WS 10-8 Linear Programming

A.) Given: $x + 2y \le 4$

$x + y \le 3$

$x \ge 0$

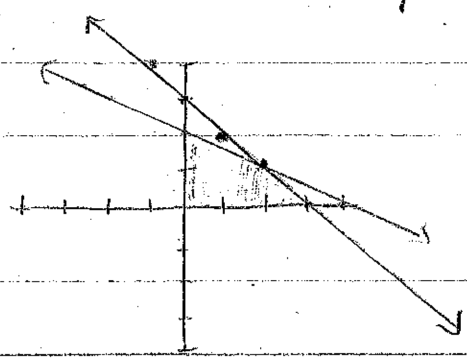
$y \ge 0$

Maximize: $P = x + 3y$

① graph and find the feasible points (vertices):

$y \le -\frac{1}{2}x + 2$ $\quad x \ge 0$

$y \le -x + 3$ $\quad y \ge 0$



Feasible points are: (0,0), (0,2), (3,0), (2,1)

② Substitute the feasible points (vertices) into the objective function to find the max

$P = (0) + 3(0) = 0$ $\quad P = (2) + 3(1) = 5$

$\boxed{P = (0) + 3(2) = 6}$ → max = 6, which is produced by (0, 2)

$P = (3) + 3(0) = 3$

B.) Given: $x + 2y \ge 6$

$x + 3y \ge 7$

$x \ge 0$

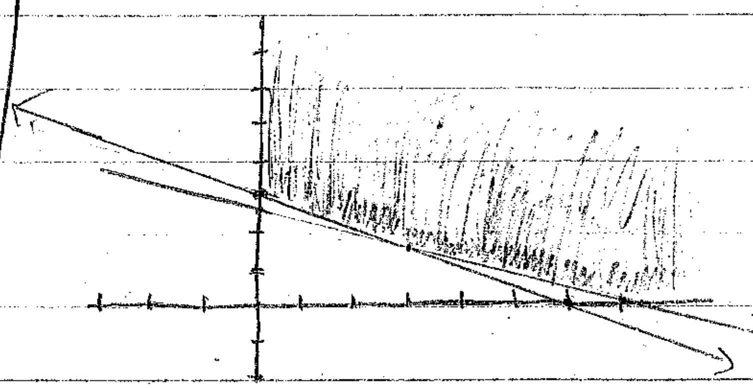
$y \ge 0$

Minimize: $C = 3x + 4y$

① graph & find the vertices:

$y \ge -\frac{1}{2}x + 3$ $\quad x \ge 0$

$y \ge -\frac{1}{3}x + \frac{7}{3}$ $\quad y \ge 0$



vertices are: (0,3), (7,0), (4,1)

② Sub the vertices into the objective function to find the min

$\boxed{C = 3(0) + 4(3) = 12}$ (0,3) produces a min of 12

$C = 3(7) + 4(0) = 21$

$C = 3(4) + 4(1) = 16$

2.) A.) x = # of short-sleeved shirts

y = # of long-sleeved shirts

$30x + 45y \le 14400$ $x \ge 0$

$x + y \le 400$ $y \ge 0$

• graph on calc to find vertices:

$(0,320), (400,0), (0,0), (240,160)$

$P = 11x + 16y$ (max)

$P = 11(0) + 16(320) = 5120$

$P = 11(400) + 16(0) = 4400$

$P = 11(0) + 16(0) = 0$

$\boxed{P = 11(240) + 16(160) = 5200}$

• max daily profit is \$5200.00

B.) The manager would probably prefer to produce different #'s than the ones giving max profit b/c the demand for short sleeve shirts could be less than for long sleeve shirts.

3.) amt of colombian coffee can't exceed 100 lbs (1600 ounces), + amt of special blend can't exceed 120 lbs (1920 ounces)

$x \ge 0$, $y \ge 0$

x = # of packages of low-grade mixture

y = # of packages of high-grade mixture

$4x + 8y \le 1600$

$12x + 8y \le 1920$

$P = \$0.30x + \$0.40y$

$y \le -\frac{1}{2}x + 200$

$y \le -\frac{3}{2}x + 240$

graph these two functions + find where they intersect to get $x = 40$, $y = 180$

feasible points (vertices)

$(0,0), (0,200), (40,180), (160,0)$

$P = .3(0) + .4(0) = 0$

$\boxed{P = .3(40) + .4(180) = 84}$

$P = .3(0) + .4(200) = 50$

$P = .3(160) + .4(0) = 48$

* 40 packages of low-grade + 180 packages of high grade to get max profit of \$84