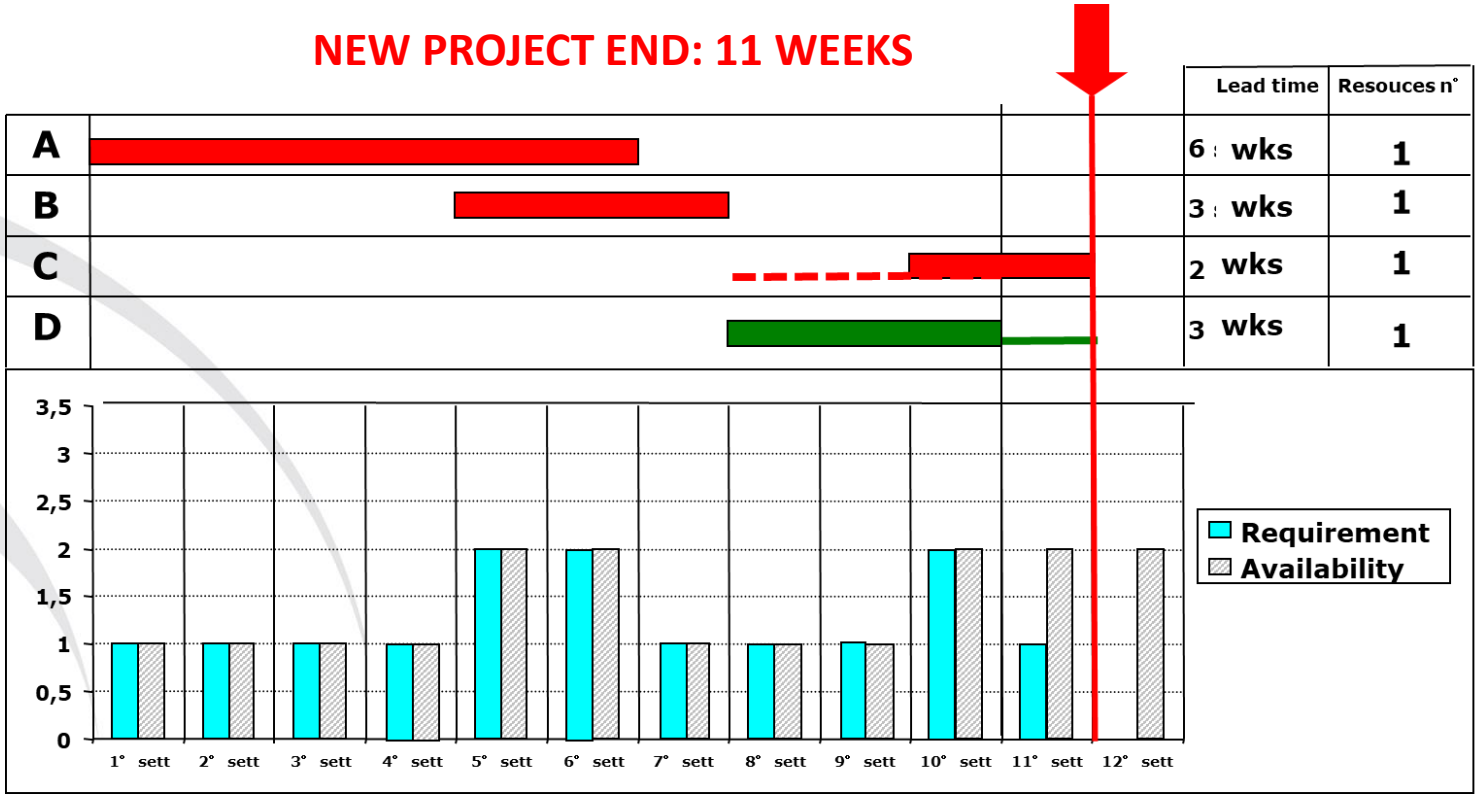


RESOURCE SMOOTHING
(Time Constrained Schedule)

- In this case it is **NOT** possible to apply the resource smoothing technique and guarantee the project end **without** requiring changes in the **availability** of the resources.

