Project Management Exercises

PM_1:

Consider the following data about the "OnTime" project:

Act.	A	B	C	D	E	F	G	H	I	J	K	L
Pred.	-	-	-	A	C	BDE	BDE	F	F	GH	IJ	GH
t(days)	2	3	1	3	4	2	3	1	1	2	3	3

a) Draw the project network using A-O-A.
b) Determine ES, EF, LF, LS for each activity.
c) What is the completion time of the project?
d) Identify all paths.

PM_2:

Consider the following data about the "WithTime" project:

Activ	A	B	C	E	F	G	H	I	J
Pred.	-	-	-	AB	AB	B	C	C	EGH
t(days)	5	4	8	6	4	5	2	3	4

a) Draw the project network using A-O-N.
b) Determine ES, EF, LF, LS for each activity.
c) What is the completion time of the project?
d) Identify all paths.

PM_3:

Consider the project "INOVTIME". The list of activities (A to I) and their optimistic completion time, the most likely completion time, and the pessimistic completion time are given in the following table:

		Time (days)		
Activ.	Pred.	a	m	b
A	---	1	1	1
B	---	1	2	3
C	---	1	3	5
D	C	2	3	4
E	A	1	2	3
F	B	2	2	2
G	E,F	1	3	5
H	E,F	3	7	11
I	D,G	2	5	8

a) Draw the project network using A-O-A.
b) Determine the expected completion time and variance for each activity.
c) What is the minimum time to complete the project? Write down the critical path.

PM_4:

The “NAVYTEC” project is composed by the following activities:

Activity	Immediate predecessor (s)	Expected time (days)	Standard deviation (days)
A	----	7	3
B	----	8	1
C	A	12	2
D	A	6	3
E	B	3	2
F	E,D	6	1
G	C	10	4
H	E,D	2	2
I	H	8	1
J	G,H	6	2

a) Represent the project using the A-O-N network diagram.
b) Determine the earliest start (ES) and latest start (LS) for all activities. Identify the critical path activities.
c) Knowing that the optimistic time and pessimistic time for activity B is 4 and 16 days, respectively. Determine the most likely time this activity.
d) What is the probability that the project will take less than 34 days?

PM_5:

Consider the project "WITHOUT-TIME". The list of activities (A to J) and their optimistic completion time, the most likely completion time, and the pessimistic completion time are given in the following table:

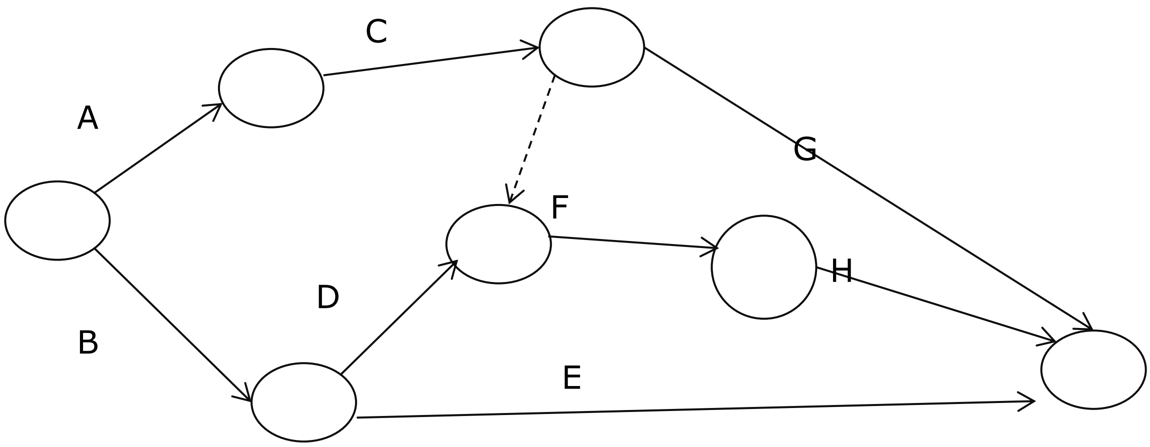
		Time (days)		
Activ.	**Pred.**	**a**	**m**	**b**
A	----	2	2	2
B	----	1	1	1
C	B	1	2	3
D	A	2	3	4
E	A	1	2	3
F	C,D	3	4	5
G	E,F	1	2	3
H	C,D	2	3	4
I	G	1	1	1
J	H,I	4	5	6

a) Draw the project network using AOA.
b) Determine the total project completion time and the critical path for the project.
c) What is the probability that the project will take less than 16 days?
d) Assuming that each one of the critical activities has a cost of €200 per day and each one of non-critical activities a cost of €100 per day, determine the total cost of the project.
e) If the contractor finishes the project at least two days before the deadline he receives a bonus of 10% of the project value which is 1.5 million euros. If there is a delay of 1 or more days the contractor will face a penalty of 12.5%. What is the expected value of the project?

