# PERT and CPM

- PERT
  - Project Evaluation Review Technique
- CPM
  - Critical Path Method

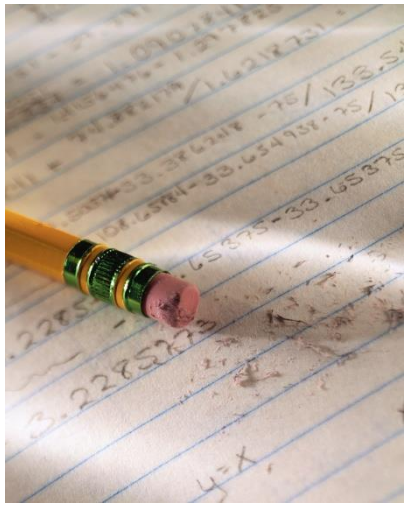
# What does project management accomplish?

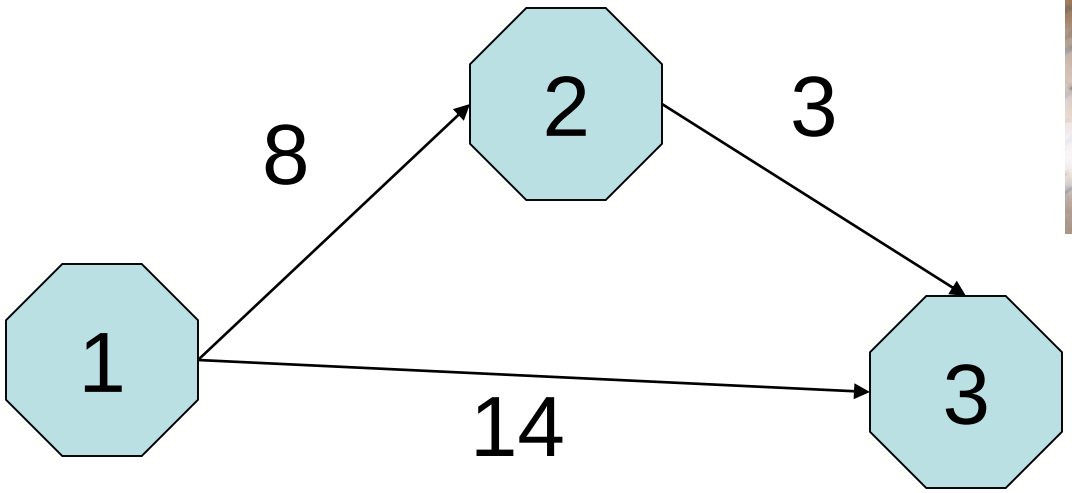
1. Graphical display of project
2. Estimate length of project
3. Identify most important events in project
4. Determine how long an activity can be delayed without delaying the project

# CRITICAL PATH

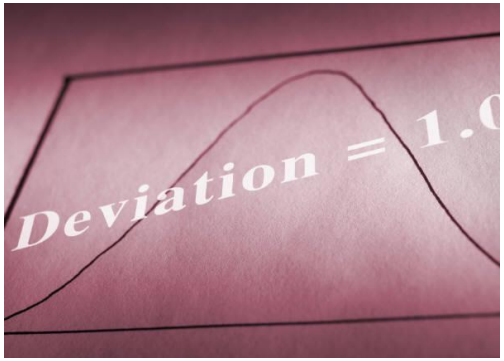
**the series of events that takes the longest amount of time and thus determines how long the project will take**

