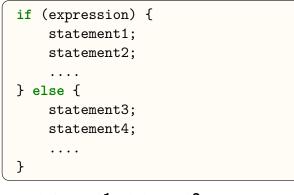
Conditional Execution

• many problems require executing statements only in some circumstances

 $e.g\ read$ two integers and print largest one

- sometimes called **control flow**, **branching** or **conditiional execution**
- The C if Statement can do this.

The else keyword



- statement1, statement2, ... are executed if expression is non-zero.
- statement3, statement4, ... are executed if expression is zero.

The if Statement

if (expression) {
 statement1;
 statement2;

. . . .

}

- statement1, statement2, ... are executed if expression is non-zero.
- statement1, statement2, ... are NOT executed if expression is zero.
- There is no "boolean" type in C.
 0 is regarded as "FALSE" anything non-zero is regarded as "TRUE"

The if Statement

Multiple if statements can be chained together:

```
int a, b;
printf("Please enter two numbers, a and b: ");
scanf("%d %d", &a, &b);
if (a > b) {
    printf("a is greater than b\n");
} else if (a < b) {
    printf("a is less than b\n");
} else {
    printf("a is equal to b\n");
}
```

Relational Operators

C has the usual operators to compare numbers:

- > greater than
- >= greater than or equal to
- < less than
- <= less than or equal to
- != not equal to
- == equal to
- Be careful comparing doubles for equality using == or !=
- Remember doubles are approximations.

Logical Operators

- C has logical operators: && || !
- Logical operators allow us to combine comparisons, eg: mark > 0 && mark < 100
- logical operators return: the int 0 for false the int 1 for true
- && is the and operator true if both operands are true 2>0 && $2<10\mapsto 1$ && $1\mapsto 1$
- || is the or operator true if either operand is true 24>42 || $2<10\mapsto 0$ || $1\mapsto 1$
- ! is the **not** operator true iff its operands is false $!(24>42)\mapsto !0\mapsto 1$

Relational Operators

- Many languages have a separate type for true & false.
- C just uses numbers.
- C convention is zero is false, other numbers true.
- relational operators return: the int 0 for false the int 1 for true
- For example:

Logical Operators - Conditional evaluation

- The C operator && || have a useful property.
- They always evaluate their left-hand side first.
- They only evaluate their right-hand side if needed.
- && will not evaluate right-hand side if left-hand side is false (zero).
- || will not evaluate right-hand side if left-hand side is true (non-zero).
- For example we can write

x != 0 && y/x > 2

without risking division by zero.

Unary Negation operator

The unary negation operator converts a non-zero operand into 0 and 0 into 1. For example,

```
if (!(height <= 130 && width <= 240)) {
    printf("Envelope too large!\n");
}</pre>
```

.. is the same as ..

```
if (height > 130 || width > 240) {
    printf("Envelope too large!\n");
}
```

