The Heritage Computer Challenge
2008
Heritage High School
Newport News, Virginia
Visual Basic Division

Welcome

Welcome to the Heritage Computer Challenge for 2008! 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, radio buttons, and combo boxes.

Solutions should be named and saved in folders on your personal drive K as indicated under each project title.

Problem List

Wind Chill	10 points
What the Hex	10 points
Three Sailors and a Monkey	20 points
Drag and Release	30 points

Wind Chill
(10 points)

Solution name: WindChill

In the winter time, when it's cold outside, the weather forecaster on television tells us the temperature outside in two ways. First, we get the actual temperature. Second, we get the "wind chill", which is a measure of how cold the air feels to human skin.

The National Weather Service currently uses a special formula to calculate wind chill. It is:

$$W = 35.74 + 0.6215T - 35.75V^{0.16} + 0.4275TV^{0.16}$$

where T is the actual temperature in Fahrenheit,

V is wind speed in miles per hour,

and W is the wind chill.

Write a Visual Basic program that allows the user to type the temperature and wind speed into two text boxes. When the user clicks a button labeled "Calculate Wind Chill", the wind chill is displayed below the button using a label.

People don't care about fractions of degrees, so your wind chill value should be rounded to the nearest whole number.

Here is some sample data so you can check your answers.

| Temperature	Wind Speed	Wind Chill
32	15	22
45	25	36
25	20	11
0	5	-11

What the Hex
(10 points)

Solution name: WhatTheHex

The common number system used in most of the world today is the decimal, or base 10, number system. Each position represents a power of 10. Beginning on the right, the powers are 0, then 1, then 2, and so forth. This results in powers of 1, 10, 100, 1000, and so forth. The 10 digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

You live in the era of computers. Computers use binary which is easily represented using the hexadecimal, or base 16, number system. School children around the world are being taught to count in hexadecimal. In hexadecimal, each position represents a power of 16. Beginning on the right, the powers are 0, then 1, then 2, and so forth. This results in powers of 1, 16, 256, 4096, and so forth. The 16 digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

Your job as programmer is to write a Visual Basic program that will convert decimal numbers to hexadecimal numbers. Your program is to be a prototype and will therefore be limited to positive whole numbers only. It should reject invalid integers as well as negative integers.

Here are some screen shots of a sample program.
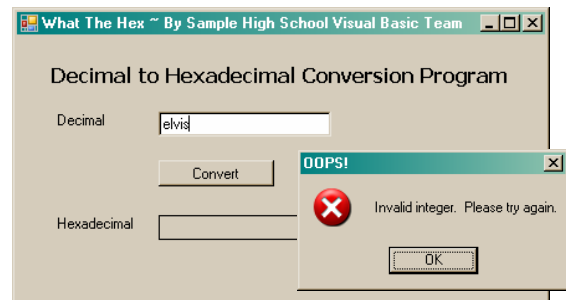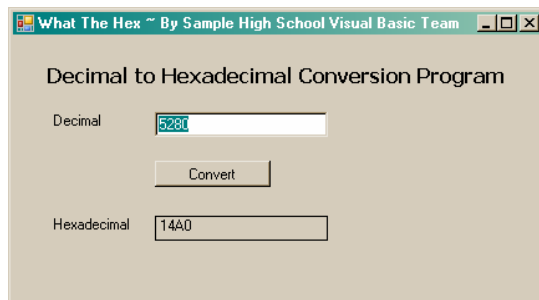
Three Sailors and a Monkey
(20 points)

Solution name: 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 Visual 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 in a text box (multiline=true) with scrollbars so we can scroll down and see all of your solutions, 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.

There is no input to this problem. Here is a sample showing the first three solutions. There are many more, of course.
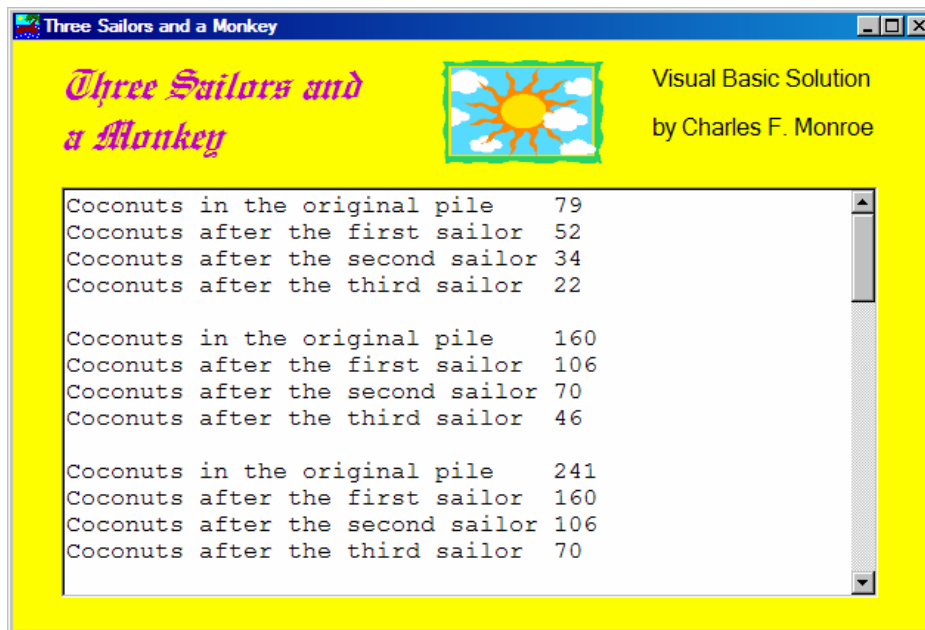
Drag and Release
(30 points)

Solution name: DragRelease

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Write a program that allows the user to select between two shapes—circle or
rectangle--and five colors.  (Use option buttons or combo boxes—your choice.)

Then when the user presses the left mouse button, drags the mouse, and
releases the left mouse button the selected shape is drawn on the form in the
selected color.

If the shape is a rectangle, the locations where the mouse button was pressed
and then released should be opposite corners of the rectangle.

If the shape is a circle, the center of the circle should be the location
where the left mouse button went down and the location where the left mouse
button was released should be one of the points on the circle.

Sample run:
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