Practice Problems

1) Solve the Edmond Public Schools Problem in Module 8 forcing the solution to be integers.

2) Solve the Sports Ill./Around Town ad problem in Module 8 forcing the solution to be integers.

3) Solve the Starducks problem in Module 8, forcing the solution to be integers.

4) MUTUAL "FUN" MODELING!! - The table below depicts the attributes of 8 mutual funds. The fund's BETA (riskiness related to the market), its investment category (Large-Cap, Small-Cap, and International), the company (Vanguard, MFS, UBS), the anticipated yearly return under Middle East unrest conditions (RET1) and the anticipated yearly return under peaceful Middle East political conditions (RET2).

	FUND1	FUND2	FUND3	FUND4	FUND5	FUND6	FUND7	FUND8
Beta	1.4	2.2	1.2	1.7	3.1	2.4	1.8	0.9
Category	Large	Small	Large	Intl	Intl	Small	Intl	Large
Company	VAN	VAN	MFS	MFS	UBS	UBS	VAN	UBS
RET1	-1.3	-3.6	-4.2	7.1	6.3	-2.1	4.6	-2.1
RET2	15.1	21.2	12.3	11.7	20.3	24.7	12.2	10.6

You have been instructed to invest up to $25,000 of a client's money in these 8 funds. You do NOT have to invest all $25,000, though any non-invested amount will earn 0% return.

Parameters/restrictions/guidelines your investment model should consider:

1) Minimizing Weighted Beta (amount invested in fund X times fund X beta) is your objective.
2) Under market conditions RET1, invest such that your model shows no loss (return is at least 0).
3) Under market conditions RET2, invest such that your model shows at least a 15% return on the $25,000, though again, it does not need to invest all $25,000 in funds. So using RET2 anticipated return figures, your investments should give you at least a monetary return of (.15*25000).
4) No more than 50% of the total invested funds (not the $25,000 unless your model suggests to invest it all) can be invested in a particular fund category.
5) No more than 40% of the total invested funds (not the $25,000 unless your model suggests to invest it all) can be invested in a particular company.
6) To simplify investments, the investment allocation must be in whole numbers.

Create and solve a mathematical programming model (LP) that addresses this investment situation.

5) LOOKING FOR MR. GOODMEAL - A recent article identified 7 best fast food meal under 350 calories. It can be found here: http://health.yahoo.net/experts/eatthis/7-fast-food-meals-under-350-calories.

The 'best meals' are found at seven different fast food restaurants. The article gives information such as calories, grams of fat, grams of saturated fat, and sodium content. One meal is a 'breakfast' meal (Dunkin' Donuts). Three of the meals have 'beef' (counting ham in this category) – three have chicken, one (breakfast) has nothing in these categories.

Being the adventuresome soul that you are, you set out to create an aggregate plan (not a daily plan) for a one week diet that uses these 7 proposed meals to account for at least 14 and no more than 20 of your weekly meals.

You are constrained by a budget of $70 for food (we are not worried about transportation cost now – maybe we'll see this problem again!). You have collected some data about approximate cost for each meal, and that is shown below in the table along with your own personal preferences on the favorability of each meal (higher is more preferential on a scale of 1 to 50) . In creating your aggregate plan, your objective is to maximize this weighted preference value (number of times using that meal multiplied by the preference measure).

Meal	Panda	Subway	Chick	McD	BK	TBell	DDonuts
Cost	6	5	4	2.5	3.75	3	3.25
Preference	41	32	34	27	30	37	22

You also need to add constraints that reflect some health related parameters – Your aggregate meal plan cannot 'provide' more than 5400 calories, 150 g of fat, 50 g of saturated fat, and 22000 mg of sodium. Note that this aggregate plan is providing an unknown number of meals (subject to the limitations stated above) and thus there will be some additional food allowed in the course of the week.

Your aggregate plan must provide at least 2 breakfast meals during the course of the week. And, for the sake of variety, your plan must limit the number of visits to each individual location (meal) to no more than 25% of the total number of meals found in the aggregate plan. So, as an example, if your aggregate plan accounts for 8 total meals, that means that you can visit each location at most 2 times (25% of the total).

Create an appropriate mathematical programming model that determines the aggregate meal plan which maximizes 'preference' subject to the constraints outlined above. And yes, the number of visits must be whole numbers.