CS 111
Introduction to Computer Science

Fall 2015

Lecture 5: Sep 22, 2015

Are All Input (Fahrenheit) Values Acceptable?

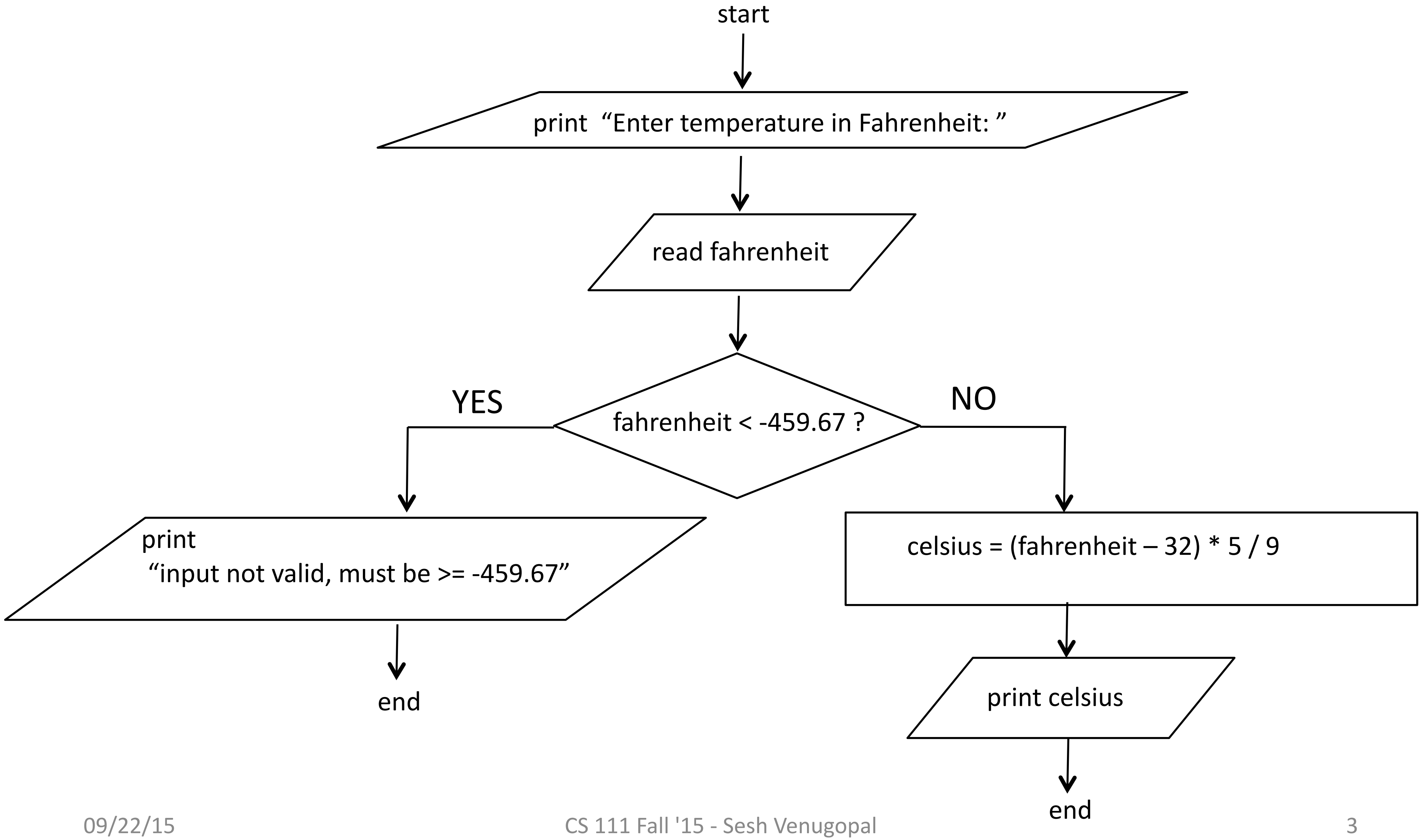
The temperature of **-273.15** Celsius is called ABSOLUTE ZERO.

Molecular energy is minimal at absolute zero – this temperature **cannot be reached** by natural or artificial means

-273.15 Celsius is equivalent to **-459.67** Fahrenheit –
any F values less than this would be below absolute zero.

Input values less than **-459.67** are NOT acceptable to our program

Rejecting Unacceptable Input – Making a Decision (Yes/No)



start

print "Enter temperature in Fahrenheit: "

read fahrenheit

fahrenheit < -459.67 ?

