Modeling hw2

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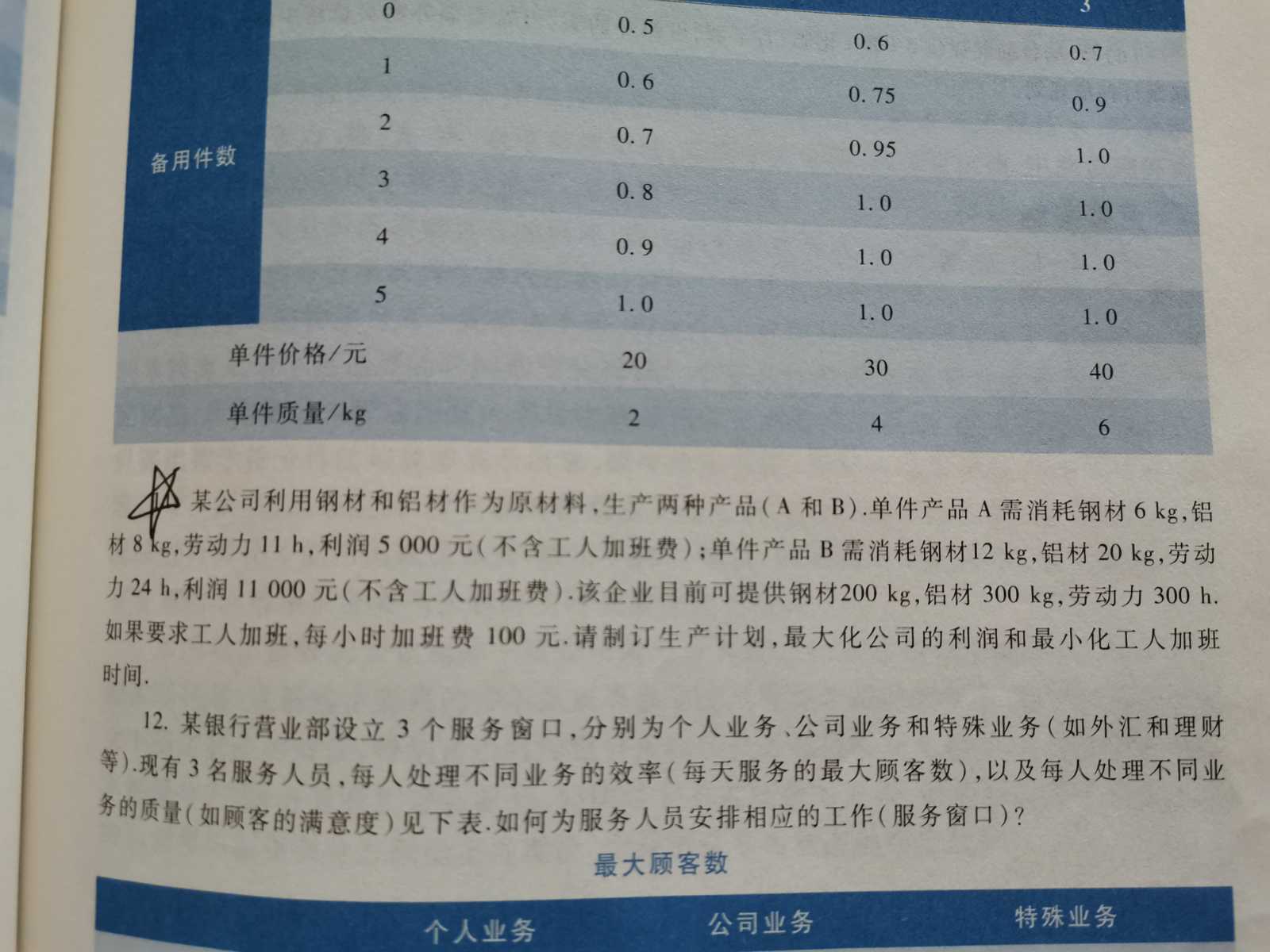
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Problems

# **Model Establishing**

Let x: = the No. of product A, and y: = the No. of product B.

