7-5 Systems of Inequalities in Two Variables Day 2

Linear Programming Application Practice:

Example: Purchasing Fertilizer

   Johnson's Produce is purchasing fertilizer with two nutrients: N(nitrogen) and P(phosphorus). They need at least 180 units of N and 90 units of P. Their supplier has two brands of fertilizer for them to buy. Brand A costs $10 a bag and has 4 units of N and 1 unit of P. Brand B costs $5 a bag and has 1 unit of each nutrient. Johnson's Produce can pay at most $800 for the fertilizer. How many bags of each brand should be purchased to minimize cost?

Variables: Objective Function:

Constraints:
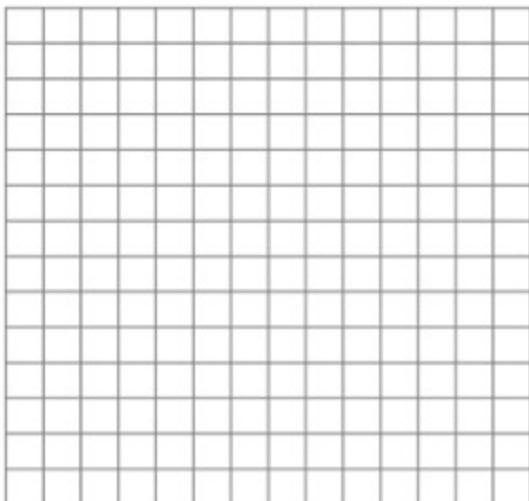
Vertices:

Solution:

Example: Minimizing Operating Costs

Gonza Manufacturing has two factories that produce three grades of paper: low-grade, medium-grade, and high-grade. It needs to supply 24 tons of low-grade, 6 tons of medium-grade, and 30 tons of high grade paper. Factory A produces 8 tons of low-grade, 1 ton of medium-grade, and 2 tons of high-grade paper daily, and costs $2000 per day to operate. Factory B produces 2 tons of low-grade, 1 ton of medium-grade, and 8 tons of high-grade paper daily, and costs $4000 per day to operate. How many days should each factory operate to fill the orders at minimum cost?

Variables: Objective Function:

Constraints:
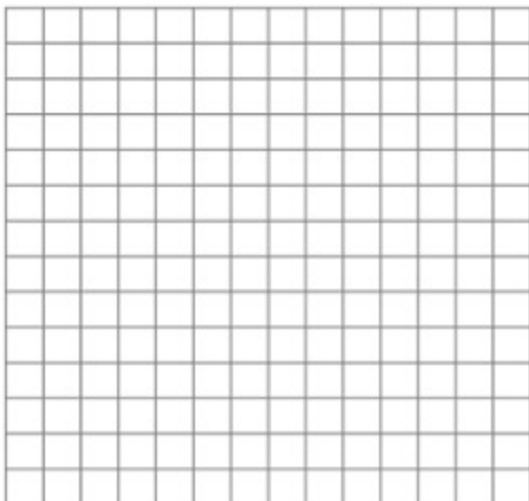
Vertices:

Solution:

Other Practice Problems:

Ex: 1   Pearson's Metals mines two ores: R and S. The company extracts minerals A and B from each type of ore. It costs $50 per ton to extract 80 lbs of A and 160 lbs of B from ore R. It costs $60 per ton to extract 140 lbs of A and 50 lbs of B from ore S. Pearson's must produce at least 4000 lbs of A and 3200 lbs of B. How much of each ore should be processed to minimize cost? What is the minimum cost?

Ex: 2   A student earns $10 per hour for tutoring and $7 per hour as a teacher's aid. Let x = the number of hours each week spent tutoring and let y = the number of hours each week spent as a teacher's aid. If the student has the following constraints what is the maximum amount of money the student can earn from the two jobs? To have enough time for studies, the student can work no more then 20 hours per week. The tutoring center requires that each tutor spend at least three hours per week tutoring but no more than eight hours per week tutoring.

Ex: 3   A manufacturer produces two models of mountain bicycles. The times (in hours) required for assembling and painting each model are given in the following table:

	Model A	Model B
Assembling	5	4
Painting	2	3

The maximum total weekly hours available in the assembly department and the paint department are 200 hours and 108 hours, respectively. The profits per unit are $25 for model A and $15 for model B. How many of each type should be produced to maximize profit?

Ex: 4 On June 24, 1948, the former Soviet union blocked all land and water routes through East Germany to Berlin. A gigantic airlift was organized using American and British planes to bring food, clothing, and other supplies to the more than 2 million people in West Berlin. The cargo capacity was 30,000 cubic feet for an American plane and 20,000 cubic feet for a British plane. To break the Soviet blockade, the Western Allies had to maximize cargo capacity, but were subject to the following restrictions:

- No more than 44 planes could be used.
- The larger American planes required 16 personnel per flight, double that of the requirement for the British planes. The total number of personnel available could not exceed 512.
- The cost of an American flight was $12,000 and the cost of a British flight was $5,000. Total weekly costs could not exceed $375,000.
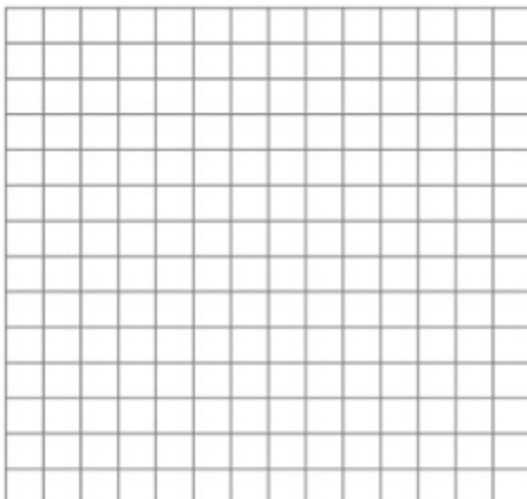
Find the number of American and British planes that were used to maximize cargo capacity.

FORMAT

Variables: Objective Function:

Constraints:

Vertices:

Solution: