Package ‘goalprog’

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R topics documented:

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achievements

Ignizio (1976) Example Data Sets

Description

The data set is a data frame that defines the achievement goals $g_1(n,p), g_2(n,p), ..., g_K(n,p)$. The columns depend on the formulation of the goal programming problem.

For a lexicographical goal programming problem, the data frame has four named columns. The first column is called 'objective' and it contains the index for a particular problem object. The second column is called 'priority' and it is the level to which the row (i.e. objective) is assigned. The third column is called 'p' and it contains the weight associated with the positive deviation variable. The fourth column is called 'n' and it contains the weight associated with the negative deviation variable. An objective can appear in two rows if each deviation variable is to be assigned to a different priority level.

For a weighted goal programming problem, the data frame has five named columns. The first four columns are identical to the columns in the data frame for a lexicographical goal programming problem. The fifth column is called 'w' and it is the weight associated with the specified priority level.

Format

The data set is a data frame.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>
References


See Also

ignizio.datasets

---

calc.ta  |  Calculate achievement function for the k-th priority level

Description

This function calculates the achievement function for the k-th priority level.

Usage

calc.ta(tab, k)

Arguments

- **tab**: An object of class 'llgptab' that is the modified simplex tableau
- **k**: An integer priority level

Value

None.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

llgptab
calc.ta.k  
*Calculate the achievement for the highest k priority levels*

**Description**
This function calculates the achievement function for priority levels 1 through k.

**Usage**
`calc.ta.k(tab, k)`

**Arguments**
- **tab**: An object of class 'llgptab' that is the modified simplex tableau
- **k**: An integer priority level

**Value**
An object of class 'llgptab' in which the index rows have been updated.

**Author(s)**
Frederick Novomestky <fnovomes@poly.edu>

**References**

**See Also**
`calc.ta`, `llgptab`

---

calc.ti  
*Calculate the k-th index row*

**Description**
This function calculates the index row for the k-th priority level.

**Usage**
`calc.ti(tab, k)`
**calc.ti.k**

**Arguments**
- `tab` : An object of class 'llgptab' that is the modified simplex tableau
- `k` : An integer priority level

**Value**
None.

**Author(s)**
Frederick Novomestky &lt;fnovomes@poly.edu&gt;

**References**

**See Also**
- `llgptab`

---

**Description**
This function calculates the index rows for the highest k priority levels

**Usage**

calc.ti.k(tab, k)

**Arguments**
- `tab` : An object of class 'llgptab' that is the modified simplex tableau
- `k` : An integer priority level

**Value**
An object of class 'llgptab' in which the index rows have been updated.

**Author(s)**
Frederick Novomestky &lt;fnovomes@poly.edu&gt;
References


See Also

calc.ti, llgptab

check.ev.cp  Check entering variable for complementary pivoting

Description

This function determines if the candidate non-basic variable can enter the solution basis based on complementary pivoting.

Usage

check.ev.cp(tab, s)

Arguments

<table>
<thead>
<tr>
<th>arg</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tab</td>
<td>A list of named components that are the augmented modified simplex tableau</td>
</tr>
<tr>
<td>s</td>
<td>An integer index for the candidate non-basic variable</td>
</tr>
</tbody>
</table>

Details

This test only applies to decision variables and not to the deviation variables. It determines if there is a basic decision variable in the current solution that is in the same complementary class as the candidate decision variable. If there is, then the function returns FALSE to indicate that the candidate variable cannot be added. Otherwise, the function returns true.

Value

A boolean value TRUE or FALSE.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>
check.tb

Check for negative RHS values and repair tableau

Description

This function examines the b vector (i.e., target values). If any negative values are found, then the elements matrix is repaired and appropriate labels and vectors are exchanged.

Usage

check.tb(tab)

Arguments

| tab | An object of class 'llgptab' that is the modified simplex tableau |

Value

An object of class 'llgptab' in which the index rows have been updated.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

llgptab

coefficients

Ignizio (1976) Example Data Sets

Description

The data set is a matrix of coefficients for the linear objective functions for a linear goal programming problem. The number of rows equals the number of objectives and the number columns equals the number of decision variables.

