2018-09-03

ES-1

m { {...} {...} {...} {...} }

```
/* @ requires true
   @ ensures (\result == true) <==> (\exists int c1, c1>=0 && c1< m[0].length
   @                                  (\exists int c2, c2>=0 && c2 < m[0].length && c1!=c2 ;
   @                                      (\sum int r; r>=0 && r<m.length ; m[r][c1])
   @                                       ==
   @                                      (\sum int r; r>=0 && r<m.length ; m[r][c2])
   @                                  )
   @                              ) ||
   @                              (\exists int r1, r1>=0 && r1< m.length
   @                                  (\exists int r2, r2>=0 && r1 < m.length && r1!=r2 ;
   @                                      (\sum int c; c>=0 && c<m[0].length ; m[r1][c])
   @                                       ==
   @                                      (\sum int c; c>=0 && c<m[0].length ; m[r2][c])
   @                                  )
   @                              ) ;
   @ signals (NullMatrixException NME) m == null;
   @ signals (InvalidMatrixException IME) ! (\forall int r1, r2; r1>=0 && r1<m.length && r2>=0 && r2<m.length && r1!=r2;
   @                                          m[r1].length == m[r2].length)
   @ */
```

m.length { . . . } m[0].l
. . .
. . .
. . .

m[r][c]

- Indovina /*@ pure @*/ method (ArrayList<String> a)

```
/*@ requires a!=null && a.size() >= 2 ;
  @ signals (InvalidSizeException ISE) a.size()%2 != 0 ;
  @ ensures (\result == true) <==> (\forall int d; d>=0 && d<a.length && d%2!=0; a.get(d).length() == a.get(d-1).length &&
  @                                  (\forall int i; i>=0 && i<a.get(d).length();
  @                                    (\forall int j; j = a.get(d).length()-1 - i;
  @                                      a.get(d).charAt(i).equals(a.get(d-1).charAt(j));
  @                                  )));
  @
  @
  @
  @ */
```

- ArrayList<Integer> method (ArrayList<String> a)

```
/* @ requires a!=null ;
   @ ensures \result.size() == 5 ;
   @ ensures (\forall int i; i>=0 && i<5 ;
   @              \result.get(i) == (\sum int p; p>=0 && p<a.size() ;
   @                                   (\num_of int c; c>=0 && c<a.get(p).length() ;
   @                                     a.get(p).charAt(c) == "aeiou".charAt(i))));
   @
   @
*/
```

- int /* @ pure @*/ method (int[] a)

```
/* @ require a!=null;
   @ ensures \result == (\max int m, m>=0 && m<a.length-1 ;
   @                       (\sum int i; i>=m && i<a.length; a[m]))
   @
   @
*/
```

ES-2

- Tessera

```
List<Pretorse> lista;
int punti;
double price;
```

```
/*@ public invariant
  @                          pretorse() != null &&
  @                          pretorse().price() > 0 &&
  @                                (\sum Pistla p;  pretorse().contains(p);   costo(pretorse().get(p)) < 5000 &&
  @                                 (\sum Pistla ;  pretorse().contains(p);  l.pretorse().get(p).punti()) < 1000
  @
  @
*/
```

```
/*@  private invariant  Pistla p != null &&
  @                      p.costo > 0 &&
  @                      p.punti > 0
  @
  @
*/
```

```
/*@ requires p != null;
  @ ensures (\result == p.costo) <==> (\exists Pistla p; p != null; pretorse().contains(p))
*/
```

ES-3

```
public class Main {
    private int[] a = new int[50];
    private Thread[] subr = new Thread[5];
    public Main() {
        for (int i=0; i<50; i++) a[i] = (int)(Math.random()*10);
    }

    public void start() {
        int indx = 0;
        int[] subvector = new int[5];
        for( Subpraer s : subr ){
            for(int i = 0; i < 10; i++) {
                subvector[i] = a[indx*10+i];
            }
            subr[indx] = new Thread(new Sub(subvector));
            indx++;
        }

        for( Subpraer s: subr ) {
            s.start()
        }

        for( Subpraer s: subr ) {
            s.join();
        }

        Sout( res.stream().reduce(0, (a,b) -> Integer.sum(a,b))

}
```

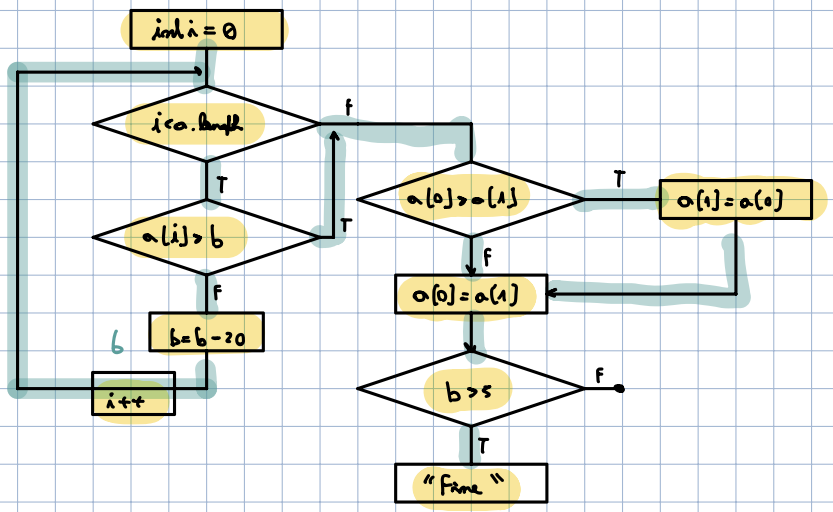
```
public class Sub {
    private int a[] = new int[5];
    private Main m;
    public Sub(int[] a, Main m) {
        this.a = a; this.m = m;
    }

    @Override
    public void run() {
        int res=0
        for (int i:=0; i<5; i++)
            res += a[i];

        m.add(r);
    }
```

```
private ArrayList<Integer> arr = new ArrayList<>();
public SingleClass add(int a) {
    this.arr.add(a)
}
```

ES-4



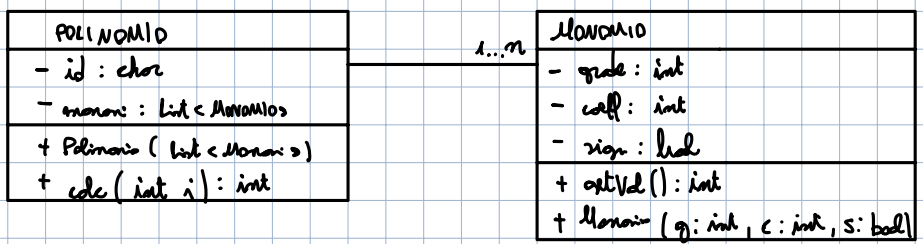
- < a = {4, 7, 6}, b = 26 >

  < a = {4, 3, 5}, b = 65 >

- < 10, 2, 13 > SO

  b = -10 → a = {2, 2, 13} No output

ES-5




```
public int calc(int i) {
    int result = 0;
    for (Monomio m : monomi)
        result += m.getVal(i);

    return result;
}
```

```
public int getVal(int K) {
    return = Math.pow((coeff * K), grado) * (sign ? -1 : 1);
}
```