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← MNS407 Management Science, Fall 2024

407 Week 4: Homework#4 (Homework)

INSTRUCTOR
Vahid Keyhani
National University, La Jolla CA

Current Score						Due Date		
QUESTION	1	2	3	4	5	6	TOTAL SCORE -/8 0.0%	SAT, NOV 23, 2024 11:59 PM PST Request Extension
POINTS	-1.33	-1.33	-1.33	-1.33	-1.35	-1.33		

Instructions	Assignment Submission & Scoring
<p>This quiz covers material in Chapter 9. . You have 5 attempts to get this right. Feel free to submit until you are satisfied with the results. Do not forget to use the practice button and help hints in the process. Remember you have taken the "Getting Started in Web Assign for Mathematics" quiz in week one because the way you write your answers matters for homework, quizzes, and the final. Be careful with syntax again.</p>	<p>Assignment Submission For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.</p> <p>Assignment Scoring Your last submission is used for your score.</p>

1. [-/1.33 Points]

DETAILS

MY NOTES

CAMMIMS16 9.TB.049.

A cookie recipe gives the following numbered steps.


1. Preheat oven.
2. Grease cookie sheets.
3. Cream shortening and sugar.
4. Mix eggs and flavoring into the cream.
5. Measure and sift dry ingredients.
6. Add dry ingredients to mixture.
7. Drop the completed mixture by spoonfuls onto sheets and bake for 10 minutes.

Although the steps are numbered, they do not always reflect immediate precedence relationships. Develop a table that lists the immediate predecessors for each activity. (Enter your answers as comma-separated lists. If an activity does not have immediate predecessors, enter NONE.)

Activity	Immediate Predecessor
1	<input type="text"/> <input type="text"/>
2	<input type="text"/> <input type="text"/>
3	<input type="text"/> <input type="text"/>
4	<input type="text"/> <input type="text"/>
5	<input type="text"/> <input type="text"/>
6	<input type="text"/> <input type="text"/>

7	<div style="border: 1px solid black; height: 30px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; height: 30px;"></div>
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Show My Work

(Optional) 

2. [-/1.33 Points]

DETAILS

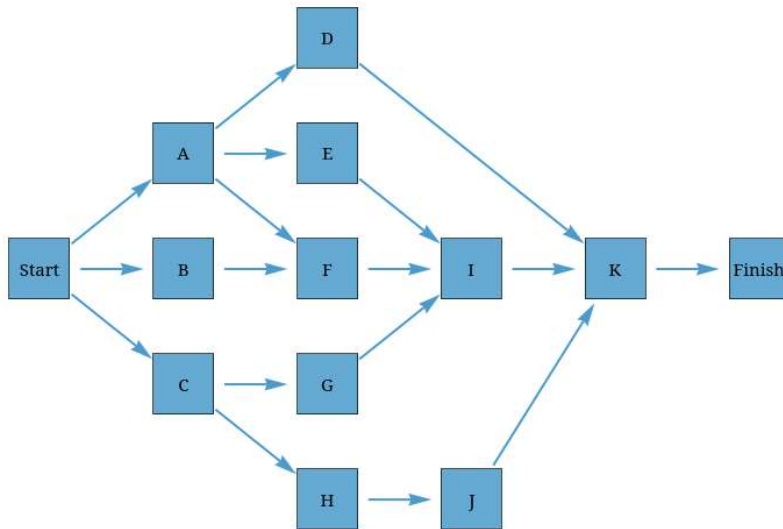
MY NOTES

CAMMIMS16 9.TB.055.

PRACTICE ANOTHER

You may need to use the appropriate [technology](#) to answer this question.

Use the following network with activities and times estimated in days to answer the questions.




Activity	Optimistic	Most Probable	Pessimistic
A	2	5	6
B	1	3	7
C	7	8	11
D	5	12	14
E	3	4	5
F	7	8	11
G	4	6	8
H	3	6	8
I	5	7	12
J	11	12	13
K	1	3	4

(a) What are the critical path activities? (Enter your answers as a comma-separated list.)

(b) What is the expected time (in days) to complete the project?

days

- (c) Based only on the critical path, what is the probability the project will take more than 26 days to complete? (Round your answer to four decimal places.)