Format

The data set is a matrix.
dv.llgp

**Author(s)**
Frederick Novomestky <fnovomes@poly.edu>

**References**

**See Also**
ignizio.datasets

---

**dv.llgp**

*Determine subscript of departing variable for a LLGP problem*

**Description**
Determine subscript of departing variable for a lexicographical linear goal programming (LLGP) problem.

**Usage**
dv.llgp(tab, sp)

**Arguments**
- **tab**
  An object of class 'llgptab' the modified simplex tableau
- **sp**
  An integer index of non-basic variable to enter the basis

**Details**
Determine the row associated with the minimum $b_i/e_{i,s'}$. In the event of a tie, select the row having the basic variable with the higher priority level. Designate this row as $i'$. The basic variable associated with row $i'$ is the departing variable.

**Value**
An integer index for the variable departing the basis.

**Author(s)**
Frederick Novomestky <fnovomes@poly.edu>

**References**
See Also

llgptab, dv.tie

---

dv.tie  

*Resolve tie for departing variables*

**Description**

This function returns the row index of the departing variable based on which of the corresponding variables has a higher priority level.

**Usage**

```
dv.tie(tab, i, ip)
```

**Arguments**

- `tab`: An object of class 'llgptab' that is the modified simplex tableau
- `i`: An integer index for a departing variable
- `ip`: An integer index for a departing variable

**Value**

An integer index for a departing variable.

**Author(s)**

Frederick Novomestky <fnovomes@poly.edu>

**References**


**See Also**

dv.llgp, llgptab
ev.llgp  

Determine subscript of entering variable

Description

This function returns the subscript of the non-basic variable entering the basis at the k-th priority level.

Usage

ev.llgp(tab, k)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tab</td>
<td>An object of class 'llgptab' the modified simplex tableau</td>
</tr>
<tr>
<td>k</td>
<td>An integer priority level</td>
</tr>
</tbody>
</table>

Value

An integer value.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

llgptab, dv.llgp

fix.fp  

Round floating point values that are with tolerance of integer

Description

This function returns a numeric value that is integer if it is within the specified tolerance of being integer. Otherwise, the given argument value is returned.

Usage

fix.fp(z, tol = 1e-04)
**Arguments**

- `z` A numeric floating or integer value
- `tol` The tolerance used to determine how close argument `z` is an integer

**Value**

A numeric value.

**Author(s)**

Frederick Novomestky <fnovomes@poly.edu>

**References**


**See Also**

`llgptab`

**Examples**

```r
fix.fp(1.01)
fix.fp(1.001)
fix.fp(1.0001)
fix.fp(1.00001)
fix.fp(1.000001)
```

---

**Description**

This function returns an integer complementarity class for the given variable name.

**Usage**

```r
get.variable.class(tab, variable)
```

**Arguments**

- `tab` A list of named components with the augmented modified simplex tableau
- `variable` A character string with the name of the variable
Details

The function uses the variable.classes component of the tableau to determine the complementarity class for the given variable. If the variable is not found then a zero value is returned.

Value

A positive integer if the variable is found; zero otherwise.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

See Also

check.ev.cp

ignizio.datasets  Ignizio (1976) Sample Data Sets

Description

A collection and description of data sets that are examples found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by Ignizio.

Format

Each data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

ignizio.example.3.1, ignizio.example.3.2, ignizio.example.3.3, ignizio.example.3.5, ignizio.example.3.6, llgp
Description

The data set that corresponds to Example 3-1 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find \( x' = [x_1, x_2] \), \( n' = [n_1, n_2, n_3] \) and \( p' = [p_1, p_2, p_3] \) that minimize \( a = [(2p_1), (n_2), (n_3)] \)

The objectives are as follows

1. \( 10x_1 + 15x_2 + n_1 - p_1 = 40 \)
2. \( 100x_1 + 100x_2 + n_2 - p_2 = 1000 \)
3. \( x_2 + n_3 - p_3 = 7 \)

\( x, n, p \geq 0 \)

The solution is \( x' = [4, 0] \) and \( a = [0, 600, 7] \)

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

ignizio.datasets

Examples

```r
data( ignizio.example.3.1 )
soln <- llgp( coefficients, targets, achievements )
```
Description

The data set that corresponds to Example 3-2 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by the author.

