Lesson 7: Exercises

7.1 For the unidimensional 01 knapsack problem,

$z = \max \left\{ px \mid wx \leq c,\ x \in \{0, 1\}^n \right\}$

with

- $n = 5$
- $p = (5, 3, 2, 7, 4)$
- $w = (2, 8, 4, 2, 5)$
- $c = 10$

compute randomly m feasible solutions aiming to initialise a population of individuals for an evolutionary algorithm (genetic algorithms, ant colony, particle swarm optimisation, etc.).

Example of result with $m = 5$:

```
x = [0, 1, 0, 1, 0]
z = 10
x = [1, 0, 0, 1, 1]
z = 16
x = [1, 1, 0, 0, 0]
z = 8
x = [1, 0, 1, 1, 0]
z = 14
x = [1, 0, 1, 1, 0]
z = 14
```

Entrée [ ]:

```

```

7.2 Revise the exercise 7.1 in order to compute and display also

- the average value of $z(x)$, and
- the average number of variables at 1 in solutions

Entrée [ ]:

```

```

7.3 Revise the exercise 7.2 such that

- the value of n is randomly selected in $[10, 500]$
- the value of m is randomly selected in $[10, 100]$
- the n values of p and w are randomly selected in $[1, 25]$
- the value of c is equal to $(\sum_{i=1}^{n} w_i)/2$

Entrée [ ]:

7.4 Given the following range of values for x

```
x = -10:10
```

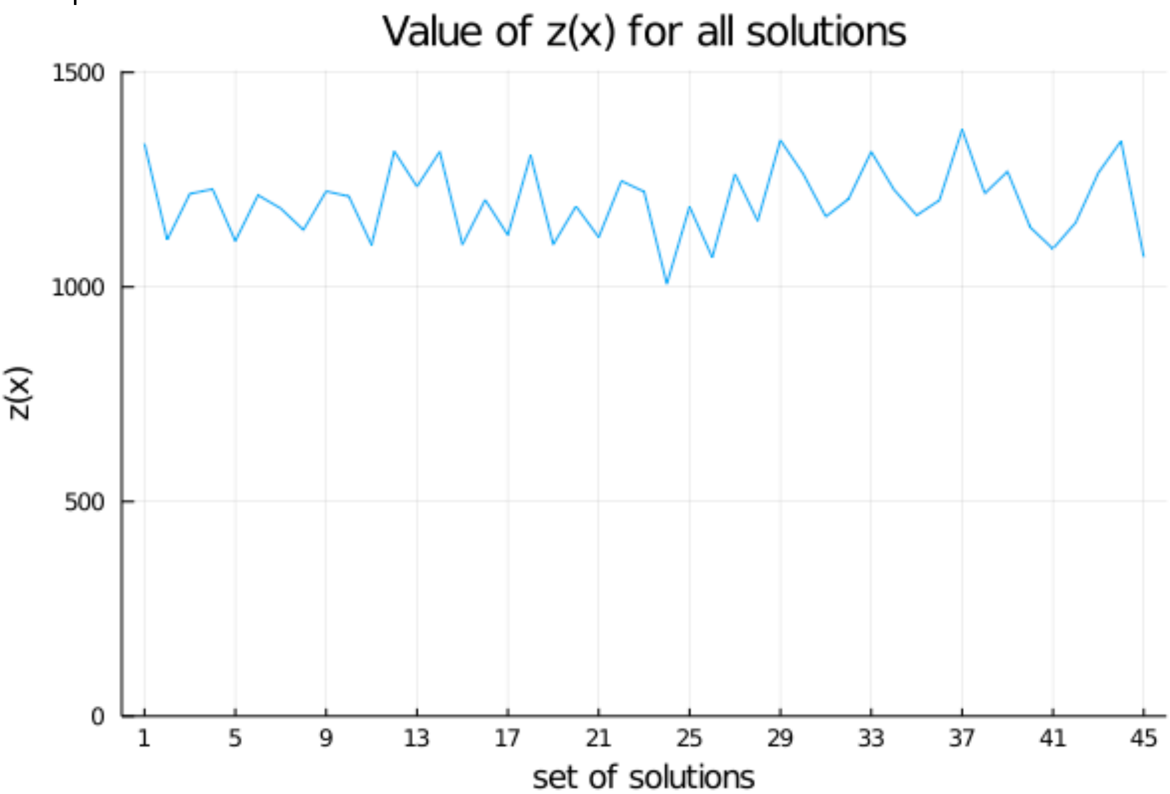
plot $y = x^2$.

Entrée [ ]:

7.5 Revise the exercise 7.3 in order to plot the values of $z(x)$ for all solutions generated.

Make sure that the graphic generated remains readable.

Example :



Entrée [ ]:

7.6 Execute the following code

```
using Plots; gr()
p1 = plot(x, x)
p2 = plot(x, x.^2)
p3 = plot(x, x.^3)
p4 = plot(x, x.^4)
plot(p1,p2,p3,p4,layout=(2,2),legend=false)
```

and then create a 4×1 plot that uses `p1` , `p2` , `p3` , and `p4` as subplots.

Entrée [ ]: