

Programming with C++

COMP2011: Examples on C++ Basics and Controls

Cecia Chan
Brian Mak
Dimitris Papadopoulos
Pedro Sander
Charles Zhang

Department of Computer Science & Engineering
The Hong Kong University of Science and Technology
Hong Kong SAR, China



Part I

Guess The Number



Game Description

- The game program picks a random number in the range of 1 to 100.
- Two players take turns to guess the number.
- After each guess, the program should tell the player if the number is correct, larger than or smaller than their guessed number.
- Whoever first guesses correctly wins the game.

Typical Output

Player 1, please enter your guess:

15

Sorry, the number is smaller than 15

Player 2, please enter your guess:

9

Sorry, the number is bigger than 9

Player 1, please enter your guess:

10

Player 1, you win!!!

Program Requirement

- Validate that a guessed number is in the range set by the program.
 - request a player to enter again until the input is valid.
- Determine if a guess is correct.
- Give suitable feedback to the players.
- Keep running until a guess is correct.

Part II

Draw an Isosceles Right-Angled Triangles (RATs)



Draw Triangles

- Design a program that prints some isosceles right-angled triangles (RAT), and allows users to set their size.

- A RAT that has a size of 4 looks like this:

```
*  
**  
***  
****
```

- Furthermore, try the following variations:

Fat RAT	Hollow RAT	Upside-down RAT
<pre>* *** ***** ***** *****</pre>	<pre>* ** * * * * *****</pre>	<pre>***** ***** *** ** *</pre>

A Row of RATs

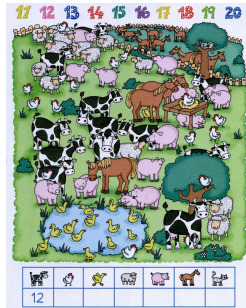
Now try this:

```
*      *      *      *      *      *      *      *      *      *
**     **     **     **     **     **     **     **     **     **
***    ***    ***    ***    ***    ***    ***    ***    ***    ***
***** ***** ***** ***** ***** ***** ***** ***** *****
*****
```

You'll need to measure the width of your screen first.

Part III

Count Animals



The Count Animals Problem

- There are two types of animals, pigs and sheeps in a farm.
- Each pig weighs 4.5 units and each sheep weighs 3 units.
- The total weight of animals in a barn should be exactly 36 units.
- List out all possible combinations of pigs and sheeps in the farm.

Solution:

$$0 * 4.5 + 12 * 3 = 36$$

$$2 * 4.5 + 9 * 3 = 36$$

$$4 * 4.5 + 6 * 3 = 36$$

$$6 * 4.5 + 3 * 3 = 36$$

$$8 * 4.5 + 0 * 3 = 36$$

Part IV

GPA Calculator



- Assume the following letter grade to grade point conversion:

Letter Grade	Grade Point
A	4.0
B	3.0
C	2.0
D	1.0
F	0.0

- Design a program that calculates a student's GPA (grade point average).

Typical Output

```
No.  of credits of your course (0 to stop):  3
Your letter grade (A, B, C, D or F):  A
No.  of credits of your course (0 to stop):  4
Your letter grade (A, B, C, D or F):  B
No.  of credits of your course (0 to stop):  2
Your letter grade (A, B, C, D or F):  E
Invalid input, please enter your grade again!
No.  of credits of your course (0 to stop):  2
Your letter grade (A, B, C, D or F):  D
No.  of credits of your course (0 to stop):  0
You have taken a total of 9 credits ...
and your GPA is 2.88889
```

Program Requirements

- A student first enters the number of credits of his/her course.
- The program stops if the number of credits is ≤ 0 .
- The student then enters the letter grade A, B, C, D or F.
- Invalid letter grades are ignored and the student is prompted to re-enter the grade.
- The program shall calculate the total number of credits earned by the student and his/her GPA according to the following formula:

$$\frac{\sum_{i=1}^n (grade_i * credit_i)}{\sum_{i=1}^n credit_i}$$