# How Long Will The Project Take?



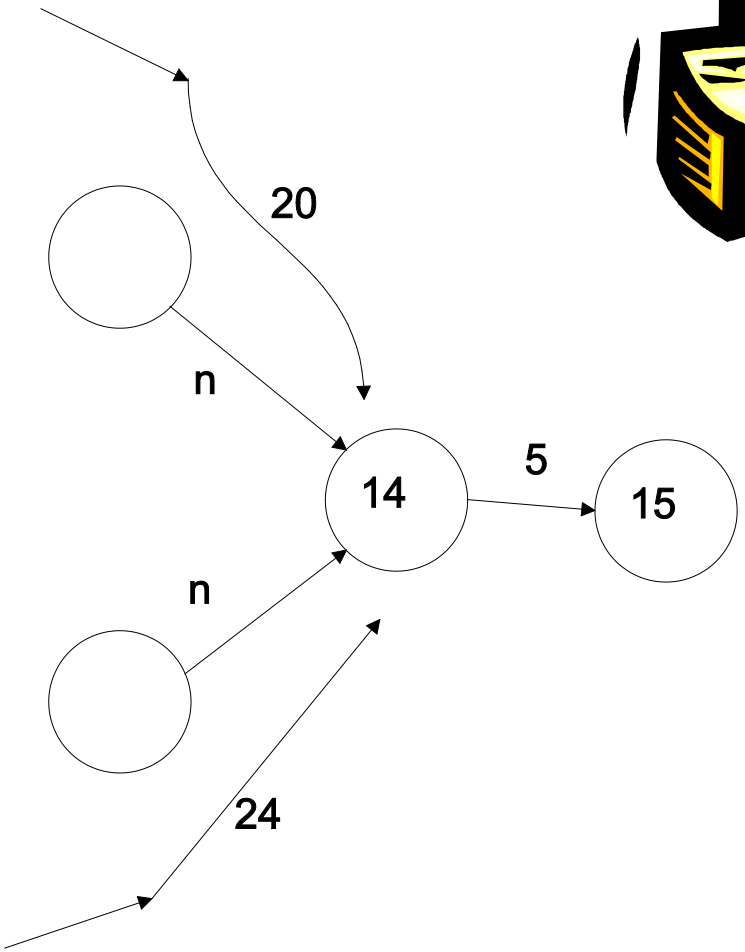


# 3 time estimates



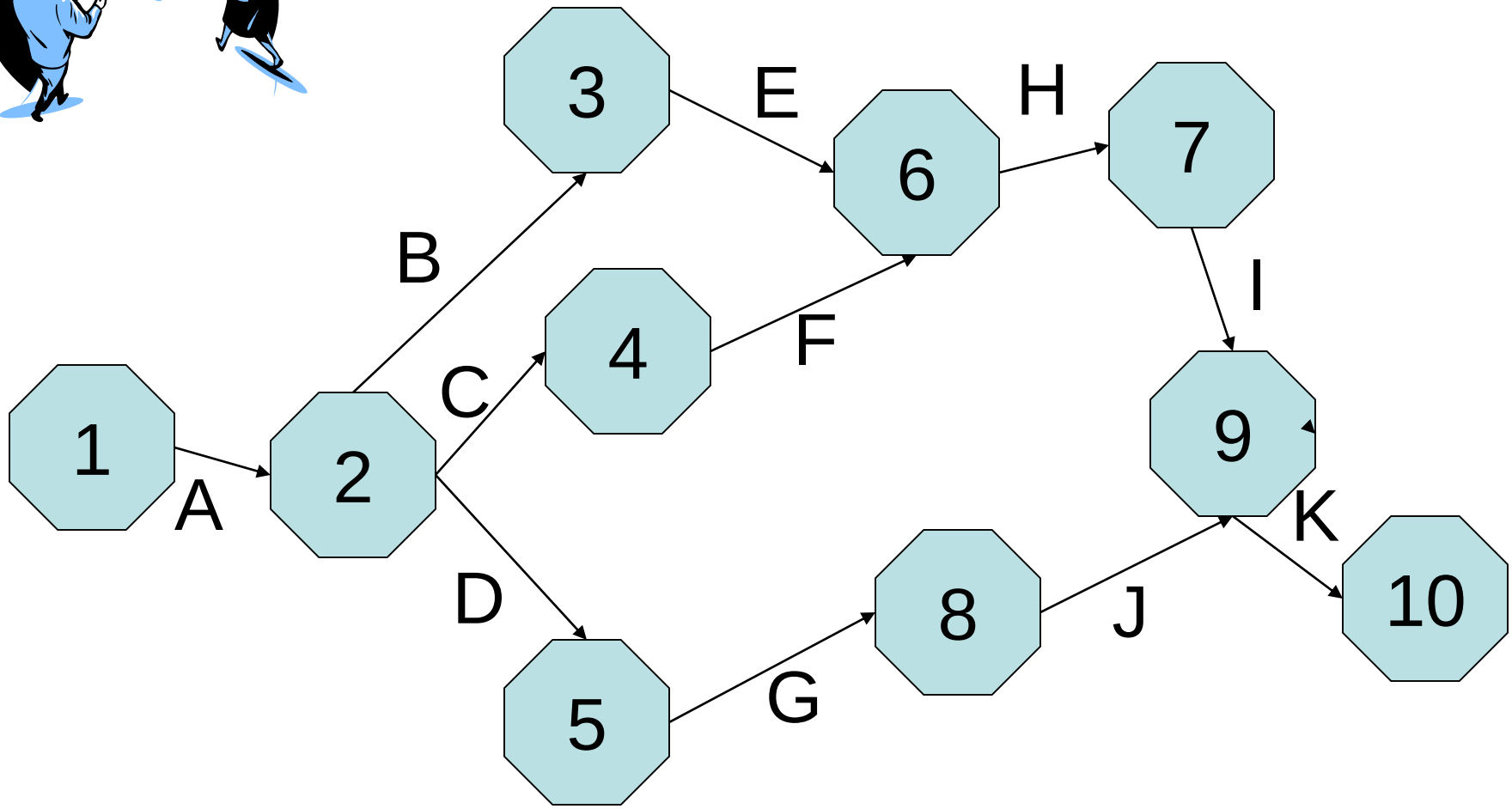

- **te = (a+4m+b)/6**
  - **a = most optimistic time**
  - **b = most pessimistic time**
  - **m = most likely time**
  - **Individual Time Estimates Based on the Beta Statistical Distribution**
  - **Overall Critical Path Based on the Normal Distribution**
  - **Central Limit Theorem**
  - **As a sample gets larger, the sampling distribution of the mean starts to approximate a normal distribution.**

# When will activity 14-15 be completed?



# Page 104 # 10 15th Edition Homework # 8

| Job | Predecessor Job | a | m | b |
|---|---|---|---|---|
| A | ------- | 2 | 3 | 4 |
| B | A | 1 | 2 | 3 |
| C | A | 4 | 5 | 12 |
| D | A | 3 | 4 | 11 |
| E | B | 1 | 3 | 5 |
| F | C | 1 | 2 | 3 |
