References, Primitives, and Control Flow

June 14, 2017

What's the difference?

```
Integer one = new Integer(1);
int one = 1;
```

A. 32 vs 64 bit

B. Java 8 vs. older versions

C. Reference vs. primitive

D. No difference

Which is Valid?

(Assume no other code…)

A. char justC = new char(“c”);

B. char justC = c;

C. String justOneSimpson = “the” + “Bart” + “the”;

D. int complicatedSix = “2” + 4;

Which is True?

A. “A string” instanceof String

B. String instanceof “A string”

C. int instanceof of float

D. “first string” instanceof “second string”

What's `intValue`?

```
EX:
Integer choiceInt = 3;
choiceInt.intValue();
```

A. Variable declaration

B. Type declaration

C. Method invocation

D. Variable assignment

What's the Output?

```
String[] ramones = {“Joey”, “Tommy”};
for (String aRamone : ramones) {
     System.out.print(aRamone + “❤️”);
 }
```

A. Joey❤️Tommy❤️

B. ❤️❤️

C. JoeyTommy❤️

D. Syntax error

Which is not “Java”?

A. The compiler

B. The runtime

C. The language standard

D. The IDE

Which is _not_ for looping?

A. `for (<prefix>; <test>; <suffix>) { <block> }`

B. `<type> <identifier> = <statement>;`

C. `do { <block> } while (<test>);`

D. `for (<variable> ; <collection>) { <block> }`

Housekeeping

- Homework 1
- Email vs. Piazza
- Office hours change
- Submissions and requirements

Data Types

Java Types

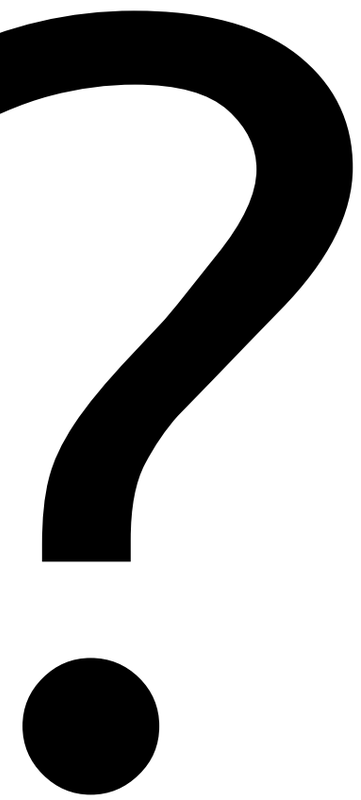
- Goals of a type system
  - Programmer conveience
  - Security
  - Performance
- Types in Java
  - Primitives
  - References

Boolean

- true
- false

Numbers

- short
- int
- long
- float
- double



int + int (int32)

int * int (int32)

byte

- 8 bits
- Arbitrary data
- Predictable memory allocation (security)

Char

- Unicode encoding
- Encased in single quotes
- Different from Strings

Quick note on text handling over the ages, since its unlikely you'll get it in any other class and its important to understand

