Superbats, Inc. manufactures two different quality wood baseball bats, the Wallbanger and the Dingbat. The Wallbanger takes 8 hours to trim and turn on a lathe and 2 hours to finish it. It has a profit of $17. The Dingbat takes 5 hours to trim and turn on a lathe and 5 hours to finish, but its profit is $29. The total time per day available for trimming and lathing is 80 hours and for finishing is 50 hours. How many of each type of bat should be produced to have the maximum profit? What is the maximum profit?

**Step 1: Define the variables**

Let \( x \) stand for the number of Wallbanger bats produced.
Let \( y \) stand for the number of Dingbats produced.

**Step 2: Write a system of inequalities to describe the real-life constraints Superbats faces.**

Are they limited by the amount of time set aside for trimming and lathing?
Are they limited by the amount of time set aside for finishing?
Can they produce a negative amount of either kind of bat?

<table>
<thead>
<tr>
<th></th>
<th>Wallbanger Bats</th>
<th>Dingbats</th>
<th>Total Available Time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lathing Constraint:</td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Finishing Constraint</td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

**Step 3: Graph the system of inequalities. Be sure to LABEL YOUR \( x \) AND \( y \) AXES.**

*Hint: Carefully choose the scale for your axes. Do you need any negative numbers?*
Step 4: Find the coordinates of the feasible region.

Step 5. Write a function in terms of $x$ and $y$ to describe Superbats, Inc.’s earnings.

Step 6. Evaluate the profit function at each of the coordinates of the feasible region.

Step 7. Find the company’s maximum profit.
Rosalyn works no more than 20 hours a week during the school year. She is paid $10 an hour for tutoring geometry students and $7 an hour for delivering pizzas for Pizza King. She wants to spend at least 3 hours but no more than 8 hours a week tutoring. Find Rosalyn’s maximum earnings.

**Step 1: Define the variables**

Let $x$ stand for the number of hours Rosalyn tutors.
Let $y$ stand for the number of hours Rosalyn delivers for Pizza King.

**Step 2: Write a system of inequalities to describe the real-life constraints Rosalyn faces.**

Is Rosalyn limited by the number of hours she works?  
Is Rosalyn limited by the number of hours she tutors?  
Can Rosalyn work a negative amount of hours per week?

**Step 3: Graph the system of inequalities.**
Step 4: Find the coordinates of the feasible region.

Step 5. Write a function in terms of x and y to describe Rosalyn’s earnings.

Step 6. Evaluate the profit function at the coordinates of the feasible region to determine how many hours Rosalyn should tutor and work for Pizza King.

Step 7. Find Rosalyn’s maximum earnings.
A batch of cookies takes 8 cups of flour and 30 minutes to bake. One cake takes 4 cups of flour and 90 minutes to bake. Brad’s Bakery has 64 cups of flour and can bake for only 9 hours (540 minutes). Brad must make at least 3 batches of cookies. If the bakery makes $4 on each batch of cookies and $15 profit on each cake, determine how many of each should be produced to maximize profit. What is the maximum profit?

Step 1: Define the variables

Let \( x \) stand for the amount of batches of cookies Brad bakes.
Let \( y \) stand for the amount of cakes Brad bakes.

Step 2: Write a system of inequalities to describe the real-life constraints Brad faces.

Is Brad limited by the amount of flour he has on hand?
Is Brad limited by time in any way?
Can Brad bake a negative amount of cookies or cakes?

Step 3: Graph the system of inequalities.
Step 4. Find the coordinates of the feasible region.

Step 5. Write a function in terms of x and y to describe Brad’s profit.

Step 6. Evaluate the profit function at the coordinates of the feasible region to determine how many cookies and cakes Brad should make.

Step 7. Find the maximum profit.
TeeVee Electronics, Inc. makes LCD and Plasma televisions. The equipment in the factory allows for making at most 450 LCD televisions and 200 Plasma televisions in one month. Each LCD television costs $600 to produce and each Plasma television costs $900 to produce. During the month of November, the company can spend at most $360,000 to make these televisions. The profit for each LCD television is $125 and the profit for each Plasma television is $200. To maximize their profits, how many of each type should they make?

Step 1: Define the variables

Let \( x \) stand for the number of LCD televisions TeeVee Electronics should make.

Let \( y \) stand for the number of Plasma televisions TeeVee Electronics should make.

Step 2: Write a system of inequalities to describe the real-life constraints the company faces.

Is the company limited by the number of televisions they make?
Is the company limited by the cost to produce the televisions?
Can the company make a negative number of televisions?

Step 3: Graph the system of inequalities. Be sure to LABEL YOUR \( x \) AND \( y \) AXES.
Step 4: Find the coordinates of the feasible region.

Step 5. Write a function in terms of x and y to describe the company’s profit.

Step 6. Evaluate the profit function at each of the coordinates of the feasible region.

Step 7. What is the company’s maximum profit?
The students in the Future Homemakers Club are making canvas tote bags and leather tote bags for a money making project. They will line both types of tote bags with canvas and use leather for the handles of both bags. For the canvas tote bags, they will need 4 yards of canvas and 1 yard of leather. For the leather tote bags, they need 3 yards of leather and 2 yards of canvas. Their faculty advisor has purchased 60 yards leather and 120 yards of canvas. If the club plans to sell the canvas bags at a profit of $20 each and the leather bags at a profit $35 each, determine the number of canvas and leather bags that they need to make for a maximum profit. What is the maximum profit?

Step 1: Define the variables

Let \( x \) stand for the number of canvas tote bags they make
Let \( y \) stand for the number of leather tote bags they make.

Step 2: Write a system of inequalities to describe the real-life constraints the club faces.

Are they limited by the amount of leather they have on hand?
Are they limited by the amount of canvas they have on hand?
Can they make a negative number of either kind of bag?

<table>
<thead>
<tr>
<th></th>
<th>Canvas bags use how much?</th>
<th>Leather bags use how much?</th>
<th>Total materials on hand?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canvas constraint</td>
<td></td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>Leather constraint</td>
<td></td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

Step 3: Graph the system of inequalities. Be sure to LABEL YOUR \( x \) AND \( y \) AXES.
Step 4: Find the coordinates of the feasible region.

Step 5. Write a function in terms of \( x \) and \( y \) to describe the club’s profit.

Step 6. Evaluate the profit function at each of the coordinates of the feasible region.

Step 7. What is the club’s maximum profit?
The Northern Wisconsin Paper Mill can convert wood pulp to either notebook paper or newsprint. The mill can produce at most 200 units of paper per day. At least 10 units of notebook paper and 80 units of newspaper are required daily by regular customers. If the profit on a unit of notebook paper is $500 and the profit on a unit of newsprint is $350, how many units of each type of paper should the manager have the mill produce each day to maximize profits? What is the profit per day?

Step 1: Define the variables

Let $x$ stand for the units of notebook paper manufactured
Let $y$ stand for the number of newsprint manufactured

Step 2: Write a system of inequalities to describe the real-life constraints the Paper Mill faces.

Is there a maximum on the units of paper produced each day?
Is there a minimum on the units of newsprint and notebook paper?

Step 3: Graph the system of inequalities. Be sure to LABEL YOUR x AND y AXES.

Hint: before you begin graphing, carefully plan out what the scale of your axes will be!
Step 4: Find the coordinates of the feasible region.

Step 5. Write a function in terms of $x$ and $y$ to describe the Paper Mill’s earnings.

Step 6. Evaluate the profit function at each of the coordinates of the feasible region.

Step 7. Find the Northern Wisconsin Paper Mill’s maximum profit.