## Introduction to Java

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## Java

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- A *programming language* specifies the words and symbols that we can use to write a program
- A programming language employs a set of rules that dictate how the words and symbols can be put together to form valid *program* statements
- The Java programming language was created by Sun Microsystems, Inc.
- It was introduced in 1995 and it's popularity has grown quickly since

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It is an object-oriented language







Encapsu	lation		Java Pro	gram Structure	<u>;</u>
<ul> <li>Classes superior encouraging operations</li> <li>Objects and internals at Separation are availab operations</li> <li>A class can specifies values and implement produced</li> </ul>	pport a particular kind on a separation between and their implementation e regarded as "black borne hidden of contract (i.e. which ole) and implementation on be viewed as a contract; which operations are offered in be viewed as an implementation be viewed as an implementation specifies how the de	of abstraction: an object's ions oxes" whose operations on of those the contract d by the class entation; the sired behavior is	<ul> <li>In the Java</li> <li>A program</li> <li>A class comparison</li> <li>A method</li> <li>Attributes/ variables)</li> <li>Behaviors/</li> <li>A Java apping called main</li> </ul>	a programming language n is made up of one or more ontains one or more <i>method</i> l contains program <i>statemen</i> properties correspond to operations correspond to plication always contains n	e: e classes is nts o fields (or to methods s a method
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## **Identifiers**

- *Identifiers* are the words a programmer uses in a program
- An identifier can be made up of letters, digits, the underscore character (\_), and the dollar sign
- Identifiers cannot begin with a digit
- Java is case sensitive Total, total, and TOTAL are different identifiers
- By convention, Java programmers use different case styles for different types of identifiers, such as
  - title case for class names Lincoln
  - upper case for constants MAXIMUM CS 111
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## **Identifiers**

- Sometimes we choose identifiers ourselves when writing a program (such as Lincoln)
- Sometimes we are using another programmer's code, so we use the identifiers that they chose (such as println)
- Often we use special identifiers called reserved words that already have a predefined meaning in the language
- A reserved word cannot be used in any other way CS 111

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Reserv	ed Word	ls	
The Jav	a reserved	words:	
abstract	else	interface	super
boolean	extends	long	switch
break	false	native	synchronized
byte	final	new	this
case	finally	null	throw
catch	float	package	throws
char	for	private	transient
class	goto	protected	true
const	if	public	try
continue	implements	return	void
default	import	short	volatile
do	instanceof	static	while
double	int	strictfp	

<ul> <li>Spaces, blar</li> </ul>	k lines, and tabs	are called white
space		
<ul> <li>White space symbols in a</li> </ul>	is used to separa program	ate words and
<ul> <li>Extra white</li> </ul>	space is ignored	
<ul> <li>A valid Java many ways</li> </ul>	program can be f	formatted in
<ul> <li>Programs sh readability,</li> </ul>	ould be formatted using consistent in	d to enhance ndentation

		**********	**********	rogram.
public class Li System.out.prin System.out.prin	ncoln2{publ tln("A quot tln("Whatev	ic static voi e by Abraham er you are, b	d main(String Lincoln:"); e a good one.	]args){ ');}}









Example	
// Facts.java Author: Lewis/Loftus // Penotrates the use of the string constraintion operator and the // automatic conversion of an integer to a string. public class Facts	
//	
public static void main (String[] args)	
<pre>// Strings can be concatenated into one long string System.out.println ('We present the following facts for your '</pre>	
System.out.println ();	
<pre>// A string can contain numeric digits System.out.println (*Letters in the Hawaiian alphabet: 12*);</pre>	
<pre>// A numeric value can be concatenated to a string System.out.println (*Dialing code for Antarctica: * + 672);</pre>	
<pre>System.out.println (*Year in which Leonardo da Vinci invented *</pre>	
<pre>System.out.println ("Speed of ketchup: " + 40 + " km per year"); }</pre>	
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String Co	ncatenation	
<ul> <li>The plus ope arithmetic ac</li> <li>The function depends on which it opport</li> </ul>	erator (+) is also used Idition that the + operator p the type of the inform	for performs nation on
<ul> <li>If both opera string and or concatenatio</li> </ul>	ands are strings, or if ne is a number, it perf n	one is a forms string
<ul> <li>If both opera</li> <li>The + opera</li> <li>Parentheses operation or</li> </ul>	ands are numeric, it a tor is evaluated left to can be used to force der	dds them o right the
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	_	
Primitive Data		N
<ul> <li>There are exactly eight primitive data types in Java</li> </ul>		•
<ul> <li>Four of them represent integers:</li> <li>byte, short, int, long</li> </ul>		
<ul> <li>Two of them represent floating point numbers:</li> <li>float, double</li> </ul>		
<ul> <li>One of them represents characters:</li> <li>char</li> </ul>		
<ul> <li>And one of them represents boolean values:</li> <li>boolean</li> </ul>		
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Characte	ers		Characte
<ul> <li>A char var Unicode cha</li> <li>A character each characc</li> <li>The Unicode character, al</li> <li>It is an inter symbols and</li> <li>Character lit 'a' '2</li> </ul>	able stores a single character racter set set is an ordered list of character corresponds to a unique character set uses sixteen b lowing for 65,536 unique ch- national character set, conta characters from many work erals are delimited by single (' '7' '\$' ','	r from the acters, and number bits per aracters ining d languages quotes: '\n'	<ul> <li>The ASCI smaller th popular</li> <li>The ASCI the Unicoupercas lowercas punctuat digits special special speci</li></ul>
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- I character set is older and nan Unicode, but is still quite
- I characters are a subset of de character set, including:

