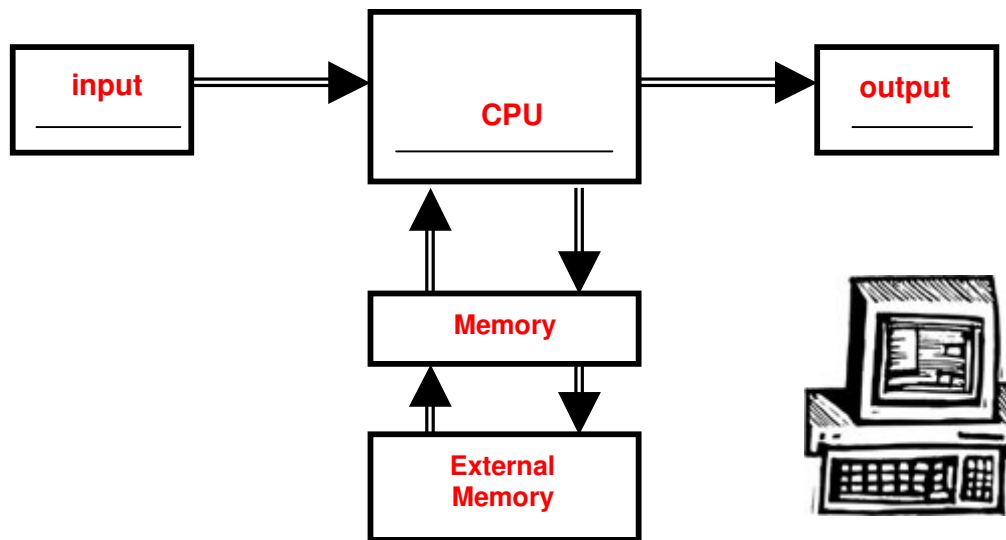
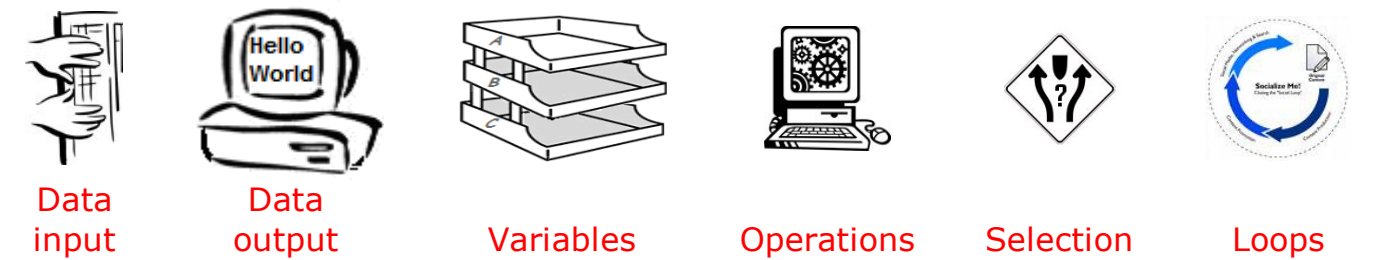


Concepts Review

1. An **algorithm** is a sequence of steps to solve a problem.
2. A **program** is the implementation of an **algorithm** in a particular computer language, like **C** and **C++**.
3. A **flowchart** is the graphical representation of an **algorithm**.
4. The main components of a typical personal **computer system** are:



5. The main elements to make programs are:



6. C/C++ distinguishes several kinds of data:





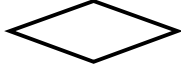

__**int**_____ is used to handle whole numbers.

__**float**_____ is used to handle numbers with decimals.

__**char**_____ is used to handle symbols and letters.

__**string**_____ is used to handle messages.

7. Fundamental notation in C++.

Beginning of instruction block	{		
Input data	cin	>>	
Output data	cout	<<	
Arithmetic operation	y = 2*x - 3;	=	
Conditional statement	if...else	==	
End of instruction block	}		

8. Parts of a C/C++ program.

```

// Name of the program ← Header: program identification
#include <iostream.h> ← Libraries

int main () ← Main program
{
  int age; } Declaration of local variables
  cout << "H
  cin >> age;
  cout << age << "! You are very young";
  return 0; ← Terminate program
}

```

Program body {

9. A **question prompt** is the output that precedes any data input.

10. Basic **dialogue** consists of a question prompt and the corresponding data input instruction.

11. Operations in C/C++.

=	+	-	*	/	%	<	>	==	!=	<=	>=	&&		!
	+	-	x	÷		<	>	=	≠	≤	≥	and	or	not
Assignment	Arithmetic					Relational						Logical		

