Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Consider the following linear programming model: 1) _____

Max $X_1^2 + X_2 + 3X_3$

Subject to:

$X_1 + X_2 \leq 3$

$X_1 + X_2 \leq 1$

$X_1, X_2 \geq 0$

This problem violates which of the following assumptions?

A) proportionality
B) certainty
C) integrality
D) linearity
E) divisibility

2) Consider the following linear programming model: 2) _____

Min $2X_1 + 3X_2$

Subject to:

$X_1 + 2X_2 \leq 1$

$X_2 \leq 1$

$X_1 \geq 0, X_2 \leq 0$

This problem violates which of the following assumptions?

A) additivity
B) linearity
C) proportionality
D) non-negativity
E) divisibility

3) A redundant constraint is eliminated from a linear programming model. What effect will this have on the optimal solution? 3) _____

A) feasible region will increase in size
B) feasible region will decrease in size
C) an increase in objective function value
D) no change
E) a decrease in objective function value

4) Consider the following linear programming model: 4) _____

Max $2X_1 + 3X_2$

Subject to:

$X_1 \leq 2$

$X_2 \leq 3$

$X_1 \leq 1$

$X_1, X_2 \geq 0$

This linear programming model has:

A) non-negative solution
B) alternate optimal solutions
C) infeasible solution
D) redundant constraint
E) unbounded solution

5) A linear programming model generates an optimal solution with fractional values. This solution satisfies which basic linear programming assumption? 5) _____

A) certainty
B) divisibility
C) non-negativity
D) proportionality
E) linearity

6) Consider the following linear programming model: 6) _____

Max $X_1 + X_2$

Subject to:

$X_1 + X_2 \leq 2$

$X_1 \geq 1$

$X_2 \geq 3$

$X_1, X_2 \geq 0$

This linear programming model has:

A) unbounded solution
B) infeasible solution
C) alternate optimal solution
D) redundant constraint
E) unique solution

7) Consider the following linear programming model 7) _____

Max $2X_1 + 3X_2$

Subject to:

$X_1 + X_2 \geq 4$

$X_1 \geq 2$

$X_1, X_2 \geq 0$

This linear programming model has:

A) unique solution
B) alternate optimal solution
C) unbounded solution
D) redundant constraints
E) infeasible solution

8) Consider the following linear programming model 8) _____

Min $2X_1 + 3X_2$

Subject to:

$X_1 + X_2 \geq 4$

$X_1 \geq 2$

$X_1, X_2 \geq 0$

This linear programming model has:

A) infeasible solution
B) unbounded solution
C) redundant constraints
D) unique optimal solution
E) alternate optimal solution

Figure 1:

	A	B	C	D	E
1					
2		X_1	X_2		
3	Number to Make:				OBJ. FN. VALUE:
4					
5	Unit profit:	$4	$3		
6					
7	Constraints:			Used	Available
8	1	3	5		40
9	2	12	10		120
10	3	1	0		15

Figure 1 demonstrates an Excel spreadsheet that is used to model the following linear programming problem:

Max: $4 X_1 + 3 X_2$

Subject to:

$3 X_1 + 5 X_2 \leq 40$

$12 X_1 + 10 X_2 \leq 120$

$X_1 \geq 15$

$X_1, X_2 \geq 0$

Note: Cells B3 and C3 are the designated cells for the optimal values of X_1 and X_2, respectively, while cell E4 is the designated cell for the objective function value. Cells D8:D10 designate the left-hand side of the constraints.

9) Refer to Figure 1. What formula should be entered in cell E4 to compute total profitability? 9) _____

A) =B2*B5 + C2*C5
B) =B3*B5 + C3*C5
C) =SUM(B3:C3)
D) =SUMPRODUCT(B5:C5,B2:C2)
E) =SUMPRODUCT(B5:C5,E8:E10)

10) Refer to Figure 1. What formula should be entered in cell D9 to compute the amount of resource 2 that is consumed? 10) _____

A) =SUMPRODUCT(B9:C9,B5:C5)
B) =B9*D9 + C9*D9
C) =SUMPRODUCT(B2:C2,B9:C9)
D) =SUM(B9:C9)
E) =SUMPRODUCT(B3:C3,B9:C9)

11) Refer to Figure 1. Which cell(s) are the *Changing Cells* as designated by "Solver"? 11) _____

A) D8:D10 B) B5:C5 C) E4 D) B3:C3 E) B2:C2

12) Refer to Figure 1. What cell reference designates the *Target Cell* in "Solver"? 12) _____

A) D8:D10 B) B3 C) C3 D) E4 E) E8:E10

13) The constraint for a given resource is given by the following equation: 13) _____

$2X_1 + 3X_2 \leq 20$

If $X_1 = 5$ and $X_2 = 3$, how many units of this resource are unused?

A) 17 B) 20 C) 19 D) 0 E) 1

14) The constraint for a given resource is given by the following equation: 14) _____

$2X_1 + 3X_2 \geq 20$

If $X_1 = 5$ and $X_2 = 4$ how many units of this resource are unused?

A) 22 B) 20 C) 0 D) 9 E) 2

15) "Solver" typically generates which of the following report(s)? 15) _____

A) limits report
B) sensitivity analysis report
C) answer report
D) A and B only
E) A, B, and C

16) _____ systematically examines corner points, using algebraic steps, until an optimal solution is found. 16) _____

A) Trial-and-error
B) The simplex method
C) Karmarkar's method
D) The graphical approach
E) none of the above

17) _____ follows a path of points inside the feasible region to find an optimal solution. 17) _____

A) Karmarkar's method
B) The graphical approach
C) Trial-and-error
D) The simplex method
E) none of the above

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

18) If a linear programming problem has alternate optimal solutions, then the objective function value will vary according to each alternate optimal point. 18) _____

19) Unbounded linear programming problems typically arise as a result of misformulation. 19) _____

20) If an isoprofit line can be moved outward such that the objective function value can be made to reach infinity, then this problem has an unbounded solution. 20) _____

21) If a redundant constraint is eliminated from a linear programming model, this will have an impact on the optimal solution. 21) _____

22) A linear programming model has the following two constraints: $X_1 \geq 3$ and $X_1 \geq 4$. This model has a redundant constraint. 22) _____

23) A linear programming problem has the following two constraints: $X_1 \leq 20$ and $X_1 \geq 25$. This problem is infeasible. 23) _____

24) It is possible to solve graphically a linear programming model with 4 decision variables. 24) _____

25) An isoprofit line represents a line whereby all profits are the same along the line. 25) _____

26) Linear programming models typically do not have coefficients (i.e., objective function or constraint coefficients) that assume random values. 26) _____

27) It is possible for a linear programming model to yield an optimal solution that has fractional values. 27) _____

28) A linear programming model has the following objective function: 28) _____
Max: $X_1^2 + 3X_2 + 4X_3$. This model violates a key linear programming model assumption.

29) In a product mix problem, a decision maker has limited availability of weekly labor hours. Labor hours would most likely constitute a decision variable rather than a constraint. 29) _____

30) When using Solver, the parameter *Changing Cells* is typically associated with the objective function. 30) _____

31) The simplex method is an algebraic solution procedure for a linear programming problem. 31) _____

32) Karmarkar's method is synonymous with the corner point method. 32) _____

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

33) Consider the following linear programming problem.

