

MTH601

Operations Research

Formula Sheet

1 Chapters, 355 Formulas

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$$5 + 3$$

$$5 + 3 = 8 \text{ days}$$

$$6 + 7 + 3$$

$$6 + 7 + 3 = 16$$

$$6 + 6$$

$$6 + 6 = 12$$

$$5 + 3$$

$$5 + 3 = 8 \text{ days}$$

$$6 + 7 + 3$$

$$6 + 7 + 3 = 16 \text{ days}$$

$$6 + 6$$

$$6 + 6 = 12 \text{ days}$$

$$1-2-4-5$$

$$1-2-4-5 = 42$$

$$1-2-3-4-5$$

$$1-2-3-4-5 = 46^*$$

$$1-3-4-5$$

$$1-3-4-5 = 41$$

$$(1+4+7)/6$$

$$(1+4+7)/6 = 2$$

$$(7-1)/6$$

$$(7-1)/6 = 1$$

$$(1+16+7)/6$$

$$(1+16+7)/6 = 4$$

$$(7-1)/6$$

$$(7-1)/6 = 1$$

$$(2+8+8)/6$$

$$(2+8+8)/6 = 3$$

$$(8-2)/6$$

$$(8-2)/6 = 1$$

$$(1+4+1)/6$$

$$(1+4+1)/6 = 1$$

$$(1-1)/6$$

$$(1-1)/6 = 0$$

$$(2+20+14)/6$$

$$(2+20+14)/6 = 6$$

$$(14-2)/6$$

$$(14-2)/6 = 2$$

$$(2+20+8)/6$$

$$(2+20+8)/6 = 5$$

$$(8-2)/6$$

$$(8-2)/6 = 1$$

$$(3+24+15)/6$$

$$(3+24+15)/6 = 7$$

$$(15-3)/6$$

$$(15-3)/6 = 2$$

$$1-2-5-6$$

$$1-2-5-6 = 10$$

$$1-3-5-6$$

$$1-3-5-6 = 17$$

$$1-2-3-5-8$$

$$1-2-3-5-8 = 36 \text{ days}$$

$$1-2-4-5-8$$

$$1-2-4-5-8 = 23 \text{ days}$$

$$1-6-7-8$$

$$1-6-7-8 = 35 \text{ days}$$

$$= 0.5000 + 0.3849$$

C_1

$$C_1 = \text{Rs. } 2/\text{item}$$

C_2

$$C_2 = \text{Rs. } 100/\text{order}$$

C_3

$$C_3 = \text{Rs. } 0.80/\text{item/month}$$

$$= \text{Rs. } 9.6/\text{item/year}$$

D

$$D = 12000 \text{ items/year}$$

D

$$D = 18000 \text{ units/year}$$

C_1

$$C_1 = \text{Rs. } 1/\text{item}$$

C_3

$$C_3 = \text{Rs. } 1.2/\text{year/item}$$

C_2

$$C_2 = \text{Rs. } 400/\text{order}$$

C_4

$$C_4 = \text{Rs. } 5/\text{year/item}$$

Slope

$$\text{Slope} = (R - D)$$

But t

$$\text{But } t = Q/D$$

D

$$D = 18000/\text{year} = 1500/\text{month}$$

R

$$R = 3000/\text{month}$$

$$= \text{Rs. } 2/\text{Unit}/\text{year}$$

MADLT

$$\text{MADLT} = (0.659 + 0.341 \text{ LT}) \text{ MAD}$$

D

$$D = \text{Demand} = 50000/\text{year}$$

No. of days

$$\text{No. of days} = 300/\text{year}$$

C3

$$C3 = 15\% \text{ of Rs. } 1.2/\text{item}/\text{year}.$$

(2) Requirement per day

$$(2) \text{ Requirement per day} = 50000/300$$

Lead time demand

$$\text{Lead time demand} = 12 \times 500/3 = 2000$$

$$= 2000 + 500 = 2500$$

$$= 5000 + 500 = 5500$$

Average inventory

