1. Larry and Tony are baking cupcakes and banana mini-loaves to sell at a school fundraiser.

   - No more than 60 cupcakes and 35 mini-loaves can be made each day.
   - Larry and Tony are able to bake at least 80 items, in total, each day.
   - It costs \$0.50 to make a cupcake and \$0.75 to make a mini-loaf.

   Determine the numbers of cupcakes and mini-loaves that Larry and Tony should make in order to minimize cost. What is the minimum cost?

define variables and state restrictions:

let x represent the number of cupcakes, $x \in W$
let y represent the number of mini-loaves, $y \in W$

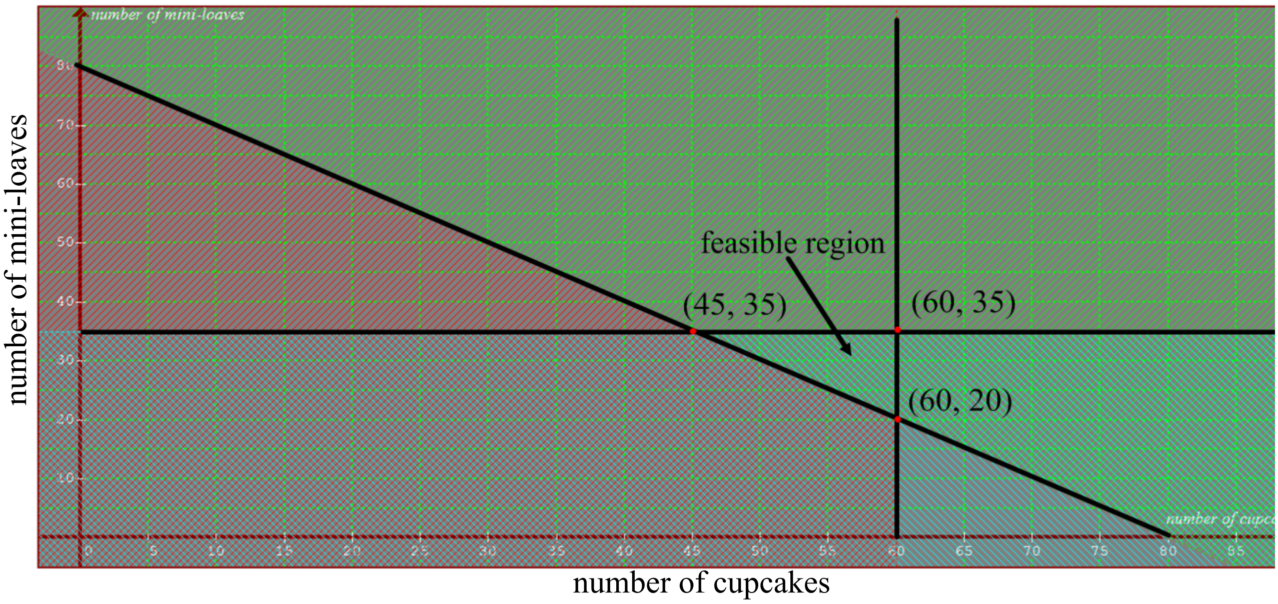
constraints:

$x \leq 60$
$y \leq 35$
$x + y \geq 80$

objective function:

let C represent cost
$C = 0.50x + 0.75y$

graph:



evaluate:

For (45, 35): $C = 0.50(45) + 0.75(35) = \$48.75$

For (60, 35): $C = 0.50(60) + 0.75(35) = \$56.25$

For (60, 20): $C = 0.50(60) + 0.75(20) = \$45.00$ *

conclusion:

Larry and Tony should make 60 cupcakes and 20 mini-loaves in order to minimize cost to \$45.00

2. A vending machine contains bottles of water and juice.

- The machine can hold a maximum of 100 bottles.
- At most, 3 bottles of water are sold for each bottle of juice.
- Each bottle of water sells for \$1.00 and each bottle of juice sells for \$1.25.

Determine the numbers of bottles of water and juice that would result in the maximum possible revenue. What is the maximum revenue?

define variables and state restrictions:

let x represent the number of water bottles, $x \in W$
let y represent the number of juice bottles, $y \in W$

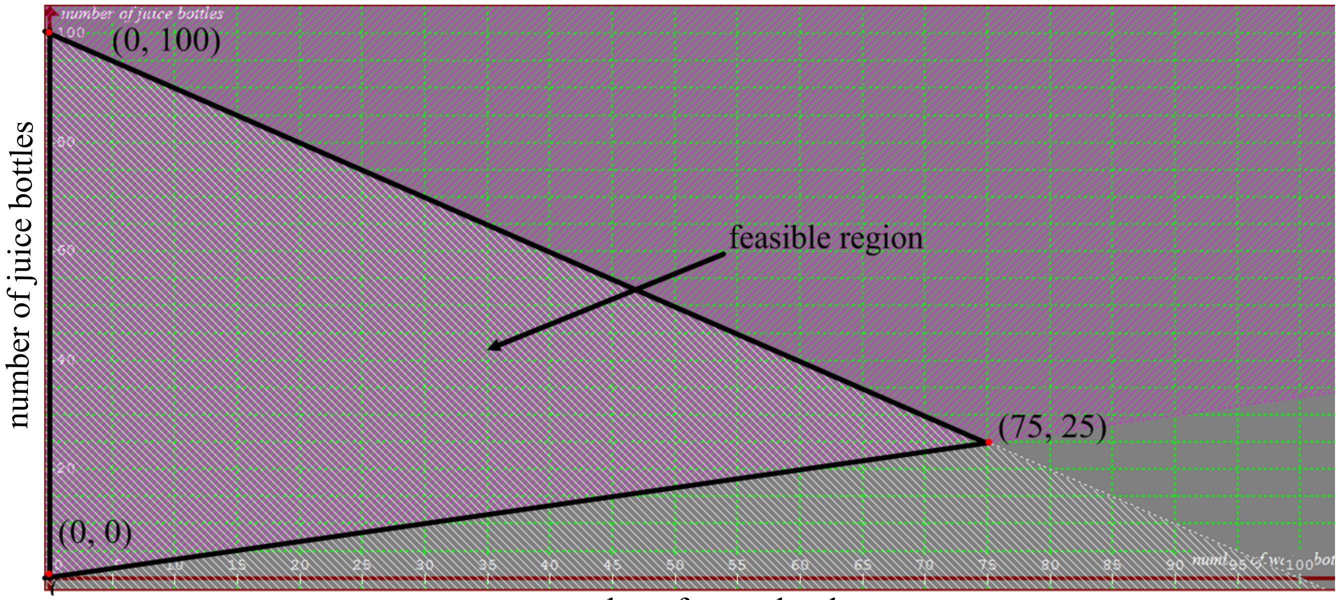
constraints:

$x \leq 3y$
$x + y \leq 100$

objective function:

let R represent revenue
$R = x + 1.25y$

graph:



evaluate:

For (0, 0): $R = 0 + 1.25(0) = \$0$

For (0, 100): $R = 0 + 1.25(100) = \$125$ *

For (75, 25): $R = 75 + 1.25(25) = \$106.25$

conclusion:

0 bottles of water and 100 bottles of juice would maximize revenue to \$125.

3. A sports equipment manufacturer produces snowboards and skis.

- It takes 4 hours to cut and mould each board and 4 hours to cut and mould each pair of skis. A maximum of 60 hours is spent on the cutting and moulding process.
- It takes 1 hour to finish a board and 2 hours to finish a pair of skis. A maximum of 20 hours is spent on the finishing process.
- The profit is \$75 for each snowboard and \$65 for each pair of skis.

