COMMERCE 290

HOMEWORK #6

Due: Thursday, November 15, 2012 before 12:00 noon

Completed homework must be handed into the Commerce 290 Homework Mailboxes located on the third floor of the **Henry Angus Building**.
These Mailboxes are located **around the corner from HA 354.**

Note: As you know from the course outline, some homework assignments are completed individually and others are completed in groups. **This homework** is to be completed by ***individual students only***. Students are reminded not to work in groups, not to discuss your homework with others and this includes using the Course Discussion Forum as a means of communication for this homework. **This is NOT a group work homework.**

A note on marking: Although you will submit one Homework with solutions to all questions, it's possible that not all of the questions will be graded.

DIRECTIONS:

1. For Question #1, **show all your supporting work and answers in this booklet only.** Questions 2, 3 and 4 should be stapled to the end of this homework.
2. **No additional cover page is required besides this cover page.**
3. No credit for answers only.
4. To receive full marks, include units in each answer.

Last Name:_____ First Name: Solution.

Student Number:_____

Signature:_____ Excel Lab Number:_____

Question	Maximum Possible	Marks Awarded
1	40	not marked
2	10	
3	30	
4	10	
Total	90	

Question 1 *(40 marks)*

Thompson Lumber is considering expanding its current product line by manufacturing a new product, backyard storage sheds. The owner has decided that the company has two alternatives it should consider; it can either build a Large plant or a Small plant to meet the expected demand for storage sheds. Potential profits will be influenced by market conditions. For a Large plant, Favourable market conditions would likely result in a net profit of $200,000 but a loss of $180,000 if Unfavourable. For a Small plant, potential profits would be $100,000 if market conditions are Favourable but a loss of $20,000 otherwise. The owner believes that there is a 60% chance of Favourable market conditions.

(a) (3 marks) Using the conservative approach, what is the best decision?

(2)

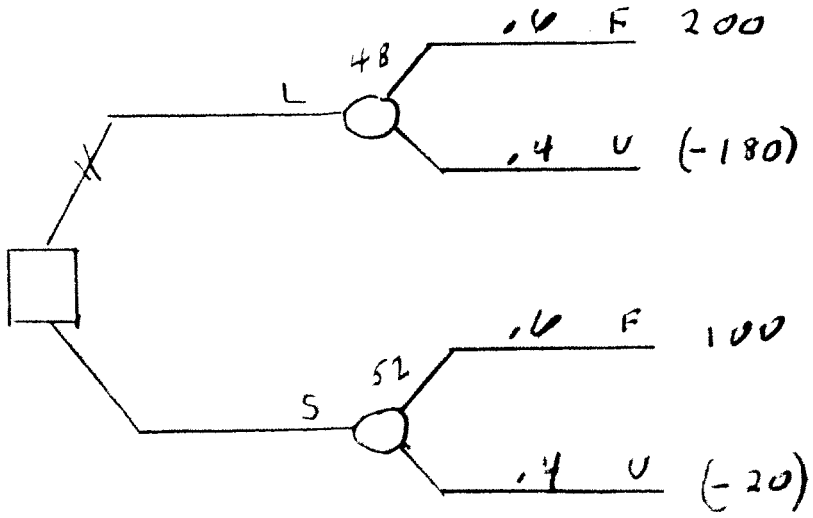
#PROFITS (1000's)	F	U	CONSERVATIVE
LARGE	200	(-180)	(-180)
SMALL	100	(-20)	(-20) * Best decision

1 mark

(b) *(2 marks)* ***For this question only***, would you recommend the above decision? Explain.

MARKERS: There are many good answers to this. Give all students 2 marks

(c) (8 marks) Use a properly constructed decision tree and the EMV approach to recommend a decision. Be sure to identify the correct decision and the expected profit.



Marking

Tree Structure (3)
Payoffs (2)
Prob (1)

-1 if no □
-1 if no O

Best Dec: SMALL] (1)
EMV: 52 (or $52,000)] (1)

(d) (4 marks) If Thompson could obtain perfect information regarding future market conditions, what is the most they should be willing to pay for this information?

$EPPI = .6(200) + .4(-20)$ ②

$= 112$

$EVPI = EPPI - EMV$ ②

$= 112 - 52$

$= 60$

Your Answer: 60

(e) (4 marks) ***For this question only***, what would the probability of Favourable market conditions have to be for management to be indifferent between the two alternatives using the EMV approach?

If indifferent, then want "p" so that:

$EMV(L) = EMV(S)$ ①

$200p + -180(1-p) = 100p + -20(1-p)$ ②

$380p - 180 = 120p - 20$

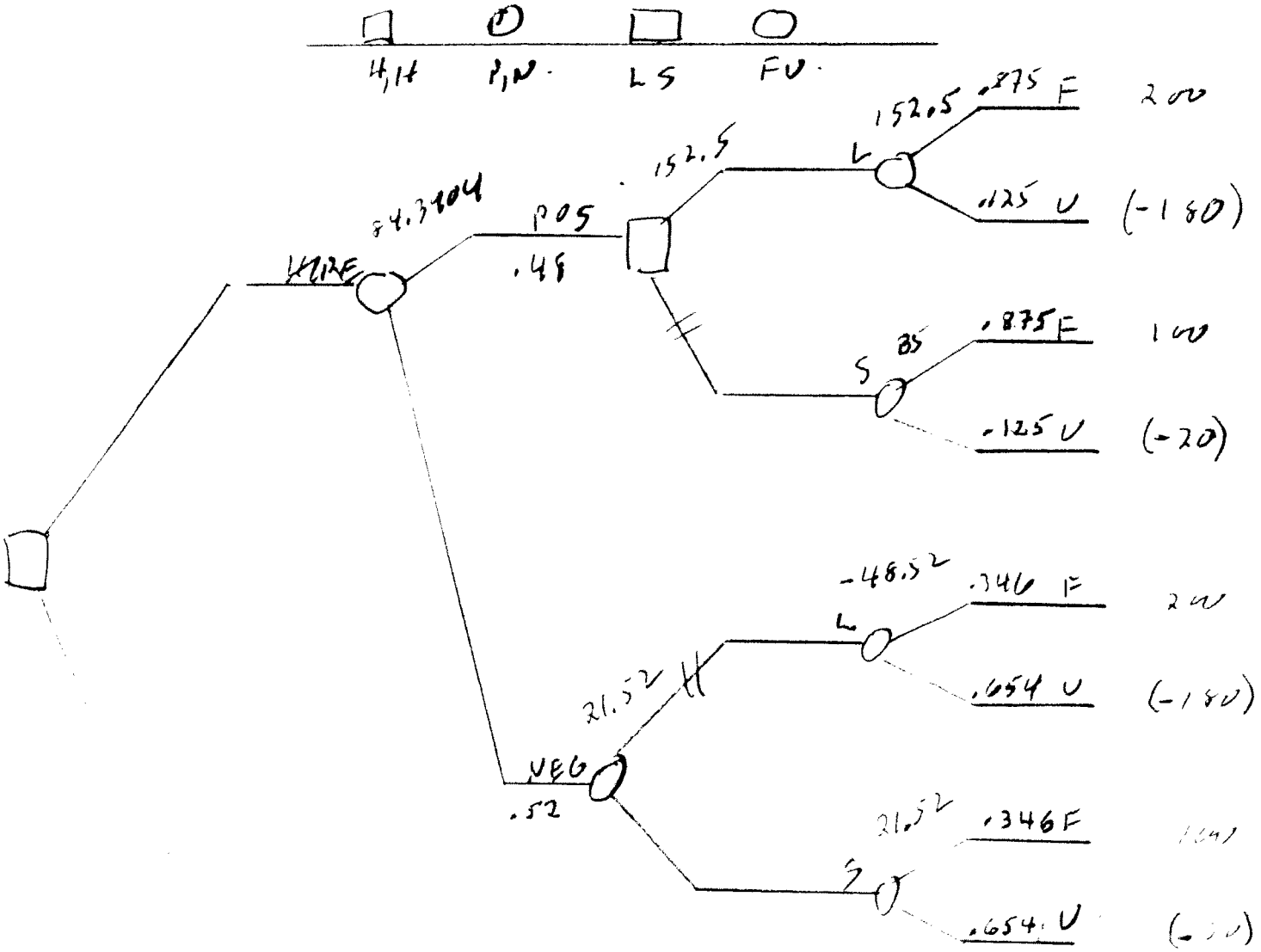
$260p = 160$

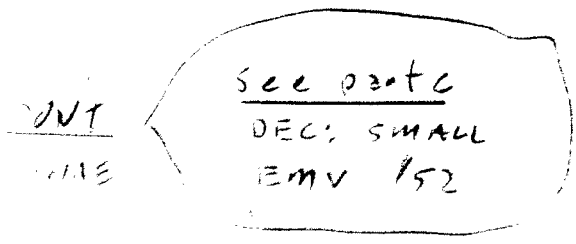
$p = \frac{160}{260}$ or .61538 ①

Your Answer: $\frac{160}{260}$ or .6154

Before deciding about building a new plant, Thompson Lumber has the option of hiring a consultant to conduct a market research survey. The consultant will charge $10,000 and will study market conditions for storage sheds. The results of the survey will either be reported as Positive (indicating Favourable market conditions) or Negative (indicating Unfavourable market conditions). In past surveys, when Favourable market conditions occurred, the probability the survey reported Positive was 70%; when market conditions were Unfavourable, the survey result was Negative 85% of the time.

(f) (13 marks)Construct a decision tree showing all branches, probabilities and payoffs(***All probabilities should be rounded to 3 decimal places).***

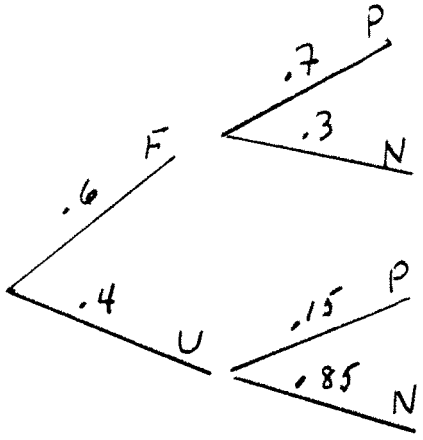




Prob calculations for part (f)

We know:

$$\left.\begin{aligned} P(P \mid F) &= .7 \\ P(N \mid U) &= .85 \\ P[F] &= .6 \\ P[U] &= .4 \end{aligned}\right\} \Rightarrow$$



ss	Prob
FP	.42
FN	.18
UP	.06
UN	.34

From tree we get the joint probability distribution:

∩	P	N	
F	.42	.18	.6
U	.06	.34	.4
	.48	.52	

$$\therefore \quad P[F \mid P] = \frac{.42}{.48} = .875$$

$$\text{and} \quad P[F \mid N] = \frac{.18}{.52} = .346 \text{ (rounded)}$$

(g) (3 marks) What is the optimal decision strategy now?

- Hire consultant] (1)
- IF P, then choose L] (1)
- IF N, " " S] (1)

(h) (1 mark) What is the expected profit using the results of the survey?

No deduction if:
$84,390.40
or 74,390.40

$84.3904
or $74.3904] (1)

Your Answer: _____

(i) (1 mark) What is the Expected Value of Sample Information (EVSI)?

EVSI = 84.3904 - 52
= $32.3904

No deduction if:
$32,390.40

$32.3904] (1)

Your Answer: _____

(j) (1 mark) What is the efficiency of this information?

$$Eff = \frac{EVSI}{EVPI} \times 100\%$$

$$= \frac{32.3904}{60}$$

$$= .5398$$

$$\approx 54\%$$

53.98%] (1)
OR 54%

Your Answer: _____

Question 2

10 marks

Costs $	s1	s2	s3	Conservative	Optimistic	Regret
d1	650	650	590	650	590	190
d2	900	600	400	900	400	250
d3	800	650	580	800	580	180

Best decisions using:

Conservative: d1
Optimistic: d2
Regret: d3

Marking Key:(10 marks)

* **Total 3 marks** for all 3 numbers in Conservative column
* **Total 3 marks** for all 3 numbers in Optimistic column
* **Total 3 marks** for all 3 numbers in Regret column (can also be shown below)
* **1 mark total** for identifying the best decisions **either** using a sentence (to the left) **or** highlighting with shading in the matrix as shown.

Regret matrix

Costs $	s1	s2	s3	Regret
d1	0	50	190	190
d2	250	0	0	250
d3	150	50	180	180

- 0 if the Regret matrix is not shown.

