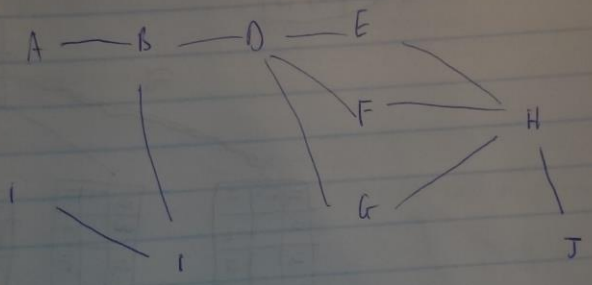
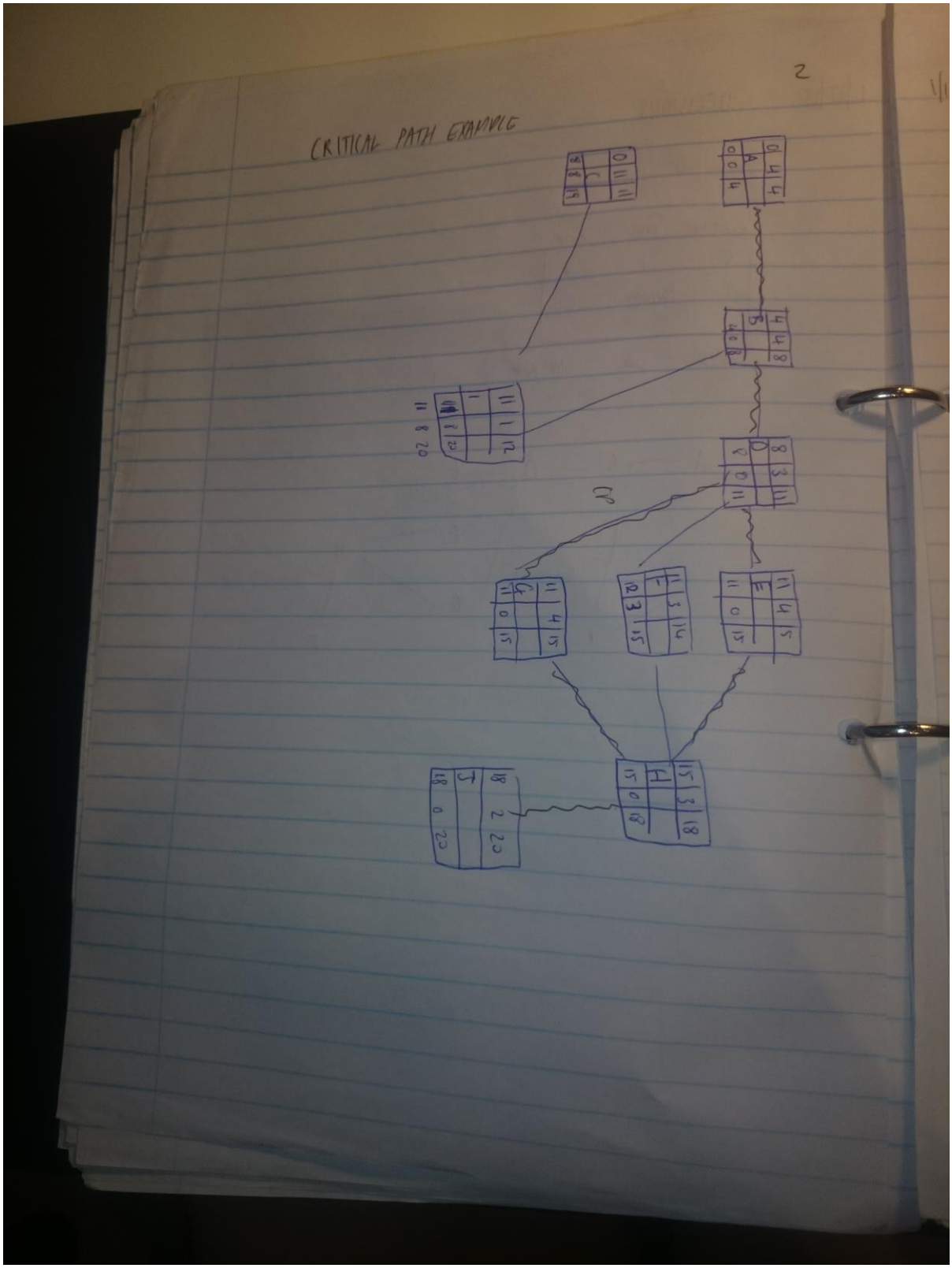
1/12/15 DECISIONS

Critical path

earliest start		earliest finish
0	4	4
A	foundation	

Latest start | Slack | latest finish



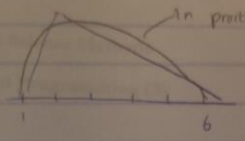

CRITICAL PATH EXAMPLE
2
CP

1/12/15 DECISIONS 3

PERT example

best case:	1	A
likely:	2	B
worst case:	6	C

PERT cost

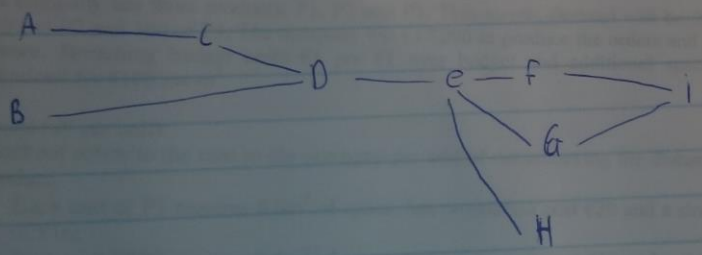


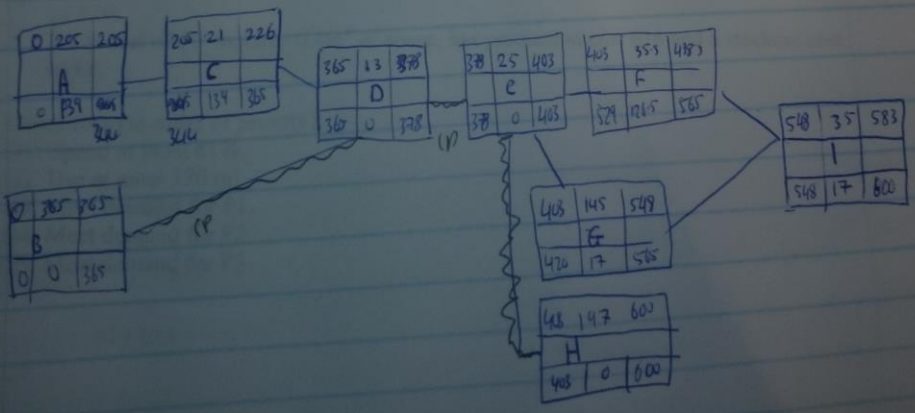
mu - average/expected outcome $\frac{a+4m+b}{6}$ $\frac{5}{6} = 2.5$

$Var = \left(\frac{c-a}{6}\right)^2$ $\sigma = \left(\frac{c-a}{6}\right)$

Advantage - can say probability each node is on CP

CP EXAMPLE





B D E

B → D → E → H CRITICAL PATH

$Var = \left(\frac{c-a}{6}\right)^2 \left(\frac{70-20}{6}\right)^2 = 69.44$

464 Management Science Methods

Laboratory on Goal Programming (2)

Implement a solution in Excel to Exercise 2 in the notes on goal programming (also given below). Use the spreadsheet from the previous goal programming lab as a template if you want.

There are 5 objectives, in order of priority. After implementing the solution, say how many of the objectives can be reached in this order. Write down a solution that satisfies this largest number of possible objectives. If not all objectives can be reached, determine how close it is possible to get to achieving them in terms of minimising the cost to the company.

Exercise 2 from notes

A company has three products: P1, P2 and P3. This month, demand will be 400 of P1, 500 of P2 and 300 of P3. The company has €17,000 to produce the orders and 370m^2 of space. Breaching budget costs €1 per €1 over budget and additional space can be obtained for €100 per m^2.

Costs (all per unit):
Stockout refers to the cost to the company per unit of not achieving the demand for that product.

- Each unit of P1 requires 0.6m^2 of space, has production cost €20 and a stockout cost of €16;
- Each unit of P2 requires 0.5m^2 of space, has production cost €18 and a stockout cost of €10;
- Each unit of P3 requires 0.4m^2 of space, has production cost €16 and a stockout cost of €8.

Objectives (in order of priority);
G1: Spend at most €17k.
G2: Use at most 370 m^2.
G3: Meet demand for P1.
G4: Meet demand for P2.
G5: Meet demand for P3.

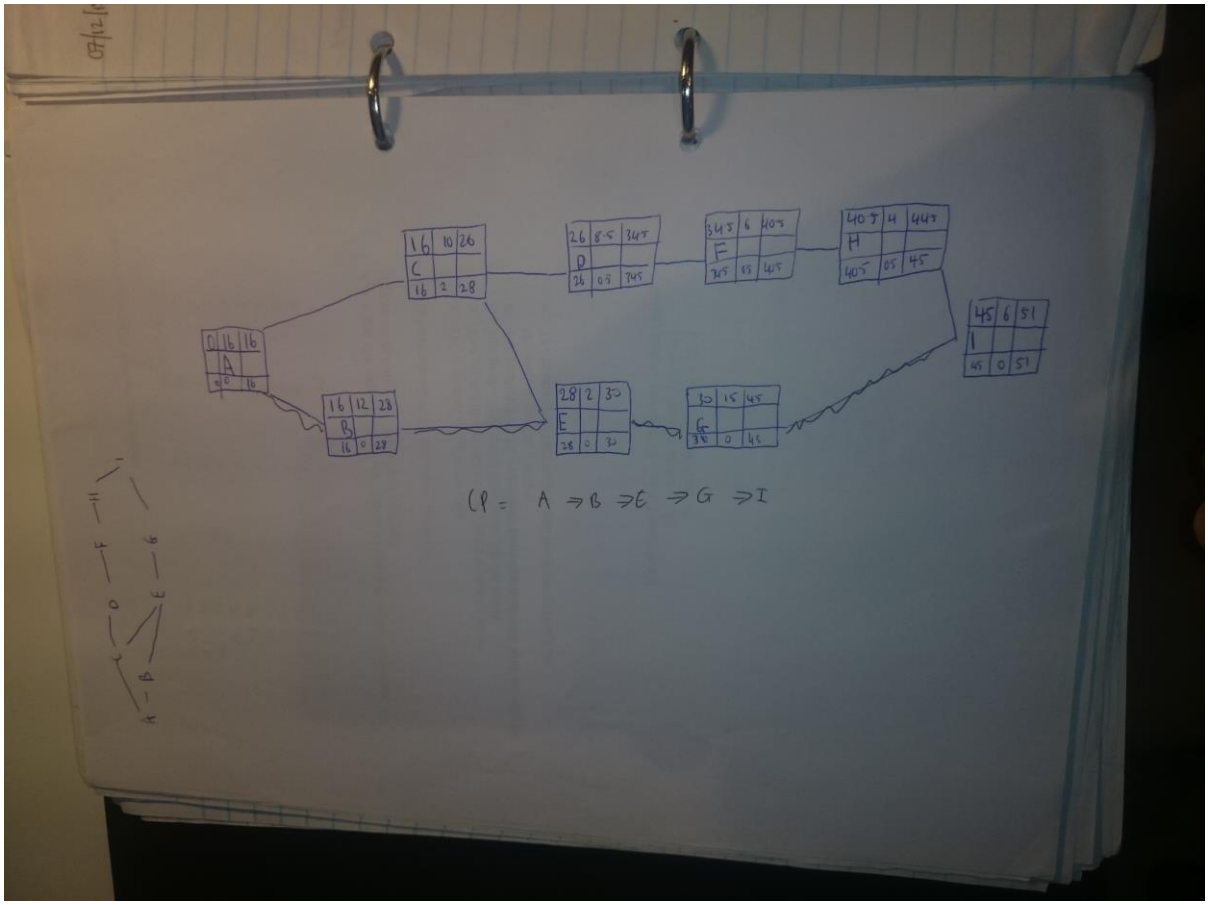
A process requires 9 steps, seen below.

	Predecessor	a	b	c
A	NA	12	15	24
B	A	10	12	14
C	A	5	8	23
D	C	5	8	14
E	B,C	1	2	3
F	D	3	6	9
G	E	6	15	24
H	F	1	3	11
I	H,G	4	6	8

1. Calculate the expected amount of time in hours (mu) for each stage, and hence solve using the critical path method.

2. Using a simulated PERT approach, calculate
   a. The expected completion time
   b. The probability it will be completed within 48 hours
   c. The probability it will take more than 60 hours
   d. The probability the previously found 'critical path' will actually be the critical path in practice
   e. The probability that stage C will be on the critical path

Notes: alpha = (mu-a)*(2b-a-c)/((b-mu)*(c-a))
(Where b=mu, let alpha = 1.5)
beta = alpha*(c-mu)/(mu-a)


A
B
C
D
E
F
G
H
I
CP = A ⇒ B ⇒ E ⇒ G ⇒ I