Maximize	$6X_1 + 4X_2$
Subject to:	$X_1 + 2X_2 \leq 16$
	$3X_1 + 2X_2 \leq 24$
	$X_1 \geq 2$
	$X_1, X_2 \geq 0$

Use Solver to find the optimal values of X_1 and X_2.

34) Consider the following linear programming problem.

Maximize $5X_1 + 3X_2$
Subject to: $X_1 + X_2 \leq 20$
$X_1 \geq 5$
$X_2 \leq 10$
$X_1, X_2 \geq 0$

Use Solver to find the optimal values of X_1 and X_2.

35) Consider the following linear programming problem.

Minimize $3X_1 + 2X_2$
Subject to: $X_1 + X_2 \geq 10$
$X_1 + X_2 \leq 20$
$X_2 \leq 10$
$X_1 \leq 18$
$X_1, X_2 \geq 0$

Use Solver to find the optimal values of X_1 and X_2.

36) Consider the following linear programming problem.

Minimize $6X_1 + 3X_22$
Subject to:
$2X_1 + 4X_2 \geq 16$
$4X_1 + 3X_2 \geq 24$
$X_1, X_2 \geq 0$

Use Solver to find the optimal values of X_1 and X_2.

37) A computer retail store sells two types of flat screen monitors: 17 inches and 19 inches, with a profit contribution of $300 and $250, respectively. The monitors are ordered each week from an outside supplier. As an added feature, the retail store installs on each monitor a privacy filter that narrows the viewing angle so that only persons sitting directly in front of the monitor are able to see on-screen data. Each 19" monitor consumes about 30 minutes of installation time, while each 17" monitor requires about 10 minutes of installation time. The retail store has approximately 40 hours of labor time available each week. The total combined demand for both monitors is at least 40 monitors each week. How many units of each monitor should the retail store order each week to maximize its weekly profits and meet its weekly demand?

38) Creatine and protein are common supplements in most bodybuilding products. Bodyworks, a nutrition health store, makes a powder supplement that combines creatine and protein from two ingredients (X_1 and X_2). Ingredient X_1 provides 20 grams of protein and 5 grams of creatine per pound. Ingredient X_2 provides 15 grams of protein and 3 grams of creatine per pound. Ingredients X_1 and X_2 cost Bodyworks $5 and $7 per pound, respectively. Bodyworks wants its supplement to contain at least 30 grams of protein and 10 grams of creatine per pound and be produced at the least cost.

Determine what combination will maximize profits.

39) A furniture store produces beds and desks for college students. The production process requires assembly and painting. Each bed requires 6 hours of assembly and 4 hours of painting. Each desk requires 4 hours of assembly and 8 hours of painting. There are 40 hours of assembly time and 45 hours of painting time available each week. Each bed generates $35 of profit and each desk generates $45 of profit. As a result of a labor strike, the furniture store is limited to producing at most 8 beds each week. Determine how many beds and desks should be produced each week to maximize weekly profits.

40) An ice cream shop sells single scoop ice cream cones that come in three flavors: chocolate only, vanilla only, and chocolate-vanilla twist. The cones are prepackaged and sold to a supermarket daily. The ingredients used along with the minimum demand of each flavor are shown as follows:

	Ice Cream Flavor		
	Chocolate	Vanilla	Chocolate-Vanilla
Ingredient:			
Chocolate	4 oz.	0 oz.	3 oz.
Vanilla	0 oz.	4 oz.	2 oz.
Min daily demand:	20 scoops	15 scoops	10 scoops

Each day, 40 pounds of chocolate and 38 pounds of vanilla are supplied to the ice cream shop from an outside vendor. The chocolate, vanilla, and chocolate-vanilla twist each yield a profit of $2.00, $2.50, and $3.00 per cone, respectively. How many chocolate, vanilla, and chocolate-vanilla twist cones must prepackage daily to maximize daily profits?

41) A company manufactures four products A, B, C, and D that must go through assembly, polishing, and packing before being shipped to a wholesaler. For each product, the time required for these operations is shown below (in minutes) as is the profit per unit sold.

Product	Assembly	Polish	Pack	Profit ($)
A	2	3	2	1.50
B	4	2	3	2.50
C	3	3	2	3.00
D	7	4	5	4.50

The company estimates that each year they have 1667 hours of assembly time, 833 hours of polishing time and 1000 hours of packing time available. How many of each product should the company make per year to maximize its yearly profit?

42) Suppose that a farmer has 5 acres of land that can be planted with either wheat, corn, or a combination of the two. To ensure a healthy crop, a fertilizer and an insecticide must be applied at the beginning of the season before harvesting. The farmer currently has 100 pounds of the fertilizer and 150 pounds of the insecticide at the beginning of the season. Each acre of wheat planted requires 10 pounds of the fertilizer and 12 pounds of the insecticide. Each acre of corn planted requires 13 pounds of the fertilizer and 11 pounds of the insecticide. Each acre of wheat harvested yields a profit of $600, while each acre of corn harvested yields $750 in profit. What is the optimal allocation for the crops that maximizes the farmer's profit?

43) A carpenter makes tables and chairs. Each table can be sold for a profit of $50 and each chair for a profit of $30. The carpenter works a maximum of 40 hours per week and spends 5 hours to make a table and 2 hours to make a chair. Customer demand requires that he makes at least twice as many chairs as tables. The carpenter stores the finished products in his garage, and there is room for a maximum of 6 furniture pieces each week. Determine the carpenter's optimal production mix.

44) A bank is attempting to determine where its assets should be allocated in order to maximize its annual return. At present, $750,000 is available for investment in three types of mutual funds: A, B, and C. The annual rate of return on each type of fund is as follows: fund A, 15%; fund B, 12%; fund C; 13%. The bank's manager has placed the following restrictions on the bank's portfolio:

- No more than 20% of the total amount invested may be in fund A.
- The amount invested in fund B cannot exceed the amount invested in fund C.

Determine the optimal allocation that maximizes the bank's annual return.

45) A warehouse stocks five different products, A, B, C, and D. The warehouse has a total of 100,000 square feet of floor space available to accommodate all the products that it inventories. The monthly profit per square foot for each product is as follows:

Product	Profit per square foot
A	$4.50
B	$3.00
C	$2.75
D	$3.75

Each product must have at least 10,000 ft^2, and no single product can have more than 25% of the total warehouse space. The warehouse manager wants to know the floor space that should be allocated to each product to maximize profit.

46) A company that is introducing a new product would like to generate maximum market exposure. The marketing department currently has $100,000 of advertising budget for the year and is considering placing ads in three media: radio, television, and newspapers. The cost per ad and the exposure rating are as follows:

	Cost/ad	Exposure/ad
Radio	$10,000	30,000 individuals
Television	$25,000	50,000 individuals
Newspaper	$5000	20,000 individuals

The marketing department would like to place twice as many radio ads as television ads. They also would like to place at least 4 ads in each advertising media. What is the optimal allocation to each advertising medium to maximize audience exposure?