YES

print
"input not valid, must be >= -459.67"

end

NO

celsius = (fahrenheit – 32) * 5 / 9

print celsius

end

Does The Modified Program Work Correctly?

TEST by running it for various input (fahrenheit) values, and compare the output (celsius) value against the expected (correct) value.

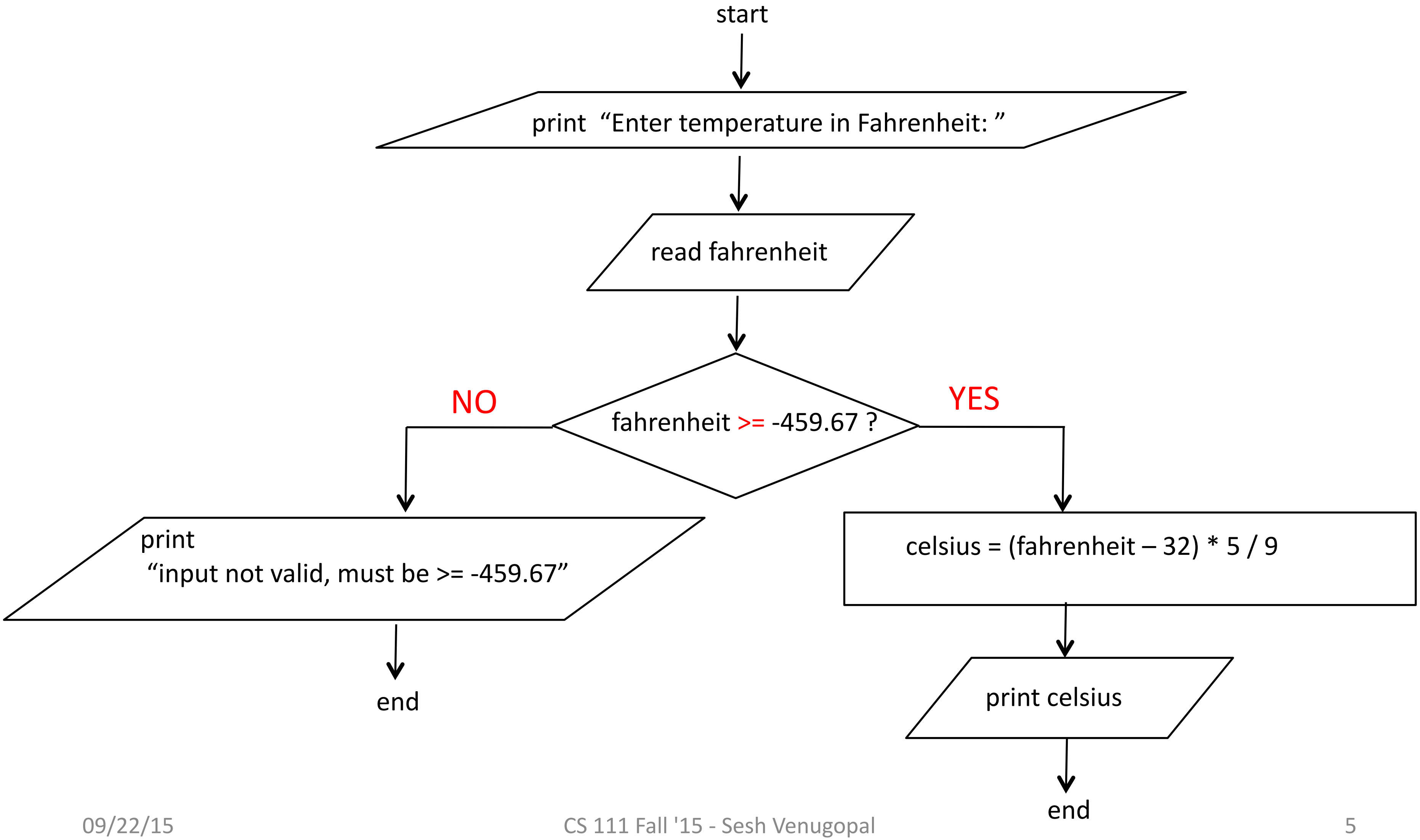
Input (Fahrenheit)	Output (Celsius)	Expected Result
32	0	0
100	37.38	37.78
-40	-40	-40
-300	-184.44	-184.44
-459.67	-273.15	-273.15
-500	Input not valid…	Input not accepted

ABSOLUTE ZERO

The results of testing the program show that it works correctly.

