Programming with C++

COMP2011: Examples on C++ Basics and Controls

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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

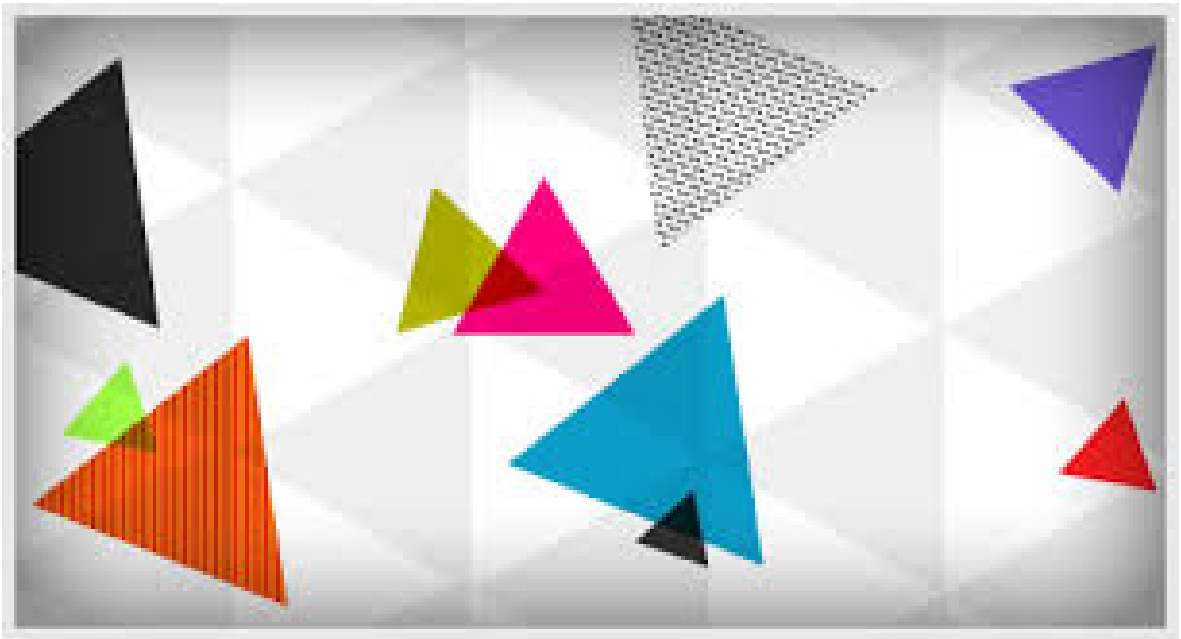
```
Player 1, please enter your guess:
15
Sorry, the number is smaller than 15
Player 2, please enter your guess:
9
Sorry, the number is bigger than 9
Player 1, please enter your guess:
10
Player 1, you win!!!
```

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:

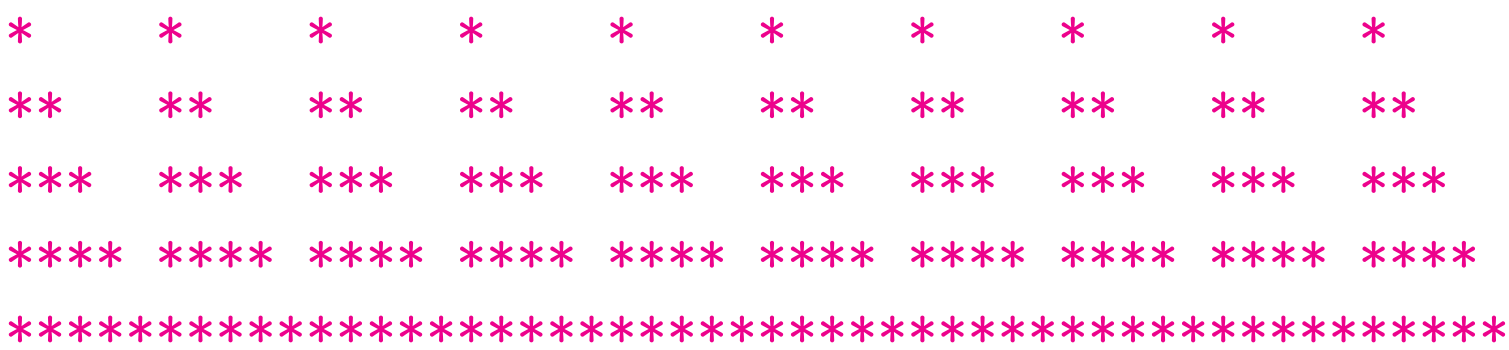
```
*
**
***
****
```

- Furthermore, try the following variations:

Fat RAT	Hollow RAT	Upside-down RAT
*	*	*****
***	**	****
*****	* *	***
*******	* *	**
*********	*****	*

A Row of RATs

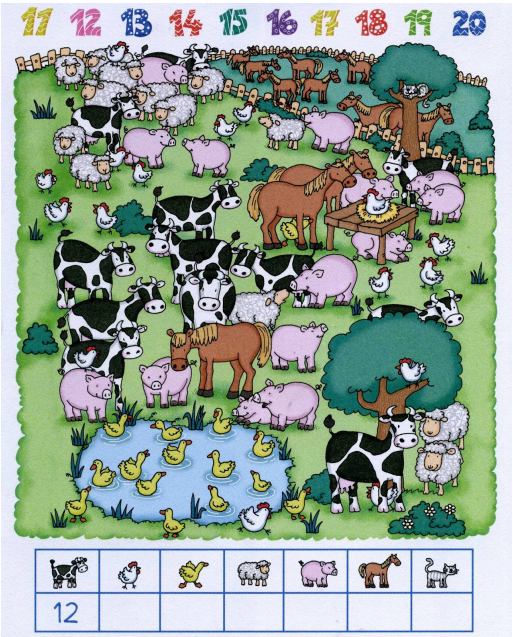
Now try this:



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 bigs and sheeps in the farm.

Solution:

$$
\begin{aligned}
0 * 4.5 + 12 * 3 &= 36 \\
2 * 4.5 + \ 9 * 3 &= 36 \\
4 * 4.5 + \ 6 * 3 &= 36 \\
6 * 4.5 + \ 3 * 3 &= 36 \\
8 * 4.5 + \ 0 * 3 &= 36
\end{aligned}
$$

Part IV

GPA Calculator

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:

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