$$\text{Average inventory} = (\text{Max. Inv.} + \text{Min. Inv.})/2$$

$$= (5500 + 500)/2 = 3000$$

(2) The Average lead time

$$(2) \text{ The Average lead time} = (13 + 14 + 15 + 16 + 17)/5$$

$$= 417 + 420 = 837$$

(4) Average inventory

$$(4) \text{ Average inventory} = (1420 + 420)/2$$

$$= 1840/2 = 920.$$

Reorder level

$$\text{Reorder level} = 12 + 14 = 26 \text{ items.}$$

$$= (10 + 40 + 210 + 160 + 150 + 60 + 70 + 80)/200$$

$$= 770/200 = 3.85 \text{ weeks}$$

No. of orders

$$\text{No. of orders} = 52/\text{year.}$$

1 stock out in 52 weeks means a 98 %

$$1 \text{ stock out in 52 weeks means a } 98 \% = (51/52) \text{ values}$$

SD

$$SD = MAD/0.8 = 60/0.8$$

2.05

$$2.05 = (SS - 0) \times 0.8/60$$

(a) Number of orders

$$(a) \text{ Number of orders} = 52/5$$

1 stock out

$$1 \text{ stock out} = (52/5 - 1)$$

1.285

$$1.285 = SS/75$$

Maximize Z

$$\text{Maximize } Z = 4X_1 + 5X_2$$

Z

$$Z = \text{Rs. } 4X_1 + 5X_2$$

Z

$$Z = \text{Rs. } 0.4X_1 + 0.6X_2 + 0.2X_3$$

Z

$$Z = \text{Rs. } 0.4 X_1 + 0.6 X_2 + 0.2 X_3$$

Z

$$Z = \text{Rs. } .085 X_1 + .100 X_2 + .065 X_3 + .130 X_4$$

$$X_1 + X_2 + X_3 + X_4$$

$$X_1 + X_2 + X_3 + X_4 = \text{Rs. } 70,000$$

Z

$$Z = .085X_1 + .100X_2 + .065X_3 + .130X_4$$

$$X_1 + X_2 + X_3 + X_4$$

$$X_1 + X_2 + X_3 + X_4 = 70,000$$

Minimize Z

$$\text{Minimize } Z = \text{Rs. } 4X_1 + 8X_2 + 9X_3$$

$$X_1 + X_2 + X_3$$

$$X_1 + X_2 + X_3 = 1,000$$

Z

$$Z = 4X_1 + 8X_2 + 9X_3$$

$$X_1 + X_2 + X_3$$

$$X_1 + X_2 + X_3 = 1,000$$

Z

$$Z = 20,000X_1 + 12,000X_2 + 9,000X_3$$

Z

$$Z = 20,000X_1 + 12,000X_2 + 9,000X_3$$

Z

$$Z = \text{Rs. } 6X_{1A} + 8X_{1B} + 1X_{1C} + 4X_{2A} + 2X_{2B} + 3X_{2C} + 3X_{3A} + 5X_{3B} + 7X_{3C}$$

$$X_{1A} + X_{1B} + X_{1C}$$

$$X_{1A} + X_{1B} + X_{1C} = 300$$

$$X_{2A} + X_{2B} + X_{2C}$$

$$X_{2A} + X_{2B} + X_{2C} = 100$$

$$X_{3A} + X_{3B} + X_{3C}$$

$$X_{3A} + X_{3B} + X_{3C} = 200$$

$$X_{1A} + X_{2A} + X_{3A}$$

$$X_{1A} + X_{2A} + X_{3A} = 150$$

$$X_{1B} + X_{2B} + X_{3B}$$

$$X_{1B} + X_{2B} + X_{3B} = 250$$

$$X_{1C} + X_{2C} + X_{3C}$$

$$X_{1C} + X_{2C} + X_{3C} = 200$$

Z

$$Z = \text{Rs. } 6X_{1A} + 8X_{1B} + 1X_{1C} + 4X_{2A} + 2X_{2B} + 3X_{2C} + 3X_{3A} + 5X_{3B} + 7X_{3C}$$