Solution Exercise n°4

RESOURCE LEVELING
(Resource Constrained Schedule)



- Which one of the following sentences is true?

a) It is possible to apply the resource smoothing technique and guarantee the project end without requiring changes in the availability of the resources.

b) Using the resource leveling technique the new project end will be 12 weeks.

c) Using the resource leveling technique the new project end will be 10 weeks.

d) Using the resource leveling technique the new project end will be 11 weeks.

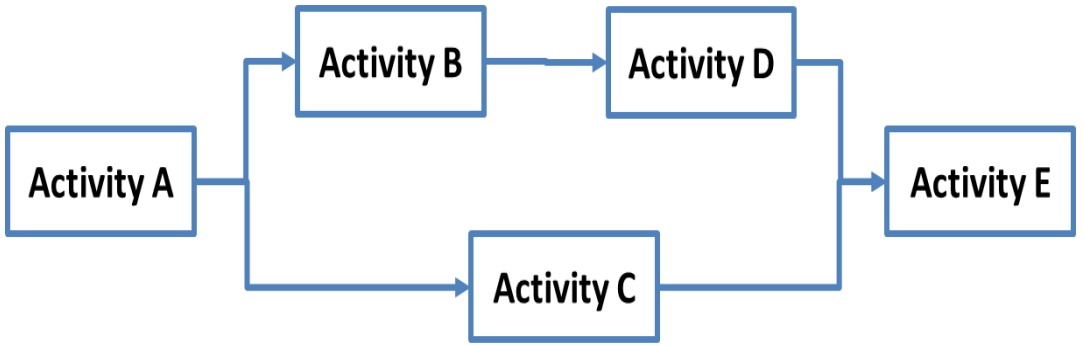
Exercise n°5

- The PM has to choose the activity to crash in order to reduce the duration of the project of 1 week. Information about the alternatives is given in the table:

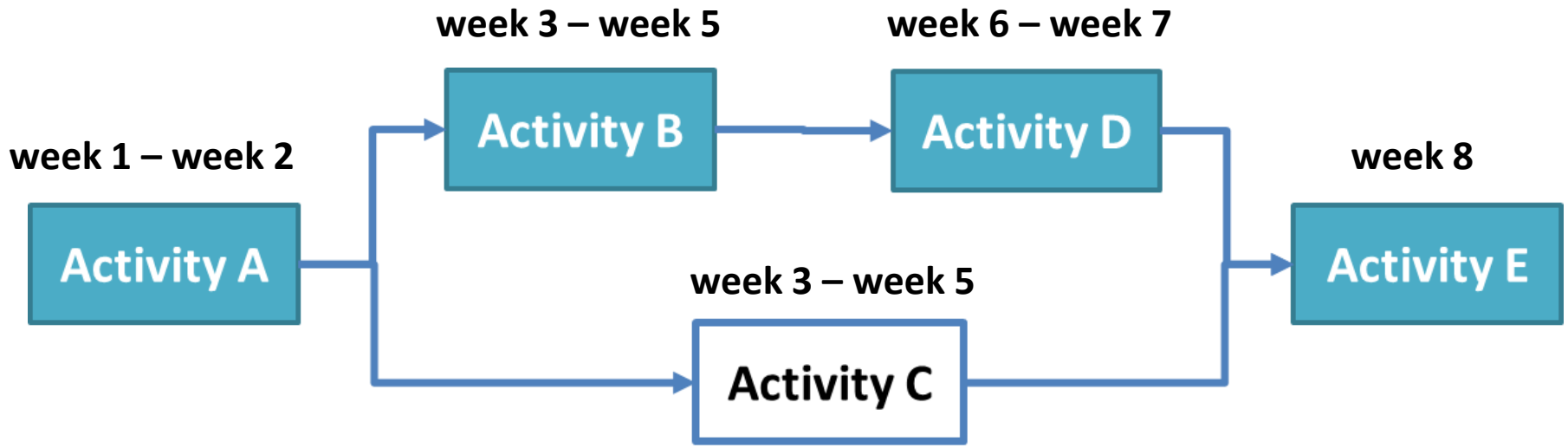
Activity	Duration (weeks)	Minimum Duration (weeks)	Crashing Cost (€/week)
A	2	2	-
B	3	2	100 €
C	3	2	100 €
D	2	1	200 €
E	1	1	-

- Which one of the following sentences is true?

a) The PM should crash Activity A.
b) The PM should crash Activity B.
c) The PM should crash Activity C.
d) The PM should crash Activity D.