| G | D | 1 | 8 | 9 |
| H | E,F | 2 | 4 | 6 |
| I | H | 2 | 4 | 12 |
| J | G | 3 | 4 | 5 |
| K | I,J | 5 | 7 | 8 |


1
2
3
4
5
6
7
8
9
10
A
B
C
D
E
F
G
H
I
J
K

| NODES | te | EF (TE) | LF (TL) | SLACK | CP |
|---|---|---|---|---|---|
| 1- 2 | 3 | | | | |
| 2- 3 | 2 | | | | |
| 2- 4 | 6 | | | | |
| 2- 5 | 5 | | | | |
| 3- 6 | 3 | | | | |
| 4- 6 | 2 | | | | |
| 5- 8 | 7 | | | | |
| 6- 7 | 4 | | | | |
| 7- 9 | 5 | | | | |
| 8- 9 | 4 | | | | |
| 9- 10 | 6.83 | | | | |

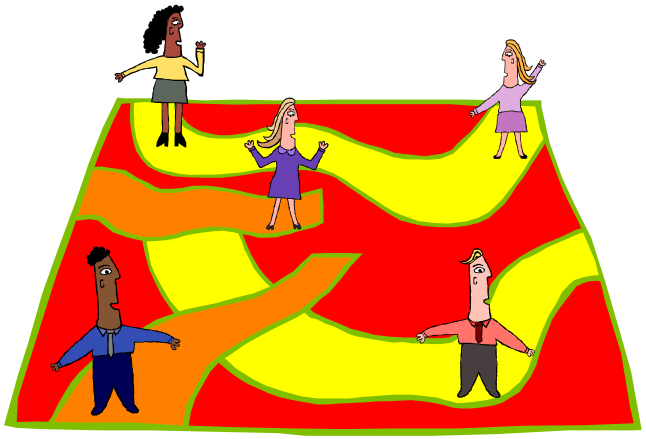
| NODES | te | EF<br>TE | LF<br>TL | SLACK | CP |
|---|---|---|---|---|---|
| 1- 2 | 3 | 3 | | | |
| 2- 3 | 2 | 5 | | | |
| 2- 4 | 6 | 9 | | | |
| 2- 5 | 5 | 8 | | | |
| 3- 6 | 3 | 8 | | | |
| 4- 6 | 2 | 11 | | | |
| 5- 8 | 7 | 15 | | | |
| 6- 7 | 4 | 15 | | | |
| 7- 9 | 5 | 20 | | | |
| 8- 9 | 4 | 19 | | | |
| 9- 10 | 6.83 | 26.83 | | | |