In the beginning…

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040	&#32;	Space	64	40	100	&#64;	@	96	60	140	&#96;	`
1	1	001	SOH (start of heading)	33	21	041	&#33;	!	65	41	101	&#65;	A	97	61	141	&#97;	a
2	2	002	STX (start of text)	34	22	042	&#34;	"	66	42	102	&#66;	B	98	62	142	&#98;	b
3	3	003	ETX (end of text)	35	23	043	&#35;	#	67	43	103	&#67;	C	99	63	143	&#99;	c
4	4	004	EOT (end of transmission)	36	24	044	&#36;	$	68	44	104	&#68;	D	100	64	144	&#100;	d
5	5	005	ENQ (enquiry)	37	25	045	&#37;	%	69	45	105	&#69;	E	101	65	145	&#101;	e
6	6	006	ACK (acknowledge)	38	26	046	&#38;	&	70	46	106	&#70;	F	102	66	146	&#102;	f
7	7	007	BEL (bell)	39	27	047	&#39;	'	71	47	107	&#71;	G	103	67	147	&#103;	g
8	8	010	BS (backspace)	40	28	050	&#40;	(	72	48	110	&#72;	H	104	68	150	&#104;	h
9	9	011	TAB (horizontal tab)	41	29	051	&#41;	)	73	49	111	&#73;	I	105	69	151	&#105;	i
10	A	012	LF (NL line feed, new line)	42	2A	052	&#42;	*	74	4A	112	&#74;	J	106	6A	152	&#106;	j
11	B	013	VT (vertical tab)	43	2B	053	&#43;	+	75	4B	113	&#75;	K	107	6B	153	&#107;	k
12	C	014	FF (NP form feed, new page)	44	2C	054	&#44;	,	76	4C	114	&#76;	L	108	6C	154	&#108;	l
13	D	015	CR (carriage return)	45	2D	055	&#45;	-	77	4D	115	&#77;	M	109	6D	155	&#109;	m
14	E	016	SO (shift out)	46	2E	056	&#46;	.	78	4E	116	&#78;	N	110	6E	156	&#110;	n
15	F	017	SI (shift in)	47	2F	057	&#47;	/	79	4F	117	&#79;	O	111	6F	157	&#111;	o
16	10	020	DLE (data link escape)	48	30	060	&#48;	0	80	50	120	&#80;	P	112	70	160	&#112;	p
17	11	021	DC1 (device control 1)	49	31	061	&#49;	1	81	51	121	&#81;	Q	113	71	161	&#113;	q
18	12	022	DC2 (device control 2)	50	32	062	&#50;	2	82	52	122	&#82;	R	114	72	162	&#114;	r
19	13	023	DC3 (device control 3)	51	33	063	&#51;	3	83	53	123	&#83;	S	115	73	163	&#115;	s
20	14	024	DC4 (device control 4)	52	34	064	&#52;	4	84	54	124	&#84;	T	116	74	164	&#116;	t
21	15	025	NAK (negative acknowledge)	53	35	065	&#53;	5	85	55	125	&#85;	U	117	75	165	&#117;	u
22	16	026	SYN (synchronous idle)	54	36	066	&#54;	6	86	56	126	&#86;	V	118	76	166	&#118;	v
23	17	027	ETB (end of trans. block)	55	37	067	&#55;	7	87	57	127	&#87;	W	119	77	167	&#119;	w
24	18	030	CAN (cancel)	56	38	070	&#56;	8	88	58	130	&#88;	X	120	78	170	&#120;	x
25	19	031	EM (end of medium)	57	39	071	&#57;	9	89	59	131	&#89;	Y	121	79	171	&#121;	y
26	1A	032	SUB (substitute)	58	3A	072	&#58;	:	90	5A	132	&#90;	Z	122	7A	172	&#122;	z
27	1B	033	ESC (escape)	59	3B	073	&#59;	;	91	5B	133	&#91;	[	123	7B	173	&#123;	{
28	1C	034	FS (file separator)	60	3C	074	&#60;	<	92	5C	134	&#92;	\	124	7C	174	&#124;	|
29	1D	035	GS (group separator)	61	3D	075	&#61;	=	93	5D	135	&#93;	]	125	7D	175	&#125;	}
30	1E	036	RS (record separator)	62	3E	076	&#62;	>	94	5E	136	&#94;	^	126	7E	176	&#126;	~
31	1F	037	US (unit separator)	63	3F	077	&#63;	?	95	5F	137	&#95;	_	127	7F	177	&#127;	DEL

Source: www.LookupTables.com

Unicode

- Old and Busted: ASCII, Windows-*, Big5…
- New Hotness: Unicode
  - Incorporates ASCII
  - Encoding vs. Codepoint

Char in Java

Which are valid?

A. ‘a’

B. “B”

C. 67

D. ‘\u0064'

E. 2147483648 (i.e. Max INT)

Arrays

- No longer a primitive, not yet a reference…
- Special syntax
- Not sized
- Truly multi-dimensional

References

- Most of Java
- Instances of Objects
- “new" (with some exceptions)

Control Flow

Code examples —>

Other Control Flow

- Methods (Friday)
- Exceptions (Monday)
- Lambda (…future)

COFFEE BREAK

モカトッキ™
mokatokki

References

- Objects, Instances and References
- Garbage collected
- Where most of Java lives
- Instances of classes
- “new”

One Slide of OOP

- Classes are the templates (or categories?)
- Classes describe kinds of data and functionality
- Instances are the specifics (the proper nouns?)
- Instances are specific data
- (More on Friday)

Reference Example

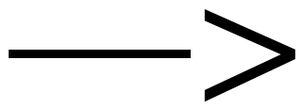
- **Category**: GreatMusicBand
  - Data: Name of band
  - Data: Members of band
    - Functionality: Count members of band
- **Specific #1:** The Pixies (Frank Black, Kim Deal, …)
- **Specific #2:** The Fall (Mark E Smith, 100 other people)
- etc

References Design

Which are good category / instance distinctions?

Option	Category	Instances
A	Animal	Reptile
B	Jeans	Pants
C	Simpsons	Seinfeld
D	Reptile	Lizard
E	Animal	My Pet Turtle

w/o References / Classes



References in Java

- Combination of data and functionality
- Specify the “category” with new
- Specify the data
- Access the functionality with “.” and “()

With References

References Summary

- References are the “instances” of the categories
- Combination of data and functionality
- “new” to create, .<method>() to call functionality
- Much more on Friday and Monday

References Speed Round

- One category (class)
- One-two pieces of data
- one-two methods
- two instances

…go!

Using References

References in Java

- Standard Library
  - Data types
  - File system
  - Networking
- Documentation online
- Import makes things less miserable

Homework 1

- Git basics
- Java basics
  - Using the standard library
    - Basic control flow
- GnuMake
  - make {clean, build, run}
- Due on Friday at start of class

Homework Bootstrap

Overview

- Primitives vs. References
  - Primitives are just data
  - References can be data + functionality
- Control flow is C-like
- Standard library is huge
- Watch for Homework 1 on Piazza