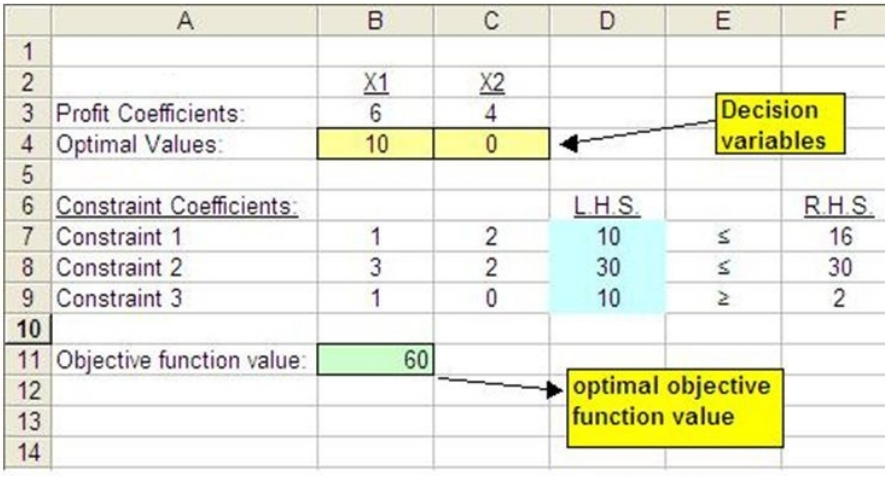
47) A meat packing store produces a dog food mixture that is sold to pet retail outlets in bags of 10 pounds each. The food mixture contains the ingredients turkey and beef. The cost per pound of each of these ingredients is as follows:

Ingredient	Cost/pound
Turkey	$2.00
Beef	$5.50

Each bag must contain at least 5 pounds of turkey. Moreover, the ratio of turkey to beef must be at least 2 to 1. What is the optimal mixture of the ingredients that will minimize total cost?

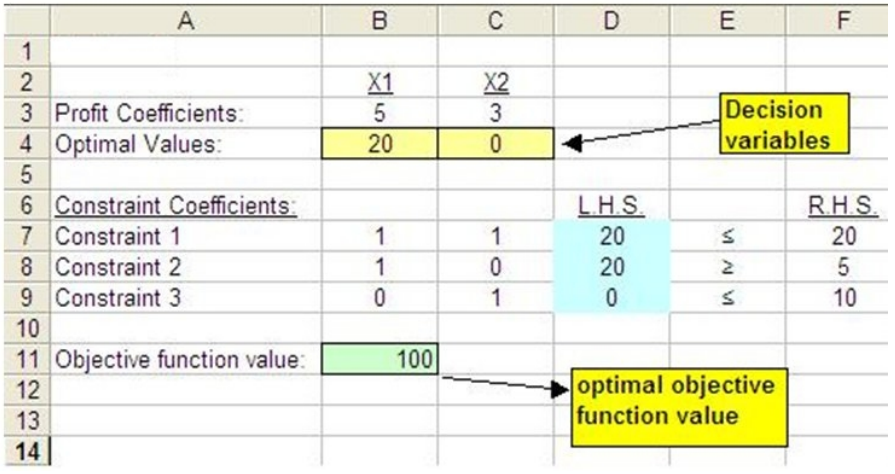
48) A company can decide how many additional labor hours to acquire for a given week. Subcontractors will only work a maximum of 20 hours a week. The company must produce at least 200 units of product A, 300 units of product B, and 400 units of product C. In 1 hour of work, worker 1 can produce 15 units of product A, 10 units of product B, and 30 units of product C. Worker 2 can produce 5 units of product B, 20 units of product B, and 35 units of product C. Worker 3 can produce 20 units of product A, 15 units of product B, and 25 units of product C. Worker 1 demands a salary of $50/hr, worker 2 demands a salary of $40/hr, and worker 3 demands a salary of $45/hr. The company must choose how many hours they should hire from each worker to meet their production requirements and minimize labor cost.

1) D
2) D
3) D
4) D
5) B
6) B
7) C
8) D
9) B
10) E
11) D
12) D
13) E
14) E
15) E
16) B
17) A
18) FALSE
19) TRUE
20) TRUE
21) FALSE
22) TRUE
23) TRUE
24) FALSE
25) TRUE
26) TRUE
27) TRUE
28) TRUE
29) FALSE
30) FALSE
31) TRUE
32) FALSE
33)



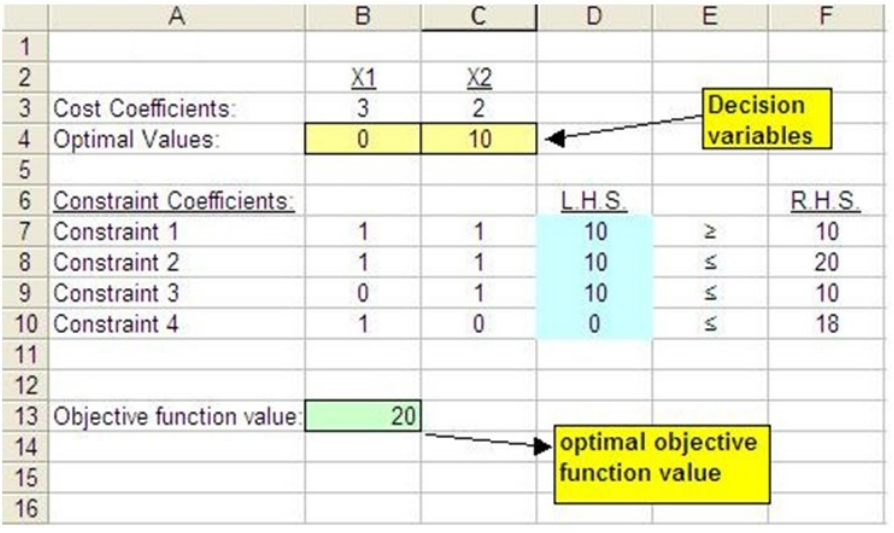
	A	B	C	D	E	F
1						
2		X1	X2			
3	Profit Coefficients:	6	4			
4	Optimal Values:	10	0			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	1	2	10	≤	16
8	Constraint 2	3	2	30	≤	30
9	Constraint 3	1	0	10	≥	2
10						
11	Objective function value:	60				
12						
13						
14						

34)



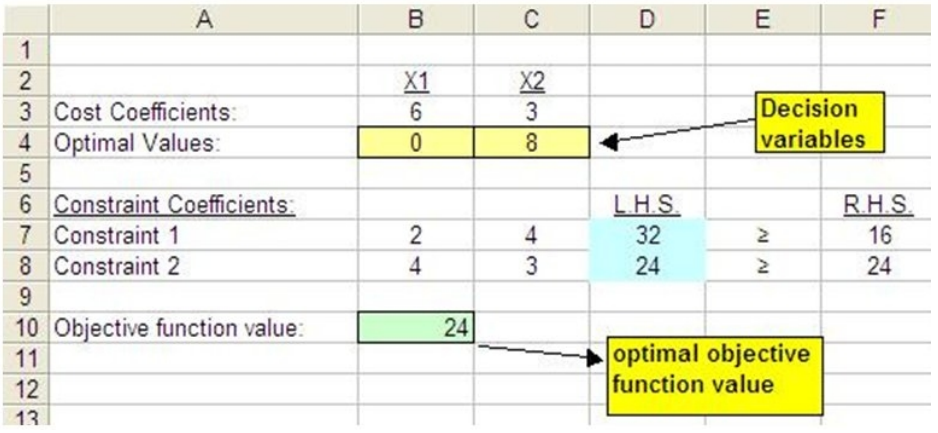
	A	B	C	D	E	F
1						
2		X1	X2			
3	Profit Coefficients:	5	3			
4	Optimal Values:	20	0			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	1	1	20	≤	20
8	Constraint 2	1	0	20	≥	5
9	Constraint 3	0	1	0	≤	10
10						
11	Objective function value:	100				
12						
13						
14						