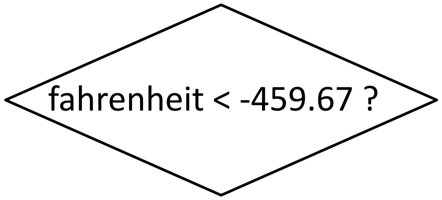
CORRECTLY WORKING means producing correct results for valid inputs, AND rejecting invalid inputs WITHOUT CRASHING.

Equivalent Program: Flipping the Inequality in the Input Check

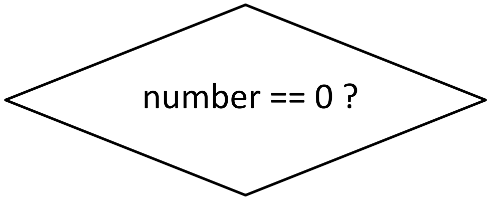

start
print “Enter temperature in Fahrenheit: ”
read fahrenheit
fahrenheit >= -459.67 ?
NO
YES
print
“input not valid, must be >= -459.67”
end
celsius = (fahrenheit – 32) * 5 / 9
print celsius
end

BOOLEAN LOGIC

The result of every arithmetic comparison is TRUE or FALSE


fahrenheit < -459.67 ?

Result is TRUE or FALSE

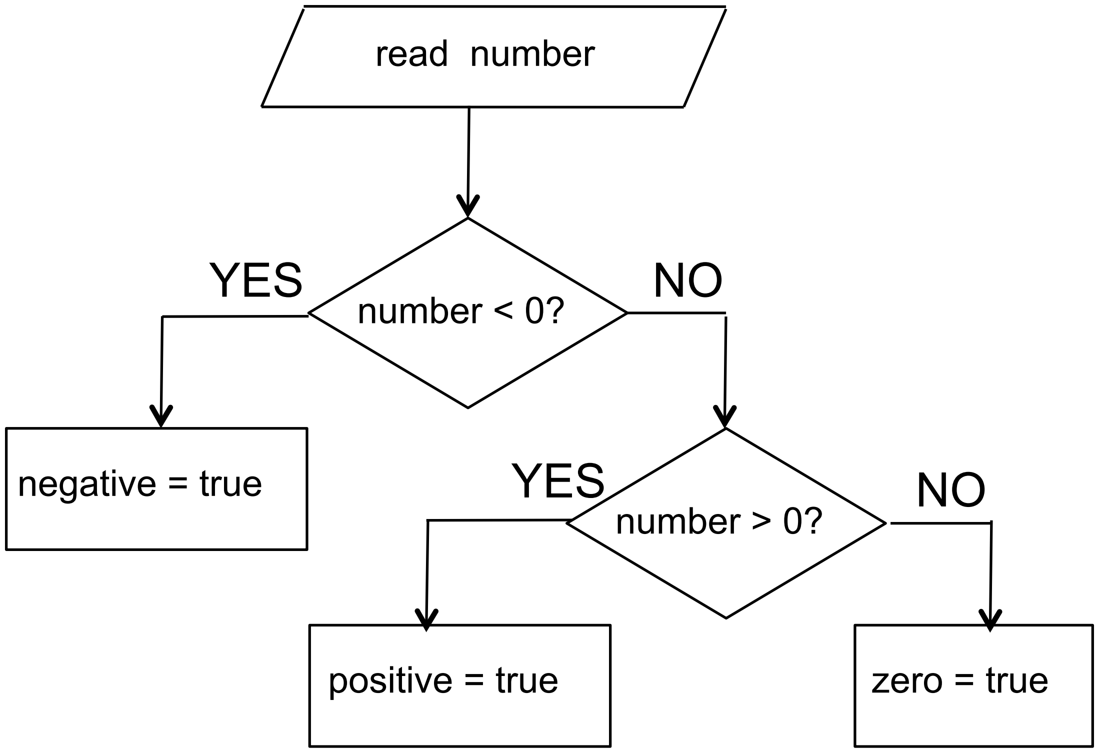

number == 0 ?