37

38

40

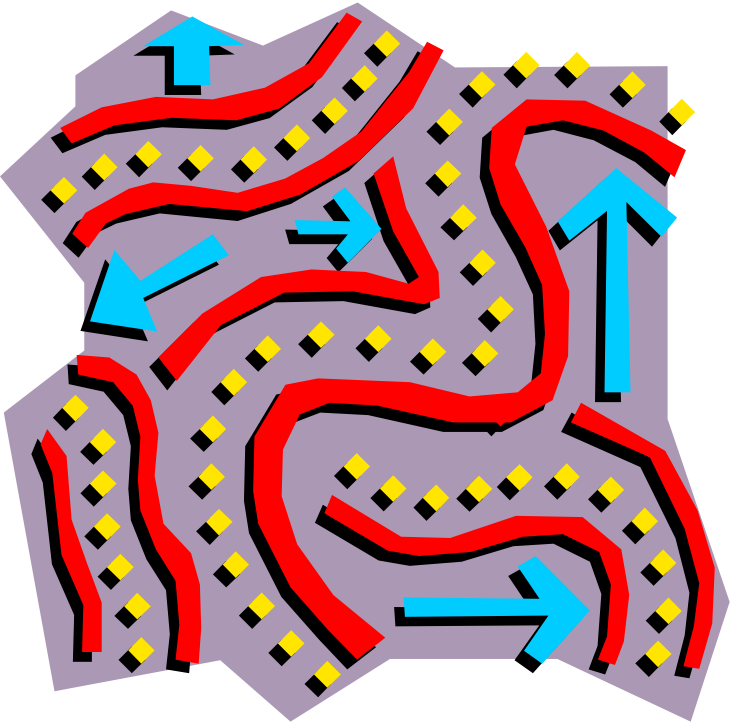
39



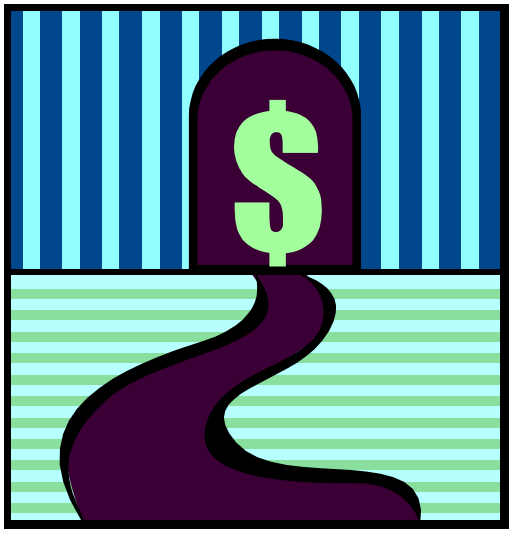
| Pre | Succ | EF (TE) | LF (TL) |
|---|---|---|---|
| 37 | 40 | 72 | |
| 38 | 40 | 81 | |
| 39 | 40 | 74 | |

| Pre | Succ | EF (TE) | LF (TL) |
|---|---|---|---|
| | | | |
| | | | |
| 37 | 40 | 72 | 81 |
| 38 | 40 | 81 | 81 |
| 39 | 40 | 74 | 81 |

| NODES | te | EF TE | LF TL | SLACK | CP |
|---|---|---|---|---|---|
| 1- 2 | 3 | 3 | 3 | | |
| 2- 3 | 2 | 5 | 8 | | |
| 2-4 | 6 | 9 | 9 | | |
| 2- 5 | 5 | 8 | 9 | | |
| 3- 6 | 3 | 8 | 11 | | |
| 4- 6 | 2 | 11 | 11 | | |
| 5-8 | 7 | 15 | 16 | | |
| 6- 7 | 4 | 15 | 15 | | |
| 7- 9 | 5 | 20 | 20 | | |
| 8- 9 | 4 | 19 | 20 | | |
| 9- 10 | 6.83 | 26.83 | 26.83 | | |