It’s not difficult to obtain following model by observing the problem.

Max(*profit*) & Min(*overtime*);

*profit* = 5000\**x* + 11000\**y* - 100\**overtime*,

6\**x* + 12\**y* <= 200,

8\**x* + 20\**y* <= 300,

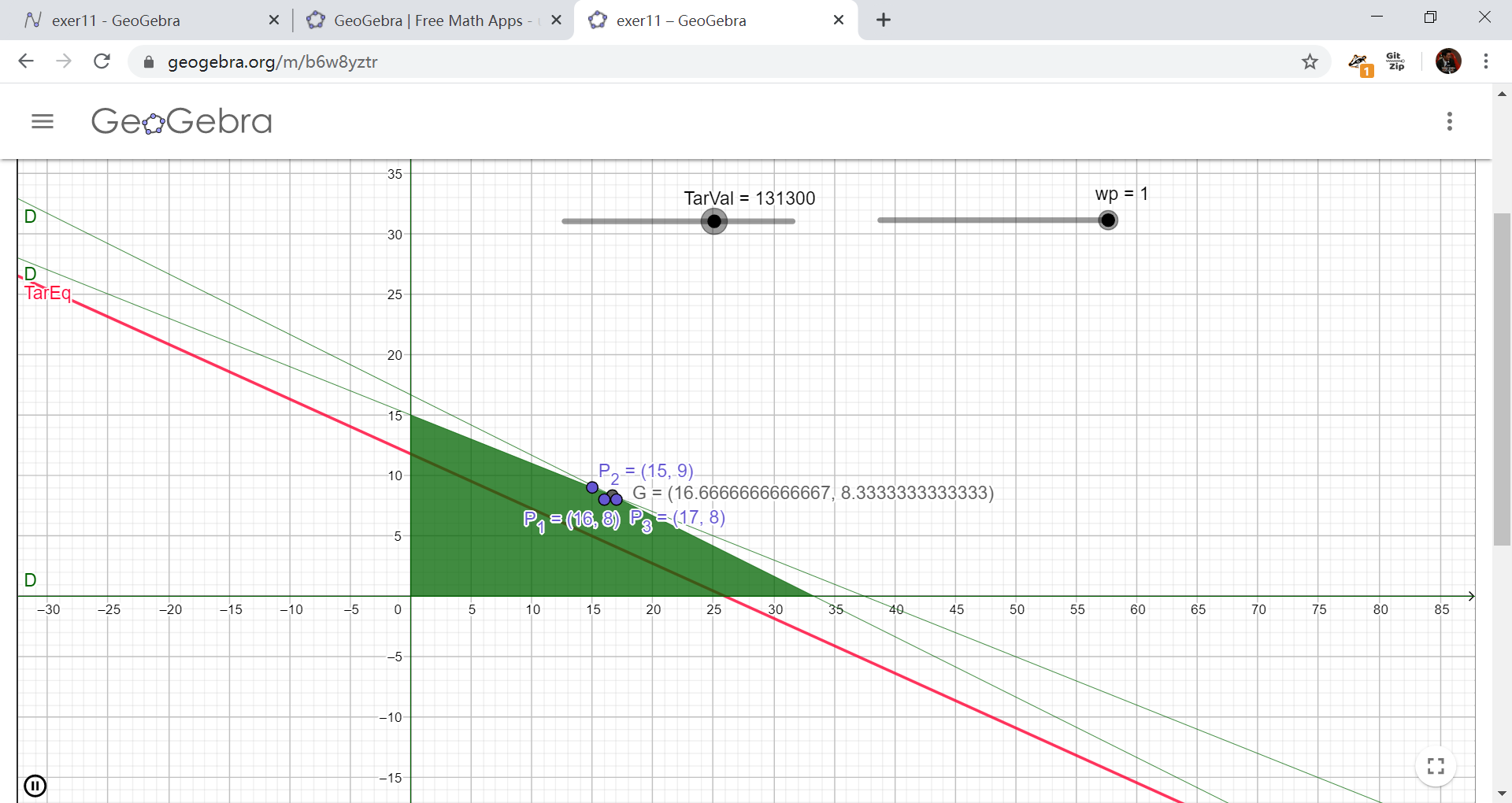
11\**x* + 24\**y* - 300 = *overtime*.