Find \( \mathbf{x}' = [x_1, x_2] \), \( \mathbf{n}' = [n_1, n_2, n_3, n_4] \) and \( \mathbf{p}' = [p_1, p_2, p_3, p_4] \) that minimize \( \mathbf{a} = [(2p_1), (n_2), (n_3)] \)

The objectives are as follows

\[
\begin{align*}
x_1 + x_2 + n_1 - p_1 &= 40 \\
x_1 + x_2 + n_2 - p_2 &= 100 \\
x_1 + n_3 - p_3 &= 30 \\
x_2 + n_4 - p_4 &= 15
\end{align*}
\]

\( \mathbf{x}, \mathbf{n}, \mathbf{p} \geq 0 \)

The solution is \( \mathbf{x}' = [4, 0] \) and \( \mathbf{a} = [25, 0, 60, 5] \)

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

ignizio.datasets

Examples

data(ignizio.example.3.2)
soln <- llgp(coefficients, targets, achievements)
Description

The data set that corresponds to Example 3.3 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find \( x' = [x_1, x_2] \), \( n' = [n_1, n_2, n_3, n_4] \) and \( p' = [p_1, p_2, p_3, p_4] \) that minimize \( a = [(2p_1 + 3p_2), (n_3), (p_4)] \)

The objectives are as follows

\[
\begin{align*}
    x_1 + x_2 + n_1 - p_1 &= 10 \\
    x_1 + n_2 - p_2 &= 4 \\
    5x_1 + 3x_2 + n_3 - p_3 &= 56 \\
    x_1 + x_2 + n_4 - p_4 &= 12 \\
\end{align*}
\]

\( x, n, p \geq 0 \)

The solution is \( x' = [4, 6] \) and \( a = [0, 18, 0] \)

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

ignizio.datasets

Examples

```r
data(ignizio.example.3.3)
soln <- llgp(coefficients, targets, achievements)
```
Description

The data set that corresponds to Example 3-5 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find $x' = [x_1, x_2]$, $n' = [n_1, n_2, n_3, n_4]$ and $p' = [p_1, p_2, p_3, p_4]$ that minimize $a = [(2p_1), (n_2), (n_3)]$

The objectives are as follows
- $8x_1 + 12x_2 + n_1 - p_1 = 10000$
- $x_1 + 2x_2 + n_2 - p_2 = 40$
- $x_1 + n_3 - p_3 = 30$
- $x_2 + n_4 - p_4 = 15$

$x, n, p \geq 0$

The solution is $x' = [30, 15]$ and $a = [0, 580, 20, 0]$

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

ignizio.datasets

Examples

data( ignizio.example.3.5 )
soln <- llgp( coefficients, targets, achievements )
Description

The data set that corresponds to Example 3-6 found in Ignizio (1976). These are examples of goal programming problems solved using the methods described by author.

Find \( x' = [x_1, x_2, x_3, x_4] \), \( n' = [n_1, n_2, n_3, n_4, n_5, n_6, n_7] \) and \( p' = [p_1, p_2, p_3, p_4, p_5, p_6, p_7] \) that minimize \( a = [(2p_1), (n_2), (n_3)] \)

The objectives are as follows

\[
\begin{align*}
    x_1 + x_2 + n_1 - p_1 &= 50000 \\
    x_1 + n_2 - p_2 &= 20000 \\
    x_2 + n_3 - p_3 &= 5000 \\
    x_2 + n_4 - p_4 &= 15000 \\
    x_3 + n_5 - p_5 &= 10000 \\
    x_4 + n_6 - p_6 &= 30000 \\
    0.06x_1 + 0.05x_2 + 0.08x_3 + 0.07x_4 + n_7 - p_7 &= 4000
\end{align*}
\]