35)



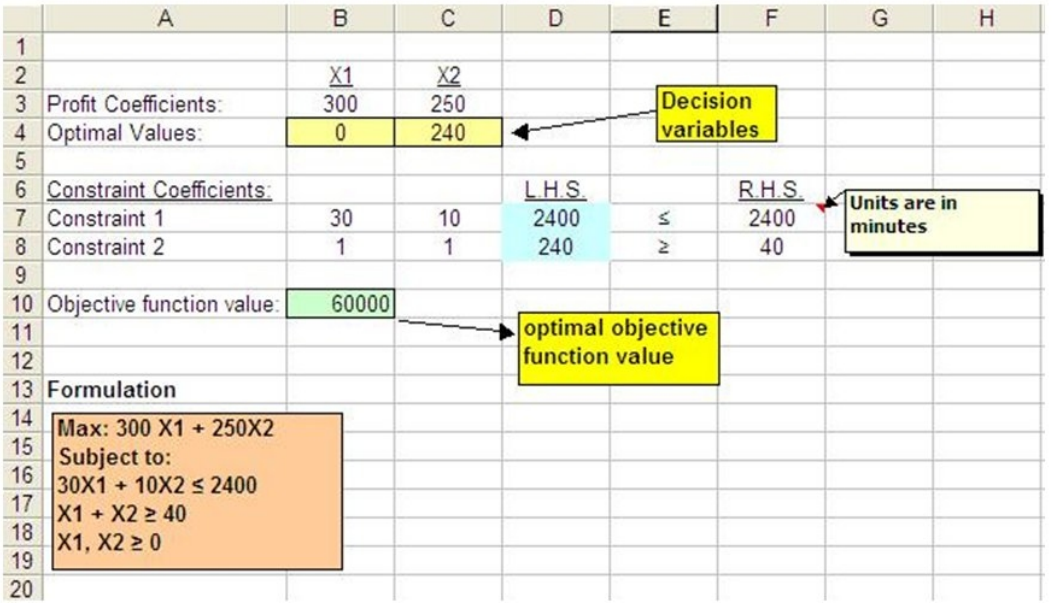
	A	B	C	D	E	F
1						
2		X1	X2			
3	Cost Coefficients:	3	2			
4	Optimal Values:	0	10			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	1	1	10	≥	10
8	Constraint 2	1	1	10	≤	20
9	Constraint 3	0	1	10	≤	10
10	Constraint 4	1	0	0	≤	18
11						
12						
13	Objective function value:	20				
14						
15						
16						

36)



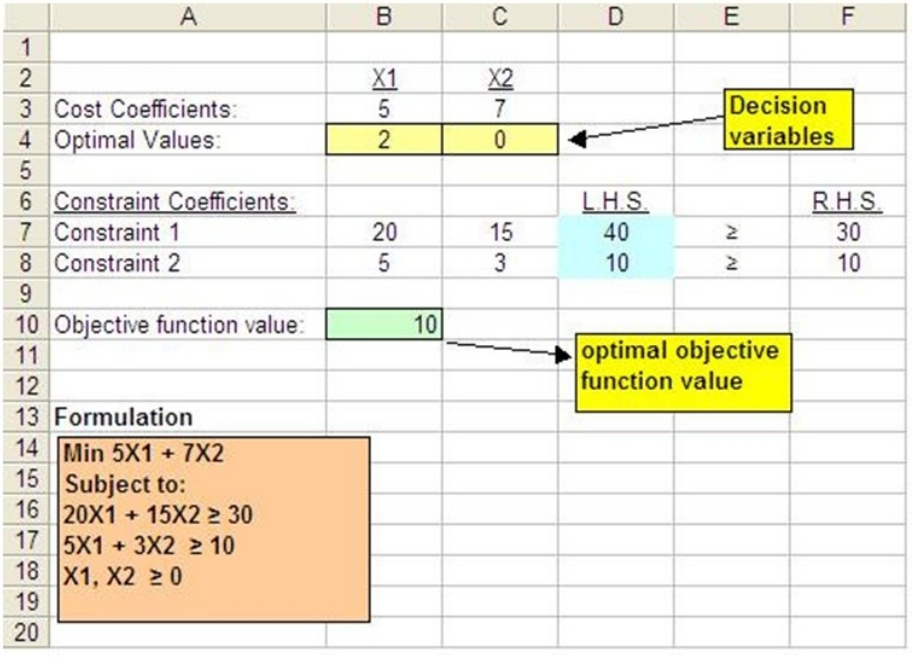
	A	B	C	D	E	F
1						
2		X1	X2			
3	Cost Coefficients:	6	3			
4	Optimal Values:	0	8			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	2	4	32	≥	16
8	Constraint 2	4	3	24	≥	24
9						
10	Objective function value:	24				
11						
12						
13						

37)



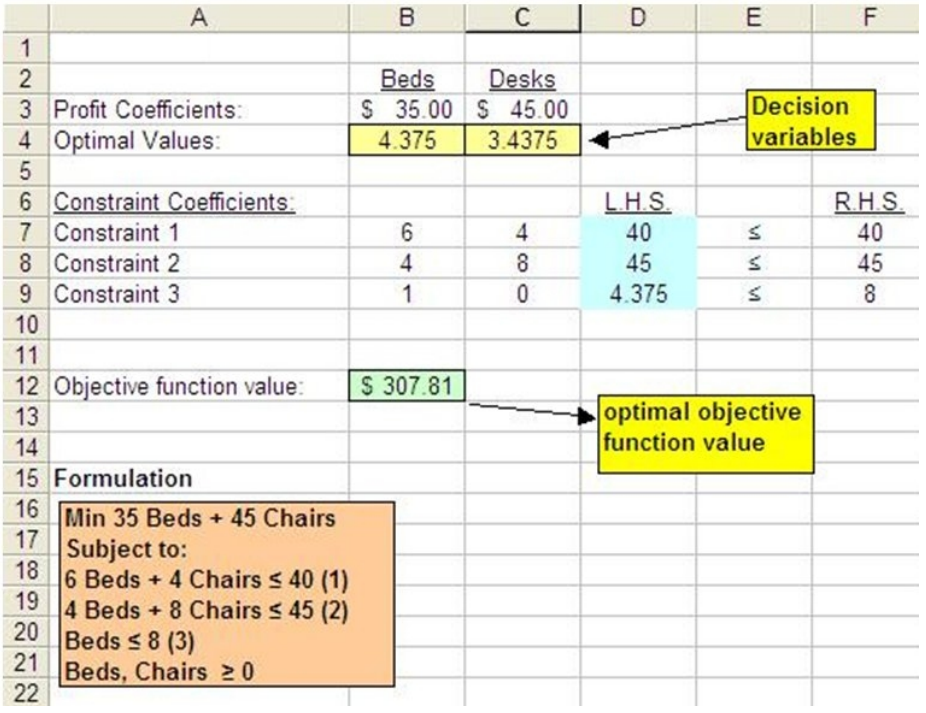
	A	B	C	D	E	F	G	H
1								
2		X1	X2					
3	Profit Coefficients:	300	250					
4	Optimal Values:	0	240					
5								
6	Constraint Coefficients:			L.H.S.		R.H.S.		
7	Constraint 1	30	10	2400	≤	2400		
8	Constraint 2	1	1	240	≥	40		
9								
10	Objective function value:	60000						
11								
12								
13	Formulation							
14								
15								
16								
17								
18								
19								
20								

