

# Practice 0

## Activities solutions

1. Given the numbers  $x = 14,32$ ,  $y = 27,12$  and  $z = 3,5$ , calculate the value of the expression

$$\frac{8x + y^2}{2 - \sqrt[6]{x^3 - \frac{1}{z}}}$$

```
-->x=14.32; y=27.12; z=3.5;

-->(8*x+y^2)/(2-(x^3-1/z)^(1/6))
ans =

- 476.45685
```

2. Indicate how to introduce, in Scilab, the matrix  $A = (a_{ij})$  of order  $50 \times 50$  such that  $a_{ii} = 10$  and  $a_{ij} = 0$  for  $i \neq j$ .

There are several possibilities. For example,

```
-->for i=1:50 do
-->    A(i,i)=10;
-->end

or, also,

-->A=10*eye(50,50);
```

3. Enter, by using blocks, in Scilab, the following matrix. Indicate the instructions that you use.

$$E = \begin{pmatrix} 1 & 0 & 0 & 8 & 8 & 8 & 8 & 8 \\ 0 & 1 & 0 & 8 & 8 & 8 & 8 & 8 \\ 0 & 0 & 1 & 8 & 8 & 8 & 8 & 8 \\ -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

```
-->*E=[eye(3,3) 8*ones(3,5);-eye(3,3) zeros(3,5)]
```

4. Write the following loop to obtain the matrix  $C = (c_{ij})$  of order  $30 \times 30$  so that  $c_{ij} = i \cdot j$ .

```
C=zeros (30,30);
for i=1:30 for j=1:30 do C(i,j)=i*j;
end end
```

Calculate the matrix  $D = C^2 - 3C$  and indicate which is the element of the matrix  $D$  that there is in the position row 17 column 25.

```
-->C=zeros(30,30);

-->for i=1:30 for j=1:30 do C(i,j)=i*j;
-->end end

-->D=C^2-3*C;

-->D(17,25)
ans =

4017100.
```

5. Write the instructions of Scilab that extract of the matrix C of the activity 4 the submatrix formed by the rows 3 and 7 and the columns 3 and 7. Write this submatrix.

```
-->C([3,7],[3,7])
ans =

    9.    21.
   21.    49.
```

6. Write the instructions of Scilab that extract of the matrix C of the activity 4 the submatrix formed by the rows 13 to 16 and the columns 17 to the 19. Write the matrix you obtain.

```
-->C([13:16],[17:19])
ans =

   221.   234.   247.
   238.   252.   266.
   255.   270.   285.
   272.   288.   304.
```

7. Given the vectors  $u = (1/4, -1/6, 5/6)$  and  $v = (1/5, 3/4, -2/3)$ , calculate the scalar product of both and the angle that form. Write this angle in degrees.

```
-->u=[1/4;-1/6;5/6]; v=[1/5;3/4;-2/3];

-->prodesc=u'*v
prodesc =

- 0.6305556

-->cosinus=prodesc/(norm(u)*norm(v))
cosinus =

- 0.6956705

-->angleradians=acos(cosinus)
angleradians =

2.3401491

-->anglegraus=angleradians*180/%pi
anglegraus =

134.08067
```

8. Solve the matrix system  $\begin{cases} 3X + Y = A \\ 2X - 5Y = B \end{cases}$  being

$$A = \begin{pmatrix} 1/2 & 0 & -1/3 \\ 0 & -2/3 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 1/5 & 1 & -1/6 \\ 1/6 & 1/5 & 2/3 \end{pmatrix}$$

We isolate the matrices unknowns:  $\begin{cases} 3X + Y = A \\ 2X - 5Y = B \end{cases} \rightarrow \begin{cases} 3X + Y = A \\ 17X = 5A + B \end{cases} \rightarrow \begin{cases} Y = A - 3X \\ X = \frac{1}{17}(5A + B) \end{cases}$

And now we use Scilab:

```
-->X=1/17*(5*A+B)
X =
```

```

0.1588235    0.0588235    - 0.1078431
0.0098039    - 0.1843137    0.9215686

-->Y=A-3*X
Y =

0.0235294    - 0.1764706    - 0.0098039
- 0.0294118    - 0.1137255    0.2352941

```

9. Given the matrix

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 7 & 8 & 9 \\ 4 & 5 & 6 \end{pmatrix},$$

calculate the matrix  $Z = A^3 - 16A^2 - 2I$ , where  $I$  is the identity matrix of order 3.

```

-->A=[1 2 3; 7 8 9; 4 5 6]
A =

1.    2.    3.
7.    8.    9.
4.    5.    6.

-->I=eye(3,3)
I =

1.    0.    0.
0.    1.    0.
0.    0.    1.

-->Z=A^3-16*A^2-2*I
Z =

- 20.    - 15.    - 12.
- 36.    - 53.    - 66.
- 27.    - 33.    - 41.

```

10. Given the matrix  $V$

$$V = \begin{pmatrix} 1 \\ 7 \\ 6 \end{pmatrix},$$

Calculate the matrix  $ZV$ , where  $Z$  is the matrix of the previous activity. Write the matrix  $ZV$  as a linear combination of the columns of  $Z$ .

```

-->V=[1;7;6]
V =

1.
7.
6.

-->Z*V
ans =

- 197.
- 803.
- 504.

```

$$ZV = V(1) * Z(:, 1) + V(2) * Z(:, 2) + V(3) * Z(:, 3)$$

if we enter it in Scilab,

```
-->ZV=V(1)*Z(:,1)+V(2)*Z(:,2)+V(3)*Z(:,3)
ZV =
- 197.
- 803.
- 504.
```

As we can check, we have obtained the same result.