\( x, n, p \geq 0 \)

The solution is \( x' = [20000, 5000, 0, 25000] \) and \( a = [0, 0, 5000, 10800] \)

Format

The data set is an R file that creates the coefficients matrix, the vector of target values and the data frame of achievement goals.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

ignizio.datasets

Examples

```r
data( ignizio.example.3.6 )
soln <- llgp( coefficients, targets, achievements )
```
llgp

Solve an LLGP problem

Description
Solve a lexicographical linear goal programming (LLGP) problem using a modified primal simplex algorithm.

Usage
llgp(coefficients, targets, achievements, maxiter = 1000, verbose = FALSE)

Arguments
- coefficients: A matrix of coefficients for the linear objective functions
- targets: A vector of target values for the objective functions
- achievements: A data frame with the deviation variables for each objective together with the priority level
- maxiter: The maximum number of iterations with a default value of 1000
- verbose: A logical value that determines if intermediate tableaus are to be printed

Details
The function implements the Ignizio (1976) modified simplex algorithm. When the user selects verbose=TRUE, the modified simplex tableau is printed at each iteration.

Value
An object of class 'llgp' which is a list with three named components
- tab: An object of type 'llgptab' for the modified simplex tableau
- solution: An object of type 'llgpout' for the optimal solution
- converged: A logical value that determines if the algorithm converged to the optimal solution

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

See Also
check.tb, calc.ti.k, calc.ta.k, ev.llgp, dv.llgp, piv.llgp, llgptab, llgpout
Examples

data(ignizio.example.3.3)
soln <- llgp(coefficients, targets, achievements)

Description

Solve a lexicographical linear goal programming (LLGP) problem using a modified primal simplex algorithm with complementary pivoting of the decision variables.

Usage

llgpcp(coefficients, targets, achievements, variable.classes, maxiter = 1000, verbose = FALSE)

Arguments

coefficients  A matrix of coefficients for the linear objective functions
targets      A vector of target values for the objective functions
achievements A data frame with the deviation variables for each objective together with the priority level
variable.classes A data frame with the complementary class assignments for the decision variables
maxiter      The maximum number of iterations with a default value of 1000
verbose      A logical value that determines if intermediate tableaus are to be printed

Details

The function implements the Ignizio (1976) modified simplex algorithm. When the user selects verbose=TRUE, the modified simplex tableau is printed at each iteration.

Value

An object of class 'llgpcp' which is a list with three named components

tab        An object of type 'llgpcptab' for the augmented modified simplex tableau
solution   An object of type 'llgpout' for the optimal solution
converged  A logical value that determines if the algorithm converged to the optimal solution

Author(s)

Frederick Novomestky <fnovomes@poly.edu>
References


See Also

check.tb, check.ev.cp, calc.ta.k, calc.ta.k, ev.llgp, dv.llgp, piv.llgp, llgpcptab, llgpout

llgpcptab

Create lexicographical LGP tableau

Description

This function returns the initial modified simplex tableau as an object of type 'llgpcptab' for a lexicographical linear programming problem with complementary pivoting and for the given objectives and achievement goals.

Usage

llgpcptab(coefficients, targets, achievements, variable.classes)

Arguments

coefficients A matrix with the coefficients of the linear objective functions
targets A vector of target values for the objective functions
achievements A data frame with the weights of the deviation variables for each objective along with the corresponding priority level
variable.classes A data frame that defines the complementarity classes for each of the variables

Details

The modified simplex tableau contains a top stub matrix, a left stub matrix, an elements matrix, index rows and achievement vector as specified in Ignizio (1976). The tableau is augmented with the variable classes frame.