Determine how many snowboards and pairs of skis should be manufactured in order to maximize profit. What is the maximum profit?

define variables and state restrictions:

let x represent the number of snowboards, $x \in W$
let y represent the number of skis, $y \in W$

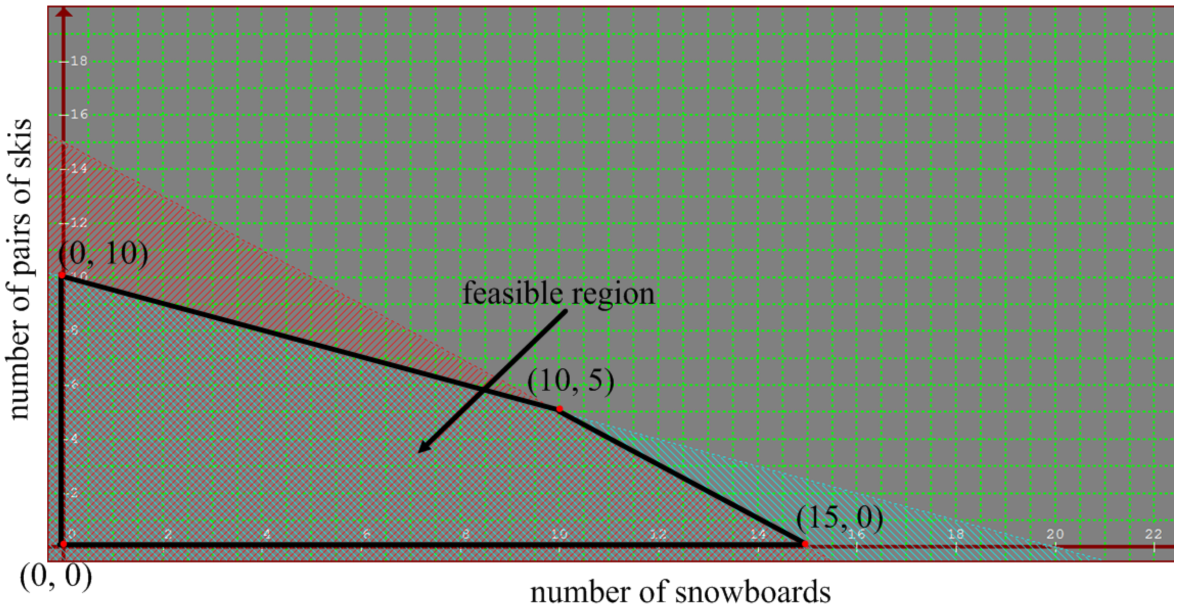
constraints:

$4x + 4y \leq 60$
$x + 2y \leq 20$

objective function:

let P represent profit
$P = 75x + 65y$

graph:



evaluate:

For (0, 0): $P = 75(0) + 65(0) = \$0$

For (0, 10): $P = 75(0) + 65(10) = \$650$

For (10, 5): $P = 75(10) + 65(5) = \$1075$

For (15, 0): $P = 75(15) + 65(0) = \$1125$ *

conclusion:

15 snowboards and 0 pairs of skis should be manufactured to maximize profit to \$1125.

4. Bella makes wallets and belts from recycled tires.

   - She can make no more than 4 wallets and at least 10 belts in a day.
   - She makes no more than 20 items, in total, in a day.
   - Each belt costs \$1.50 to make, and each wallet costs \$2.25.

   Determine the combination of wallets and belts that would minimize cost. What is this minimum cost?

define variables and state restrictions:

let x represent the number of wallets, $x \in W$
let y represent the number of belts, $y \in W$

constraints:

$x \leq 4$

$y \geq 10$

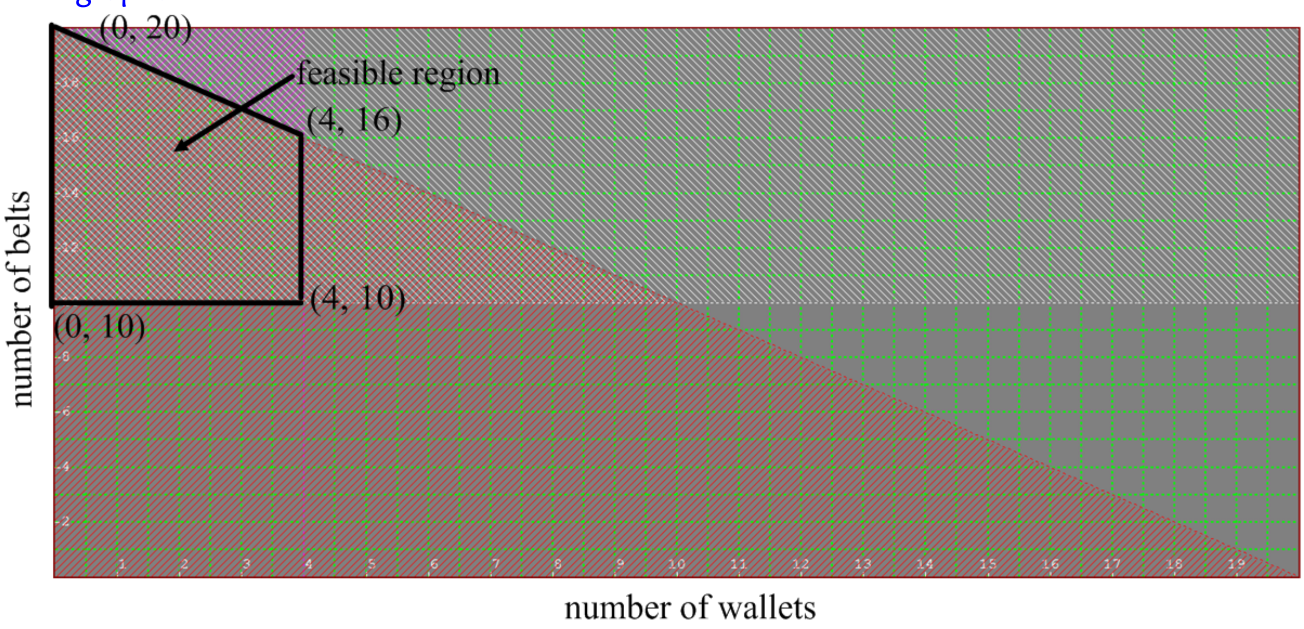
$x + y \leq 20$

objective function:

let C represent cost

$C = 2.25x + 1.50y$

graph:



evaluate:

For (0, 10): $C = 2.25(0) + 1.50(10) = \$15$

For (0, 20): $C = 2.25(0) + 1.50(20) = \$30$

For (4, 16): $C = 2.25(4) + 1.50(16) = \$33$

For (4, 10): $C = 2.25(4) + 1.50(10) = \$24$

conclusion:

0 wallets and 10 belts should be manufactured to minimize cost to \$15.

5. Caleb and Madison sell tacos and burritos from a food cart.

- No more than 50 tacos and 75 burritos can be made each day.
- Caleb and Madison can make no more than 110 items, in total, each day.
- It costs \$0.75 to make a taco and \$1.25 to make a burrito.

Determine the maximum possible cost to produce these food items. How many tacos and burritos would have to be sold?

define variables and state restrictions:

let x represent the number of tacos, $x \in W$
let y represent the number of burritos, $y \in W$