Solution Exercise n°5



Critical Path:

A – B – D - E

Activity	Duration (weeks)
A	2
B	3
C	3
D	2
E	1

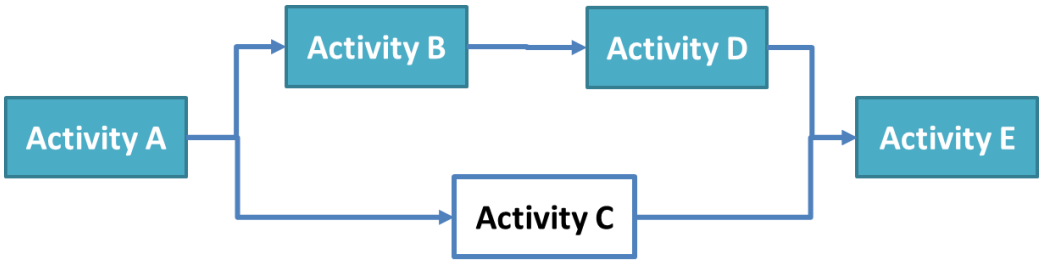
Solution Exercise n°5

- Activity A cannot be crashed.
- Activity B can be crashed with a cost of 100 €.
- Activity D can be crashed with a cost of 200 €.
- Activity C is not on the critical path so a reducing its duration would not change the duration of the project.

Activity	Duration (weeks)	Minimum Duration (weeks)	Crashing Cost (€/week)
A	2	2	-
B	3	2	100 €
C	3	2	100 €
D	2	1	200 €
E	1	1	-

- Which one of the following sentences is true?

a) The PM should crash Activity A.
b) The PM should crash Activity B.
c) The PM should crash Activity C.
d) The PM should crash Activity D.

