**Formulate** the following linear programming problem.

Management for Café Breakfast and More requires information on the total number of employees it will be staffing to operate its new restaurant located across the street from a major university. The minimum requirements for personnel have been broken down into 4-hour periods as follows.

|  |  |
| --- | --- |
| **Time period** | **Minimum # employees** |
| 7 a.m. – 11 a.m. | 12 |
| 11 a.m. – 3 p.m. | 20 |
| 3 p.m. – 7 p.m. | 18 |
| 7 p.m. – 11 p.m. | 22 |
| 11 p.m. – 3 a.m. | 20 |
| 3 a.m. – 7 a.m. | 10 |

Staffing is done by hiring personnel for six different 8-hour shifts, beginning at 7am, 11am, 3pm, 7pm, 11pm, and 3am. Obviously management would like to satisfy the requirements with the fewest number of people possible.

(**BIG HINT**: Define six decision variables as follows: Let X1 = # of personnel to begin an 8-hour shift at 7 a.m. Let X2 = # of personnel to begin an 8-hour shift at 11 a.m., and so on.)

**Solve using Excel Solver and use the reports to answer these questions:**

How many employees should begin work at 11am?

How many employees should begin work at 3am?

How many (total) employees must be staffed each day?

Are there extra employees (i.e. beyond the minimum required) during any 4-hour period?

**Modified Problem:**

Modify the problem so that employees who begin shifts at 7am, 11am, and 3pm are paid $150 per day, but employees who begin shifts at 7pm, 11pm, and 3am are paid $225 per day. What will be the objective now?

**Solve using Excel Solver and use the reports to answer these questions:**

Now, when are “extra” employees working?

If the requirement for the 11pm-3am time frame were increased to 21, what how would the daily cost be affected?

If the requirement for the 7pm-11pm time frame were decreased to 21, how would the daily cost be affected?

If the daily cost for employees who work from 11am-7pm were changed to $200 per day, what would be the effect on the solution? What would be the effect on the total daily cost?

What would the daily cost for employees working from 3am-11am have to be before it would be desirable to staff anyone to work that shift?