TÖL304G Forritunarmál

Einstaklingsverkefni 9

Hjörvar Sigurðsson

Kóði:

Kóðinn er á mynda-formi svo að syntax helst og kóðinn sé eins auðlesinn og hægt er. Sé þörf á að eiga við kóðann má finna hann í viðauka 1 aftast í skýrslunni.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;;;
;;; Design document
;;; ===============
;;;
;;; Exported
;;; --------
;;;
;;; Usage: make(a,b);
;;; Pre:   a and b are floating point numbers, b is not zero
;;; Value: The complex number a + ib
;;;
;;; Usage: getReal(z)
;;; Pre:   z is a complex number
;;; Value: The real part of the complex number
;;;
;;; Usage: getImaginary(z)
;;; Pre:   z is a complex number
;;; Value: The imaginary part of the complex number
;;;
;;; Usage: x+++y
;;; Pre:   x and y are rational numbers
;;; Value: The rational number x+y
;;;
;;; Usage: x---y
;;; Pre:   x and y are rational numbers
;;; Value: The rational number x-y
;;;
;;; Usage: x***y
;;; Pre:   x and y are rational numbers
;;; Value: The rational number x*y
;;;
;;; Usage: x///y
;;; Pre:   x and y are rational numbers, y is not zero
;;; Value: The rational number x/y
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
```

```
"complex.mmod" =
!
{{
;;;
;;; Data invariant: A complex number with real part a and
;;; imaginary part b is stored as a pair [a$b] with p and
;;; q being bigIntegers.
;;;

make =
    fun(a, b)
    {
        a = double(a);
        b = double(b);
        [a$b];
    };

getReal =
    fun(z)
    {
        head(z);
    };

getImaginary =
    fun(z)
    {
        tail(z);
    };

+++ =
    fun(a, b)
    {
        var aReal = head(a);
        var aImaginary = tail(a);
        var bReal = head(b);
        var bImaginary = tail(b);
        make((aReal + bReal), (aImaginary + bImaginary));
    };
```

```
--- =
    fun(a, b)
    {
        var aReal = head(a);
        var aImaginary = tail(a);
        var bReal = head(b);
        var bImaginary = tail(b);
        make((aReal - bReal), (aImaginary - bImaginary));
    };

*** =
    fun(a, b)
    {
        var aReal = head(a);
        var aImaginary = tail(a);
        var bReal = head(b);
        var bImaginary = tail(b);
        make((aReal * bReal - aImaginary * bImaginary), (aReal * bImaginary +
aImaginary * bReal));
    };

/// =
    fun(a, b)
    {
        var aReal = head(a);
        var aImaginary = tail(a);
        var bReal = head(b);
        var bImaginary = tail(b);

        val d = bReal * bReal + bImaginary * bImaginary;
        make((aReal * bReal + aImaginary * bImaginary) / d, (aImaginary * bReal -
aReal * bImaginary) / d);
    };
}}
*
BASIS
;
```

```
"test.mexe" = main in
!
{{
main =
    fun()
    {
        ;;; Create two complex numbers.
        var a = make(3, 2);
        var b = make(6, 4);
        write("a = "); writeln(a);
        write("b = "); writeln(b);

        ;;; Add a + b.
        ;;; Answer should be 9+6i.
        write("a +++ b = "); writeln(a+++b);

        ;;; Sub a - b.
        ;;; Answer should be -3-2i.
        write("a --- b = "); writeln(a---b);

        ;;; Multiply a * b.
        ;;; Answer should be 10+24i.
        write("a *** b = "); writeln(a***b);

        ;;; Divide a / b.
        ;;; Answer should be 1/2.
        write("a /// b = "); writeln(a///b);

        ;;; Get real part of complex number a.
        ;;; Answer should be 3.
        write("Real part of a = "); writeln(getReal(a));

        ;;; Get imaginary part of complex number a.
        ;;; Answer should be 2.
        write("Imaginary part of a = "); writeln(getImaginary(a));


        ;;; Divide 5+10i / 2-4i.
        ;;; Answer should be -1.5 +2i.
        write("5+10i /// 2-4i = ");
        writeln((make(5, 10)) /// (make(2, -4)));
    };
}}
*
"complex.mmod"
*
BASIS
;
```

Keyrsla:

```
a = [3.0 $ 2.0]
b = [6.0 $ 4.0]
a +++ b = [9.0 $ 6.0]
a --- b = [-3.0 $ -2.0]
a *** b = [10.0 $ 24.0]
a /// b = [0.5 $ 0.0]
Real part of a = 3.0
Imaginary part of a = 2.0
5+10i /// 2-4i = [-1.5 $ 2.0]
```

Viðauki 1

<u>Kóði:</u>

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;;;
;;; Design document
;;; ===============
;;;
;;; Exported
;;; --------
;;;
;;; Usage: make(a,b);
;;; Pre:   a and b are floating point numbers, b is not zero
;;; Value: The complex number a + ib
;;;
;;; Usage: getReal(z)
;;;        Pre:   z is a complex number
;;; Value: The real part of the complex number
;;;
;;; Usage: getImaginary(z)
;;;        Pre:   z is a complex number
;;;        Value: The imaginary part of the complex number
;;;
;;; Usage: x+++y
;;; Pre:   x and y are rational numbers
;;; Value: The rational number x+y
;;;
;;; Usage: x---y
;;; Pre:   x and y are rational numbers
;;; Value: The rational number x-y
;;;
```

```
;;; Usage: x***y
;;; Pre:   x and y are rational numbers
;;; Value: The rational number x*y
;;;
;;; Usage: x///y
;;; Pre:   x and y are rational numbers, y is not zero
;;; Value: The rational number x/y
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

"complex.mmod" =
!
{{
;;;
;;;        Data invariant: A complex number with real part a and
;;; imaginary part b is stored as a pair [a$b] with p and
;;; q being bigIntegers.
;;;

make =
        fun(a, b)
        {
                a = double(a);
                b = double(b);
                [a$b];
        };

getReal =
        fun(z)
        {
                head(z);
```

```
	};

getImaginary =
	fun(z)
	{
		tail(z);
	};

+++ =
	fun(a, b)
	{
		var aReal = head(a);
		var aImaginary = tail(a);
		var bReal = head(b);
		var bImaginary = tail(b);
		make((aReal + bReal), (aImaginary + bImaginary));
	};

--- =
	fun(a, b)
	{
		var aReal = head(a);
		var aImaginary = tail(a);
		var bReal = head(b);
		var bImaginary = tail(b);
		make((aReal - bReal), (aImaginary - bImaginary));
	};

*** =
	fun(a, b)
```

```
	{
		var aReal = head(a);
		var aImaginary = tail(a);
		var bReal = head(b);
		var bImaginary = tail(b);
		make((aReal * bReal - aImaginary * bImaginary), (aReal * bImaginary + aImaginary * bReal));
	};

/// =
	fun(a, b)
	{
		var aReal = head(a);
		var aImaginary = tail(a);
		var bReal = head(b);
		var bImaginary = tail(b);

		val d = bReal * bReal + bImaginary * bImaginary;
		make((aReal * bReal + aImaginary * bImaginary) / d, (aImaginary * bReal - aReal * bImaginary) / d);
	};
}}
*
BASIS
;

"test.mexe" = main in
!
{{
main =
	fun()
```

```
{
    ;;; Create two complex numbers.
    var a = make(3, 2);
    var b = make(6, 4);
    write("a = "); writeln(a);
    write("b = "); writeln(b);

    ;;; Add a + b.
    ;;; Answer should be 9+6i.
    write("a +++ b = "); writeln(a+++b);

    ;;; Sub a - b.
    ;;; Answer should be -3-2i.
    write("a --- b = "); writeln(a---b);

    ;;; Multiply a * b.
    ;;; Answer should be 10+24i.
    write("a *** b = "); writeln(a***b);

    ;;; Divide a / b.
    ;;; Answer should be 1/2.
    write("a /// b = "); writeln(a///b);

    ;;; Get real part of complex number a.
    ;;; Answer should be 3.
    write("Real part of a = "); writeln(getReal(a));

    ;;; Get imaginary part of complex number a.
    ;;; Answer should be 2.
    write("Imaginary part of a = "); writeln(getImaginary(a));
```

```
                ;;; Divide 5+10i / 2-4i.
                ;;; Answer should be -1.5 +2i.
                write("5+10i /// 2-4i = ");
                writeln((make(5, 10)) /// (make(2, -4)));
        };
}}
*
"complex.mmod"
*
BASIS
;
```