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Range Basic Variable

Linear Programming 281 (LPR281)

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# Introduction

Range of a basic variable (BV) column is calculated as a change to the original BV column can be found as businesses are in positions where they can make changes to the outputs they produce, from its profit, constraint, or maximum constraint. When that occurs, the BV column can be found to be in a position in which it is no longer found to be optimal, i.e., in a sub-optimal basis or infeasible basis.

In this scenario, an instrument-maker, Hans, provided information of his business as he wanted gauge the performance to find out any potential changes he might make to increase profit.

# Content

## Hans’ Lutherie

With a goal to maximise profit, Hans has opted to find the best way in which he can make more money as he feels as if he is not making the most out of what is available in his instrument making shop. For each instrument he sells, he makes R50 profit for each harp, R30 for each violin, and R20 for each guitar he sells.

He is limited to 40 hours (hrs) of weekly labour hours, 20 polishing hrs, and he has set a goal of selling at least 10 instruments per week to be able to save up for his planned family trip to the Eastern Cape. Each of the constraints are listed below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Harp | VIOLIN | GUITAR | Limit/Minimum |
| Labour hrs | 8 | 6 | 1 | 48 |
| Polishing hrs | 4 | 2 | 2 | 20 |
| Min. sales | 2 | 2 | 5 | 10 |
|  |  |  |  |  |

He has an agreement with a local primary school which states that their students can have a free guitar to learn an extra-curricular skill.

# Range Calculations

## Original LP

## Standard/Canonical form

## Dual method optimal table

A picture containing screenshot, text, line, number

Description automatically generated

## Math preliminaries

## Range for e3

## Range for x3’

## Range for x2

# Interpretation

For Hans to be able to be at his most optimal point, he must sell:

* no more harps ()
* 8 violins ()
* 3 guitars ()

At this point, he makes a weekly profit of R276 while being able to sell approximately 18 more guitars than his goal.

is the change in which Hans can modify the optimal solution. This would mean that the optimal solution can change 7,6 \* , of which can decrease by a maximum of 4 or increase by 90.

# Conclusion

When working out the range of the basic variable for Hans’ Lutherie, this problem worked itself out to be optimal as no variable was found to be negative in row – in the case for a sub-optimal basis – and no constraints had a negative right hand side – in the case for an infeasible basis.