

Prescriptive Analytics - HW 7

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1. Readings completed

2. John's Problem:

Payoff Matrix:

	Re-Elected	Not re-elected
Sell half of the business	480,000	70,000
Sell entire business	260,000	260,000

Maxi-Min & Maxi-Max Approaches:

	Re-Elected	Not re-elected	Maxi-Min	Maxi-Max
Sell half of the business	480,000	70,000	70,000	<u>480,000</u>
Sell entire business	260,000	260,000	<u>260,000</u>	260,000

Mini-Max Regret Approach:

	Re-Elected	Not re-elected	Mini-Max Regret
Sell half of the business	0	190,000	<u>190,000</u>
Sell entire business	220,000	0	220,000

Maxi-Min: \$260,000 payoff (**Decision: Sell the entire business**)

Maxi-Max: \$480,000 payoff (**Decision: Sell half of the business**)

Mini-Max Regret: \$190,000 (**Decision: Sell half of the business**)

MO: $0.65(\text{Not re-elected}) > 0.35(\text{Re-elected}) \rightarrow \$260,000 > \$70,000$
(**Decision: Sell his entire business**)

EV: Sell half of the business → $0.35(\$480,000)+0.65(\$70,000) = \$213,500$
 Sell entire business → $0.35(\$260,000)+0.65(\$260,000) = \underline{\$260,000}$

(Decision: Sell his entire business)

ER: Sell half of the business → $0.35(\$0)+0.65(\$190,000) = \$123,500$
 Sell entire business → $0.35(\$220,000)+0.65(\$0) = \underline{\$77,000}$

(Decision: Sell his entire business)

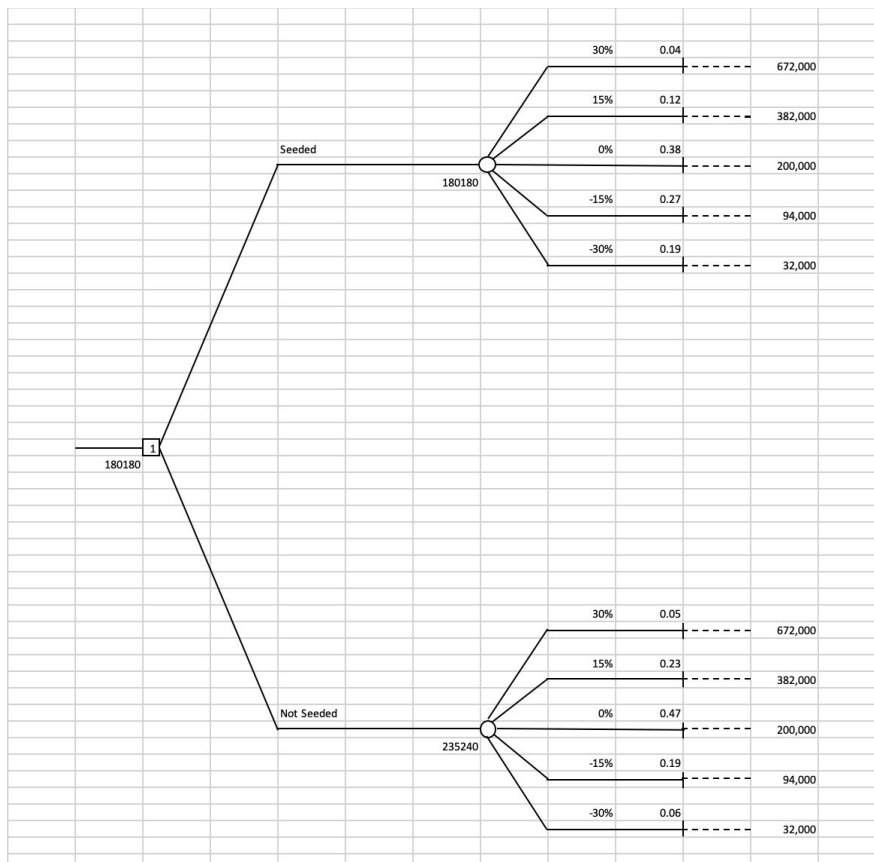
Expected payoff with PI = $0.35(\$480,000)+0.65(\$260,000) = \$337,000$

Expected payoff based on EV = $\$260,000$

EVPI = $|\$337,000 - \$260,000| = \$77,000$ (Equal to ER)

