HW3 - Quantum Mechanics

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1 Presenting the structure of program

The program consists of 3 Java classes.

Program starts in **Main** class, where is described assignment and computed results for every example. In this class are called methods from class **Vector** where all computations methods (`isOrthonormal()`, `innerProduct()`, . . .) are implemented. Class **Complex** is used only for neat implementation of computing with complex numbers.

More details about implementation can be seen in comments in the code.

2 Examples

```
ASSIGNMENT:
|s>=(1/sqrt{2})(i,1)
|m^(1)> = (0,1); |m^(2)> = (0,1)

RESULTS:
|s> is unit vector: true
Are vectors |m^(1)>; |m^(2)> orthonormal: false
We do not calculate probabilities.
------------------------------------------------------------

ASSIGNMENT:
|s>=(1/sqrt{2})(1,-i)
|m^(1)> = (cos 2,sin 2); |m^(2)> = (-sin 2,cos 2)

RESULTS:
|s> is unit vector: true
Are vectors |m^(1)>; |m^(2)> orthonormal: true
Probability of |m^(1)> outcome: 0.5
Probability of |m^(2)> outcome: 0.5
```

```
----------------------------------------------------------------

ASSIGNMENT:
|s>=(1/sqrt{2})(1,-i)
|m^{1}> = (cos 2,sin 2); |m^(2)> = (-sin 2,cos 2)

RESULTS:
|s> is unit vector: false
Are vectors |m^(1)>; |m^(2)> orthonormal: true
We do not calculate probabilities.
----------------------------------------------------------------

ASSIGNMENT:
|s>=(1/sqrt{2})(1+i,0)
|m^{1}> = (1/sqrt{2})(1,i); |m^(2)> = (1/sqrt{2})(1,-i)

RESULTS:
|s> is unit vector: true
Are vectors |m^(1)>; |m^(2)> orthonormal: true
Probability of |m^(1)> outcome: 0.5
Probability of |m^(2)> outcome: 0.5
----------------------------------------------------------------

ASSIGNMENT:
|s>=(1/sqrt{2})(1,i)
|m^{1}> = (1/sqrt{2})(1,i); |m^(2)> = (1/sqrt{2})(1,-i)

RESULTS:
|s> is unit vector: true
Are vectors |m^(1)>; |m^(2)> orthonormal: true
Probability of |m^(1)> outcome: 1.0
Probability of |m^(2)> outcome: 0.0
----------------------------------------------------------------

ASSIGNMENT:
|s>=(sqrt{3}/2,i/2)
|m^{1}> = (1/sqrt{2})(1,i); |m^(2)> = (1/sqrt{2})(1,-i)

RESULTS:
|s> is unit vector: true
Are vectors |m^(1)>; |m^(2)> orthonormal: true
Probability of |m^(1)> outcome: 0.933012701892219
Probability of |m^(2)> outcome: 0.066987298107781
----------------------------------------------------------------
```

```
ASSIGNMENT:
|s>=(sqrt{3}/2,i/2)
|m^{1}> = (sqrt{3}/2,1/2); |m^(2)> = (-1/2,sqrt{3}/2)

RESULTS:
|s> is unit vector: true
Are vectors |m^(1)>; |m^(2)> orthonormal: true
Probability of |m^(1)> outcome: 0.625
Probability of |m^(2)> outcome: 0.375
-------------------------------------------------------------
```