Question 3

SMA 3.53 - Comfy Shoes

Input Data

Beginning Shoe Inventory	0	*pairs*
Ending Shoe Inventory	0	*pairs*
# shoes produced per quarter per worker	500	*pairs*
Cost per worker per quarter	$ 5,000.00	
Inventory costs/quarter/pair shoes	$ 10.00	

5 marks

Time Periods covered by different shift workers

		Quarter1	Quarter2	Quarter3	Quarter4	Total # Employees
Shift	Quarter1	10	10	10		10
Starting	Quarter2		0	0	0	0
At	Quarter3	2		2	2	2
	Quarter4	0	0		0	0
Total workers to schedule each quarter		**12**	**10**	**12**	**2**	

5 marks

Supply of shoes (pairs) produced per quarter	6000	5000	6000	1000	*pairs*
On hand after production	6000	5000	8000	1000	*pairs*
	>=	>=	>=	>=	
Minimum Demand per Quarter	6000	3000	8000	1000	*pairs*
Ending Inventory	0	2000	0	0	
Ending Inventory 4th Quarter		0	=	0	*pairs*

5 marks

Cost Information

	Costs per Quarter				
	Quarter1	Quarter2	Quarter3	Quarter4	Total Cost
Labor Costs	60,000.00	50,000.00	60,000.00	10,000.00	180,000.00
Inventory Costs	-	20,000.00	-	- 0.00	20,000.00
	60,000.00	70,000.00	60,000.00	10,000.00	$ 200,000.00

5 marks

Summary:

Comfy Shoes should schedule:
10 employees beginning in Q1
0 employees beginning in Q2
2 employees beginning in Q3
0 employees beginning in Q4

The Total Cost of this plan is
$200,000

5 marks

-1 if they ignore the "0's" for Q2 and Q4 unless they say something explicit like: mgt should only schedule 10 …and 2 ...

Marking Key:

This model page is worth 25 marks

-0 if the model is well organized & easy to understand. It does NOT have to look exactly like the solution key.
-0 if they print in landscape
*-0 if they do not show row /column headings**
-0 if they show gridlines

Input Data Section:
-0 if they include this information somewhere else; for example the cost info is put below in the Cost Information section.

Total Cost section:
-1 if they do not include costs by quarter

Microsoft Excel 11.0 Sensitivity Report

Adjustable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
G14	Quarter1 Total # Employees	10	0	60000	1.48918E+13	10000
G15	Quarter2 Total # Employees	0	0	45000	5000.000008	2.97836E+13
G16	Quarter3 Total # Employees	2	0	50000	4999.999998	5000.00001
G17	Quarter4 Total # Employees	0	4999.999996	54999.99999	1E+30	4999.999996

Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
C22	On hand after production Quarter1	6000	10.00000002	6000	0	1000
D22	On hand after production Quarter2	5000	0	3000	2000	1E+30
E22	On hand after production Quarter3	8000	20	8000	0	2000
F22	On hand after production Quarter4	1000	0	1000	0	1E+30
D27	Ending Inventory 4th Quarter >=	-3.86535E-12	16.66666666	0	5999.999999	0

Marking Key: (Q3d)
This Sensitivity Report is worth 5 marks just for printing this page
-0 for printing in lanscape or portrait

Question 4

10 marks

or Target Cell

Demand Q1

	G13	G14	G15	G16	G28	Total Cost	Change in Cost
5000	9.3333333	1.3333333	0.6666667	0	$	193,333.33	
5100	9.4	1.2	0.8	0	$	194,000.00	$ 666.67
5200	9.4666667	1.0666667	0.9333333	0	$	194,666.67	$ 666.67
5300	9.5333333	0.9333333	1.0666667	0	$	195,333.33	$ 666.66
5400	9.6	0.8	1.2	0	$	196,000.00	$ 666.67
5500	9.6666667	0.6666667	1.3333333	0	$	196,666.67	$ 666.67
5600	9.7333333	0.5333333	1.4666667	0	$	197,333.33	$ 666.66
5700	9.8	0.4	1.6	0	$	198,000.00	$ 666.67
5800	9.8666667	0.2666667	1.7333333	0	$	198,666.67	$ 666.67
5900	9.9333333	0.1333333	1.8666667	0	$	199,333.33	$ 666.66
6000	10	-1.608E-12	2	0	$	200,000.00	$ 666.67

1 mark for naming

7 marks

The shadow price for demand in Q1 between 5,000 to 6,000 units is:

$6.67

2 marks

Note that the $666.67 must be divided by 100 since shadow price is defined as the change **per unit** NOT the change per 100 units.

Marking Key:

- 0 for printing in landscape
- 0 if they include Row/Column headings
- 0 if they include gridlines