

## Using Excel's Solver Package

We'll take as our example the cat problem:

$x_1$  = number of Siamese

$x_2$  = number of Persians

Objective Function: Maximize income  $12x_1 + 10x_2$

Constraints:

$2x_1 + x_2 \leq 90$  Tuna

$x_1 + 2x_2 \leq 80$  Liver

$x_1 + x_2 \leq 50$  Chicken

$x_1, x_2 \geq 0$

### How to enter the problem into Excel

	A	B	C	D	E	F
20		<b>Variables</b>				
21		Siamese	Persians		These cells (B21 and B22) are where the values of our variables will be kept. We start at the origin (0, 0) as usual.	
22		0	0			
23						
24	<b>Constraints</b>					
25	tuna	2	1	=B24*B\$21+C24*C\$21	<=	90
26	liver	1	2	=B25*B\$21+C25*C\$21	<=	80
27	chicken	1	1	=B26*B\$21+C26*C\$21	<=	50
28	<b>Objective Function</b>					
29	income	12	10	=B28*B\$21+C28*C\$21		
30						
31						
32						
33					(Optional) Reminders of what kind of constraint each is.	The constant bound for each constraint.
34	We use variables	Coefficients just get		These are the only		
35	like "x1" and "s2"	entered underneath		formulas you have to		
36	because it's easier	the corresponding		enter. All you have to		
37	to do algebra with	variables as they		do is to mimic the		
38	them than with	appear in original		algebra in the original		
39	whole words like	formulation of the		formulation. For		
40	"liver" But the	problem.		example,		
41	computer doesn't			2 x1 + 1 x2		
42	care, so you can			is the same as		
43	just use words			B24*B\$21+C24*C\$21		
44	instead of variable					
45	names if you want.					
46	Doing so makes the					
47	results easier to					
48	interpret					
49						

## How to Use Excel's Solver

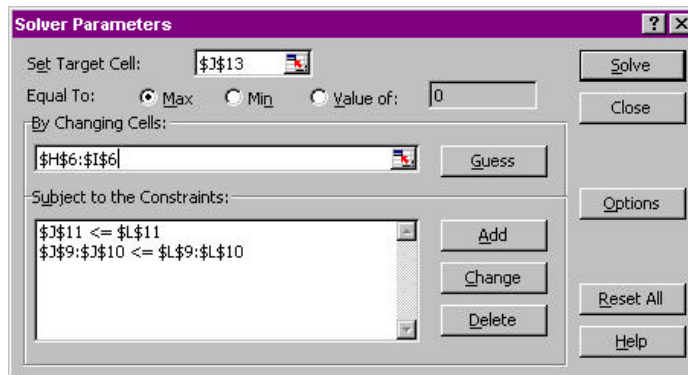
The cell names below refer to the following in excel

	G	H	I	J	K	L
4		<b>Variables</b>				
5		Siamese	Persians			
6		0	0			
7						
8	<b>Constraints</b>					
9	tuna	2	1	0	<=	90
10	liver	1	2	0	<=	80
11	chicken	1	1	0	<=	50
12	<b>Objective Function</b>					
13	income	12	10	0		

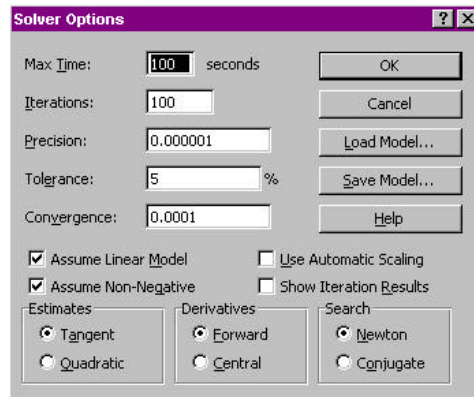
- Choose “*Solver*” from the “*Tools*” menu
- Fill in these five elements:
  1. “*Set Target Cell*” should be the cell with your objective function formula (J13)
  2. “*Equal to*” should be set to min or max, as needed
  3. “*By Changing Cells*” should be the cells with your variable values (above, H6:I6)
  4. “*Subject to Constraints*” is filled in as follows:
    - Click the “*Add*” button
    - Fill in the first box with the formula for the left hand side of your constraint (J9)
    - Make sure the inequality in the middle is the one you need
    - Fill in the second box with the constant on the right hand side of your constraint (L9)
    - Click “*OK*”
    - Repeat with the other constraints

NOTE: If the inequalities are the same for each constraint, you can save time by doing all together. For example, above, you can enter J9:J11 <= L9:L11 for the three constraints

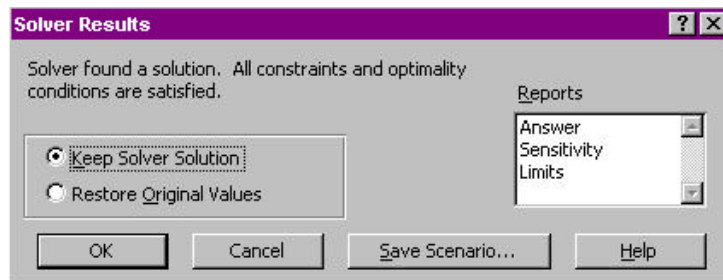
When you're finished with this problem it should look something like this



- Finally, hit the “Options” button
  - Click “Assume Linear Model” on
  - Click “Assume non-negative” on. (This takes care of the  $x_1, x_2 \geq 0$ )
  - Click “OK” to leave “Options”



- Click on “Solve” to get things going
- When Excel gets done solving things, you get a box that looks like...



Before you click on “OK,” click on the word “Sensitivity” to the right. When you do that, you get a new tab added to the spreadsheet that helps you interpret the results of the solution. New tabs will also be added for “Answer” and “Limits” if you would like that information as well.

- Select “Keep Solver Solution” if it isn’t already checked, and select “OK.”
- Excel replaces the values for  $x_1$  and  $x_2$ , and the rest of the data is calculated automatically.

	G	H	I	J	K	L
4		<b>Variables</b>				
5		Siamese	Persians			
6		40	10			
7						
8	<b>Constraints</b>					
9	tuna	2	1	90	< =	90
10	liver	1	2	60	< =	80
11	chicken	1	1	50	< =	50
12	<b>Objective Function</b>					
13	income	12	10	580		
14						

Therefore the maximum (580) is given with Siamese = 40 and Persians = 10.