



## Computer Science – Lecture 9 Pascal Programming II

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Blackboard IFP



## Objectives

- To understand variables & types
- To understand assignment statements
- We will cover more jargon & buzzwords as we go along
- Tomorrow's practical:
  - More Pascal Programming!



## Pascal Variable Names

- **Variables are places to keep information**
- **Last week we looked giving variables a name**
  - Start with a letter, followed by letters, numbers and ‘\_’
  - Cannot be a “reserved word” (program, var, while...)
  - Cannot contain blanks
- **It is always best to use meaningful names**
  - BankBalance is better than bb
  - Because most programs have to be changed!
    - Often by someone else!



## Pascal Variable Types - 1

- **Pascal has four “built-in” types**
  - (A “built-in” type is one that comes with Pascal – later on we will see how to construct our own types)
- **Integer**
  - A whole number, positive or negative, e.g. 543
  - Do not use ',' to separate thousands
  - The range is usually quite large, but NOT infinite
    - Typically roughly +/- 2 billion (2,000,000,000)
  - Integers are stored exactly



## Pascal Variable Types - 2

- **Real**

- Any number, positive or negative, including decimals
- E.g. 3.141592, 7.0, 3.1E6
- Range is very, very large (but still NOT infinite)
  - At least 10E-25 to 10E38
- Reals may NOT be stored exactly
  - Very large numbers may lose least significant digits
  - Very small numbers may lose least significant digits
  - All decimal numbers are subject to errors
  - Be VERY careful comparing real numbers
- It is best to avoid real numbers if you can



# Real Number Errors

- All numbers are subject to rounding errors
- Some numbers cannot be represented exactly in binary – consider 0.3 (decimal)

0

0

1

0

0

1

1

1.0

0.5

0.25

0.125

0.0625

0.03125

0.015625

$$\begin{array}{r} 0.25000 \\ +0.03125 \\ \hline 0.28125 \end{array}$$

$$\begin{array}{r} 0.250000 \\ +0.031250 \\ \hline +0.015625 \\ \hline 0.296875 \end{array}$$



# Pascal Variable Types - 3

- **Char**
  - Can be any single character ‘+’, ‘a’, ‘A’
- **Boolean**
  - Can be either ‘true’ or ‘false’
  - Named after a British mathematician, George Boole
- **We “Declare” variables like this:**

— `Var variable-name [, variable-name...] : variable-type;`

This is the keyword ‘var’

These are one or more variable names (note the comma)

This one of the types, real, char...

— `E.g. var BankBalance : integer;`

Don't forget the ‘;’!



# Assigning Values to Variables

- We use the “assignment operator”
- An “operator” is like a mathematical operation
  - ‘+’, ‘-’ etc.
- The assignment operator assigns a value to a variable e.g.
  - Start := 0;
  - Gross := 102 \* 1.175;
  - TotalSoFar := TotalSoFar + 1;
  - ThisOne := LastOne;
- A common error is to use ‘=’ instead
  - Say to yourself ‘:=’ means “becomes” or “is set to”



# Assigning Types

- You can only assign values of the same type as the variable
  - E.g. cannot assign the value 'T' to an Integer variable
- The only exception is an integer assigned to a real variable
  - It will be automatically converted
- We will look later at how to convert between types



## Tomorrow's Practical

- **Two programs involving types**
  - See work sheet
- **Some homework**
  - Questions and a some more small programs
- **You can try your homework during the practical**
- **Worksheets available today if required**
  
- **Karl will be available to help between 13:00 and 15:00 in the IT Degree Lab**