Linear Programming Application -- Nike shoes - Microsoft Word

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3.4: Advanced Algebra DATE: 11/19

Linear Programming

Target 3A. Translate a verbal model into an algebraic model
Target 3D. Graph a system of inequalities to determine the feasible region and maximize or minimize the objective function
Target 3E. Problem solve using Linear Programming

Problem

A shoe company produces Air Jordan's and regular Nike sporting shoes. Long-term projections indicate an expected demand of at least 100 Nikes and 80 Air Jordan's each day. Because of limitations on production capacity, no more than 200 Nikes and 170 Jordan's can be made daily. To satisfy a shipping contract, a total of at least 200 shoes must be shipped each day.

If each Nike sold results in a $2 loss, but each Air Jordan produces a $5 profit, how many of each type should be made daily to maximize net profits?

See step 5

Step 1: Define the variables. Hint: Variables are defined using the question.	Let n be the # of NIKE shoes Let j be the # of Jordan shoes
Step 2: Write a system of inequalities. Hardest part!	① $n \geq 100$, $j \geq 80$ (at least) ② $n + j \leq 200$ (no more than) ③ $n \leq 200$, $j \leq 170$ (no more than)

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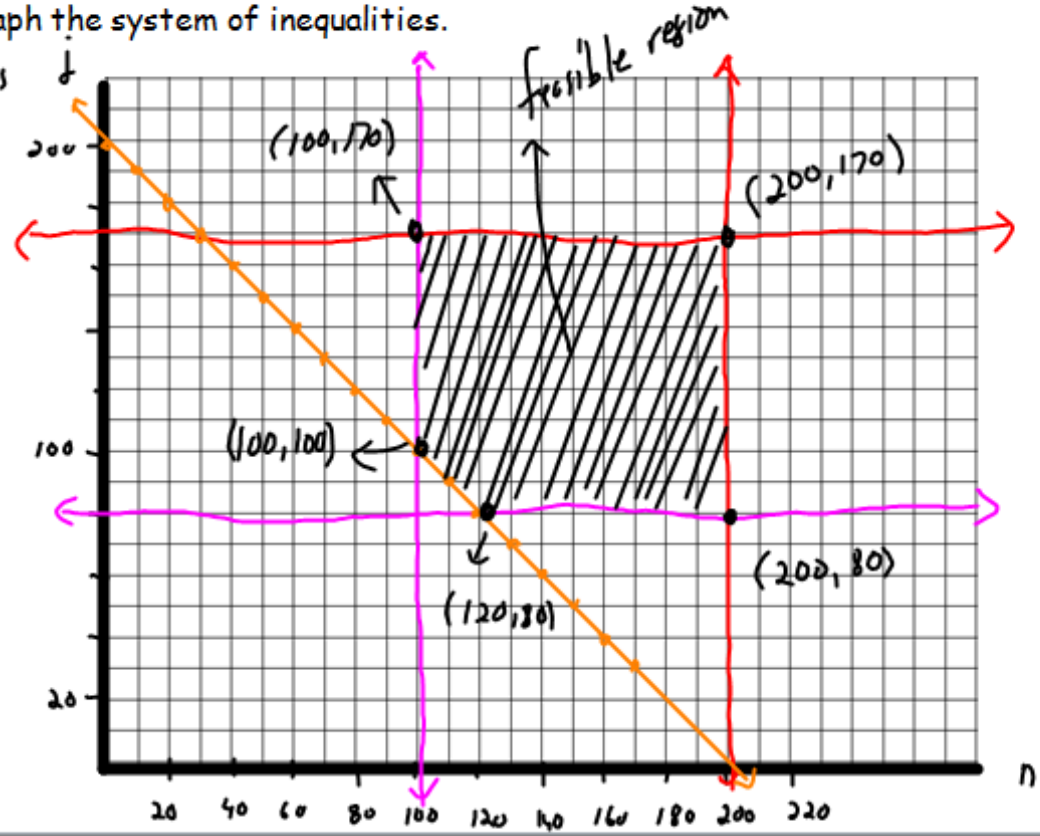
Step 3: Graph the system of inequalities.



All lines solid!

$n \geq 100$ shade ↑ or →

$j \geq 80$ shade ↑

$n \leq 200$ shade ↓ or ←

$j \leq 170$ shade ↓

$n + j < 200$

$-n \quad -n$

$j < -1n + 200$

Slope: $-\frac{1}{1} = \frac{-10}{10}$ ↓ →

y-int: 200

shade ↑

Step 4: Find the coordinates of the vertices of the feasible region.

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Step 4: Find the coordinates of the vertices of the feasible region.	The coordinates are: 1. (200, 80) 2. (200, 170) 3. (120, 80) 4. (100, 100) 5. (100, 170)
Step 5: Write a function to be maximized or minimized.	$P(n, j) = -2n + 5j$ negative means loss
Step 6: Substitute the coordinates of the vertices into the function.	

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Step 6: Substitute the coordinates of the vertices into the function.	Use function $P(n,j) = -2n + 5j$ $(200, 80)$: $-2(200) + 5(80) = 0$ $(200, 170)$: $-2(200) + 5(170) = 450$ $(120, 80)$: $-2(120) + 5(80) = 160$ $(100, 100)$: $-2(100) + 5(100) = 300$ $(100, 170)$: $-2(100) + 5(170) = 650$
Step 7: Select the greatest or least result. Answer the problem.	The greatest result is To max. profit, make 100 Nikes & 170 Jordans each day! Phew...

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