Show My Work(Optional) 

3. [-/1.33 Points]

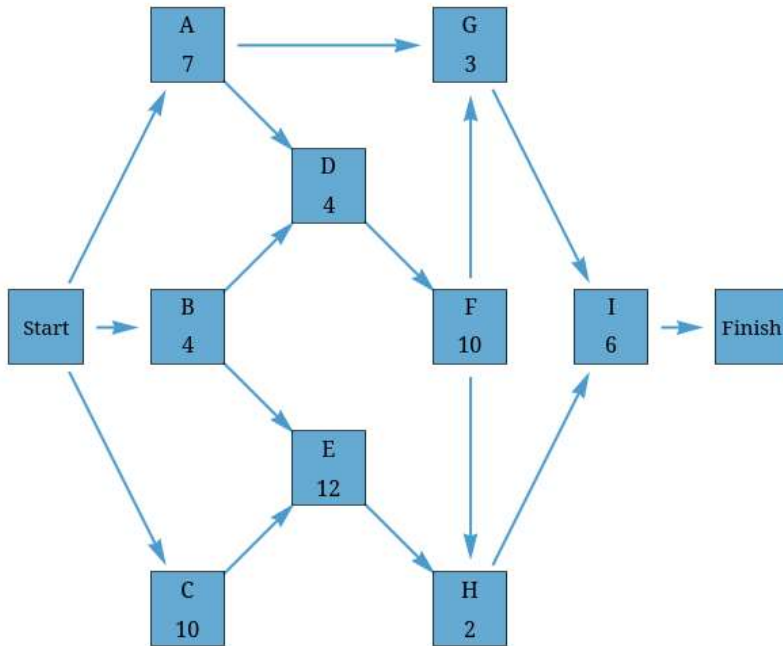
DETAILS

MY NOTES

CAMMIMS16 9.TB.051.

PRACTICE ANOTHER

A project network is shown in the figure.



Use a forward and a backward pass to determine the critical path, and then fill out the following table. Activity times are in weeks. (For the precedence activities, enter your answers as comma-separated lists. If an activity does not have immediate predecessors, enter NONE.)

Activity	Precedence Activities	Activity Time (weeks)	ES	LS	EF	LF	Slack	Critical Path?
A	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
B	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
C	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼

D	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
E	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
F	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
G	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
H	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
I	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼

Now assume that the times listed are only the expected times instead of being fixed times. Is the probability of being finished in fewer than 26 weeks more or less than 50%?

- The probability is more than 50% because 26 weeks is less than the expected time for the project.
- The probability is less than 50% because 26 weeks is less than the expected time for the project.
- The probability is more than 50% because 26 weeks is more than the expected time for the project.
- The probability is less than 50% because 26 weeks is more than the expected time for the project.

Show My Work

(Optional) 

4. [-/1.33 Points]

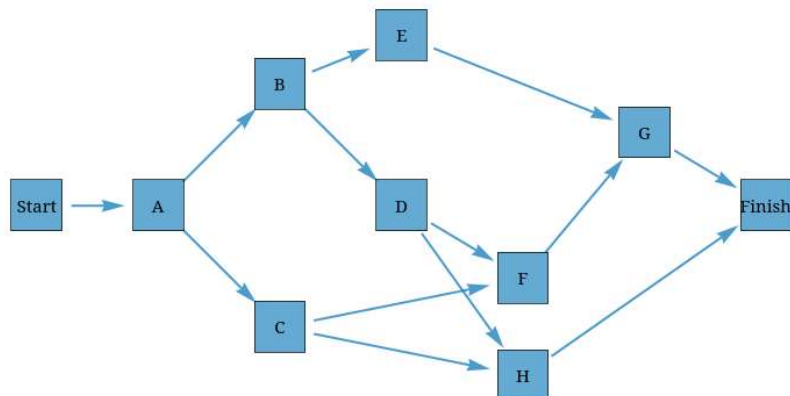
DETAILS

MY NOTES

CAMMIMS16 9.TB.057.

PRACTICE ANOTHER

A project network is shown in the figure.



For the project represented above, determine the earliest and latest start and finish times for each activity.

Activity	Duration	ES	LS	EF	LF	Slack
A	6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
B	4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
C	6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
D	3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
E	8	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
F	3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
G	8	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
H	10	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Determine the expected overall completion time.

