

ICT 126 2.0 Introduction to Computer Programming

Data types, conversion, casting and
operators

Basic Data Types

- **Types**
 - boolean** either true or false
 - char** 16 bit Unicode 1.1
 - byte** 8-bit integer (signed)
 - short** 16-bit integer (signed)
 - int** 32-bit integer (signed)
 - long** 64-bit integer (signed)
 - float** 32-bit floating point (IEEE 754-1985)
 - double** 64-bit floating point (IEEE 754-1985)
- **String** (class for manipulating strings)
- **Java uses Unicode to represent characters internally**

Type Conversion

- Implicit change of type can occur when operands are of different type

byte < short < int < long < float < double

short

long

double

long

double

double



Type Casting

- It is possible to **explicitly specify** that an expression be converted to a different type

eg:

- `a = int (3.52 * 10) ;` **→** **?**

- `a = (int)3.52 * 10 ;` **→** **?**



Example

- Print ASCII value of a given character.
- Print character of a given ASCII value.
- Print the simple letter of a given capital letter



Arithmetical Operators

■ + **PLUS**

■ $A + B$

■ - **MINUS**

■ $A - B$

■ * **MULTIPLY**

■ $A * B$

■ / **DIVIDE**

■ A / B

■ % **MOD**

■ $A \% B$



Example

Write a program to read the Salary and print number of notes to pay it (Coin Analysis).

Enter Salary (Rs)	: 37930
No of Rs 2000 notes	: 18
No of Rs 1000 notes	: 1
No of Rs 500 notes	: 1
No of Rs 200 notes	: 2
No of Rs 100 notes	: 0
No of Rs 50 notes	: 0
No of Rs 20 notes	: 1
No of Rs 10 notes	: 1



Assignment Operators

<u>Operator</u>	<u>Statement</u>	<u>Meaning</u>
• =	• A = 10	• A = 10
• +=	• A += 10	• A = A + 10
• -=	• A -= 10	• A = A - 10
• *=	• A *= 10	• A = A * 10
• /=	• A /= 10	• A = A / 10
• %=	• A %= 10	• A = A % 10



Example

Write a program to read a time in seconds and print number of days, hours, minutes and seconds.

```
Enter time (s)           : 699673
```

```
8 days 2 hours 21 minutes and 13 seconds
```



Relational Operators

- **==** **Equal**
- **!=** **Not Equal**
- **>** **Greater Than**
- **<** **Less Than**
- **>=** **Greater Than or Equal**
- **<=** **Less Than or Equal**



Examples

■ $83 > 12$ →

■ $5 > 5$ →

■ $5 \geq 5$ →

■ $7 = 7$ →

■ $9 \neq 8$ →

■ $'a' == 'A'$ →

■ $'a' < 'A'$ →



Logical Operators

- **!** **NOT**
- **&&** **AND**
- **||** **OR**

■ **!(5 > 7)** ➔

■ **(5 > 7) && (9 < 10)** ➔

■ **(5 > 7) || (9 < 10)** ➔



Increment & Decrement Operators

- ++ - **Increment Operator**
- -- - **Decrement Operator**

A++	A=A+1	After the Operation
++A	A=A+1	Before the Operation
A--	A=A-1	After the Operation
--A	A=A-1	Before the Operation



Examples

■ a = 10;

● b = ++a;

a ?

b?

■ a = 10;

● b = a++ ;

a ?

b?

■ a = 10;

● b = --a ;

a ?

b?

■ a = 10;

● b = a-- ;

a ?

b?



Examples

■ `a = 10;`

● `b = ++a + 1;`

a ?

b?

■ `a = 10;`

● `b = a++ - 1;`

a ?

b?

■ `a = 10;`

● `b = --a - 1;`

a ?

b?

■ `a = 10;`

● `b = a-- + 1;`

a ?

b?



Examples

■ `a = 10; b = 2;`

● `c = ++a - b-- + a++;` a ? b? c?

■ `a = 10; b = 2;`

● `b = a++ + --b --a;` a ? b?

■ `a = 10; b = 2;`

● `c = a-- + ++b - b-- ;` a ? b? c?

■ `a = 10; b = 2;`

● `c = a-- - ++a - b-- + ++b ;` a ? b? c?



Bitwise Operators

- **>>** **Right Shift**
- **<<** **Left Shift**
- **&** **Bitwise AND**
- **|** **Bitwise OR**
- **^** **Bitwise XOR**
- **~** **1's Complement**



Bitwise Operators

$a = 8$

$b = 3$

$c = -8$

- $a >> 2$ $a?$
- $b << 3$ $b?$
- $a >> b$ $a?$ $b?$
- $c = a \& b$ $a?$ $b?c?$
- $c = a | b$ $a?$ $b?c?$
- $c >> 2$ $c?$



Bitwise Operators

$a = 8$

$b = 3$

$c = -8$

- $c = a \wedge 2$

$a?$

$c?$

- $c = a \wedge b$

$a?$

$b?c?$

- $c = 8 \& b$

$b?$

$c?$

- $c = a | 7$

$a?$

$c?$

- $c = \sim b$

$b?$

$c?$



Conditional Operators ? : (Ternary Operator)

- $(A > B) ? C = A : D = B ;$

```
if (A > B)
    C = A ;
else
    D = B ;
```

- $C = (A > B) ? A : B ;$

```
if (A > B)
    C = A ;
else
    C = B ;
```



Examples

- Write a program to read unit price, Qty and print total payable with 10% discount.
- Discount is allowed only if total price is greater than Rs 1000.