12. Operator precedence in algebra, C and C++:

()	* /	+ -
1 st	2 nd	3 rd

13. Let $a=5$, $b=10$, $c=2$, $d=5$ and $e=1$, indicate the value of y after **evaluating** the following **expressions**:

a) $y = a + b * c / d + e;$ // y is _____
 ___ + ___ * ___ / ___ + ___

b) $y = a + (b * c) / d + e;$ // y is _____
 ___ + (___ * ___) / ___ + ___

c) $y = a + b * (c / d) + e;$ // y is _____
 ___ + ___ * (___ / ___) + ___

d) $y = (a + b) * c / d + e;$ // y is _____
 (___ + ___) * ___ / ___ + ___

e) $y = a + b * c / (d + e);$ // y is _____
 ___ + ___ * ___ / (___ + ___)

f) $y = (a + b) * c / (d + e);$ // y is _____
 (___ + ___) * ___ / (___ + ___)

14. A formula can be broken down in several steps to **track** it more easily.

$$X_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$S1 = 4 * a * c$$

$$S2 = b * b$$

$$S3 = 2 * a$$

$$S4 = \sqrt{S2 - S1}$$

$$S5 = -b + S4$$

$$S6 = -b - S4$$

$$X1 = S5 / S3$$

$$X2 = S6 / S3$$

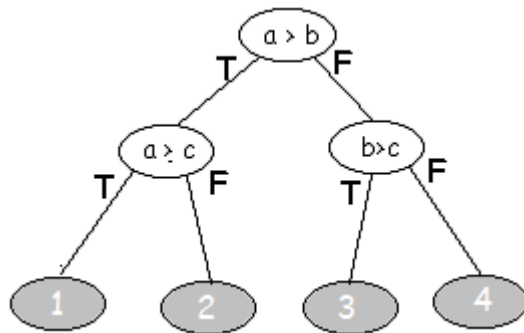
15. A **Boolean expression** compares two values, which results in any of two possible outcomes: true or false.

