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?

variables and restrictions:

let c represent the number of cupcakes, $c \in W$
let m represent the number of mini-loaves, $m \in W$

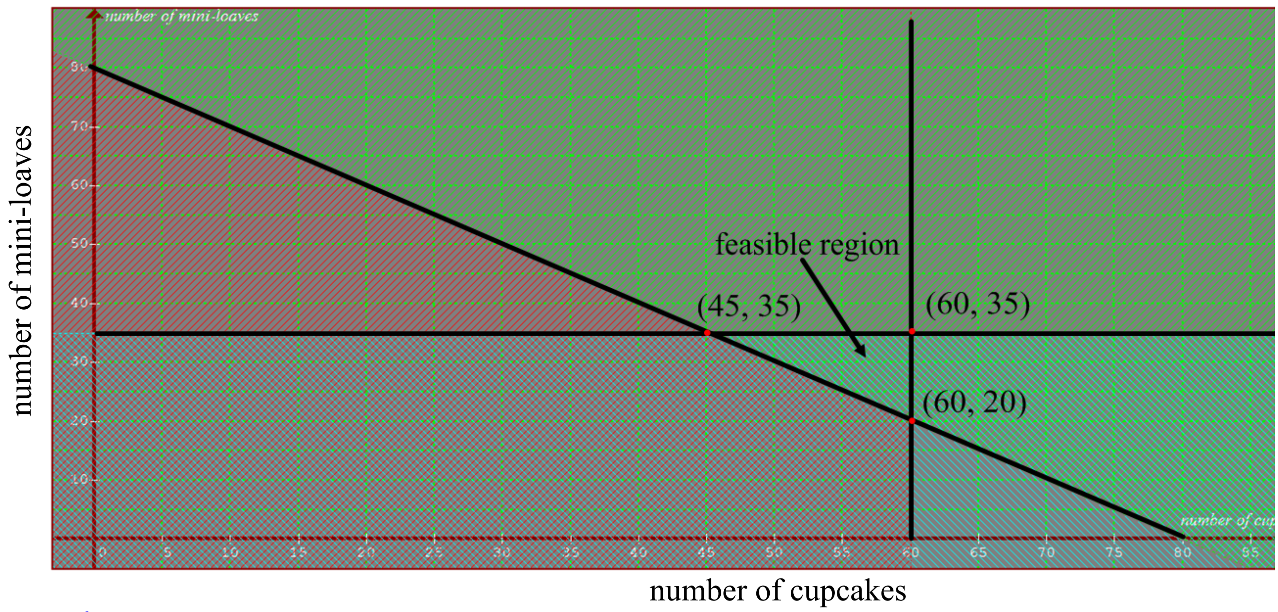
constraints:

$c \geq 0$
$m \geq 0$
$c \leq 60$
$m \leq 35$
$c + m \geq 80$

objective function:

let C represent cost
$C = 0.50c + 0.75m$

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 sells juice and water.

- 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 juice and water that would result in the maximum possible revenue. What is the maximum revenue?

variables and restrictions:

let w represent the number of water bottles, $w \in W$
let j represent the number of juice bottles, $j \in W$

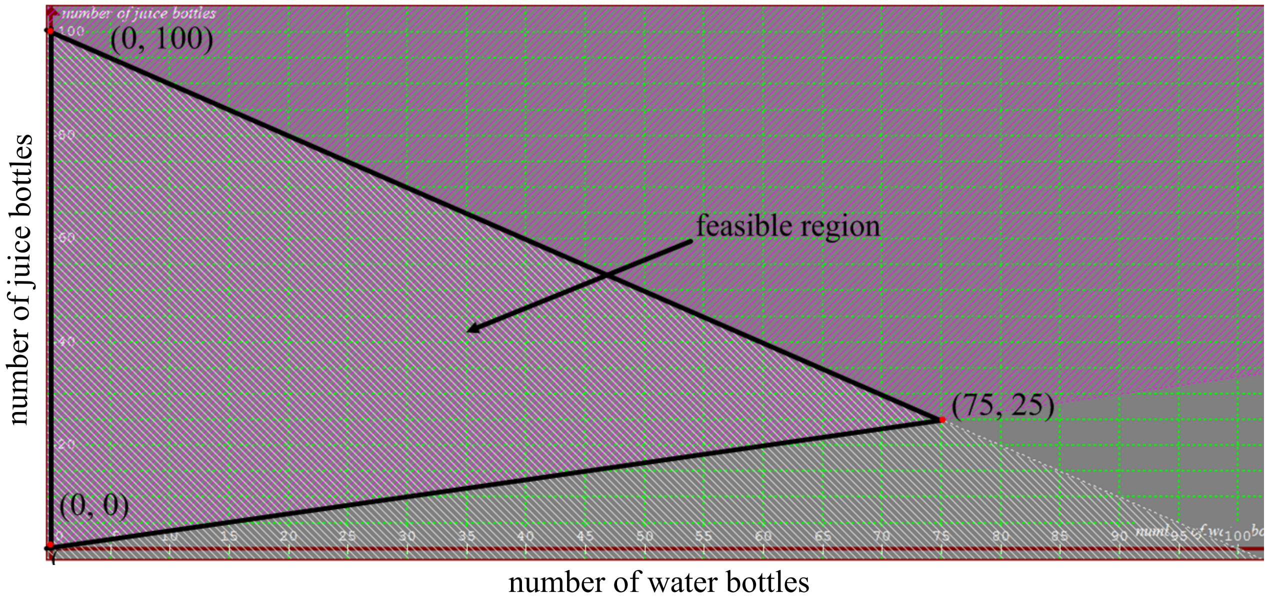
constraints:

$w \geq 0$
$j \geq 0$
$w \leq 3j$
$w + j \leq 100$

objective function:

let R represent revenue
$R = w + 1.25j$

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?

variables and restrictions:

let b represent the number of snowboards, $b \in W$
let s represent the number of skis, $s \in W$

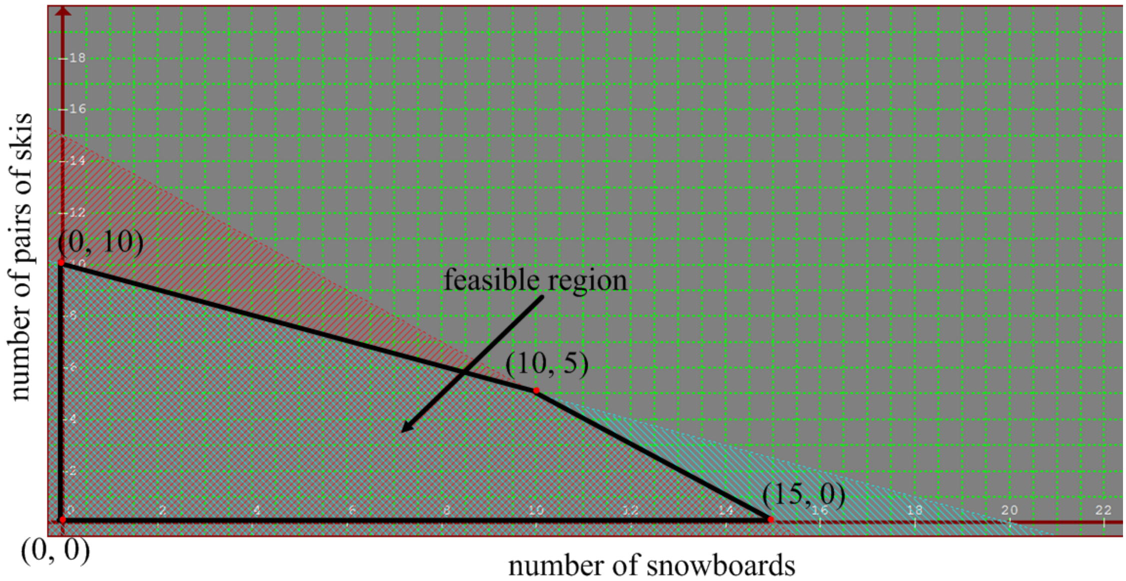
constraints:

$b \geq 0$
$s \geq 0$
$4b + 4s \leq 60$
$b + 2s \leq 20$

objective function:

let P represent profit
$P = 75b + 65s$

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?

variables and restrictions:

let w represent the number of wallets, $w \in W$
let b represent the number of belts, $b \in W$

