*An Excel Modeling
Practice Problem*

Padgett's Widgets

The Padgett's Widgets Problem

Market research by Padgett's Widget Company has revealed that the demand for its products varies with the price according to this relation:

$$D = 761 - 8.6\ P$$

where
> D is demand in widgets, and
> P is price in dollars.

For example, if the widget price is set to $50, demand will be 761 - 8.6(50) = 331 widgets. Each widget costs $40 to make and Padgett's is contemplating charging a price somewhere between $50 and $80.

The per-unit profit is the difference between price and manufacturing cost, and total profit equals demand multiplied by per-unit profit. For example, if price is $50 and demand is 331 units, total profit will be 331($50-$40) = $3,310.

The Spreadsheet Model to Build
Construct a spreadsheet model that can:
- Compute Padgett's profit as a function of price for four widget sale prices: $50, $60, $70, and $80.
- Allow you to determine which price yields the highest profit and can show the optimal price as manufacturing costs change.
- Be modified to track the same information for 40 widget sale prices ranging from $50 to $90.

Outputs to produce
Outputs to produce include:
- A printout of a worksheet that incorporates the information we know about Padgett's Widget Company. Specifically, the market research information from the company, and formulas to calculate key values (demand, unit profit, and total profit for widgets at the four given price levels). In your formulas for demand, include only cell references, no actual numbers. (E.g.- Your model will need variables for price and the given values 761 and 8.6. Refer to cells that hold these values;don't include these values in the formulas you write.)
- A printout of the same worksheet version above but with formulas displayed and readable. Widen columns in order to display the formulas completely and include row and column headings on the printout.
- A printout of a simple line graph of profits at the four price levels. Include a two-line title surrounded by a border and a legend that

names the chart line "Profit".

A Further Refinement of the Model

Your model should show that Padgett's profit is highest when the widget price is set at $60. However, with only four widget price options, this model is only a rough estimate of the best sale price.

As a refinement of your first model, create another version of the worksheet showing 40 widget prices ranging from $50 to $90 in $1 increments. For this version, change the manufacturing cost from $40 to $45. (Your model should be constructed so this change is easy to make and requires no editing of other spreadsheet elements.)

Add a new line graph as a chart on this same worksheet, showing widget profits at 40 price levels.

Tips
Adjustments that can make this chart more effective include:
- Select a line graph type that includes data point markers and not just a line.
- Add horizontal gridlines to the chart.
- Modify the x-axis to thin out the number of data labels by selecting the axis and choosing Format Axis, and selecting Scale. Experiment with different values in the Major Unit text box.
- To better differentiate the top of the profit curve, size the embedded chart so it's longer on its vertical than on its horizontal dimension.
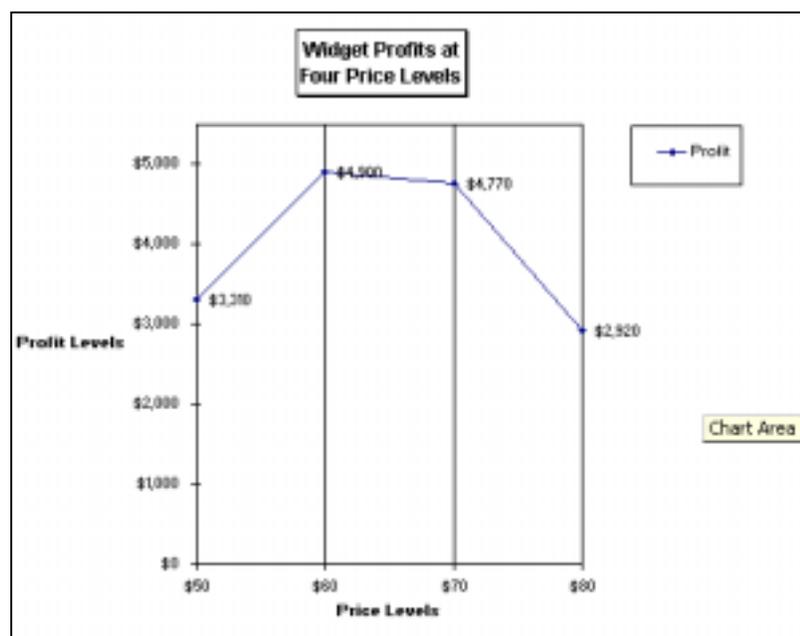
Sample Printouts