16. Boolean expressions are used in conditional statements and iterative statements.

17. Given the expression $0 < X < 10$, how many values can X take?

a) If X is an integer: 9 b) If X is a floating point: infinite

18. A **decision tree** shows all possible outcomes given several Boolean expressions.



Case 1: $a > b, a > c$





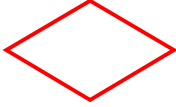

Case 2: $a > b, c > a$

Case 3: $a \leq b, b > c$

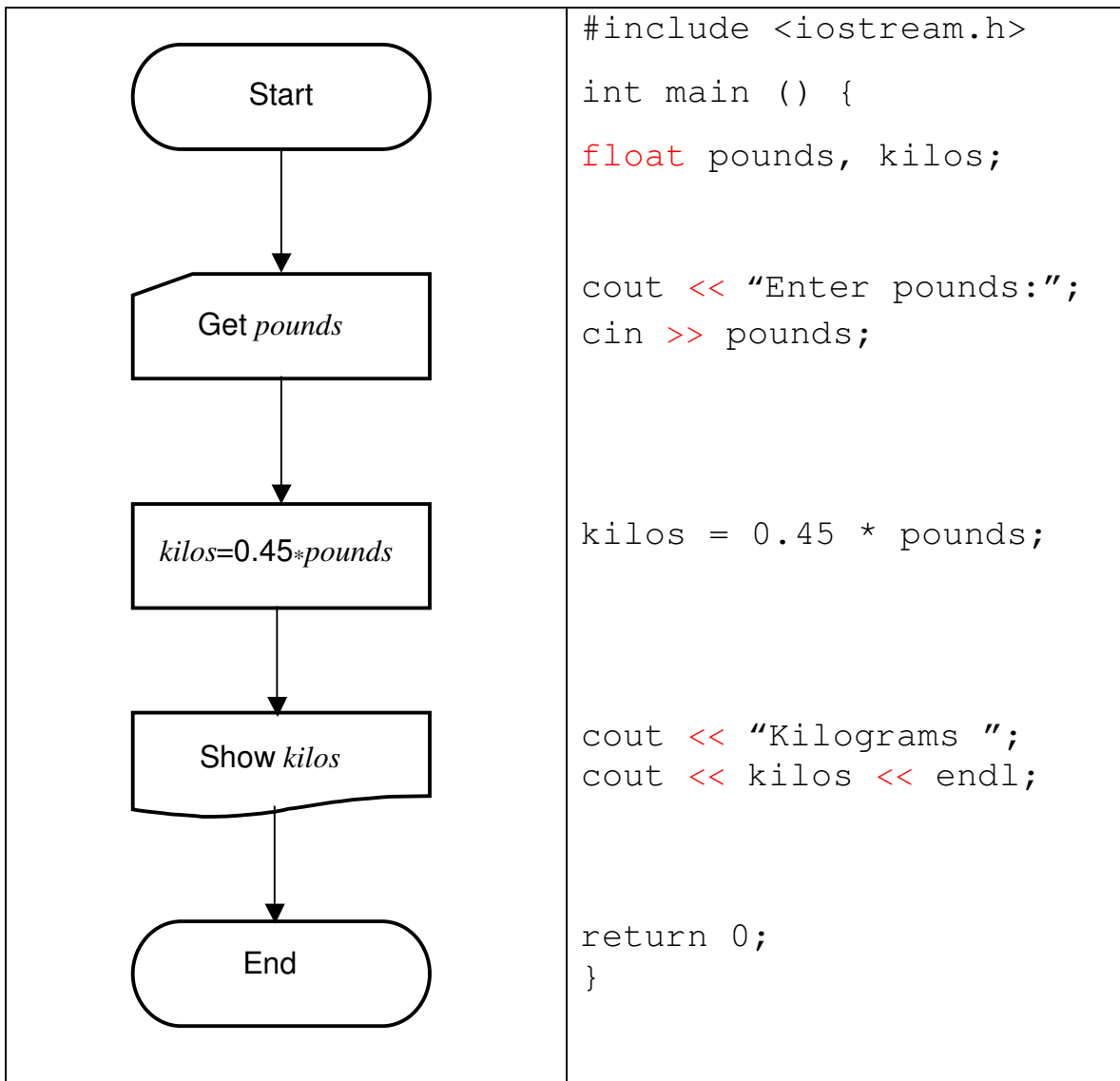
Case 4: $a \leq b, b \leq c$

19. A flowchart is a step-by-step visual guide indicating how to perform a specific task. The symbols most widely used are:

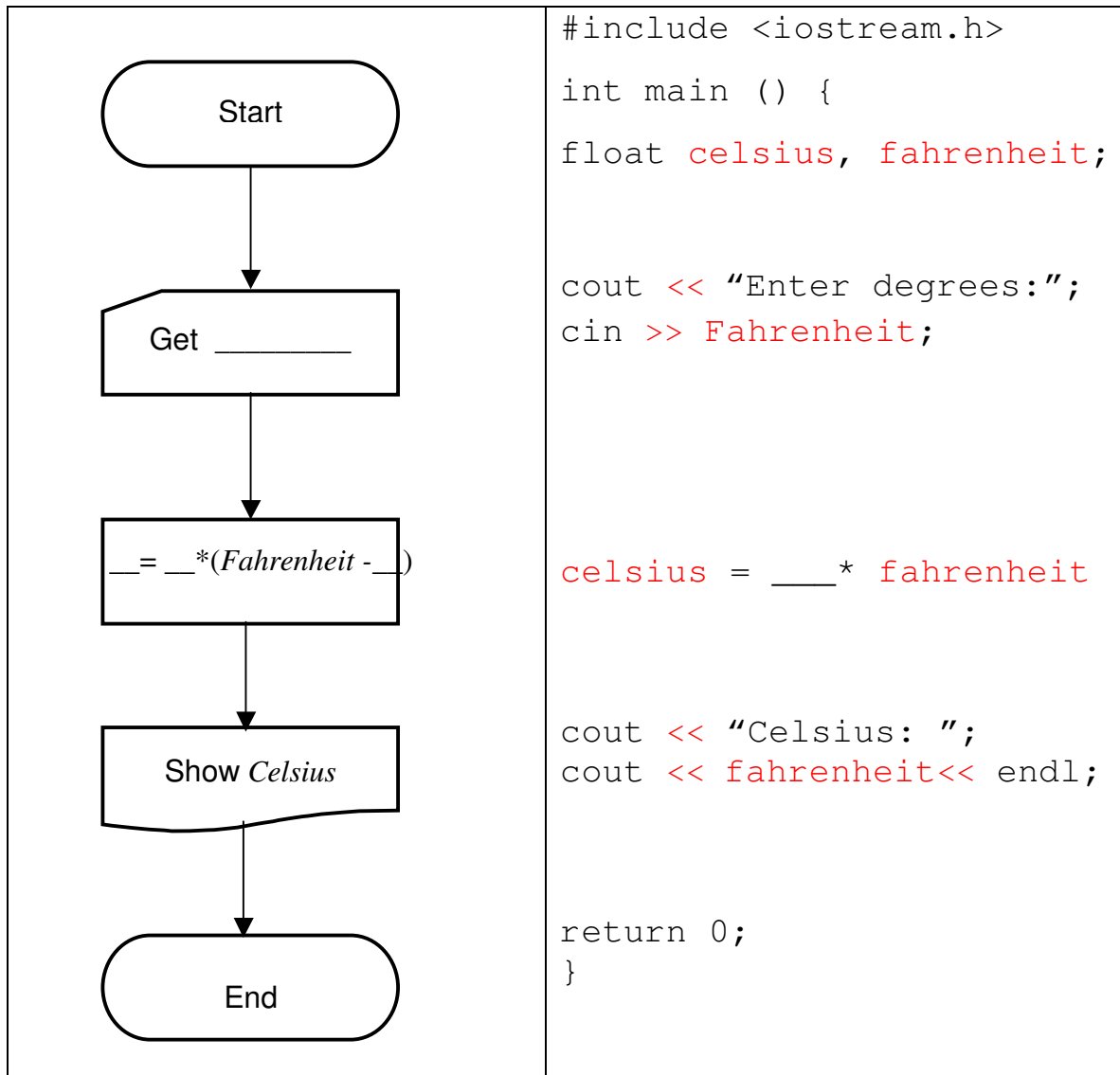
Start/end task		
Get data from user		

Display results		
Perform operation		
Evaluate condition		

20. An example of a sequential flowchart, and its corresponding C++ program, to transform any amount of pounds into kilograms.



21. An example of a sequential flowchart, and its corresponding C++ program, to transform any amount of Fahrenheit degrees into Celsius.



22. How many times the message is printed?

```

for (num=-5;num<=4; num=num+1) {
  cout << "Hello World" << endl;
}
  
```

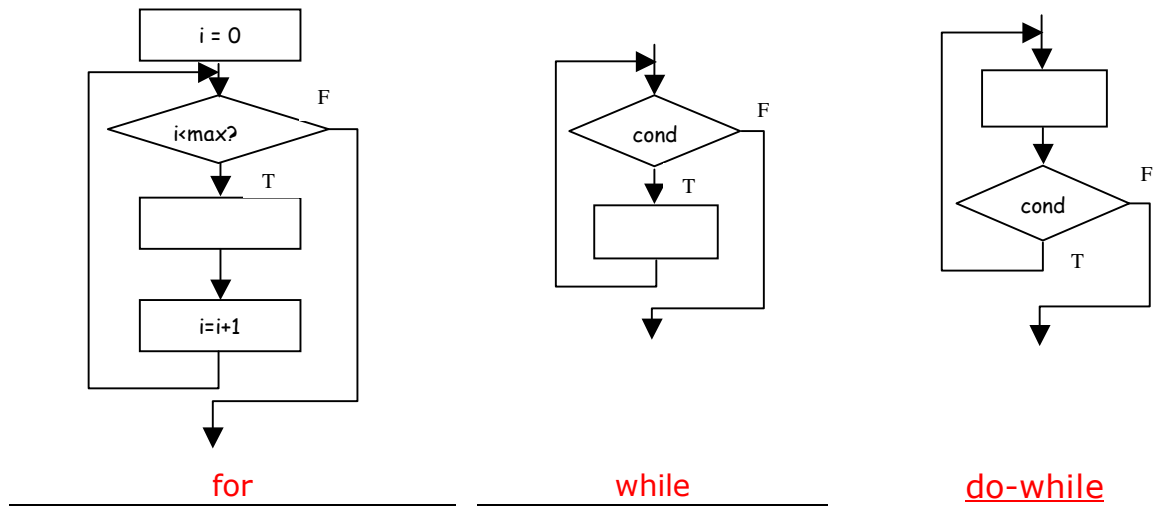
```

while (num < 10) {
  cout << "Hello World" << endl;
}
  
```

a) 10 times

b) Unsure (either none or infinite)