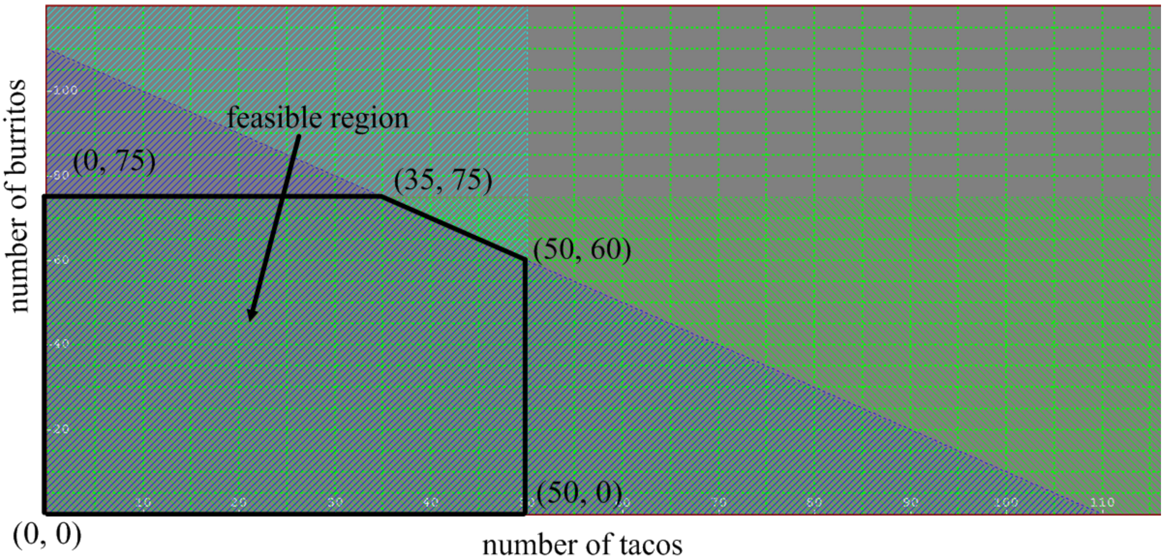
constraints:

$x \leq 50$
$y \leq 75$
$x + y \leq 110$

objective function:

let C represent cost
$C = 0.75x + 1.25y$

graph:



evaluate:

For (0, 0): $C = 0.75(0) + 1.25(0) = \$0$

For (0, 75): $C = 0.75(0) + 1.25(75) = \$93.75$

For (35, 75): $C = 0.75(35) + 1.25(75) = \$120$ *

For (50, 60): $C = 0.75(50) + 1.25(60) = \$112.50$

For (50, 0): $C = 0.75(50) + 1.25(0) = \$37.50$

conclusion:

The maximum possible cost is \$120 for 35 tacos and 75 burritos.

6. Yanni collects stamps and baseball cards.

- He has at most 100 stamps and at most 75 baseball cards.
- He has at least 1 stamp and at least 1 baseball card.
- He has no more than 150 items, in total.
- Each stamp cost him 10 cents and each baseball card cost him 50 cents.

a. Determine the *minimum* amount that Yanni could have spent on his collection and for how many stamps and baseball cards this would be.
b. Determine the *maximum* amount that Yanni could have spent on his collection and for how many stamps and baseball cards this would be.

define variables and state restrictions:

let x represent the number of stamps, $x \in W$
let y represent the number of baseball cards, $y \in W$

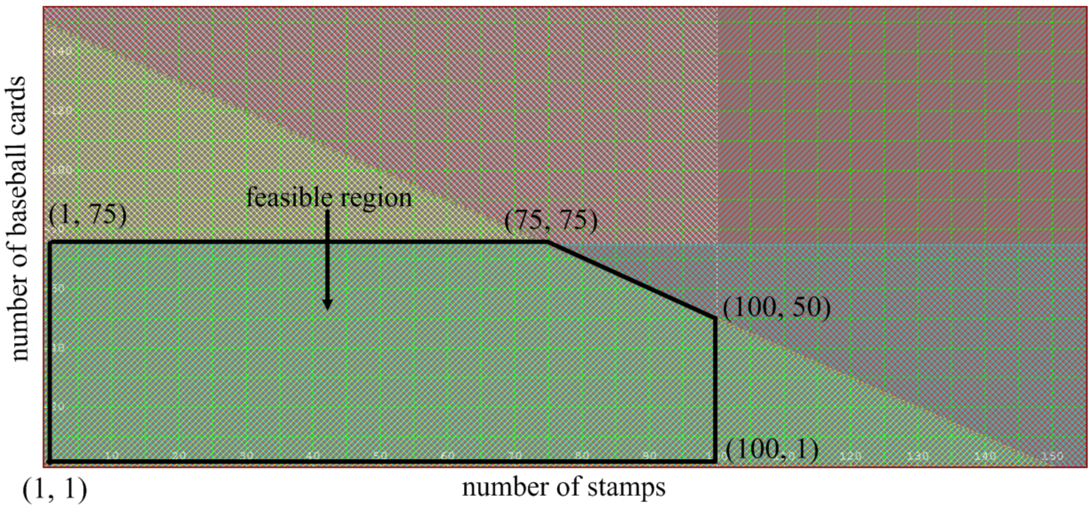
constraints:

$x \geq 1$
$y \geq 1$
$x + y \leq 150$

objective function:

let C represent cost
$C = 0.1x + 0.5y$

graph:



evaluate:

For (1, 1): $C = 0.1(1) + 0.5(1) = \$0.60$ *

For (1, 75): $C = 0.1(1) + 0.5(75) = \$37.60$

For (75, 75): $C = 0.1(75) + 0.5(75) = \$45$ *

For (100, 50): $C = 0.1(100) + 0.5(50) = \$35$

For (100, 1): $C = 0.1(100) + 0.5(1) = \$10.50$

conclusion:

a) The minimum that Yanni could have spent is \$0.60 on 1 stamp and 1 baseball card.
b) The maximum that Yanni could have spent is \$45 on 75 stamps and 75 baseball cards.

7. A local artist classifies her paintings as either scenic or portrait.

- She limits the number of paintings she does to a maximum of 8 per week.
- It takes her an average of 6 hours to do a scenic painting and an average of 3 hours to do a portrait. She works a maximum of 30 hours per week.
- She sells her scenic paintings for \$300 and her portrait paintings for \$200.

Determine the numbers of scenic and portrait paintings that would maximize revenue.

define variables and state restrictions:

let x represent the number of scenic paintings, $x \in W$
let y represent the number of portrait paintings, $y \in W$

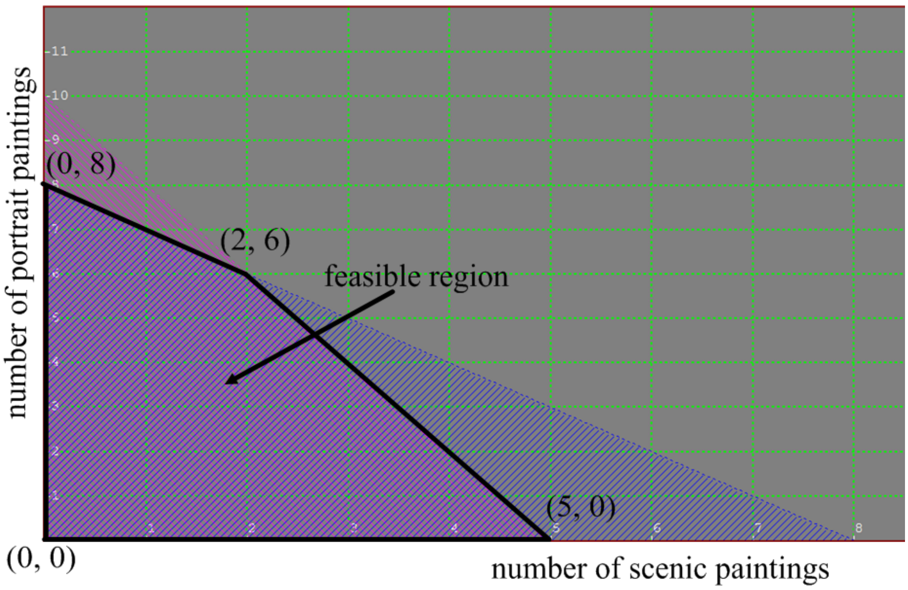
constraints:

$x + y \leq 8$
$6x + 3y \leq 30$

objective function:

let R represent revenue
$R = 300x + 200y$

graph:



evaluate:

For (0, 0): $R = 300(0) + 200(0) = \$0$

For (0, 8): $R = 300(0) + 200(8) = \$1600$

For (2, 6): $R = 300(2) + 200(6) = \$1800$ *

For (5, 0): $R = 300(5) + 200(0) = \$1500$

conclusion:

2 scenic and 6 portraits should be painted in order to maximize profit to \$1800.