1. **(30 points)** The Loco Cocoa company produces tins of three different blends of hot chocolate: the light and easygoing Fireside blend, the rich and bitter Midnight blend, and the complex and spicy Mayan blend. A tin of Fireside uses six ounces of sugar, six ounces of powdered milk, and three ounces of cocoa powder, and can be sold for a profit of \$5. A tin of Midnight uses four ounces of sugar, three ounces of milk, and five ounces of cocoa, and can be sold for a profit of \$7. Lastly, a tin of Mayan uses four ounces of sugar, five ounces of milk, four ounces of cocoa, and a sixteenth of an ounce (a pinch!) of cayenne pepper, and can be sold for a profit of \$8.

   The company's latest shipment of supplies has 4320 ounces of sugar, 4800 ounces of powdered milk, 3360 ounces of cocoa powder, and 40 ounces of cayenne.

   (a) **(14 points)** Produce a linear-programming formulation of this scenario, including constraints and a profit function.

   (b) **(9 points)** Could they produce 600 tins of Fireside, 100 of Midnight, and 100 of Mayan with the materials they have on hand? If not, why not, and if so, how much profit would they make?

   (c) **(9 points)** Could they produce 300 tins of Fireside, 200 of Midnight, and 300 of Mayan with the materials they have on hand? If not, why not, and if so, how much profit would they make?

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1	/ 32
2	/ 36
3	/ 32
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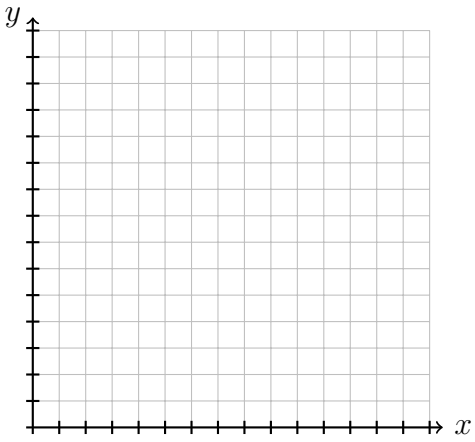
2. **(36 points)** You are making necklaces and earrings from woven wire and gemstones. Each necklace requires 4 feet of wire and 3 gemstones, while each pair of earrings requires one foot of wire and 4 gemstones. Necklaces sell for a profit of $35 each and pairs of earrings for $10 each. Each week you get 100 feet of wire and 300 gemstones. What combination of products can you produce each week to maximize your profit? Decimal answers are allowed; they'd represent a weekly average production.

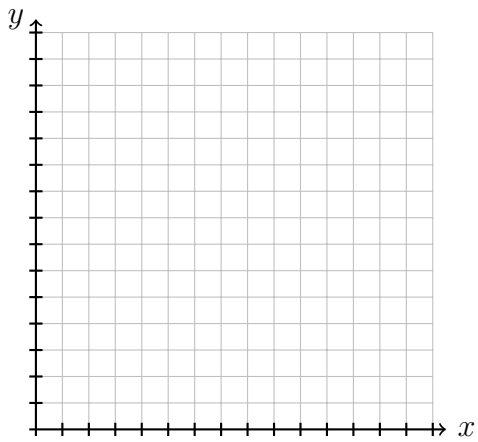
   The graph grid below is included for your use if desired.



3. **(32 points)** Consider the linear programming problem in which we maximize the profit function $11x + 4y$ subject to the conditions

$$\begin{cases} 2x + \ y \leq 30 \\ 3x + 5y \leq 90 \\ 2x \qquad \leq 26 \\ x \geq 0, y \geq 0 \end{cases}$$

(a) **(10 points)** Sketch the constraint lines, labeling the intercepts, on the axes below, and shade the feasible region (indicate the scale on the axes).



(b) **(14 points)** Find the coordinates for each potential feasible profit-maximizing point in the graph above.

(c) **(8 points)** Find the value of the pair (x,y) maximizing the profit on the above graph.