Klein Industries manufactures three types of portable air compressors: small, medium, and large, which have unit profits of $20.50, $34.00, and $42.00, respectively. The projected monthly sales are:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Small | Medium | Large |
| Minimum | 14,000 | 6,200 | 2,600 |
| Maximum | 21,000 | 12,500 | 4,200 |

The production process consists of three primary activities: bending and forming, welding, and painting. The amount of time in minutes needed to process each product in each department is shown below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Small | Medium | Large | Available Time |
|  | Bending/forming | 0.4 | 0.7 | 0.8 | 23,400 |
|  | Welding | 0.6 | 1.0 | 1.2 | 23,400 |
|  | Painting | 1.4 | 2.6 | 3.1 | 46,800 |

How many of each type of air compressor should the company produce to maximize profit?

1. Formulate and solve a linear optimization model using the auxiliary variable cells method and write a short memo to the production manager explaining the sensitivity information.
2. Solve the model without the auxiliary variables and explain the relationship between the reduced costs and the shadow prices found in part A.