Chapter 2
Introducing Data Types and Operators

Based on the course literature:

Java: A beginner's guide

Fifth Edition

Herbert Schildt

What we'll cover

- Java primitive types
- Literals
- Scope
- Operations
- Type conversion

Java types

Java primitive types

Type	Meaning
boolean	Represents true/false values
byte	8-bit integer
char	Character
double	Double precision floating point
float	Single precision floating point
int	Integer
long	Long integer
short	Short integer

Integers

Type	Width in bits	Range
byte	8	-128 to 127
short	16	-32768 to 32767
int	32	-2147483648 to 2147483647
long	64	-9223372036854775808 to 9223372036854775807

Floating point numbers

Type	Width in bits
float	32
double	64

Doubles have double the accuracy of floats and are therefore the default for many of the inbuilt math methods in Java.

As with all floating point numbers and binary maths, decimals are always approximations.

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Demo1

Characters

- Characters are represented by 16-bits in Java
- Java uses the Unicode standard
- 65536 - characters are available. (all characters in all languages)

```
char ch;
ch = ‘ X’;
```

To assign a character to a char variable you must use single quotes

Demo2

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Booleans

- true or false values
- booleans can control conditional statements

```
if (b == true)
```

is the same as

```
if (b)
```

Demo3

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Literals

Literal	Type
‘a’	character literal
“Hello world	string literal
¨12.345	double literal
¨12.345F	float literal
12	integer literal (can be assigned to short, char, byte)
12L	long literal

hex, oct and binary

```
0xFF // hex for 255 in decimal
011 // oct for 9 in decimal
0b1100 // binary for 12 in decimal
```

Character escape sequences

Escape sequence	Description
\’	Single quote
\”	Double quote
\\	Backslash
\n	New line
\t	Horizontal tab

Demo4

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Variable assignments

Declaring

type var-name;

Initialising

type var = value;

int a, b = 10, c = 3, d;

Dynamic initialisation

double volume = 3.1416 * radius * radius * height;

Scope

- Java has block scope.
- A scope defines where your variables are visible within your code.
- It also determines how long a variable should live in memory.
- Variables declared in a scope are only visible within the scope in which they were created.

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Demo5

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Demo6

Arithmetic operators

Operator	Meaning
+	Addition
-	Subtraction
*	Multiply
/	Divide
%	Modulus
++	Increment
- -	Decrement