38)



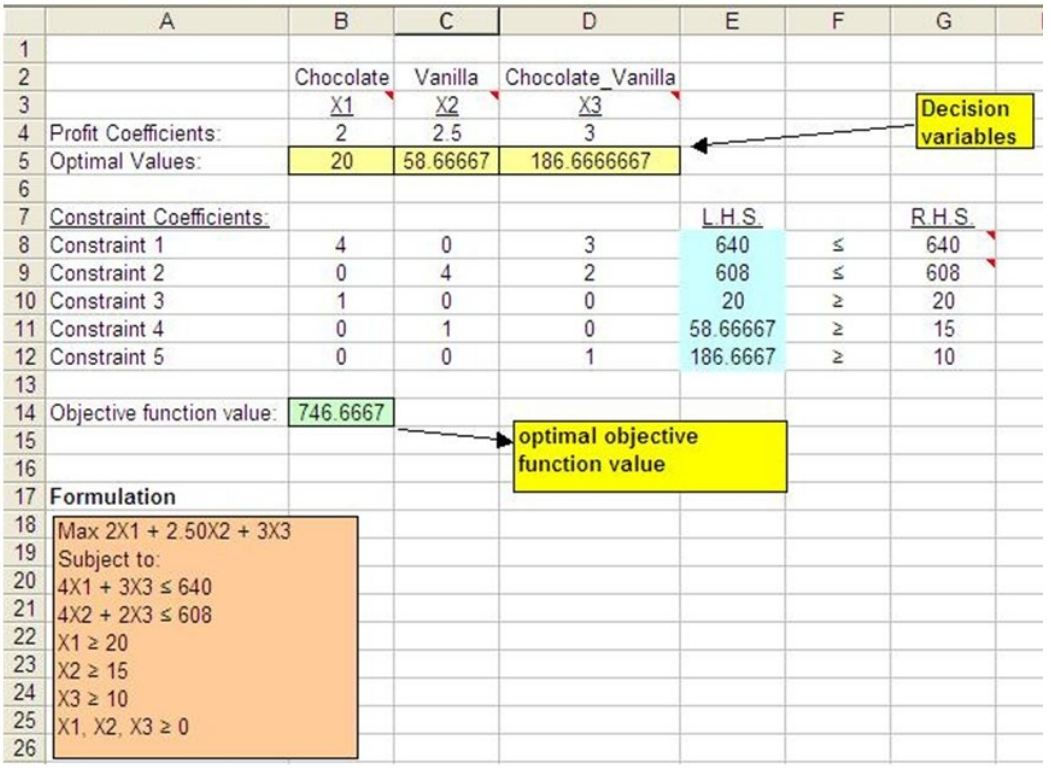
	A	B	C	D	E	F
1						
2		X1	X2			
3	Cost Coefficients:	5	7			
4	Optimal Values:	2	0			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	20	15	40	≥	30
8	Constraint 2	5	3	10	≥	10
9						
10	Objective function value:	10				
11						
12						
13	Formulation					
14						
15						
16						
17						
18						
19						
20						

39)



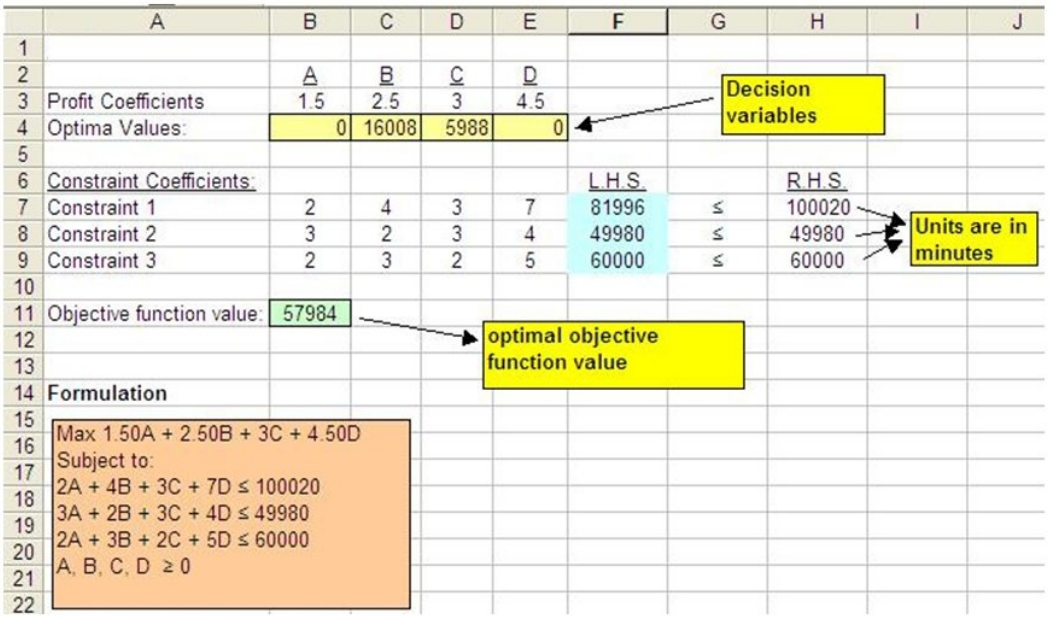
	A	B	C	D	E	F
1						
2		Beds	Desks			
3	Profit Coefficients:	$ 35.00	$ 45.00			
4	Optimal Values:	4.375	3.4375			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	6	4	40	≤	40
8	Constraint 2	4	8	45	≤	45
9	Constraint 3	1	0	4.375	≤	8
10						
11						
12	Objective function value:	$ 307.81				
13						
14						
15	**Formulation**					
16	**Min 35 Beds + 45 Chairs**					
17	**Subject to:**					
18	**6 Beds + 4 Chairs ≤ 40 (1)**					
19	**4 Beds + 8 Chairs ≤ 45 (2)**					
20	**Beds ≤ 8 (3)**					
21	**Beds, Chairs ≥ 0**					
22						

40)