PM_6:

The GELFRIO company has awarded the construction contract of a new cross-docking warehouse to BETUM. The project manager of BETUM identified the following activities required to build the warehouse:

Activity	A	B	C	D	E	F	G	H
Predecessor	-	-	A	B	B	C,D	C	F
Expected time (weeks)	2	3	7	5	2	2	3	4
Standard deviation (weeks)	1	2	3	1	2	1	1	3
Slack (S)	0	1	0	1	10	0	3	0



a) Determine the average completion time of the project and identify the critical path.
b) Assume that activities A and G are delayed by 3 and 2 weeks, respectively. What is the impact of these delays in the average completion time of the project?
c) The contract states that BETUM will receive a lump sum equivalent to 30% of the expected receipt value of the project upon signing it. The contract value is 500,000 €. BETUM will receive a 20% bonus in the event the project is finished two or more weeks before the expected finishing date. On the other hand, if the project is delayed one or more weeks, BETUM will have a 25% penalty.
   Assume that the probability of the project being delayed by one or more weeks compared to the deadline is 41.29%, and that the probability of finishing the project two or more weeks before the deadline is 32.64%.
   Find the lump sum that BETUM will receive upon signing contract.

PM_7:

MODULEX was contracted to construct an industrial warehouse. The Project Manager presented the activities required to complete the construction project, and their respective duration (in weeks), and also their associated costs (in Euros):

Activities	A	B	C	D	E	F	G	H
Predecessors	-	A	-	B,C	B	D,E	F	D
Normal Time	2	4	8	6	3	10	4	3
Crash Time	1	2	5	3	1	6	4	3
Normal Cost	1,140	910	900	1,075	1,100	1,600	500	850
Crash Cost	1,210	1,040	1,050	1,525	1,130	2,100	500	850

a) [1.0] Draw the project network.
b) [1.0] Determine the duration and cost of the project.
c) [2.0] Explain how the duration of the project can be reduced by 4 weeks, and what would be the cost of this reduction?
d) [1.0] MODULEX will need a vehicle to transport its personnel to the construction site, and has asked for a quote from a car hire firm. Knowing that the cost of the car hire is 120 Euros a week, what is the optimum duration of the project (that which minimizes the total cost)?

PM_8:

The ITConsulting company is developing a new Information System. It estimates the following activities and costs for the completion of the project:

Activities	A	B	C	D	E	F	G	H
Predecessors	-	-	-	A	B	A, C	E	F, G
Normal Time (days)	4	2	3	7	1	9	8	6
Crash Time (days)	2	1	1	5	1	7	6	5
Normal Cost (€)	50	200	100	150	200	300	50	150
Crash Cost (€)	80	220	110	200	200	380	65	180

a) Draw the project network.
b) Determine the project completion time and the critical path.
c) Determine the total cost of the project.
d) The company decided that the project completion time must be anticipated by 4 days with the minimum cost increase. Which activities should be crashed and what is the minimum cost increase?

PM_9:

Consider the following table showing data for the project TECHPRO:

Activity	A	B	C	D	E	F	G	H
Predecessor	-	-	A	B,C	B	C	D,E,F	F
Normal time = tn (weeks)	3	4	2	5	4	6	3	2
Crash time= tc (weeks)	2	2	2	4	3	3	1	2
Normal cost = cn (1,000 €)	160	210	250	120	700	120	100	100
Crash cost = cc (1,000 €)	220	260	250	135	800	210	200	100
Crash cost/week	60	25	---	15	100	30	50	---
tn-tc	1	2	---	1	1	3	2	---

Having analysed the network diagram, the project manager identified the following possible paths:
ACFH= 13
ACFG = 14
ACDG = 13
BEG = 11
BDG= 12

a) Identify the critical path, and the total cost of the project;
b) Suppose that the client of the TECHPRO project has a budget of 1,900,000 euros. In how many weeks can you anticipate the project completion? What activities should be crashed?