$$X_{1A} + X_{1B} + X_{1C}$$

$$X_{1A} + X_{1B} + X_{1C} = 300$$

$$X_{2A} + X_{2B} + X_{2C}$$

$$X_{2A} + X_{2B} + X_{2C} = 100$$

$$X_{3A} + X_{3B} + X_{3C}$$

$$X_{3A} + X_{3B} + X_{3C} = 200$$

$$X_{1A} + X_{2A} + X_{3A}$$

$$X_{1A} + X_{2A} + X_{3A} = 150$$

$$X_{1B} + X_{2B} + X_{3B}$$

$$X_{1B} + X_{2B} + X_{3B} = 250$$

$$X_{1C} + X_{2C} + X_{3C}$$

$$X_{1C} + X_{2C} + X_{3C} = 200$$

Z

$$Z = c_1 x_1 + c_2 x_2 + \dots + c_n x_n$$

and $x_j > 0$ for all j

and $x_j > 0$ for all $j = 1, 2, \dots, n$

$$3x + 5y$$

$$3x + 5y = 15.$$

Maximize Z

$$\text{Maximize } Z = 4x + 7y$$

The co-ordinates for B are x

The co-ordinates for B are $x = 0, y = 30$.

$$x + y$$

$$x + y = 60$$

$$x + y$$

$$x + y = 60$$

The co-ordinates of D are x

The co-ordinates of D are $x = 40, y = 20$

The co-ordinates of E are x

The co-ordinates of E are $x = 40, y = 0$.