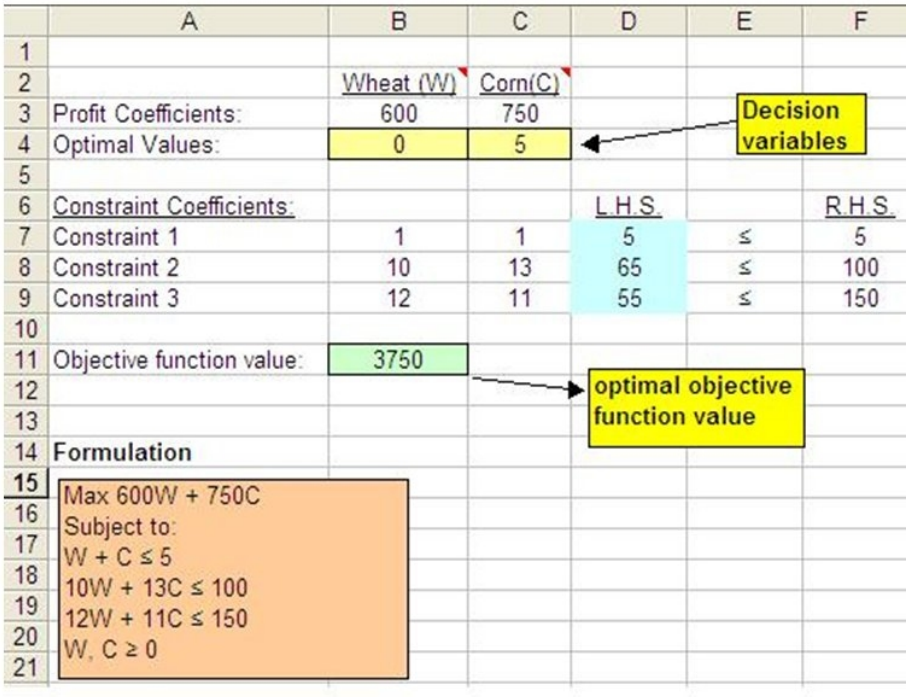


	A	B	C	D	E	F	G
1							
2		Chocolate	Vanilla	Chocolate_Vanilla			
3		X1	X2	X3			
4	Profit Coefficients:	2	2.5	3			
5	Optimal Values:	20	58.66667	186.6666667			
6							
7	Constraint Coefficients:				L.H.S.		R.H.S.
8	Constraint 1	4	0	3	640	≤	640
9	Constraint 2	0	4	2	608	≤	608
10	Constraint 3	1	0	0	20	≥	20
11	Constraint 4	0	1	0	58.66667	≥	15
12	Constraint 5	0	0	1	186.6667	≥	10
13							
14	Objective function value:	746.6667					
15							
16							
17	**Formulation**						
18	Max 2X1 + 2.50X2 + 3X3						
19	Subject to:						
20	4X1 + 3X3 ≤ 640						
21	4X2 + 2X3 ≤ 608						
22	X1 ≥ 20						
23	X2 ≥ 15						
24	X3 ≥ 10						
25	X1, X2, X3 ≥ 0						
26							

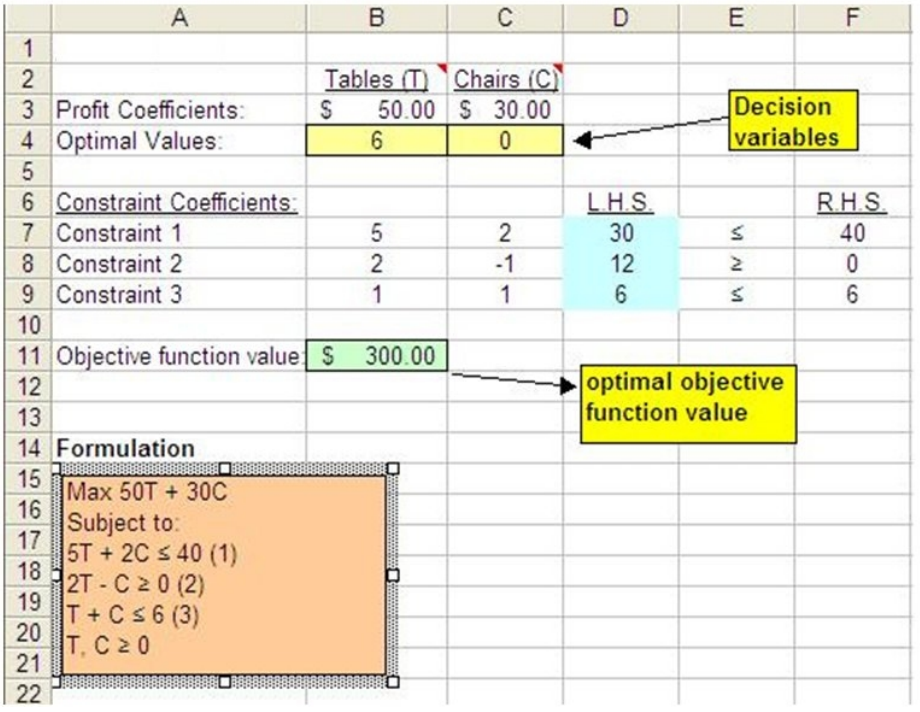
41)


A
B
C
D
E
F
G
H
I
J
A
B
C
D
Profit Coefficients
1.5
2.5
3
4.5
Optima Values:
0
16008
5988
0
Decision variables
Constraint Coefficients:
L.H.S.
R.H.S.
Constraint 1
2
4
3
7
81996
≤
100020
Constraint 2
3
2
3
4
49980
≤
49980
Constraint 3
2
3
2
5
60000
≤
60000
Units are in minutes
Objective function value:
57984
optimal objective function value
Formulation
Max 1.50A + 2.50B + 3C + 4.50D
Subject to:
2A + 4B + 3C + 7D ≤ 100020
3A + 2B + 3C + 4D ≤ 49980
2A + 3B + 2C + 5D ≤ 60000
A, B, C, D ≥ 0

42)