Value

An object of class 'llgpcptab' which is a list with the following named components

iter Current iteration number initially set to zero
variables Number of decision variables
levels Number of priority levels in the achievement function
objectives Number of objective functions
nonbasics Number of non basic variables = variables + objectives
level Current priority level
tte Elements matrix
tb Vector b initially the target values
ttw Top stub matrix
tu Left stub matrix
ti Matrix of index rows
ta Achievement vector
row.headings Vector of row headings initially the negative deviation variables
col.headings Vector of column headings initially the decision and positive deviation variables
variable.classes Data frame with the complementary classes of the decision variables

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

Examples
data(ignizio.example.3.3)
tab <- llgptab(coefficients, targets, achievements)

llgpout Obtain solution to the LLGP problem

Description
This function returns the optimal decision variables, negative deviation variables, positive deviation variables, objective function values, objective target values and the achievement function values.

Usage
llgpout(tab, coefficients, targets)

Arguments
tab a list of named components that specifies the modified simplex tableau
coefficients a matrix with the coefficients of the linear objective functions
targets A vector of target values for the objective functions
Value
An object of class 'llgpout' that is a list with five named components

- x: A numeric vector with the values of the decision variables
- n: A numeric vector with the values of the negative deviation variables
- p: A numeric vector with the values of the positive deviation variables
- f: A numeric vector with the values of the linear objective functions
- a: A numeric vector with the values of the achievement functions

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

See Also
llgptab

Examples
```r
data(ignizio.example.S.S)
soln <- llgp(coefficients, targets, achievements)
out <- llgpout(soln$tab, coefficients, targets)
```

llgptab
Create lexicographical LGP tableau

Description
This function returns the initial modified simplex tableau as an object of type 'llgptab' for a lexicographical linear programming problem for the given objectives and achievement goals

Usage
```r
llgptab(coefficients, targets, achievements)
```

Arguments
- coefficients: A matrix with the coefficients of the linear objective functions
- targets: A vector of target values for the objective functions
- achievements: A data frame with the weights of the deviation variables for each objective along with the corresponding priority level
Details

The modified simplex tableau contains a top stub matrix, a left stub matrix, an elements matrix, index rows and achievement vector as specified in Ignizio (1976).

Value

An object of class 'llgptab' which is a list with the following named components

iter Current iteration number initially set to zero
variables Number of decision variables
levels Number of priority levels in the achievement function
objectives Number of objective functions
nonbasics Number of non basic variables = variables + objectives
level Current priority level
t e Elements matrix
t b Vector b initially the target values
t w Top stub matrix
t u Left stub matrix
t i Matrix of index rows
t a Achievement vector
row.headings Vector of row headings initially the negative deviation variables
col.headings Vector of column headings initially the decision and positive deviation variables

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


Examples

data( ignizio.example.3.3 )
tab <- llgptab( coefficients, targets, achievements )
neg.ind.rows

Description
This function returns a count of the number of negative index values (i.e. rows) above \( I[k,s] \).

Usage
neg.ind.rows(tab, k, s)

Arguments
- **tab**: An object of class 'llgptab' that is the modified simplex tableau
- **k**: An integer priority level
- **s**: An integer index for a non-basic variable

Value
An integer value.

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

See Also
llgptab

piv.llgp

Description
This function updates the elements matrix and vector to reflect the change in basis variable.

Usage
piv.llgp(tab, nevc, ndvr, verbose)
pos.ind.rows

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tab</td>
<td>An object of class 'llgptab' that is the modified simplex tableau</td>
</tr>
<tr>
<td>nevc</td>
<td>The integer column index of the entering variable</td>
</tr>
<tr>
<td>ndvr</td>
<td>The integer row index of the departing variable</td>
</tr>
<tr>
<td>verbose</td>
<td>A logical value which if true prints the basis change</td>
</tr>
</tbody>
</table>

Value

An object of class 'llgptab' that is the updated modified simplex tableau.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

llgptab

---

pos.ind.rows  Count number of positive index values above I(k,s)

Description

This function returns the number of positive index values (i.e. rows) above I(k,s)