(Of course, *x*, *y*, & *overtime* >= 0.

Moreover, *x* & *y* are integers, which results

in *overtime* also being an integer.)

# Drawing the Graph

 See & play around it online at <https://www.geogebra.org/m/b6w8yztr>.

# Solve by Lingo

* See Lingo code as follows

model:

! A greedy boss wants maximum profit & minimum overtime for employees;

max = z;

!@param x: the No. of product A

@param y: the No. of product B;

wp = 0.9; ! weight of profit. This is decided by the boss;

wt = 1 - wp; ! weight of overtime;

z = profit \* wp + (-overtime) \* wt; ! Target optimal (maximum) value;

profit = 5000\*x + 11000\*y - 100\*overtime;

[Steel] 6\*x + 12\*y <= 200;

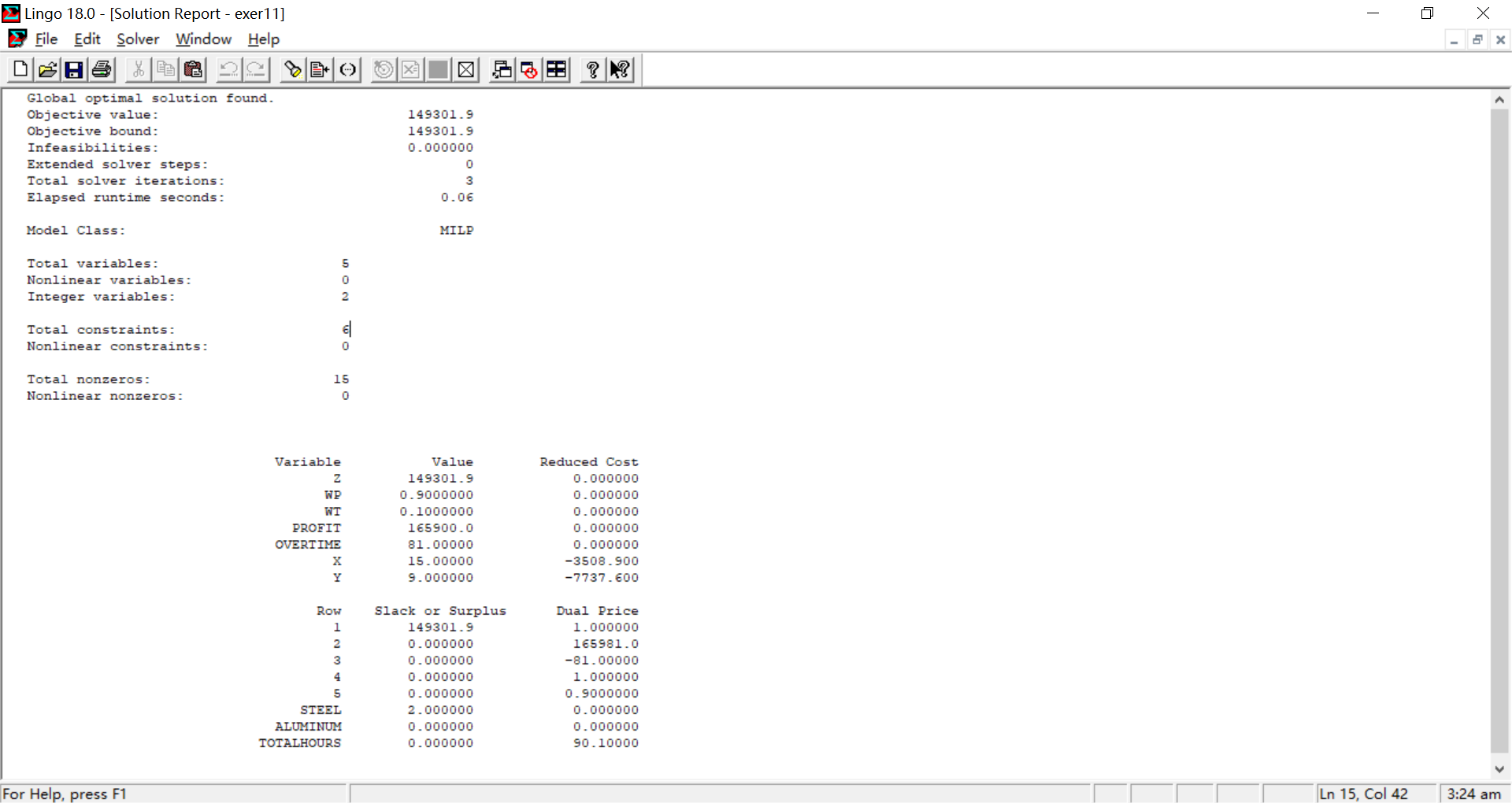
[Aluminum] 8\*x + 20\*y <= 300;

