8. a. Let P*ij* = production at plant *i* allocated to meet demand for customer *j*

Y*i*= 1 if any X*ij* 0, 0 otherwise

MIN 35 P1X + 30 P1Y + 45 P1Z + 45 P2X + 40 P2Y + 50 P2Z + 70 P3X + 65 P3Y

+ 50 P3Z + 20 P4X + 45 P4Y + 25 P4Z + 65 P5X + 45 P5Y + 45 P5Z

+ 1000 (1,325 Y1 + 1,100 Y2 + 1,500 Y3 + 1,200 Y4 + 1,400 Y5)

ST P1X + P1Y + P1Z 40,000 Y1

P2X + P2Y + P2Z 30,000 Y2

P3X + P3Y + P3Z 50,000 Y3

P4X + P4Y + P4Z 20,000 Y4

P5X + P5Y + P5Z 40,000 Y5

P1X + P2X + P3X + P4X + P5X 40,000

P1Y + P2Y + P3Y + P4Y + P5Y 25,000

P1Z + P2Z + P3Z + P4Z + P5Z 35,000

P*ij*  0

Y*i* binary

9. a. Additional Constraints: Y1+Y2 1 and Y4+Y5 1 (implement as Y1 1-Y2 and Y4 1-Y5)

11. a. MIN 21X1 + 23X2 + 25X3 + 24X4 + 20X5 + 26X6

+ 1000Y1 + 950Y2 + 875Y3 + 850Y4 + 800Y5 + 700Y6

ST X1 + X2 + X3 + X4 + X5 + X6 = 1800

X1 - 500 Y1 ≤ 0

X2 - 600 Y2 ≤ 0

X3 - 750 Y3 ≤ 0

X4 - 400 Y4 ≤ 0

X5 - 600 Y5 ≤ 0

X6 - 800 Y6 ≤ 0

X*i* ≥ 0

All Y*i* are binary

13. a. MIN 450 X1 + 650 X2 + 550 X3 + 500 X4 + 525 X5

ST X1 + X3 1

X1 + X2 + X4 + X5 1

X2 + X4 1

X3 + X5 1

X1 + X2 1

X3 + X5 1

X4 + X5 1

All X*i* are binary

where:

X1 = 1 if Sanford is selected, 0 otherwise

X2 = 1 if Altamonte is selected, 0 otherwise

X3 = 1 if Apopka is selected, 0 otherwise

X4 = 1 if Casselberry is selected, 0 otherwise

X5 = 1 if Maitland is selected, 0 otherwise

16. a. Let X*ij* = bushels (in 1000s) shipped from grove *i* to processing plant *j*

Y*ij* = 1 if X*ij* 0, 0 otherwise

MIN $168 Y14 + $400 Y15 + $320 Y16

$280 Y24 + $240 Y25 + $176 Y26

$440 Y34 + $160 Y35 + $200 Y36

ST X14 + X15 + X16 = 275

X24 + X25 + X26 = 400

X34 + X35 + X36 = 300

X14 + X24 + X34 200

X15 + X25 + X35 600

X16 + X26 + X36 225

X*ij* - M*ij*Y*ij* 0

X*ij* 0

Y*ij* binary

Note: M*ij* = MIN(supply of *i*, capacity of *j*)

17. a. MIN: 32X1 + 80X2 + 32X3 + 80X4 + 32X5 + 80X6 + 32X7

ST X1 + X2 ≥ 11

X1 + X2 ≥ 11

X1 + X2 ≥ 11

X1 + X2 ≥ 11

X2 + X3 + X4 ≥ 24

X2 + X3 + X4 ≥ 24

X2 + X3 + X4 ≥ 16

X2 + X3 + X4 ≥ 16

X4 + X5 + X6 ≥ 10

X4 + X5 + X6 ≥ 10

X4 + X5 + X6 ≥ 22

X4 + X5 + X6 ≥ 22

X6 + X7 ≥ 17

X6 + X7 ≥ 17

X6 + X7 ≥ 6

X6 + X7 ≥ 6

X2 + X4 ≥ 0.3\*(X2+X3+X4)

X4 + X6 ≥ 0.3\*(X4+X5+X6)

X2 ≥ 1

X6 ≥ 1

X*i* ≥ 0 & integer

18. a. Let X*i* = 1 if project i is selected, 0 otherwise

MAX 650 X1 + 550 X2 + 600 X3 + 450 X4 + 375 X5 + 525 X6 + 750 X7

ST 7 X1 + 6 X2 + 9 X3 + 5 X4 + 6 X5 + 4 X6 + 8 X7 20

250 X1 + 175 X2 + 300 X3 + 150 X4 + 145 X5 + 160 X6 + 325 X7 950

X2 + X6 1 (implemented as X2 1-X6 )

36. a. MIN 13 A1+ 9 B1+ 10 C1+ 11 A1+ 12 B2+ 8 C2 +

55 YA1+ 93 YB1+ 60 YC1+ 65 YA2+ 58 YB2+ 75 YC2

ST A1+ A2 = 3

B1+ B2 = 7

C1+ C2 = 4

0.4 A1+ 1.1 B1+ 0.9 C1 8

0.5 A2+ 1.2 B2+ 1.3 C2 6

A1- 3YA1 0

B1- 7YB1 0

C1- 4YC1 0

A2- 3YA2 0

B2- 7YB2 0

C2- 4YC2 0

A*i*, B*i*, C*i* and integer

Y*ij* binary