Individual Assignment #1 – Linear Programming Fundamentals

**The King’s Landing Amusement Park**

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**Decision Variables**

For the King's Landing Amusement Park case study, the decision variables are based on labor hours needed to meet weekly demand.

= Number of new employees hired in week

= Number of hours worked by experienced employees in week

= Number of hours worked by new employees in week

**The Objective Function**

The objective is to **minimize the total number of new hires** across the summer period while meeting weekly labor requirements.

Maximize Z =

Here, = The new employees hired each week.

**Model Constraints**

The park's operations are constrained by labor needs, employee work hour limits, and availability.

**Labor Demand Constraint**: Each week, the total hours worked by both experienced and new employees must meet or exceed the required hours.

**Hiring Constraints**:

* In Week 1, up to 1,500 new employees can be hired.
* From Week 2 onwards, only the specified number of new applicants can be hired.

**Sensitivity Analysis**

The sensitivity analysis shows that shadow prices highlight the value of maximizing experienced employee hours, as each additional hour reduces the need for new hires, especially in peak weeks. Marginal values confirm that experienced hours have a larger impact than new hires due to greater efficiency.

Sensitivity ranges reveal that labour demand is especially sensitive in peak months; relaxing the 30-hour limit or increasing the weekly applicant pool would enhance flexibility. The constraint impacts indicate that the applicant pool and September’s 75% reduction in experienced staff are the most restrictive, making staffing particularly tight.

Allowing more hiring or hours for experienced employees would significantly ease staffing, while stricter constraints would hinder the park’s ability to meet labour needs.

**Recommendations**

For King's Landing:

1. **Minimize New Hires**: Focus on balancing hours between experienced and new employees, maximizing hours for returning employees, and only hiring additional workers as needed.
2. **Prioritize Experienced Employees in Peak Weeks**: Use the available experienced workforce for high-demand weeks, relying on new hires where necessary.
3. **Adjust for September Attrition**: Plan to offset the loss of 75% of the workforce by the end of August, making September feasible within the available reduced workforce.