[TotalHours] 11\*x + 24\*y <= 300 + overtime;

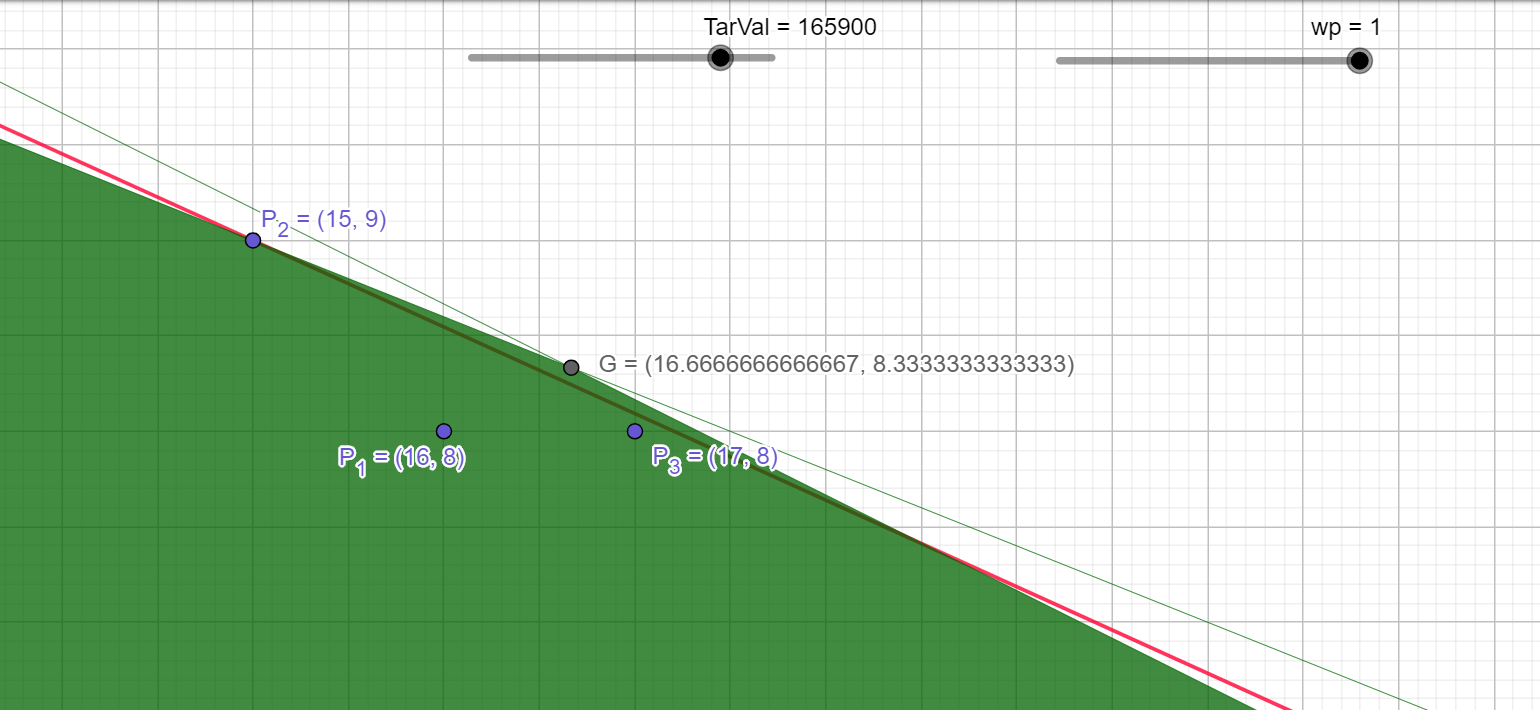
! declare variable x & y as integer only;

