The Heritage Computer Challenge 1999 Heritage High School Newport News, Virginia Visual Basic Division



Welcome

Welcome to the Heritage Computer Challenge for 1999! You are to be commended for taking the time and making the effort to be here today. Have a great time and may all your programming efforts be successful!

~Mr. Charles F. Monroe, Contest Director

Instructions

The problems for this contest appear on the following pages, listed in order of difficulty. The maximum number of points you can earn is indicated under the title to each problem.

Problems are designed in the format used by The Great Computer Challenge, held annually each Spring at Old Dominion University. Some of these problems were actually used at the Great Computer Challenge in previous years.

Because Great Computer Challenge Problems are designed for all versions of Basic, including those that are only text based, most or all of these problems will also follow that format. You will therefore be required to simulate a text-based environment even though Visual Basic is primarily graphical.

For problems that require user input, you may use any combination of Visual Basic controls, including but not limited to text boxes, input boxes, check boxes and radio buttons.

Unless otherwise instructed, all output should appear in a Picture Box or a Text Box control placed on your form. The font should be set to "Courier New" so that output of text can be fixed width. Text Boxes should be multi-line with scrollbars. Queries such as "Play again? (Y/N)" or "Repeat program? (Y/N)" should be simulated using buttons.

Solutions should be saved as a project on your personal drive K in a folder whose name is IDENTICAL to the project file name (minus the extension .vbp). Form file names are up to you.



Three Sailors and a Monkey (10 points)

Save in folder named: Sailors

Three sailors, shipwrecked with a monkey on a desert island, have gathered on one day a pile of coconuts that are to be divided early the next day. Sometime during the night, one sailor arises, divides the pile into three equal parts, and finds one coconut left over, which he gives to the monkey. He then hides his share, and returns the remaining coconuts to a single pile. Later during the same night, each of the other two sailors arises separately and repeats the performance of the first sailor. In the morning all three sailors arise, divide the pile into three equal shares, and find one coconut left over, which they give to the monkey.

Write a program in BASIC that will compute how many coconuts were in the original pile. Since there is more than one correct answer, the program should consider all coconut piles in the range of 1 to 1000. The output should be displayed on the screen and consist of the following:

a. The number of coconuts in the original pile.b. The number of coconuts after each sailor removes a third.

One correct answer is 79 and may be used to check the correctness of the program. Output for this pile could look like the following:

Coconuts in the original pile79Coconuts after the first sailor52Coconuts after the second sailor34Coconuts after the third sailor22



Pyramid of Letters (20 points)

Save in folder named: Pyramid

The Pyramid is a structure found in many cultures. This shape is often associated with supernatural power. You are asked to write a program that accepts a single character from "A" through "Z" and produces an output in the shape of a pyramid composed of the letters up to and including the letter that was input. The top letter in the pyramid should be an "A" and on each level, the next letter in the alphabet should fall between the letter that was introduced in the level above it.

EXAMPLE: (bolded values denote user input)

Please enter the letter of choice:

Е

Your pyramid is as follows:

A ABA ABCBA ABCDCBA ABCDEDCBA

Are there more letters? Enter Yes or No



Pirate Lafitte (20 points)

Save in folder named: Pirate

The year is 1811 and the fame of the pirate Lafitte has spread throughout the islands of the Caribbean and the Gulf. In Havana, there resides a wealthy soldier of fortune, Captain Hawkbill, who owns a fast gunship and can hire a large crew of tough sailors. He reasons that he can make a fortune if he can capture Lafitte and take his loot. His enterprise would bring him both fortune and favor because Lafitte is universally hated by honest, law-abiding people.

The Captain sails his ship into the Gulf of Mexico to a point 5 nautical miles north and 5 nautical miles east of Cuba. Then, from his position he sees Lafitte's ship 5 nautical miles due west. Fortunately for Hawkbill, Lafitte's ship is sailing straight south toward Cuba. Hawkbill gives chase immediately and orders his crew to sail at top speed directly at Lafitte's ship.

Write a program that will ask for the speed of each of the two vessels to be entered. Compute each ship's position at 1 minute intervals in terms of nautical miles north and east of Cuba. Assume that the case is ended if Lafitte reaches Cuba or is overtaken by Captain Hawkbill. Graphically display the chase in a format similar to the following:

L H L H L H L H L H L H

Η

CUBA

The program should accept any speeds between 1 and 15 knots. (A knot is one nautical mile per hour.) Note: The chase is over if Hawkbill's ship sails west of CUBA.

Multibase Adder (30 points)



Save in folder named: Adder

Write a program that can add two numbers presented by the user in any different base and display the sum of the two numbers in any other base. Here is a sample dialog that shows how the program should work (the user inputs are in **bold**):

Welcome to the Multibase Adder

What is the base of the first number (2-16)? 16

What is the first number in base 16? 3C

What is the base of the second number (2-16)? ${f 3}$

What is the second number in base 3? 1102

What base should be used for the sum? 11

The answer in base 11 is 8A

Would you like to add two more numbers (Y/N)?

Here are the rules regarding the program:

- 1) The bases (expressed in decimal) are from 2 through 16.
- 2) The user inputs must be valid in the base that the user chooses. The digits A, B, C, D, E, and F must be used for digits 10, 11, etc., when the base is higher than 10.
- 3) The decimal value of any input number cannot exceed 10000 (base 10). The sums, consequently, will never exceed 20000 (base 10). For example, if base 16 is chosen, the corresponding input can't be 9000.
- As soon as the user inputs an invalid base or invalid number, according to the rules above, the program should display a helpful message and allow the user to re-input the wrong data.