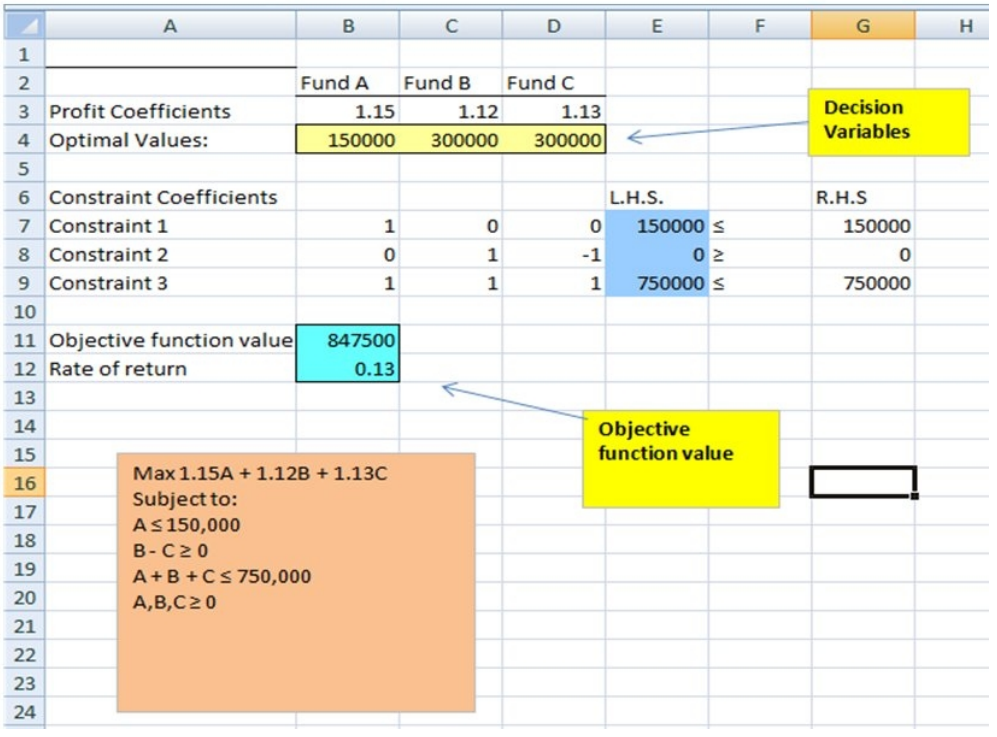

A
B
C
D
E
F
Wheat (W)
Corn(C)
Profit Coefficients:
600
750
Optimal Values:
0
5
Decision variables
Constraint Coefficients:
L.H.S.
R.H.S.
Constraint 1
1
1
5
≤
5
Constraint 2
10
13
65
≤
100
Constraint 3
12
11
55
≤
150
Objective function value:
3750
optimal objective function value
Formulation
Max 600W + 750C
Subject to:
W + C ≤ 5
10W + 13C ≤ 100
12W + 11C ≤ 150
W, C ≥ 0

43)



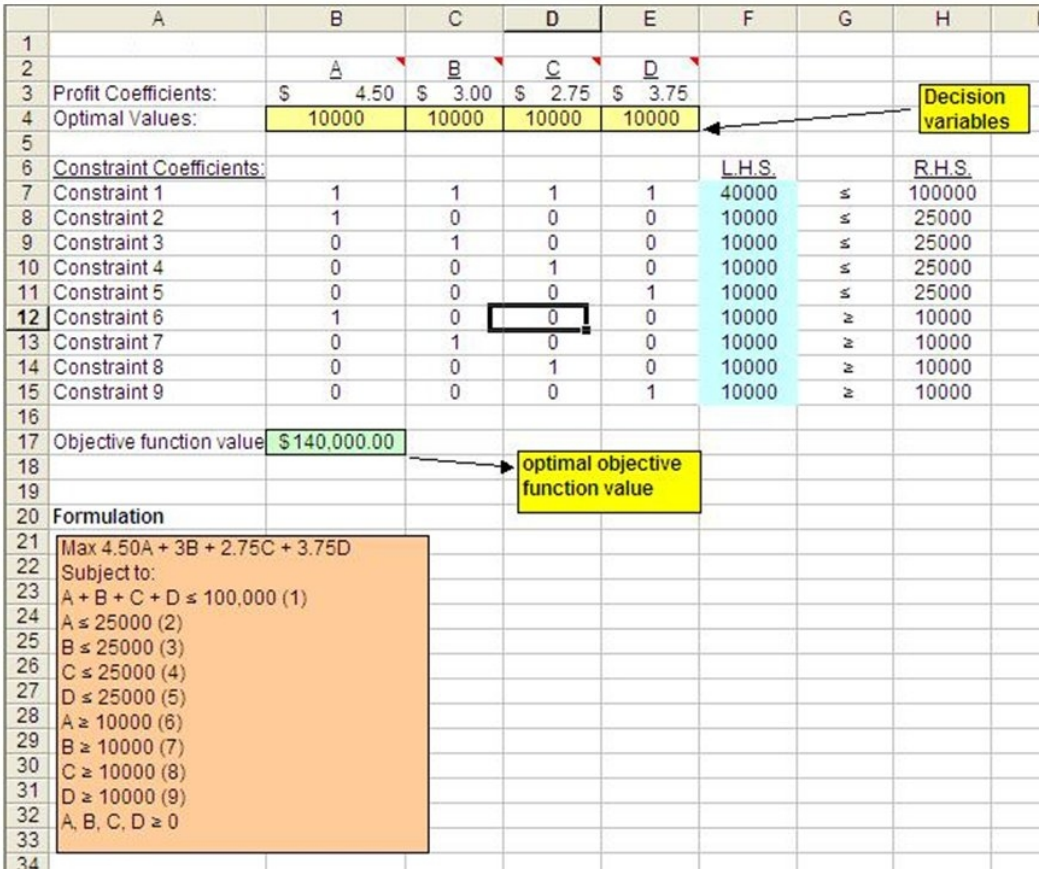
	A	B	C	D	E	F
1						
2		Tables (T)	Chairs (C)			
3	Profit Coefficients:	$ 50.00	$ 30.00			
4	Optimal Values:	6	0			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	5	2	30	≤	40
8	Constraint 2	2	-1	12	≥	0
9	Constraint 3	1	1	6	≤	6
10						
11	Objective function value:	$ 300.00				
12						
13						
14	**Formulation**					
15	Max 50T + 30C					
16	Subject to:					
17	5T + 2C ≤ 40 (1)					
18	2T - C ≥ 0 (2)					
19	T + C ≤ 6 (3)					
20	T, C ≥ 0					
21						
22						

44)



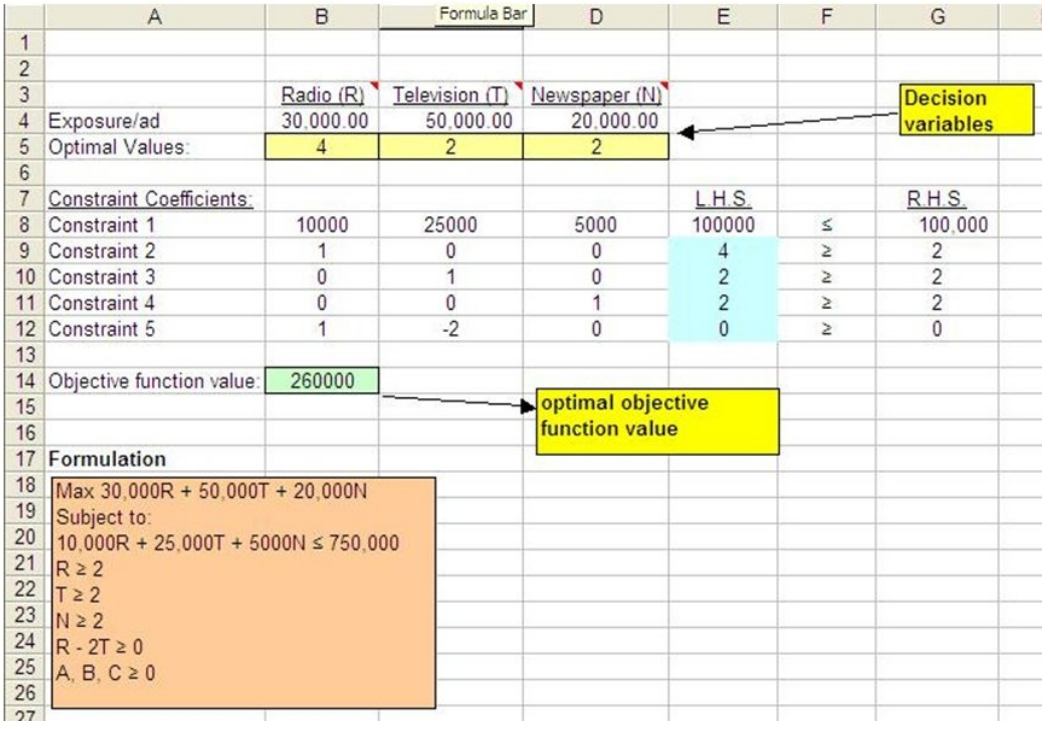
	A	B	C	D	E	F	G	H
1								
2		Fund A	Fund B	Fund C				
3	Profit Coefficients	1.15	1.12	1.13				
4	Optimal Values:	150000	300000	300000				
5								
6	Constraint Coefficients				L.H.S.		R.H.S	
7	Constraint 1	1	0	0	150000	≤	150000	
8	Constraint 2	0	1	-1	0	≥	0	
9	Constraint 3	1	1	1	750000	≤	750000	
10								
11	Objective function value	847500						
12	Rate of return	0.13						
13								
14								
15								
16	Max 1.15A + 1.12B + 1.13C							
17	Subject to:							
18	A ≤ 150,000							
19	B - C ≥ 0							
20	A + B + C ≤ 750,000							
21	A,B,C ≥ 0							
22								
23								
24								