@gin(x); @gin(y);

end

* Output

# Result & Analysis



Zooming in we shall find when , Target Equation (red line) will cross point as the last integer point in domain (green area). Moreover, if we try to change (simple to do, just to drag in the slider), and the result remains unchanged. Let’s delve a little bit into the details about why this happens.

By the model,

,

. (TarEq)

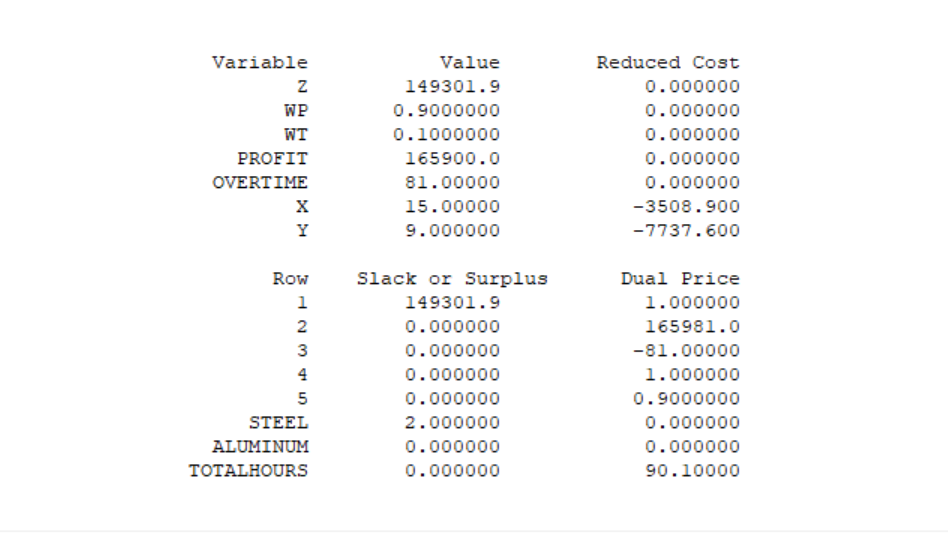
weight of profit weight of overtime

Obviously, even when , the slope of equation (TarEq) changes little, since the profit weight part has a magnitude of 102 ~103 and the overtime weight part has a magnitude of at most 101, concerning the coefficients of .

Furthermore, if we try to change the in the Lingo program, we can get the same result as that of .

So, the final solution is to **produce 15 pieces of product A, and 9 pieces of product B, with 81 hours of overtime, generating maximum profit ¥165900, and leaving 2kg of rolled steel, regardless of the wight of profit given by the boss.**

(see also the [Lingo solution report](#LingoSolutionReport) as follows)



Lingo solution report