PM_10:

The SMARTC car company is building a car prototype for a new model. The necessary activities are listed below:

Activity	Immediate predecessor	Normal Time (weeks)	Crash Time (weeks)	Normal cost (€)	Crash cost (€)
A	-	3	2	1,500	2,100
B	-	4	2	2,000	2,500
C	A	2	2	2,000	2,000
D	B, C	5	4	1,000	1,800
E	B	4	3	800	900
F	C	6	3	1,200	2,100
G	D, E, F	3	1	1,000	2,000
H	F	2	2	1,500	1,500
I	G	2	1	700	1,100

a) Draw a network diagram.
b) What is the project completion time?
c) To reduce the total time of the project by three weeks what activities should be crashed?
d) What is the minimum time to complete the project? What is its optimal cost?

PM_11:

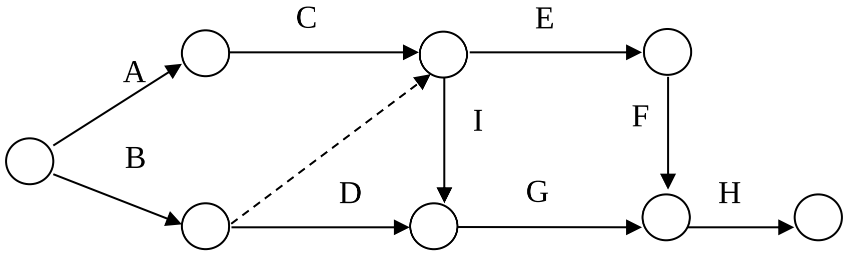
Consider the following data about the XT project:

Activity	A	B	C	D	E	F	G	H
Immediate predecessor	-	-	-	C	A	A	C	B,D,E
Normal Time (days)	4	1	5	2	2	1	2	3
Crash Time (days)	3	1	3	1	1	1	2	1
Normal cost (€1,000)	50	60	70	50	25	10	80	30
Crash cost (€1,000)	55	60	90	62	28	10	80	38

With a budget of €400,000 how many days can you anticipate the completion of the project?

Multiple Choice Questions

1. Consider the project CENTRO with network diagram, expected activity durations, and standard deviations represented below:



Activities	A	B	C	D	E	F	G	H	I
Expected duration (days)	3	8	3	3	2	4	6	3	5
Standard deviation (days)	4	4	2	2	1	2	2	1	1

What is the minimum duration of the project CENTRO?		
1		18 days
2		22 days
3		20 days
4		15 days

The early finish (EF) of activity E is:		
1		8 days
2		11 days
3		10 days
4		12 days

Knowing that the most likely and pessimistic durations for activity G are 5 and 14 days, respectively, what is the optimistic duration?		
1		3 days
2		5 days
3		2 days
4		6 days

Consider a new project with identical expected durations and standard deviations as before, but with a different set of preceding activities. Assuming the critical path of such new project is ABDF, what is the probability that the project duration exceeds 20 days?

1		0.3745
2		0.6255
3		0.5675
4		0.4325

2. The contract agreed upon for project LISHOME defines that if the contractor finishes the project before the 6th month, a bonus of 15% over the project value (5 million euros) is paid. However, if the contractor only concludes the project after the 10th month a 30% penalty over the value of the project is to be enacted. It is known that the probability of concluding the project in more than 10 months is 12% and that the likelihood of finishing the project in less than 6 months is of 4%.

What is the expected value the contractor will receive for the LISHOME project?		
1		5.030 million de euros
2		7.510 million de euros
3		4.850 million de euros
4		0.650 million de euros

3. Consider the following data taken from the DMP project:

Activities	A	B	C	D	E	F	G	H
Normal time (weeks)	5	2	2	2	3	4	4	5
Crash time (weeks)	4	1	2	1	1	4	3	2
Normal cost (euros)	1000	1000	800	700	800	800	900	500
Crash cost (euros)	1200	1070	800	1200	1600	800	1400	800