Z

$$Z = 4x + 7y$$

Z

$$Z = 4x + 7y$$

Z

$$Z = 4x + 7y = 140$$

value of Z^*

$$\text{value of } Z^* = 330.$$

Z

$$Z = 4x + 5y$$

$x + y$

$$x + y = 10$$

$2x + 5y$

$$2x + 5y = 35$$

Z

$$Z = 4x + 5y = 100$$

$x + y$

$$x + y = 10$$

$2x + 5y$

$$2x + 5y = 35$$

Therefore, Z^*

$$\text{Therefore, } Z^* = 45, x = 5, y = 5$$

Maximize Z

$$\text{Maximize } Z = 3x + 7y$$

Maximize Z

$$\text{Maximize } Z = 2x + 3y$$

Maximize Z

$$\text{Maximize } Z = 3x_1 + 5x_2$$

Z

$$Z = 4x_1 + 6x_2$$

Z

$$Z = 4x_1 + x_2$$

Z

$$Z = 5x_1 + 4x_2$$

value of Z

$$\text{value of } Z = 4x + 7y$$

Z

$$Z = 3x + 5y$$

$x + S_1$

$$x + S_1 = 40$$

$y + S_2$

$$y + S_2 = 30$$

$x + y + S_3$

$$x + y + S_3 = 60$$

Z

$$Z = 3x + 5y$$

$x + S_1$

$$x + S_1 = 40$$

$y + S_2$

$$y + S_2 = 30$$

$x + y + S_3$

$$x + y + S_3 = 60$$

$S1$

$$S1 = 40 - x$$

$S2$

$$S2 = 30 - y$$

$S3$

$$S3 = 60 - x - y$$

$$Z - 3x - 5y$$

$$Z - 3x - 5y = 0$$

$S3$

$$S3 = 60 - x - y$$

$x0$

$$x0 = 2x1 + 3x2 + 4x3$$

$x0$

$$x0 = 3x1 + 2x2 + 5x3$$

Z

$$Z = 2x + 5y$$

$-S3 + A$

$$-S3 + A = 60$$

$$Z - 2x - Mx - 5y - My + MS3$$

$$Z - 2x - Mx - 5y - My + MS3 = -60M$$

$$Z + (-2 - M)x + (-5 - M)y + MS3$$

$$Z + (-2 - M)x + (-5 - M)y + MS3 = -60M$$

Z

$$Z = 5x1 + 6x2$$

Z

$$Z = 5x1 + 6x2 + MA1 + MA2$$

$$2x1 + 5x2 - S1 + A1$$

$$2x1 + 5x2 - S1 + A1 = 1500$$

$$3x_1 + x_2 - S_2 + A_2$$

$$3x_1 + x_2 - S_2 + A_2 = 1200$$

$$Z - 5x_1 + 5Mx_1 - 6x_2 + 6Mx_2 - MS_1 - MS_2$$

$$Z - 5x_1 + 5Mx_1 - 6x_2 + 6Mx_2 - MS_1 - MS_2 = 2700M$$

$$x_2$$

$$x_2 = 2100 / 13$$

$$Z$$

$$Z = 4x_1 + x_2$$

$$Z^*$$

$$Z^* = 185/11$$

$$x_1$$

$$x_1 = 40/11$$

$$x_2$$

$$x_2 = 25/11$$

$$Z$$

$$Z = 2x + 5y$$

$$x + S_1$$

$$x + S_1 = 40$$

$$y + S_2$$

$$y + S_2 = 30$$

$$x + y - S_3 + A$$

$$x + y - S_3 + A = 60$$

$$x_0$$

$$x_0 = 2x_1 + x_2 + x_3$$

$$x_1 + x_3$$

$$x_1 + x_3 = 6$$

$$Z$$

$$Z = 3x_1 + 2.5x_2$$

Z

$$Z = x_1 + 2x_2 + 3x_3$$

$$x_1 + 2x_2 + 3x_3$$

$$x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

Z

$$Z = x_1 + x_2$$

Z

$$Z = 2x + 5y$$

Z

$$Z = 2x + y$$

$$Z - 2x - y$$

$$Z - 2x - y = 0$$

$$4x + 3y + S_1$$

$$4x + 3y + S_1 = 12$$

$$4x + y + S_2$$

$$4x + y + S_2 = 8$$

$$4x - y + S_3$$

$$4x - y + S_3 = 8$$

Z

$$Z = 3x + 2y$$

$$Z - 3x - 2y$$

$$Z - 3x - 2y = 0$$

$$x - y + S_1$$

$$x - y + S_1 = 15$$

$$2x - y + S2$$

$$2x - y + S2 = 40 \quad (2)$$

$$Z$$

$$Z = 3x - y$$

$$Z - 3x + y$$

$$Z - 3x + y = 0$$

$$x - y + S1$$

$$x - y + S1 = 10$$

$$x + S2$$

$$x + S2 = 20$$

$$Z$$

$$Z = 3x + 2y$$

$$3x + 2y + S3$$

