```
(** SISTEMI LINEARI **)

(* PIVOTING *)

Clear[a];
```

In[7]:=
```
a = {{0.003, 59.14}, {5.291, -6.13}};
x = {x1, x2};
b = {59.17, 46.78};
ab = {Join[a[[1]], {b[[1]]}], Join[a[[2]], {b[[2]]}]};
MatrixForm[a]
MatrixForm[b]
MatrixForm[x]
MatrixForm[ab]
sys = Dot[a, x] == b
Solve[sys, x]
```

Out[11]//MatrixForm=
$$\begin{pmatrix} 0.003 & 59.14 \\ 5.291 & -6.13 \end{pmatrix}$$

Out[12]//MatrixForm=
$$\begin{pmatrix} 59.17 \\ 46.78 \end{pmatrix}$$

Out[13]//MatrixForm=
$$\begin{pmatrix} x1 \\ x2 \end{pmatrix}$$

Out[14]//MatrixForm=
$$\begin{pmatrix} 0.003 & 59.14 & 59.17 \\ 5.291 & -6.13 & 46.78 \end{pmatrix}$$

Out[15]= $\{0.003\, x1 + 59.14\, x2, 5.291\, x1 - 6.13\, x2\} == \{59.17, 46.78\}$

Out[16]= $\{\{x1 \rightarrow 10., x2 \rightarrow 1.\}\}$

In[17]:=
```
ab1 = {ab[[1]], ab[[2]] - ab[[1]] * (ab[[2]][[1]] / ab[[1]][[1]])};
MatrixForm[ab1]
```

Out[18]//MatrixForm=
$$\begin{pmatrix} 0.003 & 59.14 & 59.17 \\ 0. & -104\,309. & -104\,309. \end{pmatrix}$$

In[19]:=
```
x2sol = ab1[[2]][[3]] / ab1[[2]][[2]]
x1sol = (ab1[[1]][[3]] - ab1[[1]][[2]] * x2sol) / ab1[[1]][[1]]
```

Out[19]= 1.

Out[20]= 10.
```

```
In[21]:= Clear[a, ab, ab1, b]
         eps = 1.0 * 10 ^ (-20);
         a = {{eps, 2.1}, {5.2, -3.1}};
         b = {a[[1]][[1]] + 10 * a[[1]][[2]], a[[2]][[1]] + 10 * a[[2]][[2]]};
         ab = {Join[a[[1]], {b[[1]]}], Join[a[[2]], {b[[2]]}]};
         MatrixForm[a]
         MatrixForm[b]
         MatrixForm[ab]
         sys = Dot[a, x] == b
         Solve[sys, x]
```

Out[26]//MatrixForm=

$$\begin{pmatrix} 1. \times 10^{-20} & 2.1 \\ 5.2 & -3.1 \end{pmatrix}$$

Out[27]//MatrixForm=

$$\begin{pmatrix} 21. \\ -25.8 \end{pmatrix}$$

Out[28]//MatrixForm=

$$\begin{pmatrix} 1. \times 10^{-20} & 2.1 & 21. \\ 5.2 & -3.1 & -25.8 \end{pmatrix}$$

Out[29]= $\left\{ 1. \times 10^{-20} \, x1 + 2.1 \, x2, \ 5.2 \, x1 - 3.1 \, x2 \right\} == \{21., -25.8\}$

Out[30]= $\{\{x1 \to 1., \ x2 \to 10.\}\}$

```
In[31]:= ab1 = {ab[[1]], ab[[2]] - ab[[1]] * (ab[[2]][[1]] / ab[[1]][[1]])};
         MatrixForm[ab1]
         x2sol = ab1[[2]][[3]] / ab1[[2]][[2]]
         x1sol = (ab1[[1]][[3]] - ab1[[1]][[2]] * x2sol) / ab1[[1]][[1]]
```

Out[32]//MatrixForm=

$$\begin{pmatrix} 1. \times 10^{-20} & 2.1 & 21. \\ 8.88178 \times 10^{-16} & -1.092 \times 10^{21} & -1.092 \times 10^{22} \end{pmatrix}$$

Out[33]= 10.

Out[34]= 0.

```
In[35]:= ab2 = {ab[[2]], ab[[1]]}
         ab1 = {ab2[[1]], ab2[[2]] - ab2[[1]] * (ab2[[2]][[1]] / ab2[[1]][[1]])};
         MatrixForm[ab1]
         x2sol = ab1[[2]][[3]] / ab1[[2]][[2]]
         x1sol = (ab1[[1]][[3]] - ab1[[1]][[2]] * x2sol) / ab1[[1]][[1]]
```

Out[35]= $\left\{ \{5.2, -3.1, -25.8\}, \ \left\{ 1. \times 10^{-20}, 2.1, 21. \right\} \right\}$

Out[37]//MatrixForm=

$$\begin{pmatrix} 5.2 & -3.1 & -25.8 \\ 0. & 2.1 & 21. \end{pmatrix}$$

Out[38]= 10.

Out[39]= 1.