| Pre | Succ | te | EF (TE) | LF (TL) |
|---|---|---|---|---|
| 2 | 3 | 2 | 5 | 8 |
| 2 | 4 | 6 | 9 | 9 |
| 2 | 5 | 5 | 8 | 9 |




| Pre | Succ | te | EF | LF | | |
|---|---|---|---|---|---|---|
| | | | (TE) | (TL) | LF-te | |
| 2 | 3 | 2 | 5 | 8 | 8-2 | 6 |
| 2 | 4 | 6 | 9 | 9 | 9-6 | 3 |
| 2 | 5 | 5 | 8 | 9 | 9-5 | 4 |

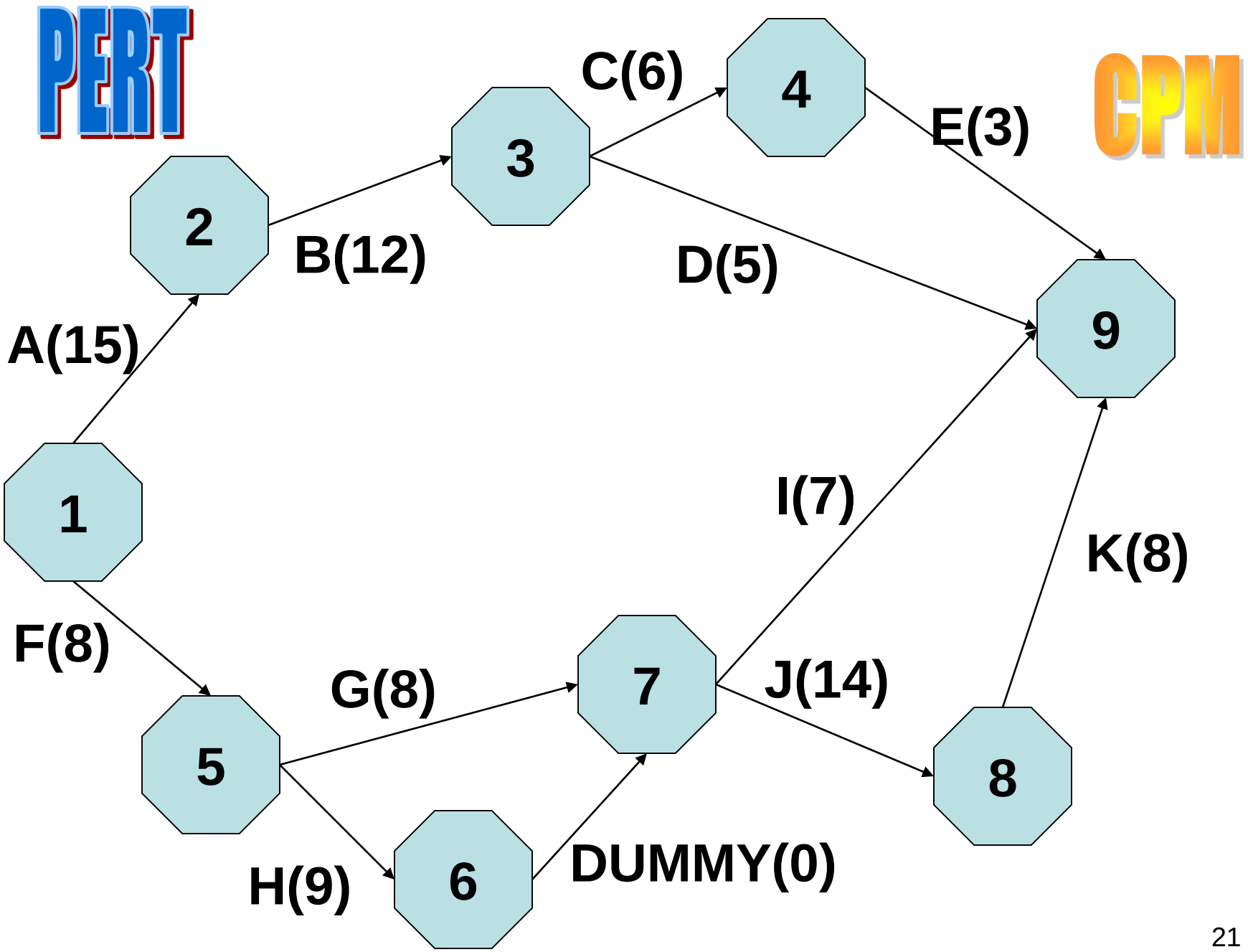
| Pre | Succ | te | EF | LF | | | |
|---|---|---|---|---|---|---|---|
| | | | (TE) | (TL) | LF-te | | |
| 2 | 3 | 2 | 5 | 8 | 8-2 | 6 | |
| 2 | 4 | 6 | 9 | 9 | 9-6 | 3 | smallest |
| 2 | 5 | 5 | 8 | 9 | 9-5 | 4 | |