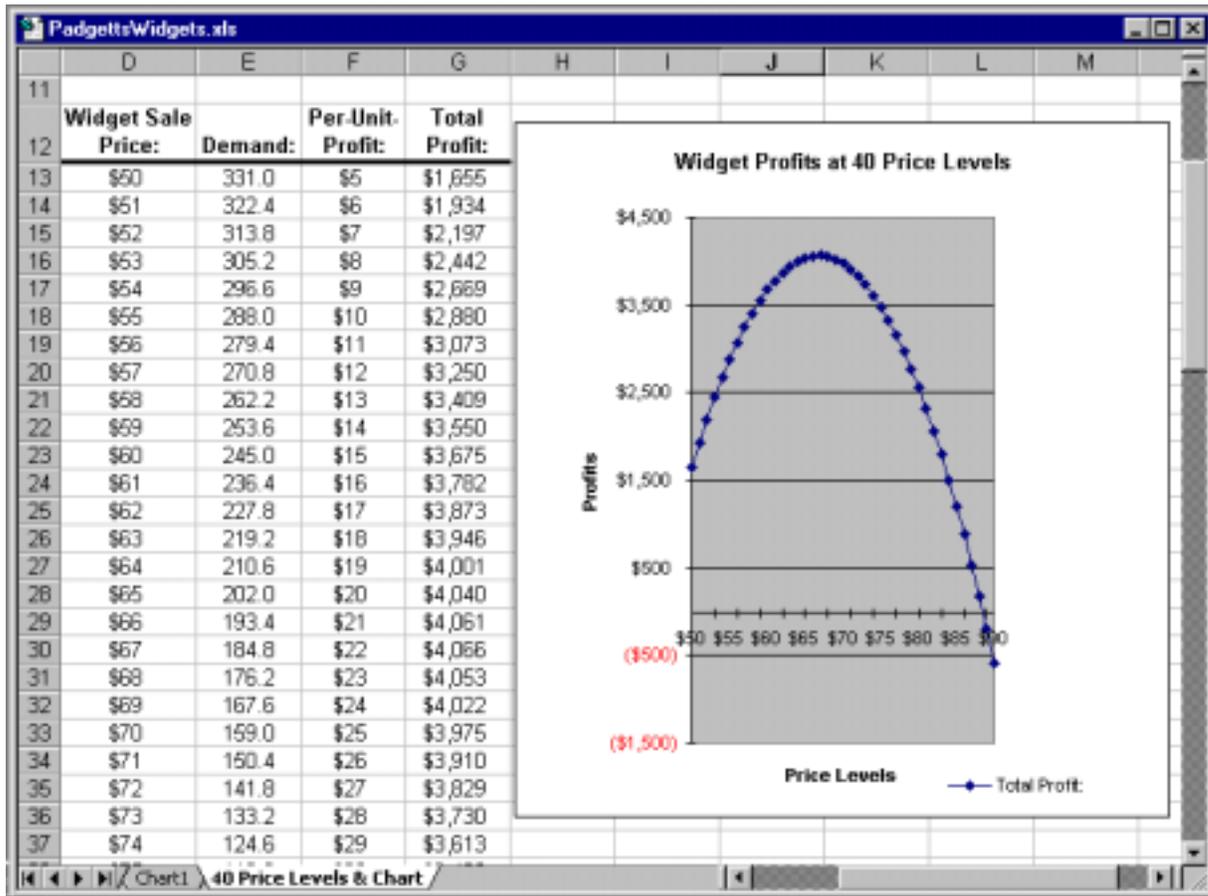Sample worksheet printouts follow.

A Basic Padgett's Widgets Model

A Chart of Profits at 4 Widget Price Levels

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Partial View of a Model Refinement Showing 40 Price Levels

PadgettsWidgets.xls

	Widget Sale Price:	Demand:	Per-Unit Profit:	Total Profit:
12				
13	$50	331.0	$5	$1,655
14	$51	322.4	$6	$1,934
15	$52	313.8	$7	$2,197
16	$53	305.2	$8	$2,442
17	$54	296.6	$9	$2,669
18	$55	288.0	$10	$2,880
19	$56	279.4	$11	$3,073
20	$57	270.8	$12	$3,250
21	$58	262.2	$13	$3,409
22	$59	253.6	$14	$3,550
23	$60	245.0	$15	$3,675
24	$61	236.4	$16	$3,782
25	$62	227.8	$17	$3,873
26	$63	219.2	$18	$3,946
27	$64	210.6	$19	$4,001
28	$65	202.0	$20	$4,040
29	$66	193.4	$21	$4,061
30	$67	184.8	$22	$4,066
31	$68	176.2	$23	$4,053
32	$69	167.6	$24	$4,022
33	$70	159.0	$25	$3,975
34	$71	150.4	$26	$3,910
35	$72	141.8	$27	$3,829
36	$73	133.2	$28	$3,730
37	$74	124.6	$29	$3,613

Chart1 \ 40 Price Levels & Chart

Widget Profits at 40 Price Levels

End