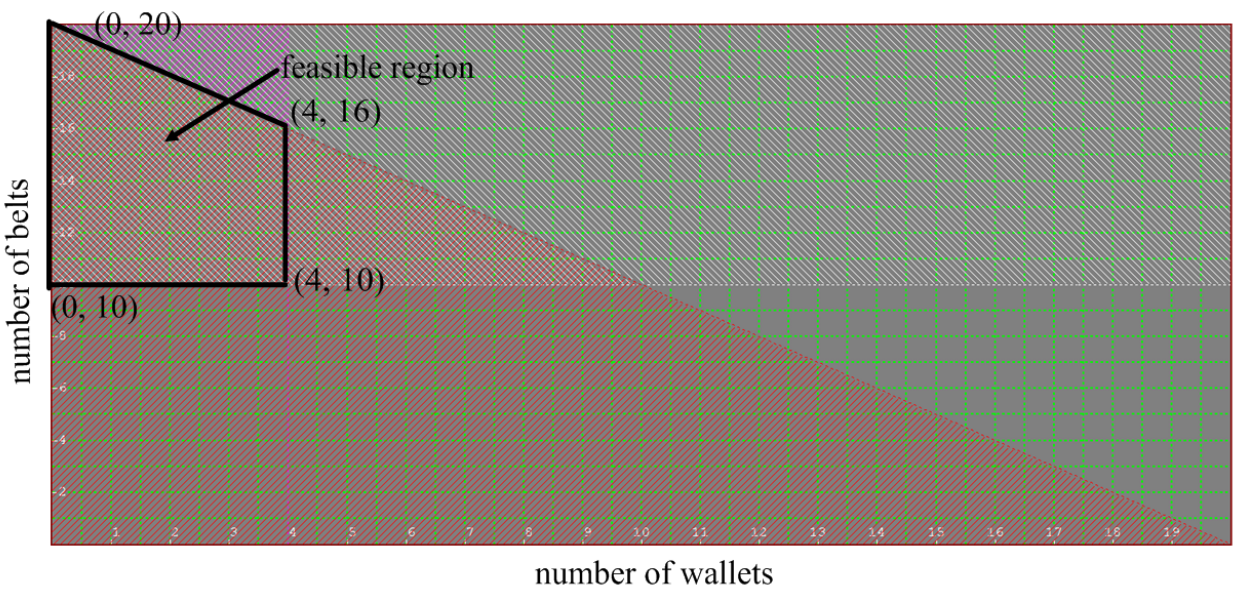
constraints:

$w \geq 0$
$b \geq 0$
$w \leq 4$
$b \geq 10$
$w + b \leq 20$

objective function:

let C represent cost
$C = 2.25w + 1.50b$

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?

variables and restrictions:

let t represent the number of tacos, $t \in W$
let b represent the number of burritos, $b \in W$

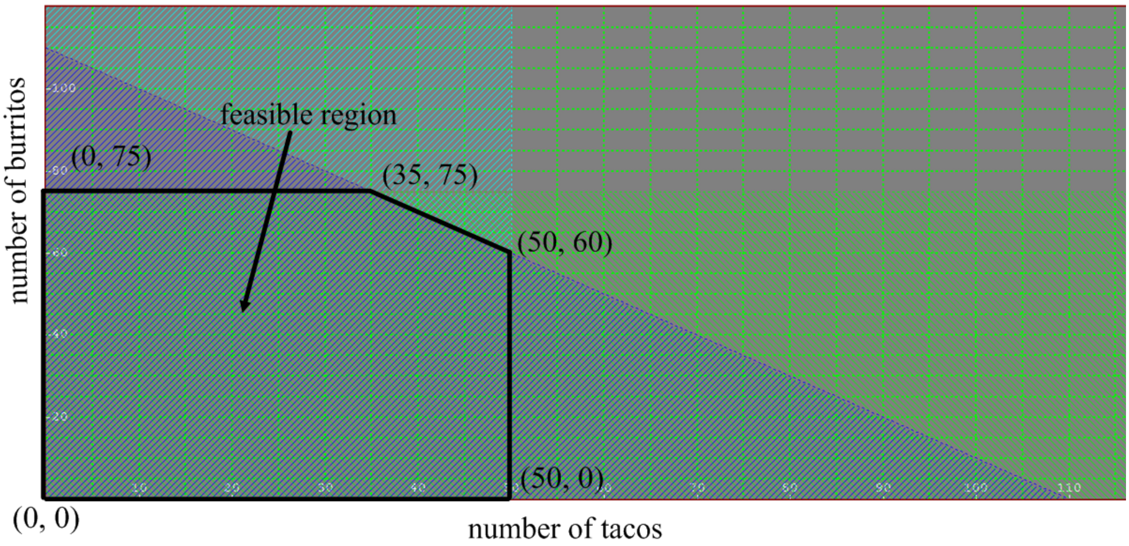
constraints:

$t \geq 0$
$b \geq 0$
$t \leq 50$
$b \leq 75$
$t + b \leq 110$

objective function:

let C represent cost
$C = 0.75t + 1.25b$

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.

variables and restrictions:

let s represent the number of stamps, $s \in W$
let b represent the number of baseball cards, $b \in W$

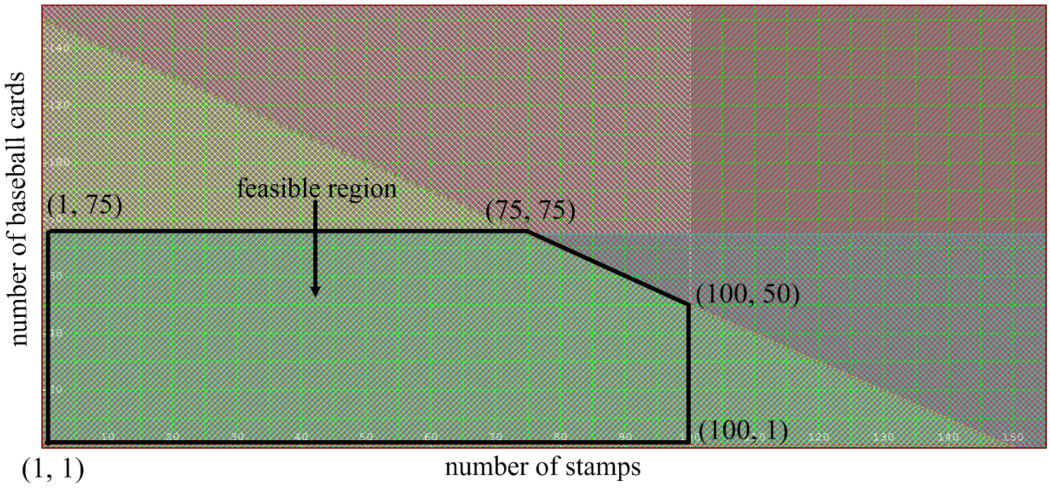
constraints:

$s \leq 100$
$b \leq 75$
$s \geq 1$
$b \geq 1$
$s + b \leq 150$

objective function:

let C represent cost
$C = 0.1s + 0.5b$

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.

variables and restrictions:

let s represent the number of scenic paintings, $s \in W$
let p represent the number of portrait paintings, $p \in W$

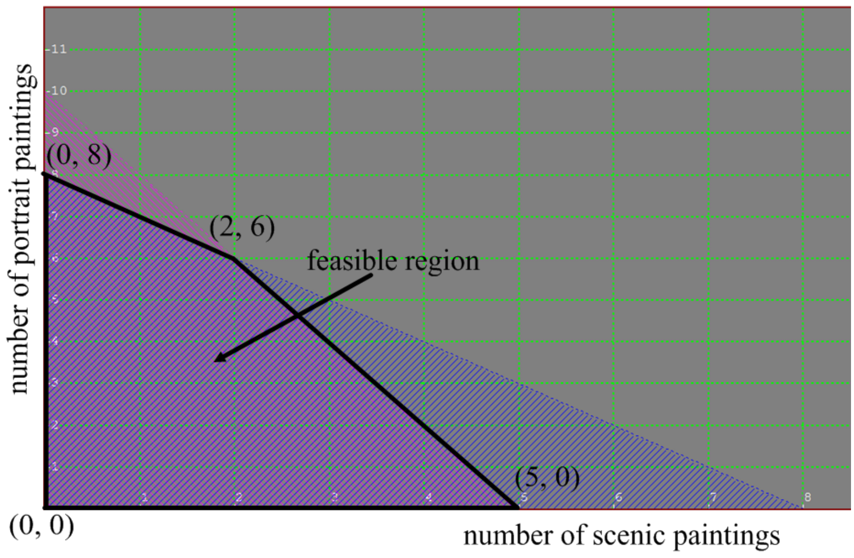
constraints:

$s \geq 0$
$p \geq 0$
$s + p \leq 8$
$6s + 3p \leq 30$

objective function:

let R represent revenue
$R = 300s + 200p$

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.