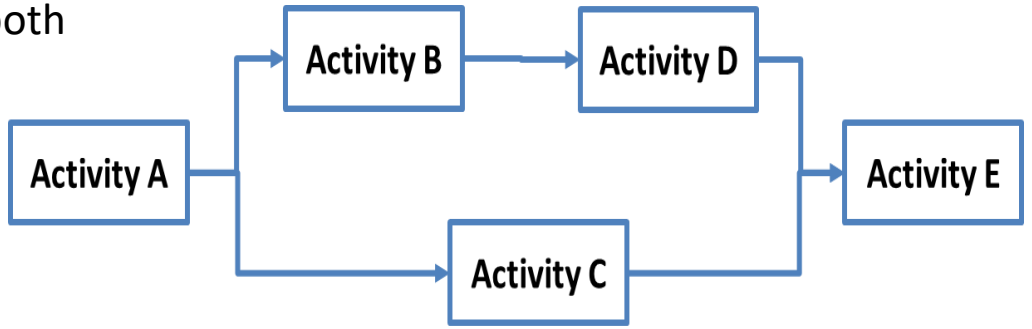


Exercise n°6

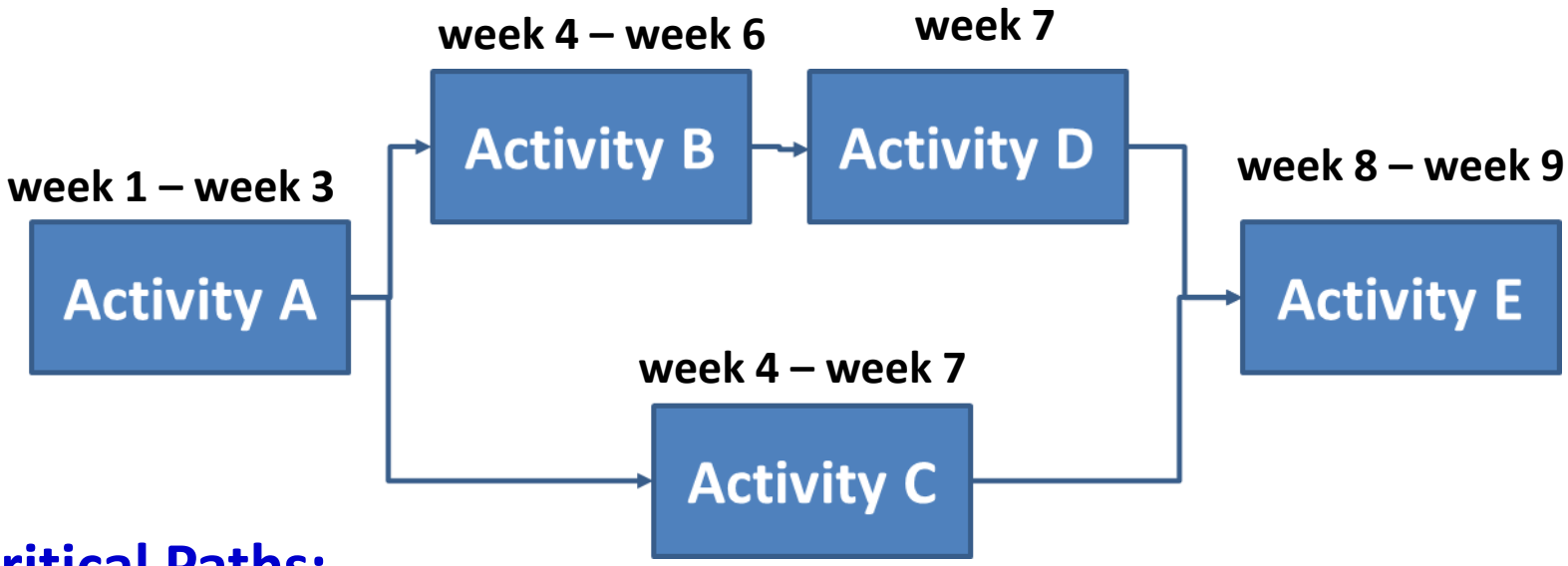
- The PM has to choose the activities to crash in order to reduce the duration of the project of 2 weeks. Information about the alternatives is given in the table:

Activity	Duration (weeks)	Minimum Duration (weeks)	Crashing Cost (€/week)
A	3	1	50 €
B	3	1	50 €
C	4	2	50 €
D	1	1	-
E	2	1	200 €

- Which one of the following sentences is true?
  a) The PM should crash Activity A.
  b) The PM should crash simultaneously both Activity B and Activity C.
  c) The PM should crash Activity C.
  d) The PM should crash Activity D.



Solution Exercise n°6



Critical Paths:

A – B – D – E

and

A – C – E

Activity	Duration (weeks)
A	3
B	3
C	4
D	1
E	2

Solution Exercise n°6

- **All** activities are on a critical path.
- Both Activity B and Activity C have to be crashed at the same time in order to reduce the duration of the project.
- **Crashing Cost (B + C)** = 50*(3 -1) + 50*(4 -2) = 200 €
- **Crashing Cost (A)** = 50 € *(3 -1) = 100 €
- Activity D cannot be crashed.

Activity	Duration (weeks)	Minimum Duration (weeks)	Crashing Cost (€/week)
A	3	1	50 €
B	3	1	50 €
C	4	2	50 €
D	1	1	-
E	2	1	200 €

- Which one of the following sentences is true?
  - a) **The PM should crash Activity A.**
  - b) The PM should crash simultaneously both Activity B and Activity C.
  - c) The PM should crash Activity C.
  - d) The PM should crash Activity D.