Result is TRUE or FALSE

The result of a comparison, TRUE or FALSE, can be explicitly stored in a BOOLEAN variable :

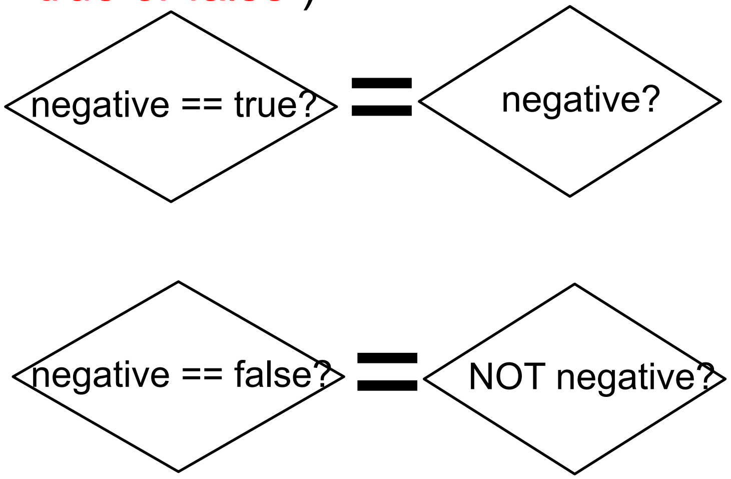
```
boolean legitF = fahrenheit >= −459.67;
boolean numZero =  number == 0;
System.out.println(legitF);   // prints true or false
System.out.println(numZero); // prints true or false
```