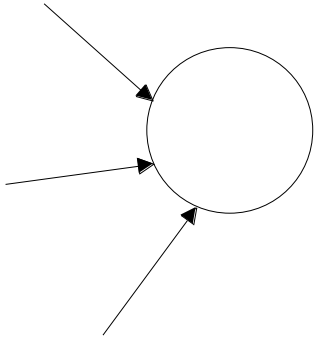
| NODES | te | EF | LF | SLACK | CP |
|---|---|---|---|---|---|
| 1- 2 | 3 | 3 | 3 | 0 | * |
| 2- 3 | 2 | 5 | 8 | 3 | |
| 2-4 | 6 | 9 | 9 | 0 | * |
| 2- 5 | 5 | 8 | 9 | 1 | |
| 3- 6 | 3 | 8 | 11 | 3 | |
| 4- 6 | 2 | 11 | 11 | 0 | * |
| 5-8 | 7 | 15 | 16 | 1 | |
| 6- 7 | 4 | 15 | 15 | 0 | * |
| 7- 9 | 5 | 20 | 20 | 0 | * |
| 8- 9 | 4 | 19 | 20 | 1 | |
| 9- 10 | 6.83 | 26.83 | 26.83 | 0 | * |

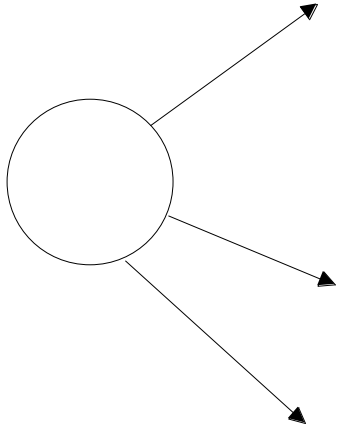
# Operations Homework # 9

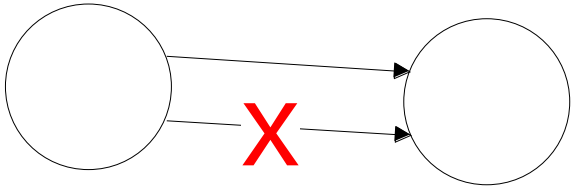
| Activity | Precedes | Time |
|---|---|---|
| start | a, f | |
| a | b | 15 |
| b | c, d | 12 |
| c | e | 6 |
| d | END | 5 |
| e | END | 3 |
| f | g, h | 8 |
| G | I, j | 8 |
| h | I, j | 9 |
| I | END | 7 |
| J | k | 14 |
| k | END | 8 |

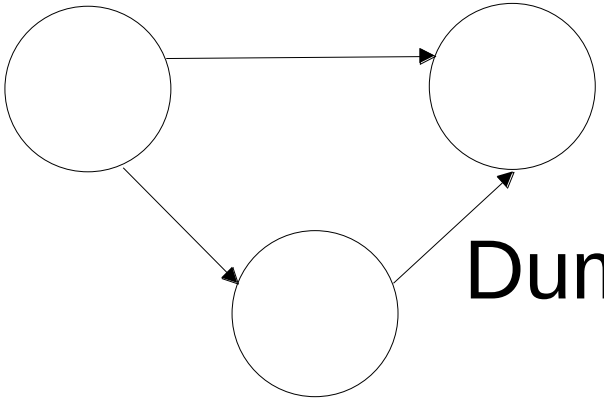
1. Draw the PERT network.
2. Determine the critical path and the expected completion time for the project.