45)



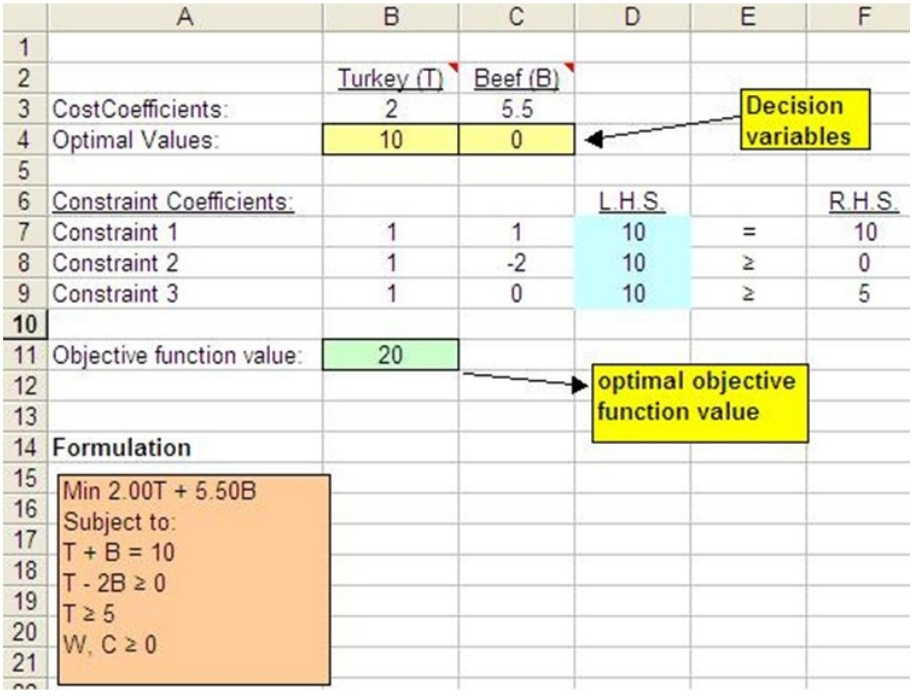
	A	B	C	D	E	F	G	H
1								
2		A	B	C	D			
3	Profit Coefficients:	$ 4.50	$ 3.00	$ 2.75	$ 3.75			
4	Optimal Values:	10000	10000	10000	10000			
5								
6	Constraint Coefficients:					L.H.S.		R.H.S.
7	Constraint 1	1	1	1	1	40000	≤	100000
8	Constraint 2	1	0	0	0	10000	≤	25000
9	Constraint 3	0	1	0	0	10000	≤	25000
10	Constraint 4	0	0	1	0	10000	≤	25000
11	Constraint 5	0	0	0	1	10000	≤	25000
12	Constraint 6	1	0	0	0	10000	≥	10000
13	Constraint 7	0	1	0	0	10000	≥	10000
14	Constraint 8	0	0	1	0	10000	≥	10000
15	Constraint 9	0	0	0	1	10000	≥	10000
16								
17	Objective function value	$140,000.00						
18								
19								
20	**Formulation**							
21	Max 4.50A + 3B + 2.75C + 3.75D							
22	Subject to:							
23	A + B + C + D ≤ 100,000 (1)							
24	A ≤ 25000 (2)							
25	B ≤ 25000 (3)							
26	C ≤ 25000 (4)							
27	D ≤ 25000 (5)							
28	A ≥ 10000 (6)							
29	B ≥ 10000 (7)							
30	C ≥ 10000 (8)							
31	D ≥ 10000 (9)							
32	A, B, C, D ≥ 0							
33								
34								

46)



	A	B	C	D	E	F	G
1			Formula Bar				
2							
3		Radio (R)	Television (T)	Newspaper (N)			
4	Exposure/ad	30,000.00	50,000.00	20,000.00			
5	Optimal Values:	4	2	2			
6							
7	Constraint Coefficients:				L.H.S.		R.H.S.
8	Constraint 1	10000	25000	5000	100000	≤	100,000
9	Constraint 2	1	0	0	4	≥	2
10	Constraint 3	0	1	0	2	≥	2
11	Constraint 4	0	0	1	2	≥	2
12	Constraint 5	1	-2	0	0	≥	0
13							
14	Objective function value:	260000					
15							
16							
17	**Formulation**						
18	Max 30,000R + 50,000T + 20,000N						
19	Subject to:						
20	10,000R + 25,000T + 5000N ≤ 750,000						
21	R ≥ 2						
22	T ≥ 2						
23	N ≥ 2						
24	R - 2T ≥ 0						
25	A, B, C ≥ 0						
26							

47)



	A	B	C	D	E	F
1						
2		Turkey (T)	Beef (B)			
3	CostCoefficients:	2	5.5			
4	Optimal Values:	10	0			
5						
6	Constraint Coefficients:			L.H.S.		R.H.S.
7	Constraint 1	1	1	10	=	10
8	Constraint 2	1	-2	10	≥	0
9	Constraint 3	1	0	10	≥	5
10						
11	Objective function value:	20				
12						
13						
14	**Formulation**					
15	Min 2.00T + 5.50B					
16	Subject to:					
17	T + B = 10					
18	T - 2B ≥ 0					
19	T ≥ 5					
20	W, C ≥ 0					
21						

48)

	Product A (A)	Product B (B)	Product C (C)			
Cost Coefficients	50	40	45			
Optimal Values	0	9.230769231	7.692307692			
Constraint Coefficients				L.H.S.		R.H.S.
Constraint 1	15	5	20	200	≥	200
Constraint 2	10	20	15	300	≥	300
Constraint 3	30	35	25	515.3846	≥	400
Constraint 4	1	0	0	0	≤	20
Constraint 5	0	1	0	9.230769	≤	20
Constraint 6	0	0	1	7.692308	≤	20
Objective function value	715.3846154					
Formulation						

Decision Variables

Optimal objective function value

Min 50A + 40B + 45C
Subject to:
15A + 5B + 20C ≥ 200
10A + 20B + 15C ≥ 300
30A + 35B + 25C ≥ 400
A,B,C ≤ 20
A,B,C ≥ 0