Some simple programs

Objectives

- Review first practical
- Start writing basic programs involving
  - Simple input
  - Variables – their declaration and management
  - Simple computations
  - Simple output
  - Maybe a simple for loop variation
- Complete Chapter 2 of the textbook.
Recap:

```c
// Sums the numbers from 1 to an entered number //
#include <iostream>
using namespace std;

int main() {
    int i, n, sum;
    cout << "Enter a number\n";
    cin >> n;
    sum = 0;
    for (i=1; i<=n; i++)
    { sum = sum + i; }
    cout << "The sum of numbers to " << n;
    cout << " is " << sum << "\n";
    return 0;
}
```

The computation

- `sum = 0;`  
  - Initialise `sum`
- `for (i=1; i<=n; i++)`
  - For each value of `i`, from 1 up to and including `n` adding 1 to `i` each time
- `{ sum = sum + i; }
  - do this:
    - Add the current `i` to `sum`
Name that variable:

A. a
B. aveScore
C. AverageScore
D. AVERAGE

B is preferable

Which is not appropriate?

A. bool done = false;
B. int n = 6.2;
C. double num_years = 0;
D. char ans = 'Y';

B, but it will work and make n = 6
Which of these assumes \( x \) has been initialised?

A. `cin >> x;`
B. `y = x;`
C. `x = y;`
D. `x++;`

B & D

Integer Division & Remainder

- The operands for integer division and remainder are `/` and `%` respectively
  - 
  - 

- It’s only if both operands are integers that the division is integer division.
  - `10.0 / 3.0` or `10.0 / 3` or `10 / 3.0` all give `3.333333333`
Drop the decimal

- By assigning a decimal number to an integer variable, you effectively drop the decimal part. For example:

```c
int i;
double x = 3.1415;
i = x; // puts the integer part of the value of x into the variable i;
//drops the decimal part
cout << i; // prints the value 3.
```

Compute change

- amount is number of cents change to issue
  - `int amount = 786;`
- coin2E is the value of a 2 euro coin
  - `int coin2E = 200;`
- How many of them?
  - `int num2E = ??`
- What’s left?
  - `amount = ??`
- See the program on the web page.
Which is NOT true at the end?

```java
int x, y, z;
double w, t;
x = 23; y = 35;
x = x + y / 4 - 3;
z = x % 3;
w = 28 / 3 + 6.5 * 2;
t = x / 4.0 + 15 % 4 - 3.5;
```

A. x is 28  
B. y is 35  
C. z is 1  
D. w is 22.333  
E. t is 6.5  

*Which is NOT true at the end?*

```java
int x, y, z;
double w, t;
x = 23; y = 35;
x = x + y / 4 - 3;
z = x % 3;
w = 28 / 3 + 6.5 * 2;
t = x / 4.0 + 15 % 4 - 3.5;
```

A. x is 28  
B. y is 35  
C. z is 1  
D. w is 22.333  
E. t is 6.5  

OPTION D –  
28/3 is 9, not 9.333, so w is 22, not 22.333.  

Note:  
x = 23 + (35/4) - 3  
= 23 + 8 - 3 = 28  
Z = 28 remainder 3 = 1
Quadratic roots

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

Assuming that \( a \) is not 0, and that \( b^2 > 4ac \) write a program to read in \( a, b, c \) and to print both roots.

- Use intermediate variables to simplify
  - e.g. discriminant for \((b^2 - 4ac)\)
  - To compute the square root of \( x \) use "sqrt(x)".

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Which ordering will work?

- A. 2 6 4 5 3 1
- B. 6 5 3 4 2 1
- C. 6 5 2 4 3 1
- D. 5 6 3 2 4 1
cout << "Area is: " << area << endl;
const double PI = 3.14;
cin >> radius;
double area = PI * radius * radius;
cout << "Enter radius: ";
double radius;

*Which ordering will work? Why?

OPTION D –
For correctness, Line 4 depends on radius and PI having valid values; radius is given a value by line 3; PI is given a value by line 2. So 3 and 2 have to precede 4.
For syntax, line 6 needs to come before 3, 4, 5, but it does in all options.

Other problems we might try

- Simple problems:
  - Read in an amount in pounds and output its equivalent in euros (£1 = 1.27).
  - Read in two numbers, write out their sum, difference and product.
- Using a FOR loop:
  - Compute n! (i.e. the factorial of n).
  - Print out the integers from 1 to n.
  - Print n down to 1. ("i--" subtracts 1 from i).
  - Print the even numbers 2 to 50. ("i = i+2" adds 2 to i).
Now

- We can’t cover every detail in class.
- Read Chapter 2 of the textbook.
- You need to cover, by yourself
  - Arithmetic operators and operator precedence
  - Type conversion
  - Details of input and output