EXERCISES SHEET 4 – PERCEPTRON

Perceptrons are one-layer neural networks that use the signal function as the activation function. Its learning algorithm is as follows:

```
Initialize the weights randomly
do
    for each learning example x from the learning set do
        a = output of the network when the input is x
        if a <> T(x) (the network answer is not correct)
            change all the network weights as follows:
            wᵢ__new = wᵢ_old + gamma × (T(x) – a) × xᵢ
            where gamma represents the learning rate
until a == T(x) for all the learning examples
```

1. Write the `Example` class, which represents a learning example. Each learning example has the inputs and the corresponding target output as attributes.

2. Write the `Perceptron` class, which represents a Perceptron neuron. The class should have an array of weights, as well as the b weight. It should also have the following methods:

`public void learn(Example[] learningExamples, double learningRate, int seed)` - Given the learning examples, the learningRate and the Random number generator's seed, this method implements the learning algorithm above.

`public int run(double[] inputs)` - given an input, computes the output of the network.

3. Implement the `Application` class that allows you to test the perceptron. Train a perceptron so that it is able to model the AND and OR logical functions.

4. What happens if you try to teach the XOR function to the perceptron? Why?