Incrementing and decrementing

```
x = 10;
y = ++x; // y is 11 and x is 11
```

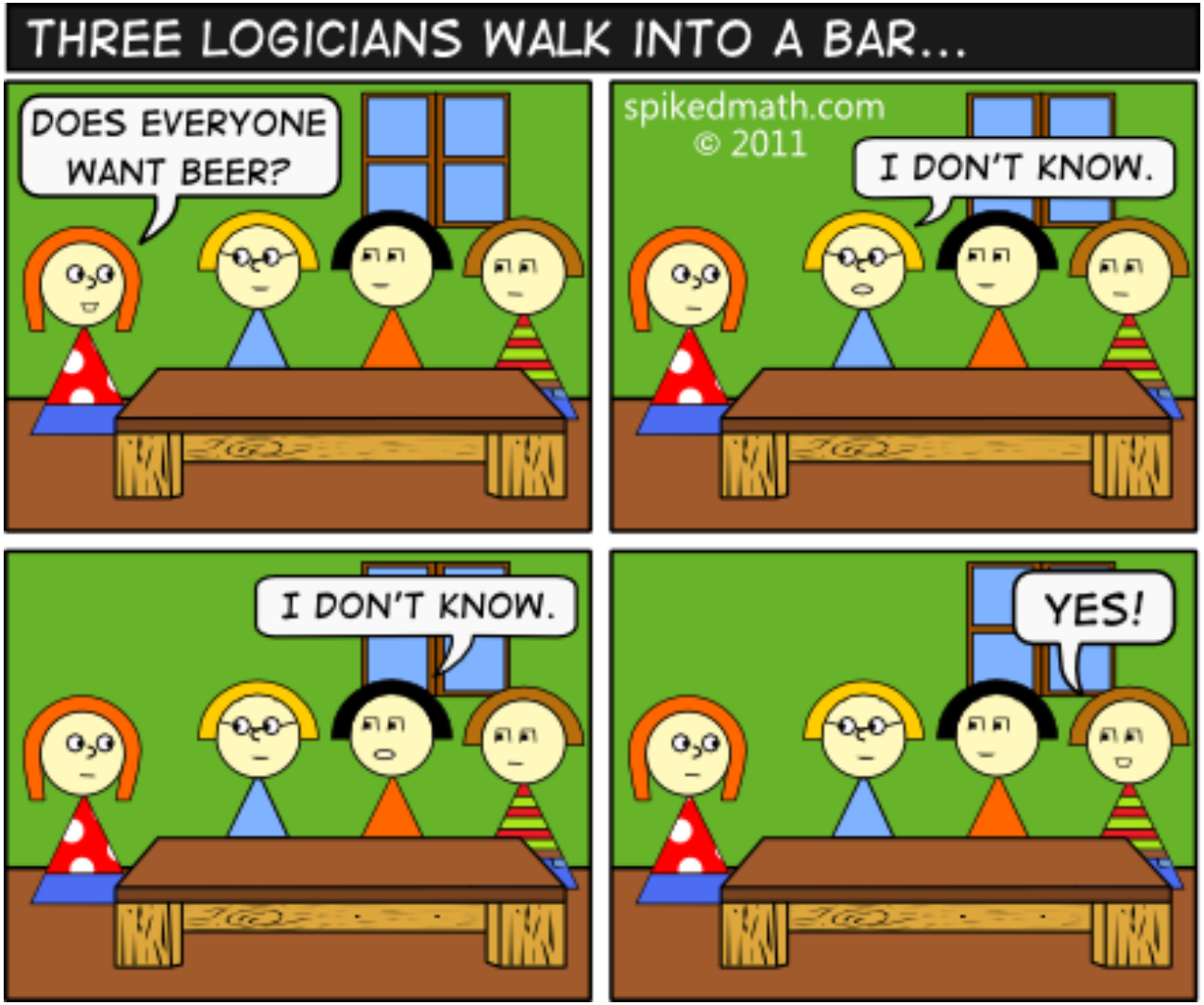
```
x = 10;
y = x++; // y is 10 and x is 11
```

Relational Operators

Operator	Meaning
==	Equal to
!=	Not equal
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to

Logical operators

Operator	Meaning
&	AND
|	OR
^	XOR (exclusive OR)
||	Short-circuit OR
&&	Short-circuit AND
!	Not


THREE LOGICIANS WALK INTO A BAR...
DOES EVERYONE WANT BEER?
spikedmath.com
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I DON'T KNOW.
I DON'T KNOW.
YES!

The assignment operator

```
var = expression;
int a, b, c;
a = b = c =100;
```

Compound assignment:

```
num += 10; // Same as num = num +10
num -= 4;
```

Compound assignment is more efficiently implemented in the Java runtime so should be used.

Type conversion

It’s possible to automatically convert a smaller type to larger ones.

i.e.

```
integerValue = byteValue;
doubleValue = floatValue;
```

However when losses may occur we have to specify that we want to convert/cast data types.

```
integerValue = doubleValue; // This will not work
```

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Casting

A cast is an instruction to cast one type to another.

```
integerValue = (int)doubleValue;
```

Demo7

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Demo8

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Expressions

Variable promotion

```
byte a = 1;
byte b = 1;
byte c = a + b; // This fails as byte is promoted to int
double d = 10.0;
byte e = a + b + d;   /* This fails because we have now
                         promoted to double */
```

Parenthesis and spacing

```
x=10/y-34*temp+(127/x); // hard to read

x = (10 / y) - (34 * temp) + (127 / x); // easier to read
```