Linear Programming - a procedure for finding the maximum or minimum of a function subject to given conditions

- will form a polygon
- Max/Min will occur at the vertices

$f(x,y) = 3x + 2y$ ← Do not graph.

$-2 \le x \le 10$ $\quad y \ge -2$

$x \ge -2$ $\quad x \le 10$

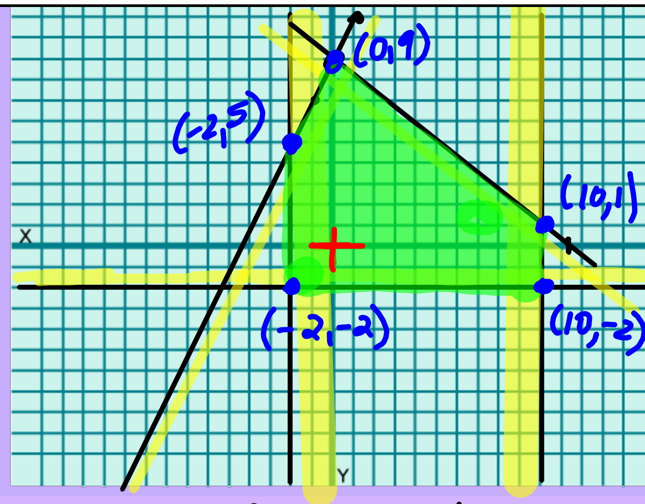
$0 - 0 \le 9$ T

$4x + 5y \le 45$ $\quad y - 2x \le 9$

$y \le 2x + 9$

$\frac{45}{4} = 11\frac{1}{4}$	0
0	9

$0 + 0 \le 45$
T



1) Graph the inequalities
2) Shade & determine the polygon
3) Find vertices of polygon
4) Sub coordinates of the vertices into $f(x,y)$ & determine max/min value.

$f(x,y) = 3x + 2y$

$f(-2,-2) = 3(-2) + 2(-2) = -10$
$\quad -6 + -4$

$f(10,-2) = 3(10) + 2(-2) = 26$
$\quad 30 + -4$

$f(10,1) = 3(10) + 2(1) = 32$

$f(0,9) = 3(0) + 2(9) = 18$

$f(-2,5) = 3(-2) + 2(5) = 4$
$\quad -6 + 10$

$\boxed{\text{Max value of 32 at (10,1)} \quad \text{Min value of -10 at (-2,-2)}}$

A nut company has 480 pounds of peanuts and 240 pounds of cashews. To make one batch of the Basic Mix it takes 12 pounds of peanuts and 4 pounds of cashews. To make one batch of the Deluxe Mix it takes 8 pounds of peanuts and 8 pounds of cashews. The profit is \$50 per batch of Basic Mix and \$35 per batch of Deluxe Mix. How many batches of each mix should be made to maximize profit?

what is to be maximized or minimized

	peanuts	cashews	profit
x = # of Basic	12	4	50
y = # of Deluxe	8	8	35
	480	240	

$f(x, y) = 50x + 35y$

$x \geq 0 \quad y \geq 0$

$12x + 8y \leq 480$

$4x + 8y \leq 240$

$f(0,0) = 50(0) + 35(0) = 0$

$f(40,0) = 50(40) + 35(0) = 2000$

$f(30,15) = 50(30) + 35(15) = 2025$

$f(0,30) = 50(0) + 35(30) = 1050$

Make 30 basic
15 deluxe

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Tiny Tot Toys produces toy cars and toy trucks. To produce each car it takes 0.30 hours of assembly, 0.20 hours of inspection, and 0.06 hours for packing. To produce each truck takes 0.50 hours for assembly, 0.08 hours for inspection, and 0.20 hours for packing. Due to equipment requirements, at least 10 cars and 5 trucks must be produced any time production is begun. The firm has available 1800 hours per week for assembly, 800 hours per week for inspection, and 600 hours per week for packing. The firm makes a profit of 50 cents for each car and 75 cents for each truck. How many cars and trucks should the firm produce each week to have maximum profit?

	assembly	insp	pack	profit	minimum to produce
x = # of cars	0.30	0.20	0.06	\$ 0.50	10
y = # of trucks	0.50	0.08	0.20	\$ 0.75	5
	1800	800	600		

$$f(x, y) = 0.50x + 0.75y$$

$$x \geq 10 \qquad y \geq 5$$

$$0.30x + 0.50y \leq 1800$$

$$0.20x + 0.08y \leq 800$$

$$0.06x + 0.20y \leq 600$$