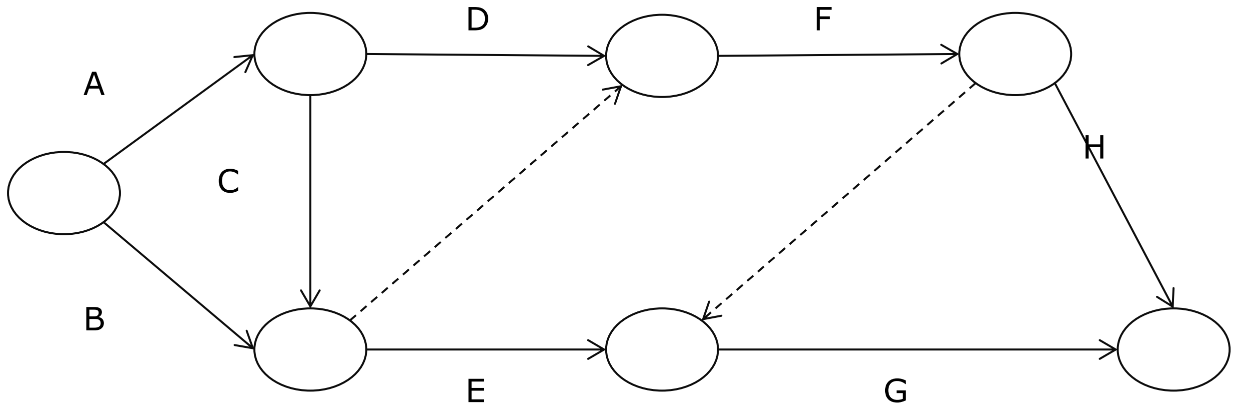
After the graphical representation of the network diagram of project DMP the following paths were identified:

BDF
ACEH
BCH
ABEG

Compute the total cost of project DMP.		
1		5700 euros
2		3100 euros
3		8870 euros
4		6500 euros

By what amount will total cost vary if the duration of project DMP is crashed by two weeks?		
1		200 euros
2		270 euros
3		300 euros
4		470 euros

4. The following network diagram describes the activities of project SODA. The table below refers to the expected durations and standard-deviations of the project activities:



Activity	A	B	C	D	E	F	G	H
Expected duration (days)	2	3	4	5	4	3	6	4
Standard-deviation (days)	1	2	2	3	2	1	2	2

Identify the critical activities for project SODA		
1		A, C, E, and G
2		A, D, F, and G
3		A, C, D, E, F, and G
4		A, C, F, and G

Which of the following is the late start (LS) of activity H?		
1		12 days
2		10 days
3		13 days
4		11 days

If the optimistic duration of activity G is 2 days and its pessimistic duration is 14 days, then the most likely duration of activity G is:		
1		5 days
2		4 days
3		6 days
4		3 days

5. Please consider the following data for the ITECH project

Activities	A	B	C	D	E	F	G	H
Normal Time (weeks)	2	3	4	5	4	3	5	6
Crash time (weeks)	1	2	1	1	2	1	1	2
Normal Cost (euros)	1,000	1,200	800	600	1,000	800	900	800
Crash cost (euros)	1,130	1,350	995	1,080	1,400	920	1500	1200

A graphical representation of the network activities produced the paths identified below:

ACEG
ADFG
ADFH
BEG

If the value of the project is of 8,500 euros, then the contractor will:		
1		earn a 4,070 euro profit
2		face a 1,075 euro loss
3		earn a 1,400 euro profit
4		face a 3,745 euro loss

By how would the total cost increase if the duration of the ITECH was reduced by two weeks?		
1		185 euros
2		190 euros
3		120 euros
4		125 euros

How would a reduction of the duration of activity H to 2 weeks (via crashing) impact on the total project duration?		
1		13 weeks
2		14 weeks
3		15 weeks
4		16 weeks

6. Consider the following data from project NOW:

Activities	A	B	C	D	E	F	G	H
Normal time (weeks)	6	5	4	3	5	4	3	3
Crash time (weeks)	5	4	2	2	2	4	3	2
Normal cost (euros)	1200	600	1000	500	600	800	500	800
Crash cost (euros)	1600	700	2100	950	1200	800	500	1100

After a network diagram was drawn the following paths were identified:

ACH
BCDE
BFGH
ACDH

Estimate the impact of crashing activity E by three weeks on the total duration of the project.		
1		Project duration is shortened by one week
2		Project duration is shortened by two weeks
3		Project duration is shortened by three weeks
4		Project duration remains unaltered

If the duration of the NOW project is crashed by two weeks what is the minimum total project cost?		
1		6550
2		6450
3		6300
4		6000