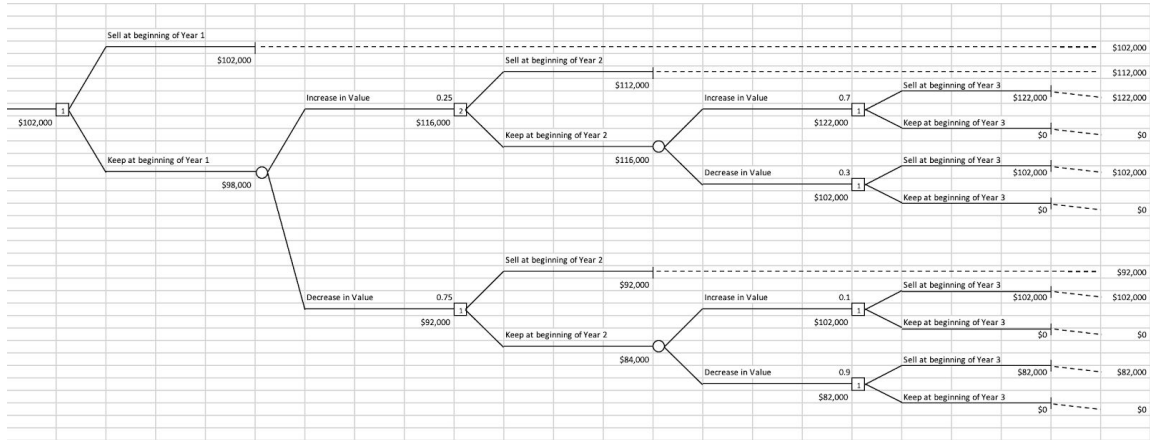
(Decision: John should accept the offer)

3. Decision Tree:



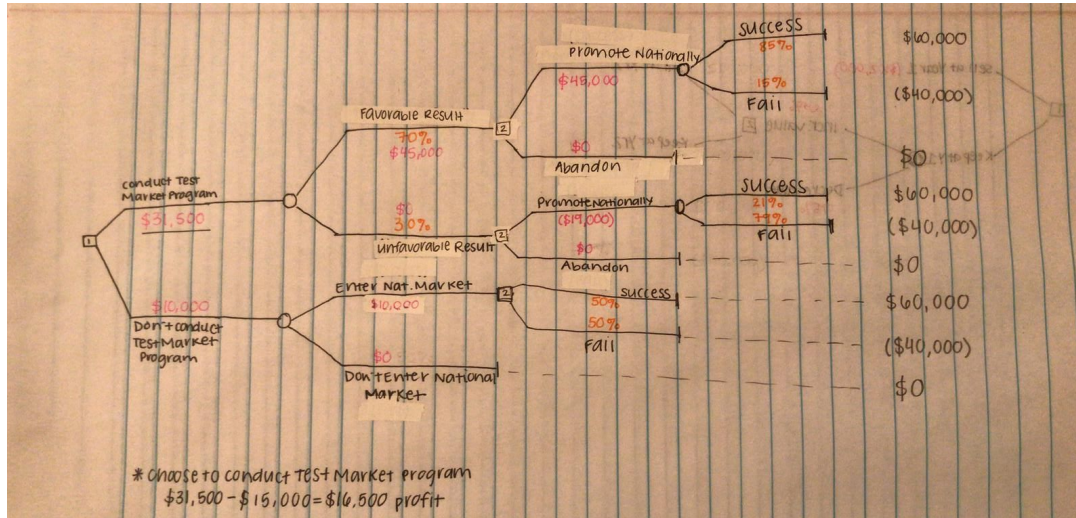
Property damage from seeding is lower.

4. Decision Tree:



Decision: Sell at beginning of Year 1

5.



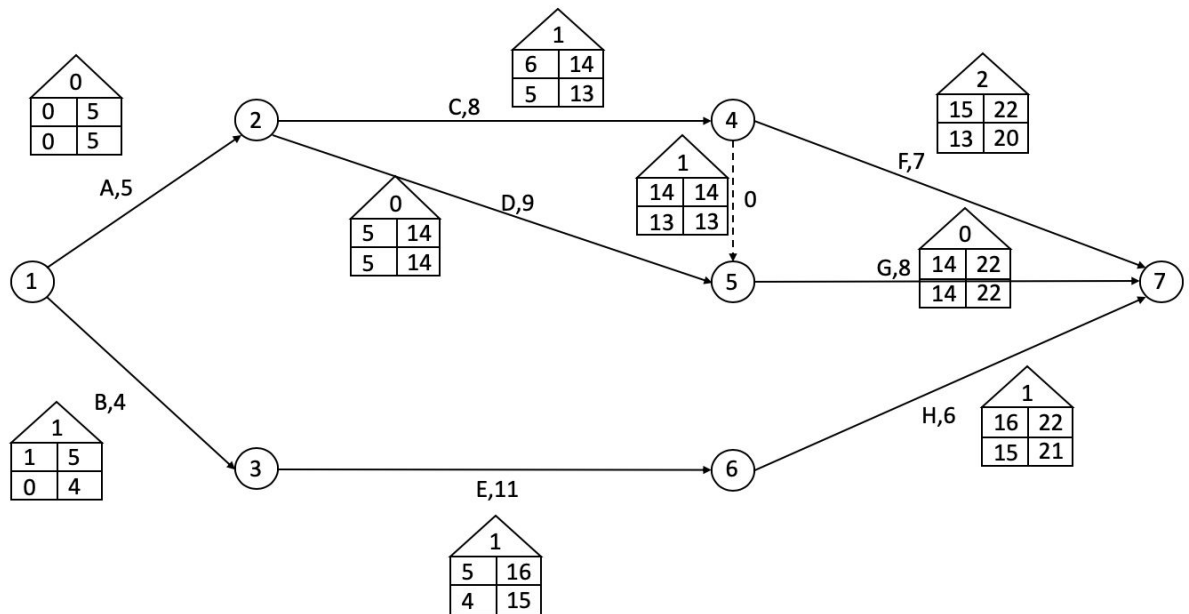
6.