uppercase letters lowercase letters punctuation digits special symbols control characters	A, B, C, a, b, c, period, semi-colon, 0, 1, 2, &,  , carriage return, tab,	
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Boolean	Arithmetic Expressions
<ul> <li>A boolean value represents a true or false condition</li> </ul>	<ul> <li>An <i>expression</i> is a combination of one or more operands and their operators</li> </ul>
<ul> <li>A boolean also can be used to represent any two states, such as a light bulb being on or off</li> <li>The reserved words true and false</li> </ul>	<ul> <li>Arithmetic expressions use the operators: Addition + Subtraction - Multiplication * Division / Remainder % (no ^ operator)</li> </ul>
are the only valid values for a boolean type boolean done = false; Spring 2004 CS 111 37	<ul> <li>If either or both operands associated with an arithmetic operator are floating point, the result is a floating point</li> <li>Spring 2004 CS 111 38</li> </ul>



Data Cor	iversions		Data Co	nversions	
<ul> <li>Sometimes from one ty</li> </ul>	it is convenient to conv pe to another	ert data	<ul> <li>In Java, da ways:</li> </ul>	ta conversions can occur	in three
<ul> <li>For example as a floating</li> </ul>	e, we may want to trea g point value during a c	an integer	<ul> <li>assignmer</li> <li>arithmetic</li> </ul>	nt conversion promotion	
<ul> <li>Conversions avoid losing</li> </ul>	s must be handled care j information	fully to	<ul> <li>casting</li> <li>Assignmen</li> </ul>	t conversion occurs when	a value
<ul> <li>Widening conversions are safest because they tend to go from a small data type to a larger</li> </ul>			of one type another	e is assigned to a variable	of
one (such as a short to an int)			<ul> <li>Only wide assignmer</li> </ul>	ning conversions can nappen	via
<ul> <li>Narrowing conversions can lose information because they tend to go from a large data type to a smaller one (such as an int to a short)</li> </ul>			<ul> <li>Arithmetic when operands</li> </ul>	promotion happens auton ators in expressions conve	natically ert their
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Class Lib	raries		Package	es	
<ul> <li>A class libra we can use</li> <li>The Java st Java develo</li> <li>Its classes a per se, but</li> <li>The Syste part of the</li> <li>Other class third party yourself</li> </ul>	rry is a collection of cla when developing prog andard class library is opment environment are not part of the Java we rely on them heavi m class and the Strin Java standard class lib libraries can be obtair vendors, or you can cr	asses that grams part of any a language ly g class are rary ned through reate them	<ul> <li>The class library ar</li> <li>Some of class libra</li> <li>Package java.lang java.applet java.awit java.swing java.net java.util java.util</li> </ul>	ses of the Java standa re organized into pack the packages in the s ary are: <u>Purpose</u> General support Creating applets for the wet Graphics and graphical use Additional graphics capabili Network communication Utilities	ard class cages standard r interfaces ties and components
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Example	
<pre>import java.util.Random;</pre>	
public class RandomNumbers	
<pre>public static void main (String[] args)</pre>	
<pre>{     Random generator = new Random();     int numl;     float num2;</pre>	
<pre>numl = generator.nextInt(); System.out.println ("A random integer: " + numl);</pre>	
<pre>numl = generator.nextInt(10); System.out.println ("From 0 to 9: " + numl);</pre>	
<pre>numl = generator.nextInt(10) + 1; System.out.println ("From 1 to 10: " + numl);</pre>	
<pre>numl = generator.nextInt(15) + 20; System.out.println ("From 20 to 34: " + numl);</pre>	
<pre>numl = generator.nextInt(20) - 10; System.out.println ("From -10 to 9: " + numl);</pre>	
<pre>num2 = generator.nextFloat(); System.out.println ("A random float [between 0-1]: " + num2);</pre>	
<pre>num2 = generator.nextFloat() * 6; // 0.0 to 5.999999 num1 = (int) num2 + 1; System.out.println (*From 1 to 6: * + num1); }</pre>	
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C a ma a ma a tha	
<ul> <li>Some method class name, the class</li> </ul>	instead of through an object of
These methors	ods are called <i>class methods</i> or
static methors	ods
<ul> <li>The Math cla</li></ul>	ass contains many static
methods, pro	oviding various mathematical
functions, su	ich as absolute value,
trigonometry	y functions, square root, etc.