Usage

pos.ind.rows(tab, k, s)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tab</td>
<td>A object of class 'llgptab' that is the modified simplex tableau</td>
</tr>
<tr>
<td>k</td>
<td>An integer priority level</td>
</tr>
<tr>
<td>s</td>
<td>An integer index for a non-basic variable</td>
</tr>
</tbody>
</table>

Value

An integer value.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>
References


See Also

llgptab

print.llgpcptab

Print the LLGP tableau at the current priority level and iteration

Description

This function implements the print generic function for an object of class 'llgpcptab' and does a pretty print of the object of the lexicographical linear goal programming (LLGP) problem with complementary pivoting.

Usage

print.llgpcptab(x, ...)

Arguments

x An object of class 'llgpcptab' which is the modified simplex tableau

... Other arguments as they may apply to the generic S3 print function

Details

The function prints the various stubs in the row and column orders described in Ignizio (1976).

Value

No value but a report is printed.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also
dv.llgp, llgptab
print.llgpout

Examples

data( ignizio.example.3.3 )
tab <- llgptab( coefficients, targets, achievements )
tab
print( tab )

print.llgpout  Print the solution

Description

This function prints the current solution to a lexicographical linear goal programming (LLGP) problem.

Usage

print.llgpout(x, ...)

Arguments

x    An object of class 'llgpout' that contains the current solution
...
Other arguments as can be applied to the S3 generic print function

Value

No value is returned but a report showing the decision variables, the goals or objectives and the achievement function.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

llgpout

Examples

data( ignizio.example.3.3 )
soln <- llgp( coefficients, targets, achievements )
soln$sout
print( soln$sout)
print.llgptab

Print the LLGP tableau at the current priority level and iteration

Description

This function implements the print generic function for an object of class 'llgptab' and does a pretty print of the object of the lexicographical linear goal programming (LLGP) problem.

Usage

print.llgptab(x, ...)

Arguments

x

An object of class 'llgptab' which is the modified simplex tableau

... Other arguments as they may apply to the generic S3 print function

Details

The function prints the various stubs in the row and column orders described in Ignizio (1976).

Value

No value but a report is printed.

Author(s)

Frederick Novomestky <fnovomes@poly.edu>

References


See Also

dv.llgp, llgptab

Examples

data( ignizio.example.3.3 )
tag <- llgptab( coefficients, targets, achievements )
tag
print( tag )
swp.headings  

*Swap row and column headings*

**Description**

This function swaps row and column headings to reflect changes in the basis.

**Usage**

swp.headings(tab, nr, nc)

**Arguments**

- **tab**: An object of class `llgptab` that is the modified simplex tableau
- **nr**: An integer row index
- **nc**: An integer column index

**Value**

An object of class `llgptab` in which the index rows have been updated.

**Author(s)**

Frederick Novomestky <fnovomes@poly.edu>

**References**


**See Also**

llgptab

---

swp.vec  

*Swap row and column vectors*

**Description**

This function swaps row and column vectors in the top and left stub matrices.

**Usage**

swp.vec(tab, nr, nc)
Arguments

- `tab` An object of class `llgptab` that is the modified simplex tableau
- `nr` An integer row subscript in the left stub matrix
- `nc` An integer column subscript in the top stub matrix

Value
None.

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

See Also
- `llgptab`

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targets | Ignizio (1976) Example Data Sets

Description
The data set is a vector of target values for the objectives. The number of elements is equal to the number of objectives.

Format
The data set is a vector.

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

See Also
- `ignizio.datasets`
zero.ind.rows

Count zero index values in column s

Description
This function returns a count of the number of zero index values in column s of index rows I.

Usage
zero.ind.rows(tab, s)

Arguments
- tab: An object of class 'llgptab' that is the modified simplex tableau
- s: An integer index value for a non-basic variable

Value
An integer value for the number of zero index values in the given column.

Author(s)
Frederick Novomestky <fnovomes@poly.edu>

References

See Also
llgptab
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