Fleytitölur

`double` gagnatagið er notað fyrir “rauntölur”

values	real numbers (specified by IEEE 754 standard)			
typical literals	`3.14159`	`6.022e23`	`-3.0` `2.0`	`1.4142135623730951`
operations	add	subtract	multiply	divide
operators	+	-	*	/

expression	*value*
`3.141 + .03`	`3.171`
`3.141 - .03`	`3.111`
`6.02e23 / 2.0`	`3.01e23`
`5.0 / 3.0`	`1.6666666666666667`
`10.0 % 3.141`	`0.577`
`1.0 / 0.0`	`Infinity`
`Math.sqrt(2.0)`	`1.4142135623730951`
`Math.sqrt(-1.0)`	`NaN`

ATH

- 5 / 3 er 1, heiltöludeiling
- 5.0 / 3.0 er 1.66… fleytitöludeiling
- 1 / 0 er villa!
- 1.0 / 0.0 er talan “óendanlegt”

Java Math

`public class Math`

`double abs(double a)`	*absolute value of a*
`double max(double a, double b)`	*maximum of a and b*
`double min(double a, double b)`	*minimum of a and b*

Note 1: `abs()`, `max()`, *and* `min()` *are defined also for* `int`, `long`, *and* `float`.

`double sin(double theta)`	*sine function*
`double cos(double theta)`	*cosine function*
`double tan(double theta)`	*tangent function*

Note 2: Angles are expressed in radians. Use `toDegrees()` *and* `toRadians()` *to convert.*
Note 3: Use `asin()`, `acos()`, *and* `atan()` *for inverse functions.*

`double exp(double a)`	*exponential* (e^a)
`double log(double a)`	*natural log* ($\log_e a$, *or* $\ln a$)
`double pow(double a, double b)`	*raise a to the bth power* (a^b)
`long round(double a)`	*round to the nearest integer*
`double random()`	*random number in* $[0, 1)$
`double sqrt(double a)`	*square root of a*
`double E`	*value of e (constant)*
`double PI`	*value of* π *(constant)*

Dæmi: Lausn 2. stigs jöfnu

$x^2+bx+c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4c}}{2}$$

```
public class Quadratic {
   public static void main(String[] args) {

      // parse coefficients from command-line
      double b = Double.parseDouble(args[0]);
      double c = Double.parseDouble(args[1]);

      // calculate roots
      double discriminant = b*b - 4.0*c;
      double d = Math.sqrt(discriminant);
      double root1 = (-b + d) / 2.0;
      double root2 = (-b - d) / 2.0;

      // print them out
      System.out.println(root1);
      System.out.println(root2);
   }
}
```

Boolean

`boolean` gagnatagið geymir sanngildi

gífurlega mikið notað fyrir stýringu forrita

values	true or false		
literals	`true` `false`		
operations	and	or	not
operators	&&	||	!

a	!a
true	false
false	true

a	b	a && b	a || b
false	false	false	false
false	true	false	true
true	false	false	true
true	true	true	true

Samanburður tekur tvö gildi af sama tagi (t.d. `int`) og skilar `boolean`

op	*meaning*	`true`	`false`
`==`	*equal*	`2 == 2`	`2 == 3`
`!=`	*not equal*	`3 != 2`	`2 != 2`
`<`	*less than*	`2 < 13`	`2 < 2`
`<=`	*less than or equal*	`2 <= 2`	`3 <= 2`
`>`	*greater than*	`13 > 2`	`2 > 13`
`>=`	*greater than or equal*	`3 >= 2`	`2 >= 3`

non-negative discriminant?	`(b*b - 4.0*a*c) >= 0.0`
beginning of a century?	`(year % 100) == 0`
legal month?	`(month >= 1) && (month <= 12)`

Hlaupár

Hlaupár er ef 4 gengur upp í árið, nema ef 100 gengur upp í árið og þá aðeins ef 400 gengur upp í árið

```
public class LeapYear {
   public static void main(String[] args) {
      int year = Integer.parseInt(args[0]);
      boolean isLeapYear;

      // divisible by 4 but not 100
      isLeapYear = (year % 4 == 0) && (year % 100 != 0);

      // or divisible by 400
      isLeapYear = isLeapYear || (year % 400 == 0);

      System.out.println(isLeapYear);
   }
}
```

Köst

Hvað er

1+true

1+2.0

1+2

1+2+”?”

1+(2+”?”)

Köst

Kast er þegar við breytum gildi af einu tagi yfir í gildi af öðru tagi.

- óbein: þegar hlutirnir gerast á bak við tjöldin
- bein: sérstaklega tekið fram í kóða með kasti eða föllum

expression	*expression type*	*expression value*
`"1234" + 99`	`String`	`"123499"`
`Integer.parseInt("123")`	`int`	`123`
`(int) 2.71828`	`int`	`2`
`Math.round(2.71828)`	`long`	`3`
`(int) Math.round(2.71828)`	`int`	`3`
`(int) Math.round(3.14159)`	`int`	`3`
`11 * 0.3`	`double`	`3.3`
`(int) 11 * 0.3`	`double`	`3.3`
`11 * (int) 0.3`	`int`	`0`
`(int) (11 * 0.3)`	`int`	`3`

Köst

Hvað er?

5 / 3

5.0 / 3

5 / 3.0

((double) 5) / 3

5 / ((double) 3)

(double) 5 / 3

(double) (5/3)

Hvaða gildi eru notuð?

- int -> double, heiltalan sem rauntala
- double -> int, námundað í átt að 0
- int -> String, strengurinn með stafina f. heiltöluna
- double -> String
- int,float -> boolean, ekki hægt, notið samanburð

Samantekt

- Öll gildi í Java hafa sín eigin gagnatög
- Breytur í Java þarf að skilgreina fyrirfram með gagnatögum
- Hægt að breyta á milli með köstum
- Klassískar prófspurningar