$$3x + 2y + S3 = 180$$

$$x + 2y - S2 + A$$

$$x + 2y - S2 + A = 12$$

$$Z - 3x - 4y + MA$$

$$Z - 3x - 4y + MA = 0$$

$$Z - 3x - Mx - 4y - 2My + MS2$$

$$Z - 3x - Mx - 4y - 2My + MS2 = -12M$$

$$Z$$

$$Z = 2x + 5y$$

$$Z$$

$$Z = 2m - 2n + 5y$$

$$m - n + y + S3$$

$$m - n + y + S3 = 6$$

$$x$$

$$x = m - n = 3$$

Z

$$Z = 2x + y$$

Z

$$Z = 4x_1 + 2x_2 + x_3$$

Z

$$Z = 4x_1 + 3x_2$$

Z

$$Z = 3x_1 + x_2$$

Z

$$Z = 2x_1 + 3x_2 + 5x_3$$

Z

$$Z = 4x_1 + x_2 + 3x_3 + 5x_4$$

Z

$$Z = 3x_1 + 2x_2$$

Z

$$Z = 5u + 6v$$

Z

$$Z = 6x_1 + 7x_2 + 8x_3$$

Z

$$Z = 60y_1 + 20y_2 + 45y_3 + 15y_4$$

Z

$$Z = 60y_1 + 20y_2 + 45y_3 + 15y_4$$

Z

$$Z = c_1x_1 + c_2x_2$$

$$a_{11}x_1 + a_{12}x_2$$

$$a_{11}x_1 + a_{12}x_2 = b_1$$

Z

$$Z = b_1y_1 + b_2y_2$$

Z

$$Z = -6x_1 + 7x_2$$

Z

$$Z = -5y_1 + 7y_2$$

Z

$$Z = 5x_1 + 2x_2$$

Z

$$Z = 20y_1 + 40y_2$$

Z

$$Z = 2x_1 + x_2 + 13x_3 - 5x_4$$

$$-x_1 + x_2 + x_3 - x_4$$

$$-x_1 + x_2 + x_3 - x_4 = 15$$

Z

$$Z = 15y_1 - 18y_2 + 25y_3$$

$$y_1 + 7y_2 + 2y_3$$

$$y_1 + 7y_2 + 2y_3 = 13$$

Z

$$Z = 4x_1 + 3x_2 + 6x_3$$

Z

$$Z = 2y_1 + 5y_2$$

$$Z - 2y_1 - 5y_2$$

$$Z - 2y_1 - 5y_2 = 0$$

$$y_1 + S_1$$

$$y_1 + S_1 = 4$$

$$y_2 + S_2$$

$$y_2 + S_2 = 3$$

$$y_1 + y_2 + S_3$$

$$y_1 + y_2 + S_3 = 6$$

Z_x

$$Z_x = 3x_1 + 4x_2$$

Z_y

$$Z_y = 3y_1 + 4y_2 + 5y_3$$

P

$$P = x_1 + 2x_2$$

$$2x_1 + 2x_2 - x_3$$

$$2x_1 + 2x_2 - x_3 = 4$$

x_0

$$x_0 = 15x_1 + 3x_2 + 16x_3$$

$$x_1 + 13x_2 + x_3$$

$$x_1 + 13x_2 + x_3 = 2$$

Z

$$Z = x_1 + 1.5x_2$$

$$x_1 - 2x_2$$

$$x_1 - 2x_2 = 1$$

x_0

$$x_0 = 2x_1 + 3x_3$$

Z

$$Z = c_{11}x_{11} + c_{12}x_{12} + \dots + c_{mn}x_{mn}$$

crs

$$crs = ur + vs$$

$$u_3 + v_2$$

$$u_3 + v_2 = 7$$

$$u_3 + v_3$$

$$u_3 + v_3 = 7$$

$$x_{11} + x_{12} + x_{13} + x_{14}$$

$$x_{11} + x_{12} + x_{13} + x_{14} = 1$$

$$x_{21} + x_{22} + x_{23} + x_{24}$$

$$x_{21} + x_{22} + x_{23} + x_{24} = 1$$

$$x_{31} + x_{32} + x_{33} + x_{34}$$

$$x_{31} + x_{32} + x_{33} + x_{34} = 1$$

$$x_{41} + x_{42} + x_{43} + x_{44}$$

$$x_{41} + x_{42} + x_{43} + x_{44} = 1$$

$$x_{11} + x_{21} + x_{31} + x_{41}$$

$$x_{11} + x_{21} + x_{31} + x_{41} = 1$$

$$x_{12} + x_{22} + x_{32} + x_{42}$$

$$x_{12} + x_{22} + x_{32} + x_{42} = 1$$

$$x_{13} + x_{23} + x_{33} + x_{43}$$

$$x_{13} + x_{23} + x_{33} + x_{43} = 1$$

$$x_{14} + x_{24} + x_{34} + x_{44}$$

$$x_{14} + x_{24} + x_{34} + x_{44} = 1$$

Total earnings are $15 + 45 + 65 + 60 + 70 + 50$

Total earnings are $15 + 45 + 65 + 60 + 70 + 50 = \text{Rs. } 3.5$ (in thousands)

