APIs

public class System.out/StdOut/Out

`Out(String name)`	*create output stream from* `name`
`void print(String s)`	*print* `s`
`void println(String s)`	*print* `s`*, followed by newline*
`void println()`	*print a new line*
`void printf(String f, ... )`	*formatted print*

Note: *Methods are static and constructor does not apply for* `System.out/StdOut`.

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)*

`public class StdIn/In`

	`In(String name)`	*create input stream from* `name`
`boolean`	`isEmpty()`	`true` *if no more values, else* `false`
`int`	`readInt()`	*read a value of type* `int`
`double`	`readDouble()`	*read a value of type* `double`
`long`	`readLong()`	*read a value of type long*
`boolean`	`readBoolean()`	*read a value of type* `boolean`
`char`	`readChar()`	*read a value of type* `char`
`String`	`readString()`	*read a value of type* `String`
`String`	`readLine()`	*read the rest of the line*
`String`	`readAll()`	*read the rest of the text*

Note: *Methods are static and constructor does not apply for* `StdIn`.

`public class String`

	`String(String s)`	*create a string with the same value as* `s`
`int`	`length()`	*string length*
`char`	`charAt(int i)`	`i` *th character*
`String`	`substring(int i, int j)`	`i` *th through* (`j-1`)*st characters*
`boolean`	`contains(String sub)`	*does string contain* `sub` *as a substring?*
`boolean`	`startsWith(String pre)`	*does string start with* `pre`*?*
`boolean`	`endsWith(String post)`	*does string end with* `post`*?*
`int`	`indexOf(String p)`	*index of first occurrence of* `p`
`int`	`indexOf(String p, int i)`	*index of first occurrence of* `p` *after* `i`
`String`	`concat(String t)`	*this string with* `t` *appended*
`int`	`compareTo(String t)`	*string comparison*
`String`	`replaceAll(String a, String b)`	*result of changing* `a`*s to* `b`*s*
`String[]`	`split(String delim)`	*strings between occurrences of* `delim`
`boolean`	`equals(String t)`	*is this string's value the same as* `t`*'s?*

public class StdDraw/Draw

	Draw()	*create a new* Draw *object*
void	line(double x0, double y0, double x1, double y1)	
void	point(double x, double y)	
void	text(double x, double y, String s)	
void	circle(double x, double y, double r)	
void	filledCircle(double x, double y, double r)	
void	square(double x, double y, double r)	
void	filledSquare(double x, double y, double r)	
void	polygon(double[] x, double[] y)	
void	filledPolygon(double[] x, double[] y)	
void	setXscale(double x0, double x1)	*reset x range to* (x_0, x_1)
void	setYscale(double y0, double y1)	*reset y range to* (y_0, y_1)
void	setPenRadius(double r)	*set pen radius to* r
void	setPenColor(Color c)	*set pen color to* c
void	setFont(Font f)	*set text font to* f
void	setCanvasSize(int w, int h)	*set canvas to* w*-by-*h *window*
void	clear(Color c)	*clear the canvas; color it* c
void	show(int dt)	*show all; pause* dt *milliseconds*
void	save(String filename)	*save to a* .jpg *or* .png *file*

Note: *Methods are static and constructor does not apply for* StdDraw.

public class StdAudio

void	play(String file)	*play the given* .wav *file*
void	play(double[] a)	*play the given sound wave*
void	play(double x)	*play sample for 1/44100 second*
void	save(String file, double[] a)	*save to a* .wav *file*
double[]	read(String file)	*read from a* .wav *file*

public class StdRandom

int	uniform(int N)	*integer between* 0 *and* N-1
double	uniform(double lo, double hi)	*real between* lo *and* hi
boolean	bernoulli(double p)	*true with probability* p
double	gaussian()	*normal, mean* 0*, standard deviation* 1
double	gaussian(double m, double s)	*normal, mean* m*, standard deviation* s
int	discrete(double[] a)	i *with probability* a[i]
void	shuffle(double[] a)	*randomly shuffle the array* a[]

public class StdArrayIO

double[]	readDouble1D()	*read a one-dimensional array of* double *values*
double[][]	readDouble2D()	*read a two-dimensional array of* double *values*
void	print(double[] a)	*print a one-dimensional array of* double *values*
void	print(double[][] a)	*print a two-dimensional array of* double *values*

Note 1. 1D *format is an integer N followed by N values.*

Note 2. 2D *format is two integers M and N followed by M×N values in row-major order.*

Note 3. Methods for int *and* boolean *are also included.*

public class StdStats

double	max(double[] a)	*largest value*
double	min(double[] a)	*smallest value*
double	mean(double[] a)	*average*
double	var(double[] a)	*sample variance*
double	stddev(double[] a)	*sample standard deviation*
double	median(double[] a)	*median*
void	plotPoints(double[] a)	*plot points at* (i, a[i])
void	plotLines(double[] a)	*plot lines connecting* (i, a[i])
void	plotBars(double[] a)	*plot bars to points at* (i, a[i])

Note: overloaded implementations are included for all numeric types

`public class Picture`

	`Picture(String name)`	*create a picture from a file*
	`Picture(int w, int h)`	*create a blank* `w`*-by-*`h` *picture*
`int`	`width()`	*return the width of the picture*
`int`	`height()`	*return the height of the picture*
`Color`	`get(int i, int j)`	*return the color of pixel (i, j)*
`void`	`set(int i, int j, Color c)`	*set the color of pixel (i, j) to* `c`
`void`	`show()`	*display the image in a window*
`void`	`save(String name)`	*save the image to a file*

`public class Stopwatch`

	`Stopwatch()`	*create a new stopwatch and start it running*
`double`	`elapsedTime()`	*return the elapsed time since creation, in seconds*

`public class Histogram`

	`Histogram(int N)`	*create a dynamic histogram for the N integer values in [0, N)*
`double`	`addDataPoint(int i)`	*add an occurrence of the value i*

`public class Turtle`

	`Turtle(double x0, double y0, double a0)`	*create a new turtle at* (x_0, y_0) *facing* a_0 *degrees counterclockwise from x-axis*
`void`	`turnLeft(double delta)`	*rotate* `delta` *degrees counterclockwise*
`void`	`goForward(double step)`	*move distance* `step`*, drawing a line*

public class Counter

	Counter(String id, int max)	*create a counter, initialized to* 0
void	increment()	*increment counter unless its value is* max
int	value()	*return the value of the counter*
String	toString()	*string representation*

public class Complex

	Complex(double real, double imag)	
Complex	plus(Complex b)	*sum of this number and* b
Complex	times(Complex b)	*product of this number and* b
double	abs()	*magnitude*
double	re()	*real part*
double	im()	*imaginary part*
String	toString()	*string representation*

public class Vector

	Vector(double[] a)	*create a vector with the given Cartesian coordinates*
Vector	plus(Vector b)	*sum of this vector and* b
Vector	minus(Vector b)	*difference of this vector and* b
Vector	times(double t)	*scalar product of this vector and* t
double	dot(Vector b)	*dot product of this vector and* b
double	magnitude()	*magnitude of this vector*
Vector	direction()	*unit vector with same direction as this vector*
double	cartesian(int i)	i *th cartesian coordinate of this vector*
String	toString()	*string representation*

public class Stack<Item>		
	Stack<Item>	*create an empty stack*
boolean	isEmpty()	*is the stack empty?*
void	push(Item item)	*push an item onto the stack*
Item	pop()	*pop the stack*

public class Queue<Item>		
	Queue<Item>()	*create an empty queue*
boolean	isEmpty()	*is the queue empty?*
void	enqueue(Item item)	*enqueue an item*
Item	dequeue()	*dequeue an item*
int	length()	*queue length*

public class ST<Key extends Comparable<Key>, Value>		
	ST()	*create a symbol table*
void	put(Key key, Value v)	*put key-value pair into the table*
Value	get(Key key)	*return value paired with key,* `null` *if key not in table*
boolean	contains(Key key)	*is there a value paired with key?*

public class SET<Key extends Comparable<Key>>		
	SET()	*create a set*
boolean	isEmpty()	*is the set empty?*
void	add(Key key)	*add* `key` *to the set*
boolean	contains(Key key)	*is* `key` *in the set?*

public class Graph

	Graph()	*create an empty graph*
	Graph(In in, String delim)	*read graph from input stream*
void	addEdge(String v, String w)	*add edge* v-w
int	V()	*number of vertices*
int	E()	*number of edges*
Iterable<String>	vertices()	*vertices in the graph*
Iterable<String>	adjacentTo(String v)	*neighbors of* v
int	degree(String v)	*number of neighbors of* v
boolean	hasVertex(String v)	*is* v *a vertex in the graph?*
boolean	hasEdge(String v, String w)	*is* v-w *an edge in the graph?*

public class PathFinder

	PathFinder(Graph G, String s)	*create an object that finds paths in* G *from* s
int	distanceTo(String v)	*length of shortest path from* s *to* v *in* G
Iterable<String>	pathTo(String v)	*shortest path from* s *to* v *in* G