

Example: Advertising

One way to set up the Chery advertising model in Excel for Solver:

	A	B	C	D	E	F	G	H	I	J
1	Advertising model									
2										
3	Inputs									
4	Exposures to various groups per ad									
5		The Big Bang Theory	Bones	Gossip Girl	Glee	How I Met Your Mother	Modern Family	NCIS	The Office	Two and a Half Men
6	channel	CBS	FOX	CW	FOX	CBS	ABC	CBS	NBC	CBS
7	Men 18-35	4.5	4.0	0.2	2.5	2.0	2.0	3.5	1.0	4.0
8	Men 36-55	2.0	3.0	0.1	1.5	1.5	1.5	3.5	2.5	3.0
9	Men >55	0.5	0.5	0.0	0.5	1.0	1.0	2.0	1.0	1.0
10	Women 18-35	4.5	1.5	1.5	3.5	2.0	2.0	2.0	1.0	3.0
11	Women 36-55	2.0	1.5	0.2	1.5	1.5	1.5	3.0	2.5	3.0
12	Women >55	0.5	0.5	0.0	0.5	1.0	1.0	2.0	1.0	1.0
13	Viewers (millions)	14	11	2	10	9	9	16	9	15
14										
15	Cost per 30 sec(\$)	192	108	59	127	145	130	167	191	201
16										
17	Advertising plan									
18		The Big Bang Theory	Bones	Gossip Girl	Glee	How I Met Your Mother	Modern Family	NCIS	The Office	Two and a Half Men
19	Number ads purchased									
20										
21	Constraints on numbers of exposures									
22		Actual exposures		Required exposures						
23				by Chery						
24	Men 18-35	=sumproduct(B7:J7,B19:J19)		80						
25	Men 36-55	↓		56						
26	Men >55		≥	30						
27	Women 18-35			120						
28	Women 36-55			56						
29	Women >55			30						
30										
31	Objective to minimize									
32	Total cost	=sumproduct(B15:J15,B19:J19)								

Note: All monetary values are in \$1000s, and all exposures to ads are in millions of exposures.

Using Solver:

- From Excel menu (typically under Data), open Solver.
- Enter objective function and variable cells.
- To enter constraints, click “Add,” then enter left and right sides of constraints and type of relationship between them.
- If all variables are greater than or equal to zero, check “Make Unconstrained Variables Non-Negative.”
- Select a solving method. If model is linear, select Simplex LP.
- Click “Solve,” then “Keep Solver Solution.”

Inputting the Advertising model into Solver:

The screenshot shows the 'Solver Parameters' dialog box in Excel. The 'Set Objective:' field contains '\$B\$32'. The 'To:' section has three radio buttons: 'Max' (unselected), 'Min' (selected), and 'Value Of:' (unselected). The 'By Changing Variable Cells:' field contains '\$B\$19:\$J\$19'. The 'Subject to the Constraints:' list contains one constraint: '\$B\$24:\$B\$29 >= \$D\$24:\$D\$29'. To the right of this list are buttons for 'Add', 'Change', 'Delete', 'Reset All', and 'Load/Save'. Below the constraints list is a checked checkbox labeled 'Make Unconstrained Variables Non-Negative'. The 'Select a Solving Method:' dropdown is set to 'Simplex LP'. Below this is an 'Options' button. A text box at the bottom explains the solving methods: '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.' At the bottom of the dialog are 'Help', 'Solve', and 'Close' buttons.

Solver Parameters

Set Objective:

To: ☐ Max ☒ Min ☐ Value Of:

By Changing Variable Cells:

Subject to the Constraints:

☒ 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.

Buttons: Add, Change, Delete, Reset All, Load/Save, Options, Help, Solve, Close

Solution to the Advertising model:

	A	B	C	D	E	F	G	H	I	J
1	Advertising model									
2										
3	Inputs									
4	Exposures to various groups per ad									
5		The Big Bang Theory	Bones	Gossip Girl	Glee	How I Met Your Mother	Modern Family	NCIS	The Office	Two and a Half Men
6	channel	CBS	FOX	CW	FOX	CBS	ABC	CBS	NBC	CBS
7	Men 18-35	4.5	4.0	0.2	2.5	2.0	2.0	3.5	1.0	4.0
8	Men 36-55	2.0	3.0	0.1	1.5	1.5	1.5	3.5	2.5	3.0
9	Men >55	0.5	0.5	0.0	0.5	1.0	1.0	2.0	1.0	1.0
10	Women 18-35	4.5	1.5	1.5	3.5	2.0	2.0	2.0	1.0	3.0
11	Women 36-55	2.0	1.5	0.2	1.5	1.5	1.5	3.0	2.5	3.0
12	Women >55	0.5	0.5	0.0	0.5	1.0	1.0	2.0	1.0	1.0
13	Viewers (millions)	14	11	2	10	9	9	16	9	15
14										
15	Cost per 30 sec(\$)	192	108	59	127	145	130	167	191	201
16										
17	Advertising plan									
18		The Big Bang Theory	Bones	Gossip Girl	Glee	How I Met Your Mother	Modern Family	NCIS	The Office	Two and a Half Men
19	Number ads purchased	0.0	0.0	0.0	30.0	0.0	0.0	7.5	0.0	0.0
20										
21	Constraints on numbers of exposures									
22		Actual exposures		Required exposures						
23				by Chery						
24	Men 18-35	101.3	>=	80						
25	Men 36-55	71.3	>=	56						
26	Men >55	30.0	>=	30						
27	Women 18-35	120.0	>=	120						
28	Women 36-55	67.5	>=	56						
29	Women >55	30.0	>=	30						
30										
31	Objective to minimize									
32	Total cost	5,062.5								

Note: All monetary values are in \$1000s, and all exposures to ads are in millions of exposures.

Integer Solution to the Advertising model:

Add a constraint in Solver: B19:J19=integer

	A	B	C	D	E	F	G	H	I	J
1	Advertising model									
2										
3	Inputs									
4	Exposures to various groups per ad									
5		The Big Bang Theory	Bones	Gossip Girl	Glee	How I Met Your Mother	Modern Family	NCIS	The Office	Two and a Half Men
6	channel	CBS	FOX	CW	FOX	CBS	ABC	CBS	NBC	CBS
7	Men 18-35	4.5	4.0	0.2	2.5	2.0	2.0	3.5	1.0	4.0
8	Men 36-55	2.0	3.0	0.1	1.5	1.5	1.5	3.5	2.5	3.0
9	Men >55	0.5	0.5	0.0	0.5	1.0	1.0	2.0	1.0	1.0
10	Women 18-35	4.5	1.5	1.5	3.5	2.0	2.0	2.0	1.0	3.0
11	Women 36-55	2.0	1.5	0.2	1.5	1.5	1.5	3.0	2.5	3.0
12	Women >55	0.5	0.5	0.0	0.5	1.0	1.0	2.0	1.0	1.0
13	Viewers (millions)	14	11	2	10	9	9	16	9	15
14										
15	Cost per 30 sec(\$)	192	108	59	127	145	130	167	191	201
16										
17	Advertising plan									
18		The Big Bang Theory	Bones	Gossip Girl	Glee	How I Met Your Mother	Modern Family	NCIS	The Office	Two and a Half Men
19	Number ads purchased	0.0	0.0	0.0	30.0	0.0	1.0	7.0	0.0	0.0
20										
21	Constraints on numbers of exposures									
22		Actual exposures		Required exposures						
23				by Chery						
24	Men 18-35	101.5	>=	80						
25	Men 36-55	71.0	>=	56						
26	Men >55	30.0	>=	30						
27	Women 18-35	121.0	>=	120						
28	Women 36-55	67.5	>=	56						
29	Women >55	30.0	>=	30						
30										
31	Objective to minimize									
32	Total cost	5,109								