= 6 per hour

$$2 \times 2150 + 2700$$

$$2 \times 2150 + 2700 = \text{Rs. } 7000$$

v

$$v = 1/(1 + r)$$

$P(n)$

$$P(n) = M + R_1 + vR_2 + v^2R_3 + \dots + v^{n-1}R_n$$

$$= x + vx + v^2x + \dots + v^{n-1}x$$

$$= x (1 + v + v^2 + \dots + v^{n-1})$$

which minimizes $P(n) / (1 - v^n)$

which minimizes $P(n) / (1 - v^n) = F(n)$ (say).

$P(n)$

$$P(n) = M + R1 + vR2 + \dots + v^{n-1}Rn$$

A26

$$A26 = (2 + 4).$$

$f2(s, x2)$

$$f2(s, x2) = Cs x2 + f1^*(x2)$$

$$10 + 30$$

$$10 + 30 = 40$$

$$40 + 40$$

$$40 + 40 = 80$$

$$60 + 30$$

$$60 + 30 = 90$$

$$30 + 40$$

$$30 + 40 = 70$$

$$30 + 30$$

$$30 + 30 = 60$$

$$30 + 40$$

$$30 + 40 = 70$$

$f3(s, x3)$

$$f3(s, x3) = Cs x3 + f2^*(x3)$$

$$70 + 40$$

$$70 + 40 = 110$$

$$40 + 70$$

$$40 + 70 = 110$$

$$60 + 60$$

$$60 + 60 = 120$$

$$30 + 40$$

$$30 + 40 = 70$$

$$20 + 70$$

$$20 + 70 = 90$$

$$40 + 60$$

$$40 + 60 = 120$$

$$40 + 40$$

$$40 + 40 = 80$$

$$10 + 70$$

$$10 + 70 = 80$$

$$50 + 60$$

$$50 + 60 = 110$$

$$f_4(s, x_4)$$

$$f_4(s, x_4) = C s x_4 + f_3^*(x_4)$$

$$20 + 110$$

$$20 + 110 = 130$$

$$40 + 70$$

$$40 + 70 = 110$$

$$30 + 80$$

$$30 + 80 = 110$$

$$f_2(s, x_2)$$

$$f_2(s, x_2) = p(x_2) + f_1^*(s, x_2).$$

$$s$$

$$s = x_2 + x_1$$

$$6 + 0$$

$$6 + 0 = 6^*$$

$$6 + 3$$

$$6 + 3 = 9^*$$

$$7 + 2$$

$$7 + 2 = 9^*$$

$$6 + 4$$

$$6 + 4 = 10^*$$

$$7 + 3$$

$$7 + 3 = 10^*$$

$$8 + 2$$

$$8 + 2 = 10^*$$

$$6 + 5$$

$$6 + 5 = 11^*$$

$$7 + 4$$

$$7 + 4 = 11^*$$

$$8 + 3$$

$$8 + 3 = 11^*$$

$$8 + 2$$

$$8 + 2 = 10$$

$$6 + 6$$

$$6 + 6 = 12^*$$

$$7 + 5$$

$$7 + 5 = 12^*$$

$$8 + 4$$

$$8 + 4 = 12^*$$

$$8 + 3$$

$$8 + 3 = 11$$

$$8 + 2$$

$$8 + 2 = 10$$

$$f_3(s, x_3)$$

$$f_3(s, x_3) = p(x_3) + f_2^*(s - x_3)$$

$$s$$

$$s = x_3 + (s - x_1)$$

$$0 + 6$$

$$0 + 6 = 6^*$$

$$2 + 6$$

$$2 + 6 = 8^*$$

$$2 + 8$$

$$2 + 8 = 10^*$$

$$4 + 6$$

$$4 + 6 = 10^*$$

$$0 + 10$$

$$0 + 10 = 10$$

$$2 + 9$$

$$2 + 9 = 11$$