23. An iterative statement repeats a block of instructions several times.



24. An array is a numbered collection of data of the same type.

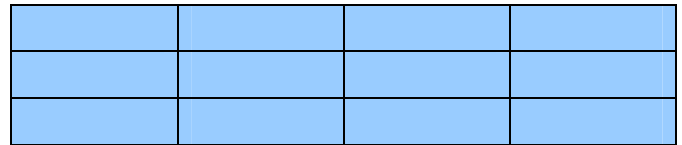
25. To declare arrays:

score



`int score[8];`

island



`char island[3][4];`

row

column

26. Given this list:

12	-1	9	5	-4	-6	2	8
0	1	2	3	4	5	6	7

a) The number in the fifth box is -4

b) The tag of the box containing 2 is 6

27. This piece of code computes the average of an array of **115** elements.

```
avg = 0.0; total = 115;
for (i=0; i < total; i = i + 1) {
    avg = avg + grades[i]; }
avg = avg / total;
```

28. This piece of code **displays** the contents of a matrix of **$N \times M$** elements.

```
M=25; N=73;
for (i=0; i < N; i = i +1) {
    for (j=0; j < M; j = j +1) {
        cout << island[i][j]; }
    cout << endl;
}
```

29. The following program is supposed to **compute** the decimal sum of the values $1/1, 1/2, 1/3, 1/4, 1/5$. However, it has several **bugs**:

```
int main () {
    float sum = 0;
    int number = 0;

    while (number < 5) {
        result = 1.0 / number;
        sum = sum + result;
    }
    cout << sum << endl;

    return 0;
}
```

```
int number=1;
float result;
while (number <= 5) {
```

30. After executing this program the screen will show the value: _____.

```
int main () {
    int i,x;

    x =0; i = 0;
    do {
        x = x + i * i;
        i = i + 1;
    } while (i < 10);
    cout << x << endl;

    return 0;
}
```

31. What is the meaning of the term **variable**, within the computing field?

A data storage space (usually an electronic component) associated with an **identifier** (name or symbol) that contains a value, and can be changed throughout the execution of the program.

32. What do you understand for **computing agent**?

Something (or someone) able to “mechanically” carry out the instructions stated in an algorithm.

33. What is a **conditional statement**?

It is an instruction that evaluates a **Boolean expression** in order to execute a specific action.

34. What is the truth-value of a conditional statement?

True or false, regarding of the status of the condition.

35. How do you link two conditional statements (i.e., a **compound** statement)?

By using a conjunction (**AND**) or a disjunction (**OR**). [Also called **logical operands**.]

36. How do you create the **truth-table** for compound conditional statements?

By making a list of all possible outcomes to all combinations of truth-value on the individual statements.

37. What is the purpose of a **loop**?

Repeat a set of steps to prevent retyping the same instructions over and over, to perform repetitive boring activities, or to perform millions of computations with total precision (“number crunching”).

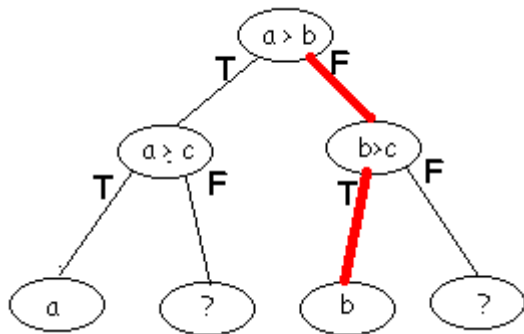
38. What is know as **primitives** of a computing device?

Basic operations (tasks or instructions) the device is able to follow.

39. Give a **detailed description** to compute the perimeter of a square. (Hint: Remember the quadractic equation example.)

```
Begin
  Request the length of one side and store it in variable L.
  Compute 4*L and store the result in P.
  Return the value stored in P.
End.
```

40. Given the following **decision tree**, indicate the **condition** that has to be true in order to reach the true value at the middle **path**.



$(a \leq b) \text{ AND } (b > c)$

41. For the sake of the argument, suppose that you have traveled back in time and prevented your parents from meeting each other. Write down the paradox that follows as a **sequence of if-then** statements

FORM A (simple wording [T.W.])

- (*) If my parents don't meet, then they don't get married.
- If they don't get married, they didn't have me.
- If they didn't have me, then I didn't travel back in time.
- If I didn't travel back in time, then I didn't prevent them from meeting.
- If I didn't prevent them from meeting, then they got married.
- If they got married, then they had me.
- If they had me, then I traveled back in time so they wouldn't meet... (and go back to the *)

FORM B (with logical operands and predicates):

- Let's my parents be Mr.X and Mrs.Y.
- If {I can travel back in time} then {I can go back to the time when Mr. X and Miss Y were young} AND {avoid them from meet each other}.
- If NOT{Mr X and Miss Y meet each other} then NOT {they will be married}
- If NOT{ Mr X and Miss Y get married} then NOT {I am born.}
- I NOT {I am born.} then NOT {I will travel back in time}..