PERT
CPM
1
2
3
4
5
6
7
8
9
A(15)
B(12)
C(6)
D(5)
E(3)
F(8)
G(8)
H(9)
DUMMY(0)
I(7)
J(14)
K(8)

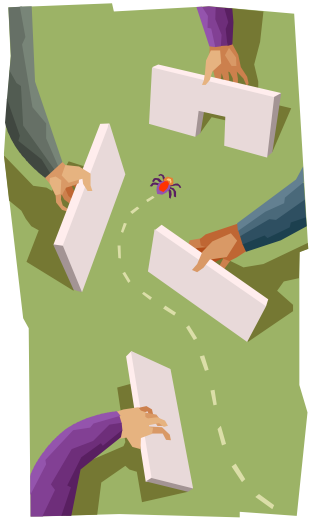


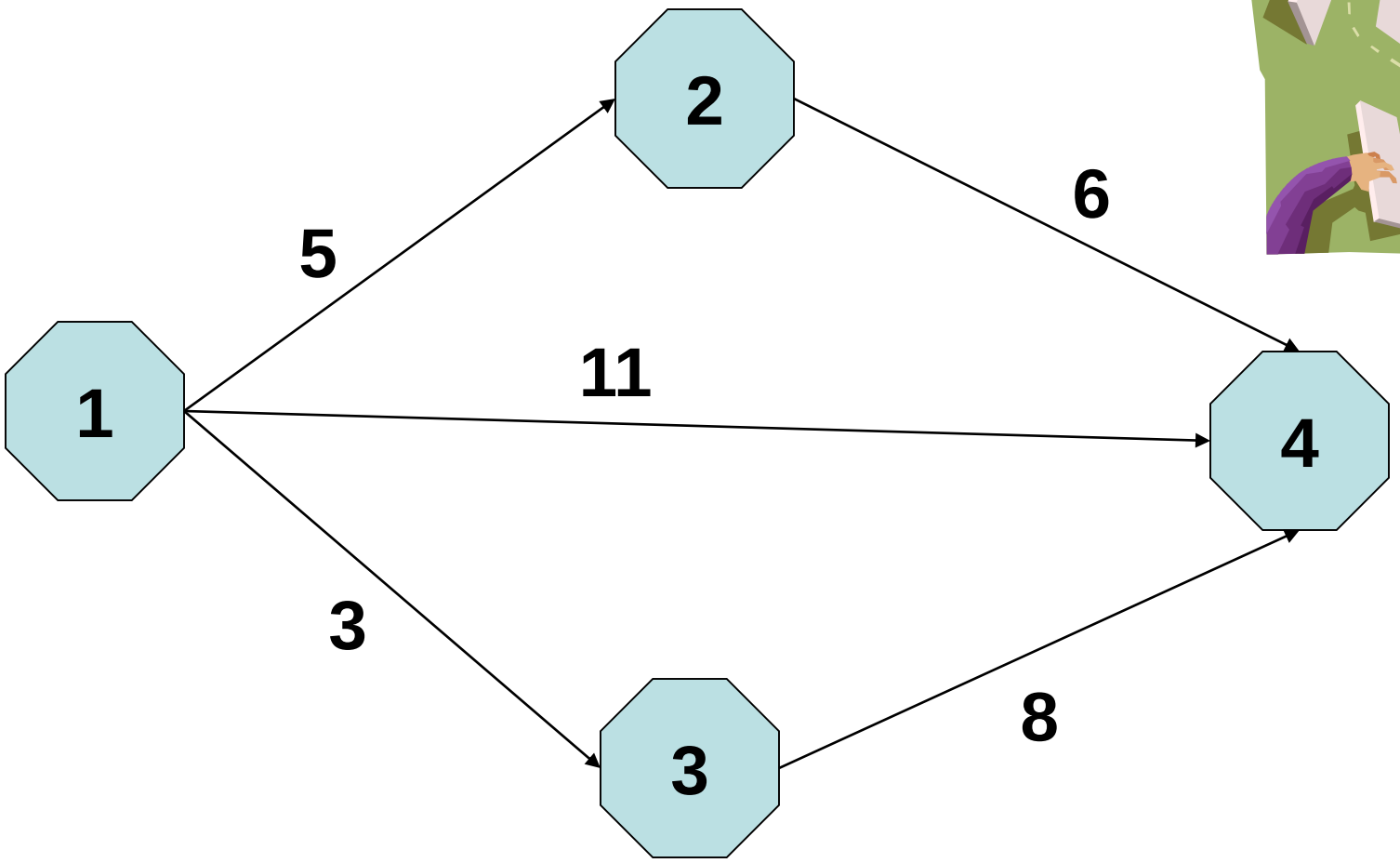




Dummy (0)