Setting Boolean (True/False) Value

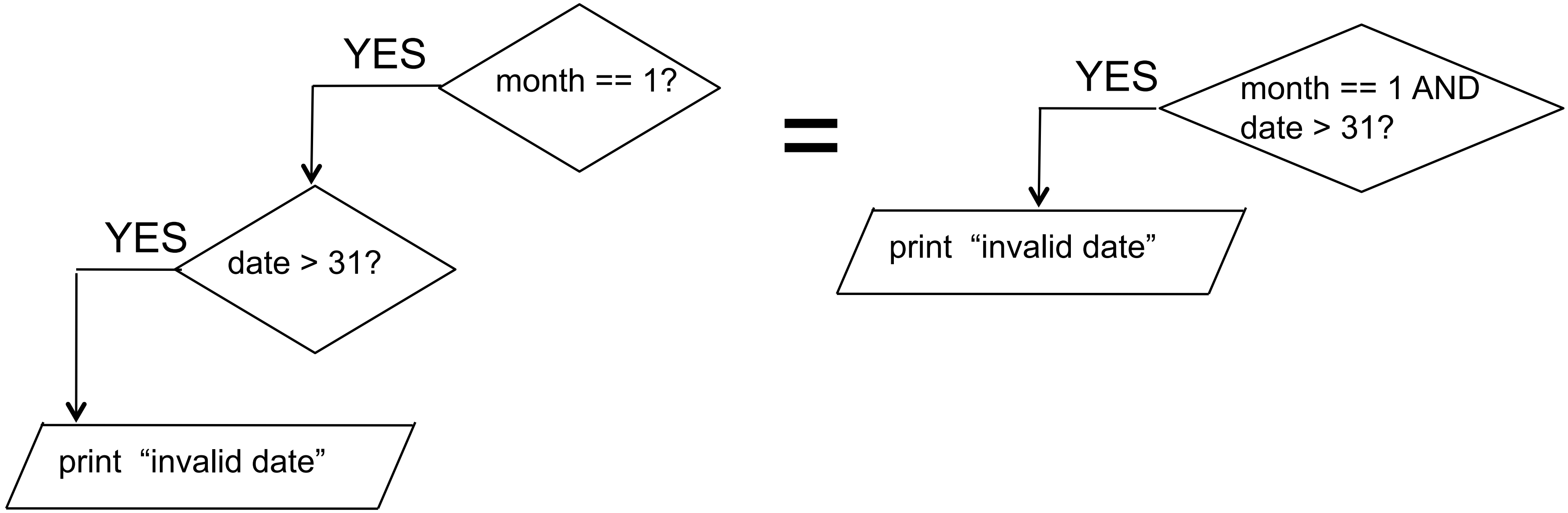


If not assigned true, value assumed to be false by default

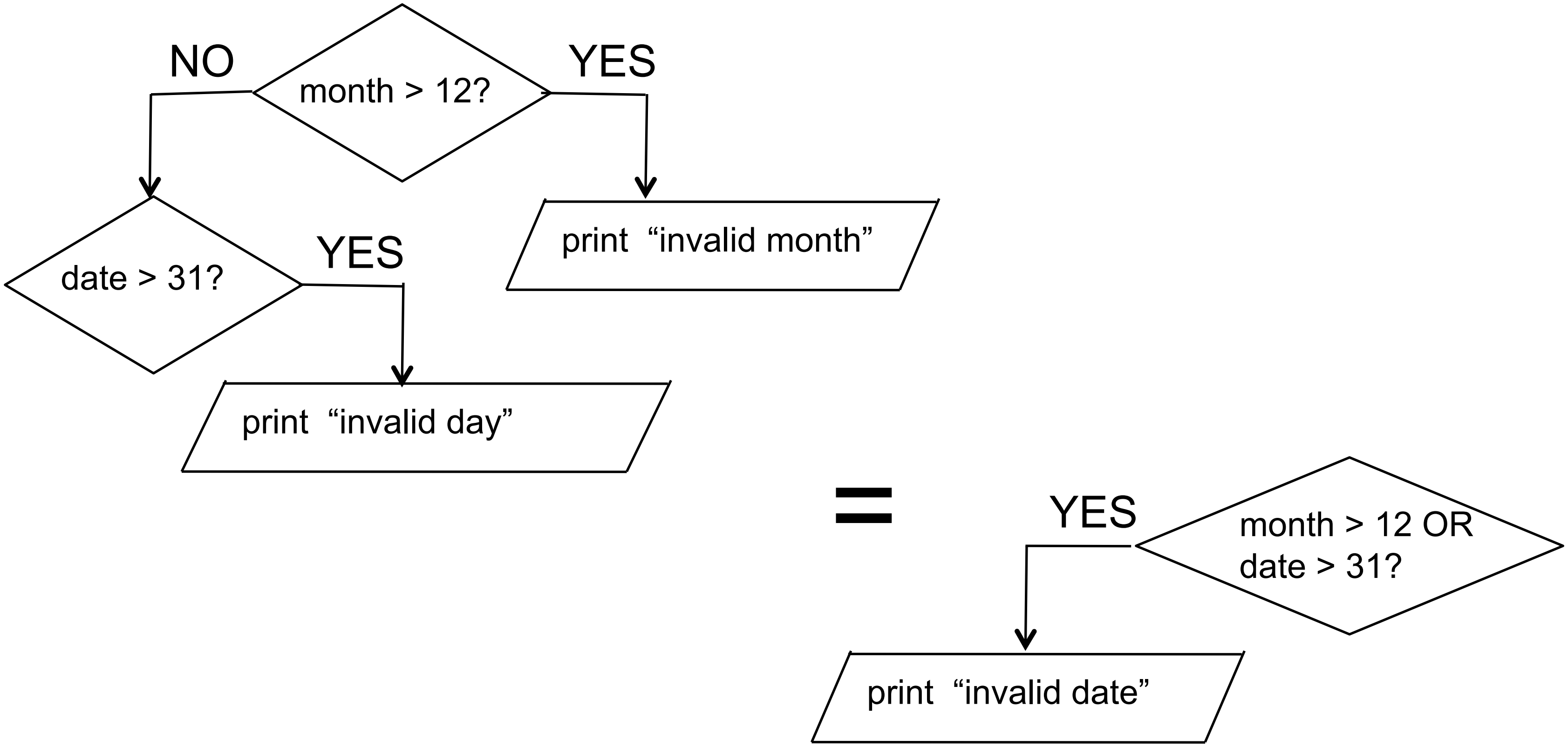
Think of true and false as boolean “constants”, just as 10 and -3 are arithmetic constants – boolean variable value can be checked for true or false (NO quotes around true or false)



Compound Condition: AND



Compound Condition: OR



NO

month > 12?

YES

date > 31?

YES

print "invalid month"

print "invalid day"

=

YES

month > 12 OR date > 31?

print "invalid date"

But note that the compounding of the conditions makes the message less specific!

BOOLEAN LOGIC: TRUTH TABLES

AND

	true	false
true	true	false
false	false	false

OR

	true	false
true	true	true
false	true	false

NOT

true	false
false	true

Boolean Expressions

NOT (!) evaluated before AND (&&) , && before OR (||)
(parens needed to change this natural order of precedence)

For the following expressions, assume a=4, b=2 and c=8

Expression	TRUE/FALSE
a > 3 && b > 3	FALSE
a > 3 || b > 3	TRUE
a >= 3 || b == 3 || c <= 10	TRUE
a >= 3 || b < 3 && c > 10	TRUE
(a >= 3 || b < 3) && c > 10	FALSE
!(a > 3)	FALSE
(a >= 3 || b < 3) && !(c == 10)	TRUE
!(a >= 3 && b < 3) && c != 10	FALSE