Show My Work

(Optional)

5. [-/1.35 Points]

DETAILS

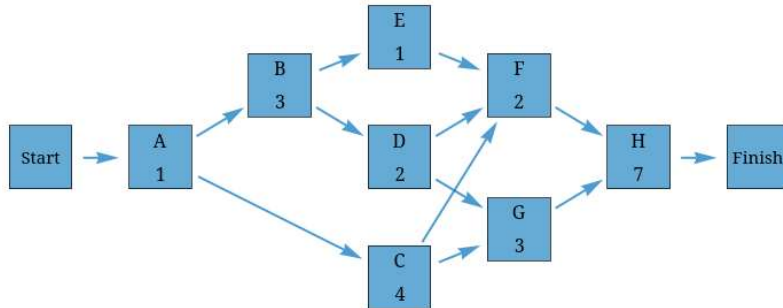
MY NOTES

CAMMIMS16 9.TB.058.

PRACTICE ANOTHER

You may need to use the appropriate [technology](#) to answer this question.

Consider the PERT/CPM network with estimated times in weeks shown in the following figure. The project is scheduled to begin on May 1.



The three-time estimate approach was used to calculate the expected times and the following table gives the variance for each activity.

Activity	Variance
A	1.2
B	0.4
C	1.3
D	0.7
E	0.4
F	0.7
G	0.5
H	1.1

(a) Give the expected project completion date and the critical path. (Enter your critical path as a comma-separated list.)

The expected project completion is weeks from May 1 with a critical path of

(b) Based only on the critical path, by what date are you 99% sure the project will be completed? (Round your answer to one decimal place.)

weeks from May 1.

Show My Work

(Optional)

6. [-/1.33 Points]

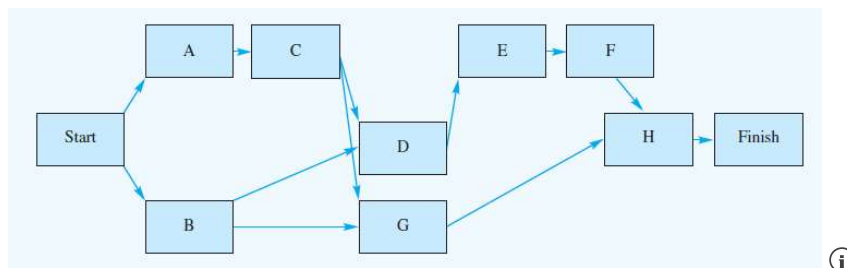
DETAILS

MY NOTES

ASWMSCI15 9.E.020.

Norton Industries is installing a new computer system. The activities, the activity times, and the project network are as follows.

Activity	Time
A	3
B	6
C	2
D	5
E	4
F	3
G	9
H	3



The critical path calculation shows B-D-E-F-H is the critical path, and the expected project completion time is 21 weeks. After viewing this information, management requested overtime be used to complete the project in 16 weeks. Thus, crashing of the project is necessary. The following information is relevant.

Activity	Time (weeks)		Cost (\$)	
	Normal	Crash	Normal	Crash
A	3	1	900	1,700
B	6	3	2,000	4,100
C	2	1	500	1,000
D	5	3	1,800	2,400
E	4	3	1,500	1,850
F	3	1	3,000	3,900
G	9	4	8,000	9,800
H	3	2	1,000	2,000

- (a) Formulate a linear programming model that can be used to make the crashing decisions for this project. (The objective function should be the additional cost of crashing. Let x_i = the finish time for activity i and y_i = the amount of time activity i is crashed where $i = A, B, C, D, E, F, G,$ and $H.$)

Min

s.t.

constraint A

constraint B

C depends on A

D depends on C

D depends on B

E depends on D

F depends on E

G depends on C

G depends on B

H depends on G

H depends on F

finish time for H

maximum crashing for A

maximum crashing for B

maximum crashing for C

maximum crashing for D

maximum crashing for E

maximum crashing for F

maximum crashing for G

maximum crashing for H

(b) Solve the linear programming model and make the minimum cost crashing decisions. What is the amount of crash time (in weeks) for each activity?

Activity	Crash Time
A	<input type="text"/>
B	<input type="text"/>

C	<input type="text"/>
D	<input type="text"/>
E	<input type="text"/>
F	<input type="text"/>
G	<input type="text"/>
H	<input type="text"/>

What is the added cost (in dollars) of meeting the 16-week completion time?


\$

(c) Develop a complete activity schedule based on the crashed activity times.

Activity	Earliest Start	Latest Start	Earliest Finish	Latest Finish	Slack	Critical Activity
A	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
B	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
C	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
D	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
E	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
F	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
G	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼
H	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	---Select--- ▼

Need Help? [Read It](#)

Show My Work

(Optional) 

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