2
5
6
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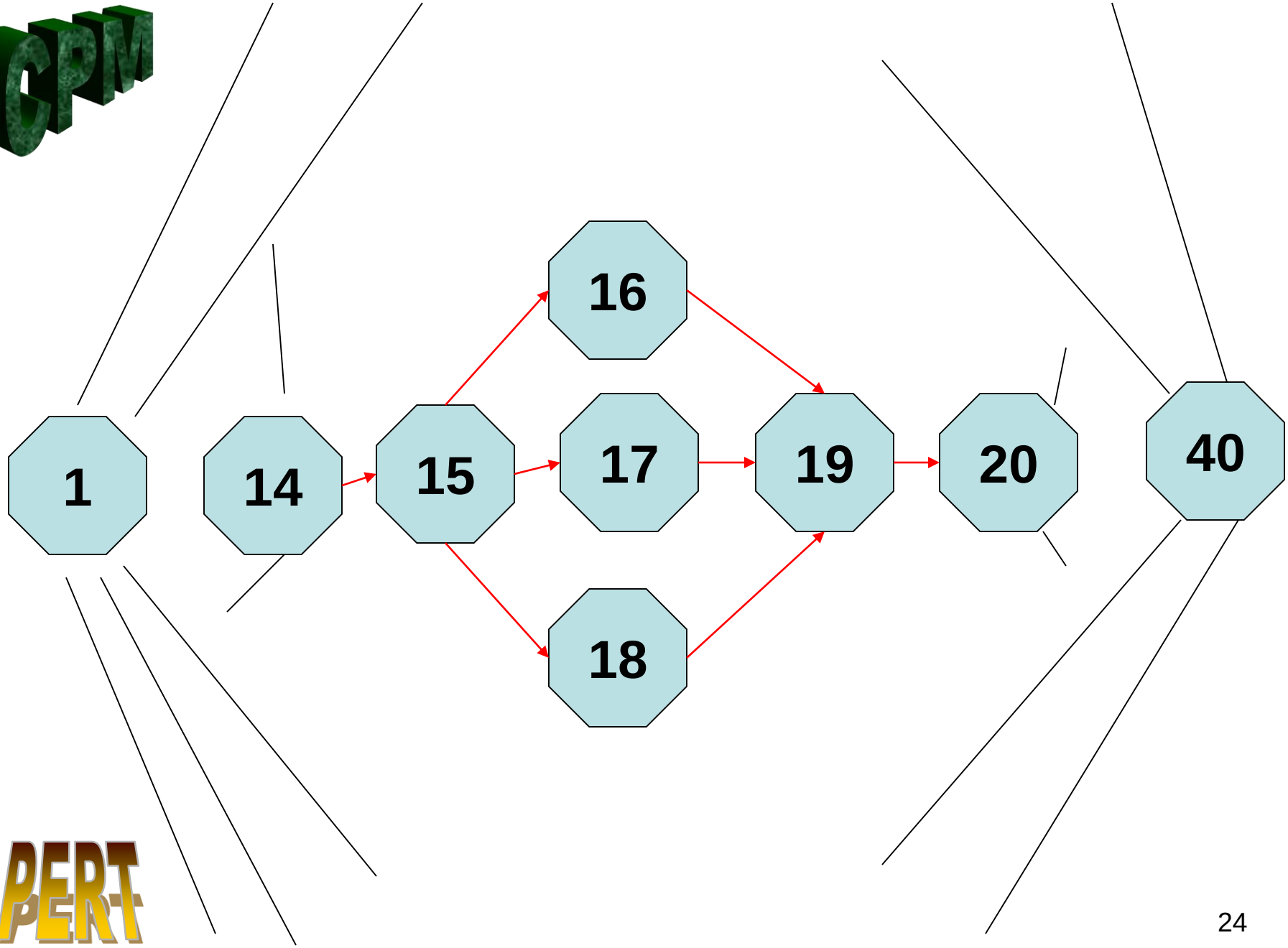
CPM
1
14
15
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PERT