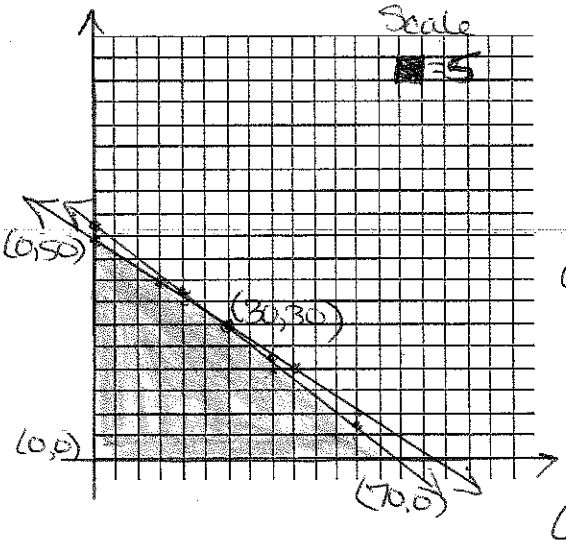
Alg II Linear Programming Worksheet 2 Name KEY

List the inequalities and function needed to answer the problem. Graph the inequalities and list the found vertices. Answer the problem.

1. Trees in urban areas help keep air fresh by absorbing carbon dioxide. A city has $2100 to spend on planting spruce and maple trees. The land available for planting is 45,000 square feet. Spruce trees cost $30 to plant and require 600 square feet of space. Maple trees cost $40 to plant and require 900 square feet of space. Spruce trees absorb 650 lb/yr of carbon dioxide and maple trees absorb 300 lb/yr of carbon dioxide. How many of each tree should the city plant to maximize carbon dioxide absorption?



	Spruce	Maple	Total
$	30	40	≤ 2100
Space	600	900	≤ 45,000
CO_2	650	300	

① $30x + 40y \le 2100$
$-30x \quad -30x$
$\frac{40y}{40} \le \frac{-30x}{40} + \frac{2100}{40}$
$y \le -\frac{3}{4}x + 52.5$

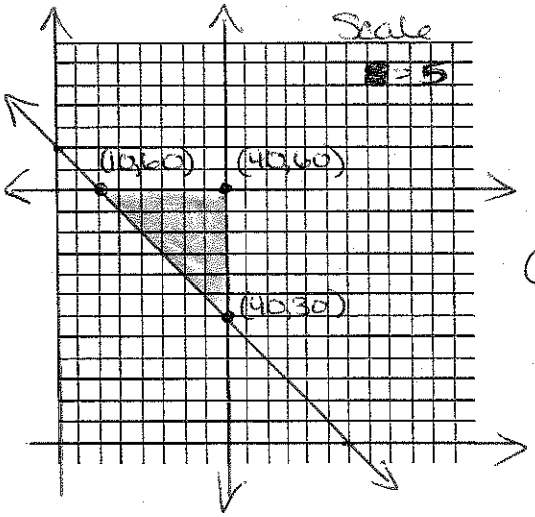
② $600x + 900y \le 45{,}000$
$-600x \quad -600x$
$\frac{900y}{900} \le \frac{-600x}{900} + \frac{45{,}000}{900}$
$y \le -\frac{2}{3}x + 50$

③ $x \ge 0$ ④ $y \ge 0$

⑤ $f(x,y) = 650x + 300y$
$f(0,0) = 0$
$f(0,50) = 15{,}000$
$f(70,0) = 45{,}500$ MAX
$f(30,30) = 28{,}500$

Answer:
70 Spruce
0 Maple

2. A toy manufacturer wants to minimize her cost for producing two lines of toy airplanes. Because of the supply of materials, no more than 40 Flying Bats can be built each day, and no more than 60 Flying Falcons can be built each day. There are enough workers to build at least 70 toy airplanes each day. It costs $12 to manufacture a Flying Bat and $8 to build a Flying Falcon. What is the minimum possible cost each day?



