

Re: Solver Help

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<http://www.tech-archive.net/Archive/Excel/microsoft.public.excel.worksheet.functions/2007-06/msg02322.html>

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I'm not sure how to send a private message to you, but if you would email me a sample worksheet i would appreciate it. Thanks.

joeu2004 wrote:

[repost due to apparent Google Groups error]

Well you seem to know what you are talking about, but i dont follow...
I think this might be beyond what i am comfortable attempting...

Dana's approach is similar to mine. So you might be uncomfortable with my response as well. But I am able to set it up in a form that allows for Solver to be used.

The problem with using Solver is: there are really 3 results to minimize. They are: (1) number of raw material in 12-foot lengths; (2) amount of scrap (see my definition below); and (3) number of cuts. Solver can only minimize one result at a time. Presumably we would choose #1 (number of 12-foot raw material); but that might not minimize #2 (amount of scrap). (But see the Endnotes.)

I define "scrap" to be a length of 1 or 2 feet. Longer pieces are not really scrap because they might be used for other projects that require material in the same lengths, namely 3-12 feet.

I might note that with the set-up described below, it might be just as easy (or easier!) to find the optimal solution manually by trial-and-error.

My set-up is quite complicated to describe. It would be easier to send you the Excel file. Feel free to send me email for that. Needless to say, there is nothing sacrosanct about my choice of cells to use. You might prefer a very different layout. That said, here goes....

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Let B1:B10 represent the required number of 12-, 11-, ..., 3-foot lengths. These are cells in which you enter your requirements.

The following cells will contain the number of each indicated pattern (with the amount of scrap in parentheses). These are the Solver variables ("by changing cells"), which we want to vary to find an optimal solution. Usually, it is prudent to blank these cells each time before using Solver.

E1: 9+3
G1: 8+4
G2: 8+3 (1)
I1: 7+5
I2: 7+4 (1)
I3: 7+3 (2)
K1: 6+5 (1)
K2: 6+4 (2)
K3: 6+3+3
M1: 5+5 (2)
M2: 5+4+3
M3: 5+3+3 (1)
O1: 4+4+3 (1)
O2: 4+3+3 (2)
Q1: 3+3+3+3

As you might imagine, the gaps between columns are used for descriptive labels.

The following cells compute the sum of the number of each cut length produced by the solution. The summation cells are used to specify the Solver constraints.

#9: E4: =sum(E1:E3)
#8: G4: =sum(G1:G3)
#7: I4: =sum(I1:I3)
#6: K4: =sum(K1:K3)

7+5: E7: =I1
6+5: E8: =K1
5+5: E9: =M1
5+4+3: E10: =M2
5+3+3: E11: =M3
#5: E16: =sum(E7:E15,E9)

8+4: G7: =G1
7+4: G8: =I2
6+4: G9: =K2
5+4+3: G10: =M2
4+4+3: G11: =O1
4+3+3: G12: =O2
#4: G16: =sum(G7:G15,G11)

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9+3: I7: =E1
8+3: I8: =G2
7+3: I9: =I3
6+3+3: I10: =K3
5+4+3: I11: =M2
5+3+3: I12: =M3
4+4+3: I13: =O1
4+3+3: I14: =O2
3+3+3+3: I15: =Q1
#3: I16: =sum(I7:I15,I10,I12,I14,3*I15)

B14 computes the total number of 12-foot raw material. That is the "target cell" for Solver. B15 computes the amount of scrap. B16 computes the number of cuts. The formulas are:

B14: =SUM(B1:B3,E1,G1:G2,I1:I3,K1:K3,M1:M3,O1:O2,Q1)
B15: =B2+G2+I2+K1+M3+O1+ 2*(B3+I3+K2+M1+O2)
B16: =SUM(B2:B3,E1,G1:G2,I1:I3,K1:K2,M1) + 2*SUM(K3,M2:M3,O1:O2) + 3*Q1

Whew! Now for the Solver set-up....

Target Cell:
\$B\$14, Min

By Changing Cells:
\$E\$1, \$G\$1:\$G\$2, \$I\$1:\$I\$3, \$K\$1:\$K\$3, \$M\$1:\$M\$3, \$O\$1:\$O\$2, \$Q\$1

Constraints:
\$E\$1 = integer
\$E\$16 >= \$B\$8
\$E\$4 >= \$B\$4
\$G\$16 >= \$B\$9
\$G\$1:\$G\$2 = integer
\$G\$4 >= \$B\$5
\$I\$16 >= \$B\$10
\$I\$1:\$I\$3 = integer
\$I\$4 >= \$B\$6
\$K\$1:\$K\$3 = integer
\$K\$4 >= \$B\$7
\$M\$1:\$M\$3 = integer
\$O\$1:\$O\$2 = integer
\$Q\$1 = integer

HTH.

Endnotes:

1. After using Solver with B14 as the Target Cell, change the Target Cell to B15 and click on Solve again, __without__ blanking the

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variable cells in E1:Q3. This might improve the solution with the additional goal of minimizing the amount of scrap.

2. Note that the constraints are ">=" instead of "=". If you used "=", Solver usually might not find a solution with integer values in the variables. Solver will silently use non-integers.

3. There may be multiple optimal solutions. Solver merely finds one. There may be subjective reasons for you to choose one of the other optimal solutions -- or even a non-optimal solution. I think it is best to think of the Solver result as a starting point, not necessarily a final answer.

4. I am a Solver neophyte. Experts might weigh in with improvements or a completely different and better approach.

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