

## Digital Technologies and Value Creation (Lecturer: Philippe Blaettchen) – Linear Programming Exercise Solution

The Solver solutions can be found in the file *Video\_solutions.xlsx*.

### Situation 1

The decision variables are  $x$  and  $y$ , the number of units of X (resp. Y) produced during the week.

The machine time constraints are:

$$\begin{aligned} 50x + 24y &\leq 40 \times 60 \text{ for A} \\ 30x + 33y &\leq 35 \times 60 \text{ for B.} \end{aligned}$$

The demand constraints are:

$$\begin{aligned} x + 30 &\geq 75 \text{ for X} \\ y + 90 &\geq 95 \text{ for Y} \end{aligned}$$

There are also nonnegativity constraints:

$$x, y \geq 0.$$

The objective (which we maximize) is:

$$x + 30 - 75 + y + 90 - 95 = x + y - 50.$$

### Situation 2

The decision variables are  $x$ , the number of videos sold, and  $y$ , the number of printed books sold. The constraints are

$$\begin{aligned} x + y &\leq 10,000 \\ x &\geq 4,000 \\ y &\geq 2,000 \\ y &\leq 4,000 \\ x, y &\geq 0. \end{aligned}$$

The objective is to maximize profit given by  $50x + 30y$ .

### Situation 3

The decision variables are  $x_{corn}$  and  $x_{cabbage}$  which is the amount of corn/cabbage he has to plant on his 80 hectares.

The objective is to maximize

$$800 x_{corn} + 500 x_{cabbage}.$$

The demand constraints are

$$\begin{aligned}x_{corn} &\geq 10 \\x_{cabbage} &\geq 20.\end{aligned}$$

The workforce and equipment constraints are

$$x_{corn} \leq 3 x_{cabbage}.$$

We also have nonnegativity constraints and land constraints:

$$\begin{aligned}x_{corn}, x_{cabbage} &\geq 0 \\x_{corn} + x_{cabbage} &\leq 80.\end{aligned}$$