	x	y
	Flying Bats	Flying Falcons
$	12	8

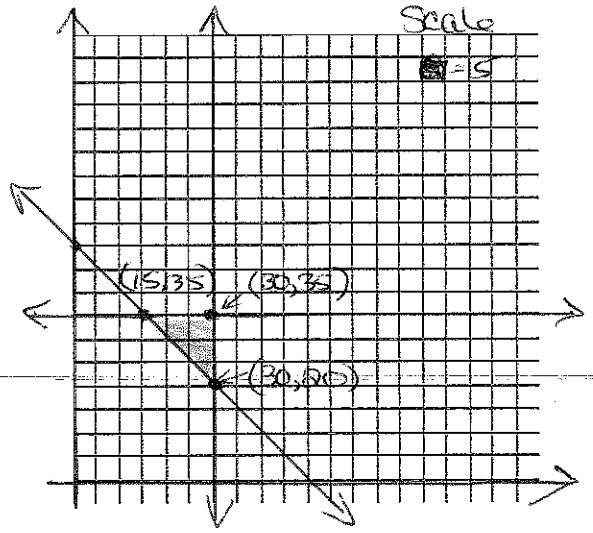
① $x \le 40$
② $y \le 60$
③ $x + y \le 70$

$f(x,y) = 12x + 8y$
$f(10,60) = 12 \cdot 10 + 8 \cdot 60$
$= 600$ MIN
$f(40,60) = 40 \cdot 12 + 8 \cdot 60$
$= 960$
$f(40,30) = 12 \cdot 40 + 8 \cdot 30$
$= 720$

Answer:
$600

At least ≥

3. A seafood restaurant owner orders at least 50 fish. He cannot use more than 30 amberjack or more than 35 flounder. Amberjack costs $4 each and flounder costs $3 each. How many of each fish should he use the minimize his cost?



	x Amberjack	y Flounder	Total
#	x	y	≥50
$	4	3	

① $x+y \geq 50$ → $y \geq -x+50$
② $x \leq 30$
③ $y \leq 35$

$f(x,y) = 4x+3y$

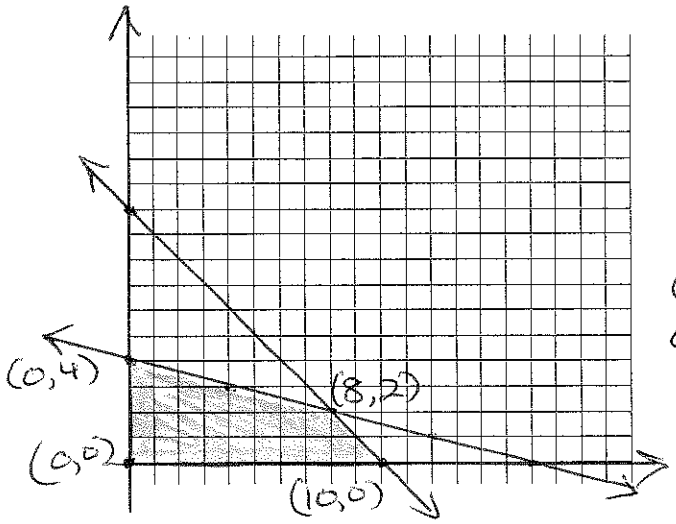
$f(15,35) = 4 \cdot 15 + 3 \cdot 35 = 165$ MIN

$f(30,35) = 4 \cdot 30 + 3 \cdot 35 = 225$

$f(30,20) = 4 \cdot 30 + 3 \cdot 20 = 180$

Answer:
15 Amberjack
35 Flounder

4. Juan makes two types of wood clocks to sell at local stores. It takes him 2 hours to assemble a pine clock, which requires 1 oz of varnish. It takes 2 hours to assemble an oak clock, which takes 4 oz. of varnish. Juan has 16 oz. of varnish in stock, and can work 20 hours. If he makes $3 profit on each pine clock and $4 on each oak clock, how many of each type should he make to maximize his profits?



	x Pine	y Oak	Total
Varnish	1	4	16
Hours	2	2	20
Profit	$3	$4	

① $x+4y \leq 16$ → $4y \leq -x+16$ → $y \leq -\frac{1}{4}x+4$
② $2x+2y \leq 20$ → $2y \leq -2x+20$ → $y \leq -x+10$
③ $x \geq 0$
④ $y \geq 0$

$f(x,y) = 3x+4y$

$f(0,0) = 0$

$f(0,4) = 16$

$f(10,0) = 30$

$f(8,2) = 32$ MAX

Answer:
8 Pine
2 Oak