

Example: Mixing Drinks at Club Fever

We are asked by Club Fever to come up with the optimal plan to mix drinks for a Thursday night.
Excel file “Mixing Drinks.xlsx”

Set up the Mixing Drinks model in Excel for Solver:

| | A | B | C | D | E | F |
|----|--|---------------------------------|--------------|---------------|---|---|
| 1 | Mixing Drinks | | | | | |
| 2 | | | | | | Notes: Recipe (1 cup = 6 ounces) |
| 3 | Monetary inputs | Sex on the Beach | Cosmopolitan | | | 1 Cup of Sex on the Beach |
| 4 | Selling price/cup | \$5.00 | \$7.00 | | | >= 1 ounce of Vodka |
| 5 | | | | | | >= 1 ounce of Peach Schnapps |
| 6 | Alcohol percentage of ingredients | | | | | >= 1 ounce of Fruit Juice |
| 7 | Vodka | 0.40 | | | | 1 Cup of Cosmopolitan |
| 8 | Peach Schnapps | 0.21 | | | | >= 1 ounce of Vodka |
| 9 | Triple Sec | 0.30 | | | | >= 1 ounce of Triple Sec |
| 10 | Fruit Juice | 0.00 | | | | >= 1 ounce of Fruit Juice |
| 11 | | | | | | |
| 12 | Required alcohol percentage | | | | | |
| 13 | | Sex on the Beach | Cosmopolitan | | | |
| 14 | | 0.12 | 0.30 | | | |
| 15 | | | | | | |
| 16 | Blending plan | | | | | |
| 17 | | Sex on the Beach | Cosmopolitan | Ounces used | | Available ingredients (ounces) |
| 18 | Vodka | | | =sum(B18:C18) | | 1200 |
| 19 | Peach Schnapps | | | ↓ | ≤ | 600 |
| 20 | Triple Sec | | | | | 500 |
| 21 | Fruit Juice | | | | | 3000 |
| 22 | Ounces produced | =sum(B18:B21) | → | | | |
| 23 | Cups sold | =B22/6 | → | | | |
| 24 | | | | | | |
| 25 | Constraints on alcohol percentage | | | | | |
| 26 | | Sex on the Beach | Cosmopolitan | | | |
| 27 | Alcohol obtained (ounces) | =sumproduct(\$B7:\$B10,B18:B21) | → | | | |
| 28 | | | ≥ | | | |
| 29 | Alcohol required (ounces) | =B14*B22 | → | | | |
| 30 | | | | | | |
| 31 | Objective to maximize | | | | | |
| 32 | Revenue | =sumproduct(B4:C4,B23:C23) | | | | |

Entering the Mixing Drinks model into Solver:

Solver Parameters

Set Objective:

To: ☒ Max ☐ Min ☐ Value Of:

By Changing Variable Cells:

Subject to the Constraints:

\$B\$18 >= \$B\$23

\$B\$19 >= \$B\$23

\$B\$20 = 0

\$B\$21 >= \$B\$23

\$B\$27:\$C\$27 >= \$B\$29:\$C\$29

\$C\$18 >= \$C\$23

\$C\$19 = 0

\$C\$20 >= \$C\$23

\$C\$21 >= \$C\$23

\$D\$18:\$D\$21 <= \$F\$18:\$F\$21

Add

Change

Delete

Reset All

Load/Save

☒ Make Unconstrained Variables Non-Negative

Select a Solving Method:

Solving Method

Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Solution to the Mixing Drinks model:

| | A | B | C | D | E | F |
|----|--|------------------|--------------|-------------|----|---|
| 1 | Mixing Drinks | | | | | |
| 2 | | | | | | |
| 3 | Monetary inputs | Sex on the Beach | Cosmopolitan | | | Notes: Recipe (1 cup = 6 ounces) |
| 4 | Selling price/cup | \$5.00 | \$7.00 | | | 1 Cup of Sex on the Beach |
| 5 | | | | | | >= 1 ounce of Vodka |
| 6 | Alcohol percentage of ingredients | | | | | >= 1 ounce of Peach Schnapps |
| 7 | Vodka | 0.40 | | | | >= 1 ounce of Fruit Juice |
| 8 | Peach Schnapps | 0.21 | | | | 1 Cup of Cosmopolitan |
| 9 | Triple Sec | 0.30 | | | | >= 1 ounce of Vodka |
| 10 | Fruit Juice | 0.00 | | | | >= 1 ounce of Triple Sec |
| 11 | | | | | | >= 1 ounce of Fruit Juice |
| 12 | Required alcohol percentage | | | | | |
| 13 | | Sex on the Beach | Cosmopolitan | | | |
| 14 | | 0.12 | 0.30 | | | |
| 15 | | | | | | |
| 16 | Blending plan | | | | | |
| 17 | | Sex on the Beach | Cosmopolitan | Ounces used | | Available ingredients (ounces) |
| 18 | Vodka | 765 | 435 | 1200 | <= | 1200 |
| 19 | Peach Schnapps | 600 | 0 | 600 | <= | 600 |
| 20 | Triple Sec | 0 | 290 | 290 | <= | 500 |
| 21 | Fruit Juice | 2235 | 145 | 2380 | <= | 3000 |
| 22 | Ounces produced | 3600 | 870 | | | |
| 23 | Cups sold | 600 | 145 | | | |
| 24 | | | | | | |
| 25 | Constraints on alcohol percentage | | | | | |
| 26 | | Sex on the Beach | Cosmopolitan | | | |
| 27 | Alcohol obtained (ounces) | 432 | 261 | | | |
| 28 | | >= | >= | | | |
| 29 | Alcohol required (ounces) | 432 | 261 | | | |
| 30 | | | | | | |
| 31 | Objective to maximize | | | | | |
| 32 | Revenue | 4,015 | | | | |

Questions:

1. With the above optimal mixing, Club Fever will obtain a revenue of \$4,015.
2. If Club Fever need to produce at least 200 cups of Cosmopolitan, how should we modify the model? How would the revenue change as a result of this modification?

Add a constraint: C23 \geq 200. Revenue would decrease to \$3,942.

3. Based on the original model, how much is Club Fever willing to pay for 2 additional handles (60 ounces each) of Peach Schnapps?

Increase the available Peach Schnapps to 720 (= 600 + 2 * 60).

Revenue would increase to \$4,258.

Maximum willingness to pay = \$4,258 – \$4,015 = \$243.