$$4 + 8$$

$$4 + 8 = 12^*$$

$$6 + 6$$

$$6 + 6 = 12^*$$

$$0 + 11$$

$$0 + 11 = 11$$

$$2 + 10$$

$$2 + 10 = 12$$

$$4 + 9$$

$$4 + 9 = 13$$

$$6 + 8$$

$$6 + 8 = 14^*$$

$$8 + 6$$

$$8 + 6 = 14^*$$

$$0 + 12$$

$$0 + 12 = 12$$

$$2 + 11$$

$$2 + 11 = 13$$

$$4 + 10$$

$$4 + 10 = 12^*$$

$$6 + 9$$

$$6 + 9 = 15$$

$$8 + 8$$

$$8 + 8 = 16^*$$

$$9 + 6$$

$$9 + 6 = 15$$

$$10 + 0$$

$$10 + 0 = 10$$

$$f_4(s, x_4)$$

$$f_4(s, x_4) = p(x_4) + f_3^*(s - x_3)$$

$$s$$

$$s = x_2 + x_1$$

$$0 + 6$$

$$0 + 6 = 6^*$$

$$5 + 6$$

$$5 + 6 = 11^*$$

$$0 + 10$$

$$0 + 10 = 10$$

$$5 + 8$$

$$5 + 8 = 13^*$$

$$6 + 6$$

$$6 + 6 = 12$$

$$0 + 12$$

$$0 + 12 = 12$$

$$5 + 10$$

$$5 + 10 = 15^*$$

$$6 + 8$$

$$6 + 8 = 14$$

$$7 + 6$$

$$7 + 6 = 13$$

$$0 + 14$$

$$0 + 14 = 4$$

$$5 + 12$$

$$5 + 12 = 17^*$$

$$6 + 10$$

$$6 + 10 = 16$$

$$7 + 8$$

$$7 + 8 = 15$$

$$8 + 6$$

$$8 + 6 = 14$$

$$0 + 16$$

$$0 + 16 = 16$$

$$5 + 14$$

$$5 + 14 = 19^*$$

$$6 + 12$$

$$6 + 12 = 18$$

$$7 + 10$$

$$7 + 10 = 17$$

$$8 + 8$$

$$8 + 8 = 16$$

$$8 + 6$$

$$8 + 6 = 14$$

$$50+60$$

$$50+60= 110$$

$$50+60$$

$$50+60= 110$$

$$50+120$$

$$50+120= 170$$

$$100+60$$

$$100+60 = 160$$

$$50+120$$

$$50+120= 170$$

$$100+60$$

$$100+60 = 160$$

$$50+180$$

$$50+180= 230$$

$$100+120$$

$$100+120 = 220$$

$$150 + 60$$

$$150 + 60 = 210$$

$$50+180$$

$$50+180= 230$$

$$100+120$$

$$100+120 = 220$$

$$150 + 60$$

$$150 + 60 = 210$$

$$20+110$$

$$20+110=130$$

$$20+110$$

$$20+110=130$$

$$40+110$$

$$40+110=150$$

$$20+170$$

$$20+170=190$$

$$40+110$$

$$40+110=150$$

$$20+170$$

$$20+170=190$$

$$40+170$$

$$40+170=210$$

$$20+230$$

$$20+230=250$$

$$40+110$$

$$40+110=210$$

$$20+230$$

$$20+230=250$$

$$40+230$$

$$40+230=270$$

$$100+110$$

$$100+110=210$$

$$120+110$$

$$120+110=250$$

$$Z$$

$$Z = 2x + 10y$$

$$(x, y)$$

$$(x, y) = (0, 2) \text{ where } Z^* = 20$$

Good Luck!

Keep practicing!