LINDO OUTPUT INTERPRETATION

1. The objective function should not contain any constant. For example, Max 2X1 + 5 are not allowed.
2. All variables must appear in the left side of the constraints, while the numerical values must appear on the right side of the constraints (that is why these numbers are called the RHS values).
3. All variables are assumed to be nonnegative. Therefore, do not type in the non-negativity conditions.
4. Click on "Solve" then choose "Solve".
5. "Do? Range (Sensitivity) Analysis". Select "Yes". After minimizing the current window, you will see the output that you may print for your managerial analysis.

It is good practice to copy the LP problem from your first window and then paste it at the top of the output page.

On the top of the page is the initial tableau, and across the top of tableau are the variables. The first row in the tableau is the objective function. The second row is the first constraint. The third row is the second constraint, and so on until all constraints are listed in the tableau.

Following the initial tableau is a statement that indicates the entering variable and the exiting variable. The exiting variable is expressed as which row the entering variable will be placed. The first iteration tableau is printed next. Entering statements and iterations of the tableau continue until the optimum solution is reached.

The next statement, `LP OPTIMUM FOUND AT STEP 2' indicates that the optimum solution was found in iteration 2 of the initial tableau. Immediately below this is the optimum of the objective function value. This is the most important piece of information that every manager is interested in.

In many cases you will get a very surprising message: "LP OPTIMUM FOUND AT STEP 0." How could it be step 0? Doesn't first have to move in order to find out a result... This message is very misleading. Lindo keeps a record of any previous activities performed prior to solving any problem you submit in its memory. Therefore it does not show exactly how much iteration it took to solve your specific problem. Here is a detailed explanation and remedy for finding the exact number of iterations: Suppose you run the problem more than once, or solve a similar problem. To find out how much iteration it really takes to solve any specific problem, you must quit Lindo and then re-enter, retype, and resubmit the problem. The exact number of vertices (excluding the origin) visited to reach the optimal solution (if it exists) will be shown correctly.

Following this is the solution to the problem. That is, the strategy to set the decision variables in order to achieve the above optimal value. This is stated with a variable column and a value column. The value column contains the solution to the problem. The cost reduction associated with each variable is printed to the right of the value column. These values are taken directly from the final simplex tableau. The value column comes from the RHS. The reduced cost column comes directly from the indicator row.

Below the solution is the `SLACK OR SURPLUS' column providing the slack/surplus variable value. The related shadow prices for the RHS's are found to the right of this. Remember: Slack is the leftover of a resource and a Surplus is the excess of production.

The binding constraint can be found by finding the slack/surplus variable with the value of zero. Then examine each constraint for the one which has only this variable specified in it. Another way to express this is to find the constraint that expresses equality with the final solution.

Below this is the sensitivity analysis of the cost coefficients (i.e., the coefficients of the objective function). Each cost coefficient parameter can change without affecting the current optimal solution. The current value of the coefficient is printed along with the allowable increase increment and decrease decrement.

Below this is the sensitivity analysis for the RHS. The row column prints the row number from the initial problem. For example the first row printed will be row two. This is because row one is the objective function. The first constraint is row two. The RHS of the first constraint is represented by row two. To the right of this are the values for which the RHS value can change while maintaining the validity of shadow prices.

Note that in the final simplex tableau, the coefficients of the slack/surplus variables in the objective row give the unit worth of the resource. These numbers are called shadow prices or dual prices. We must be careful when applying these numbers. They are only good for "small" changes in the amounts of resources (i.e., within the RHS sensitivity ranges).

Creating the Non-negativity Conditions (free variables): By default, almost all LP solvers (such as LINDO) assume that all variables are non-negative.

To achieve this requirement, convert any unrestricted variable Xj to two non-negative variables by substituting y - Xj for **every** Xj. This increases the dimensionality of the problem by only one (introduce one y variable) regardless of how many variables are unrestricted.

If any Xj variable is restricted to be non-positive, substitute - Xj for every Xj. This reduces the complexity of the problem.

Solve the converted problem, and then substitute these changes back to get the values for the original variables and optimal value.