Path	Length	Slack
1-2-3-8-9	$3+7+9+3 = 22$	$30 - 22 = 8$
1-2-3-7-8-9	$3+7+7+7+3 = 27$	$30 - 27 = 3$
1-2-4-5-6-7-8-9	$3+5+3+4+3+7+3 = 28$	$30 - 28 = 2$
1-2-4-5-7-8-9	$3+5+3+8+7+3 = 29$	$30 - 29 = 1$

1-2-4-5-8-9	$3+5+3+8+3 = 22$	$30 - 22 = 8$
1-2-5-6-7-8-9	$3+9+4+3+7+3 = 29$	$30 - 29 = 1$
1-2-5-7-8-9	$3+9+8+7+3 = \mathbf{30}$	$30 - 30 = 0$
1-2-5-8-9	$3+9+8+3 = 23$	$30 - 23 = 7$

- (1) Critical path: 30
- (2) Critical activities: 1-2-5-7-8-9
- (3) 30 weeks
- (4) See aforementioned chart for answers
- (5) Yes, Activity I is a critical activity; any delays to a critical activity will lengthen the project duration
- (6) No, Activity L is not a critical activity; any delays to a noncritical activity won't lengthen the project duration

7.



Critical Activities: A (1-2), D (2-5), G (5-7)

Critical Path: 1-2-5-7

Project Duration: 22 days

8.

(1)

Minimize $Z = XJ$

Subject to:

$XA = 0$

$XB - XA \geq 0$

$XC - XB \geq 0$

$XD - XA \geq 0$

$XE - XC \geq 0$

$XF - XE \geq 0$

$XG - XD \geq 0$

$XH - XE \geq 0$

$XI - XH \geq 0$

$XI - XG \geq 0$

$XJ - XF \geq 0$

$XJ - XI \geq 0$

$XA, \dots, XJ \geq 0$

(2)

The screenshot displays the Microsoft Excel 16.16 Answer Report for a linear programming problem. The report is titled "Microsoft Excel 16.16 Answer Report" and is located in the "Data" tab. The report includes the following sections:

- Worksheet:** [Book2]Sheet1
- Report Created:** 11/21/18 7:33:04 PM
- Result:** Solver found a solution. All constraints and optimality conditions are satisfied.
- Solver Engine:**
 - Engine: Simplex LP
 - Solution Time: 12885860.981 Seconds.
 - Iterations: 12 Subproblems: 0
- Solver Options:**
 - Max Time Unlimited, Iterations Unlimited, Precision 0.000001
 - Max Subproblems Unlimited, Max Integer Sols Unlimited, Integer Tolerance 1%, Solve Without Integer Constraints, Assume Non-Negative
- Objective Cell (Min):**

Cell	Name	Original Value	Final Value
\$C\$9	XJ	0	63
- Variable Cells:**

Cell	Name	Original Value	Final Value	Integer
\$B\$5	XA	0	0	Contin
\$C\$5	XB	0	20	Contin
\$D\$5	XC	0	30	Contin
\$E\$5	XD	0	35	Contin
\$F\$5	XE	0	38	Contin
\$G\$5	XF	0	57	Contin
\$H\$5	XG	0	48	Contin
\$I\$5	XH	0	45	Contin
\$J\$5	XI	0	58	Contin
\$K\$5	XJ	0	63	Contin
- Constraints:**

Cell	Name	Cell Value	Formula	Status	Slack
\$E\$11	XA	0	\$E\$11>=\$E\$11	Binding	0
\$E\$12	XB-XA	20	\$E\$12>=\$E\$12	Binding	0
\$E\$13	XC-XB	10	\$E\$13>=\$E\$13	Binding	0
\$E\$14	XD-XA	35	\$E\$14>=\$E\$14	Not Binding	15
\$E\$15	XE-XC	8	\$E\$15>=\$E\$15	Binding	0
\$E\$16	XF-XE	19	\$E\$16>=\$E\$16	Not Binding	12
\$E\$17	XG-XD	11	\$E\$17>=\$E\$17	Binding	0
\$E\$18	XH-XE	7	\$E\$18>=\$E\$18	Binding	0
\$E\$19	XI-XH	13	\$E\$19>=\$E\$19	Binding	0
\$E\$20	XJ-XF	12	\$E\$20>=\$E\$20	Binding	0
\$E\$21	XJ-XI	6	\$E\$21>=\$E\$21	Binding	0
\$E\$22	XJ-XD	5	\$E\$22>=\$E\$22	Binding	0

(3) Yes, the project durations match for both methodologies