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Floating-Point Data Types

What does C++ provide to deal with decimal numbers?

floating-point data type

What numbers are represented by the `float` data type?
 decimal numbers between
 -3.4E+38 and 3.4E+38

**What numbers are represented
by the `double` data type?
decimal numbers between
`-1.7E+308` and `1.7E+308`**

precision	maximum number of significant digits
	<code>float</code>'s precision
	<ul style="list-style-type: none">• 6 or 7 (depends on the compiler)
	<code>double</code>'s precision
	<ul style="list-style-type: none">• 15

Arithmetic Operators and Operator Precedence

What is one of the most important uses of a computer?

its ability to calculate

What are the five arithmetic operators?

**+ (addition) - (subtraction) * (multiplication)
/ (division) % (modulus or remainder)**

What data types can you use with

+, -, *, and /?

integral and floating-point

What data types can you use with %?

integral only

**unary
operator**

an operator that only
has one operand
ex: -5

**binary
operator**

an operator that has
two operands
ex: $8-7$

**modulus
or $\%$**

the remainder when you
divide the first number by
the second number

$100 \% 5$

$40 \% 6$

Examples:

a. $45 - 90$

b. $2 * 7$

c. $5 / 2$

d. $14 / 7$

e. $34 \% 5$

f. $4 \% 6$

g. $5.0 + 3.5$

h. $5.0 / 2.0$

Copy these into your notebook and do the calculations by hand.

Now test your answers using Code::Blocks!!

a. $45 - 90$ `cout << 45 - 90 << endl;`

b. $2 * 7$ `cout << 2 * 7 << endl;`

c. $5 / 2$

d. $14 / 7$

e. $34 \% 5$

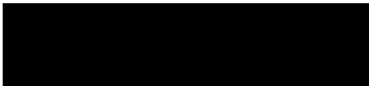
f. $4 \% 6$


g. $5.0 + 3.5$


h. $5.0 / 2.0$

Do any answers surprise you??

Order of Precedence

What operators are at a higher level of precedence than $+$, $-$? 

What does “order of precedence” remind you of? 

Unless parentheses are present, what is the associativity of the arithmetic operators? 

First, do by hand, then test your answers using Code::Blocks!!

Do any answers surprise you??

Examples:

a. $3 + 4 * 5$

b. $(3 + 4) * 5$

c. $8 + 7$

d. $\backslash 8' + \backslash 7'$

e. $8 * 7$

f. $\backslash 8' * \backslash 7'$

Expressions

If all operands (numbers) in an expression are integers, the expression is called an

integral expression.

If all operands (numbers) in an expression are floating-point number, the expression is called a

floating-point or
decimal expression.

**mixed
expression**

**an expression that has
operands of different
data types**

How does C++ evaluate a mixed expression?

if the operator has the same type of operands (both integers or both decimals), the operator is evaluated according to the type of the operands

if the operator has both types of operands (one is an integer one is a decimal), the integer is changed to a decimal (adding .0). The answer is a floating-point number (decimal).

everything follows the order of operations!

First, do by hand, then test your answers using Code::Blocks!!

Examples:

Do any answers surprise you??

a. $3 / 2 + 5.5$

b. $15.6 / 2 + 5$

c. $4 + 5 / 2.0$

d. $4 * 3 + 7 / 7 - 25.5$

Summary - do on p. 33
**How would a C++ program
evaluate 3/2?**

Do HW 1.4 on p. 32
open notes quiz tomorrow

Optional HW - read p. 47-55

1. Evaluate the following expressions.

a. $13/4$

b. $2 + 12/4$

c. $21 \% 5$

d. $3 - 5 \% 7$

e. $17.0/4$

f. $8 - 5 * 2.0$

g. $14 + 5 \% 2 - 3$

h. $15.0 + 3.0 / 2.0$

2. Do a walk-through to find the value assigned to e.
Assume that all variables are properly declared.

`a = 3;`

`b = 4;`

`c = (a % b) * 6;`

`d = c / b;`

`e = (a + b + c + d) / 4;`