

Heritage High School Newport News, Virginia

Welcome

Welcome to the Heritage Computer Challenge for 2010! 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.

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—unless the problem states otherwise.

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



Problem List

Wind Chill Quadrant Quest The Game of Nim Drag and Release 10 points 10 points 20 points 30 points



Quadrant Quest (10 points)

Solution name: QuandrantQuest

An angle of rotation (using degrees) in standard position in the coordinate plane may have any measure, positive, negative or zero.

Have the user input an angle between -360 and 360 degrees inclusive, integers only. Invalid values should be rejected.

Determine in which quadrant the terminal side of an angle

with the given measure lies or, if the terminal side lies on an axis, which part of which axis (positive x axis, negative y axis, etc.).

Display the result in a label.





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 |



The Game of Nim (simplified) (20 points)

Solution name: Nim

The traditional game of Nim is played in the following manner:

In the original game, there are three to five rows of stones each with one to seven stones. But for this problem we will use exactly three rows each with five stones arranged as shown:



Let A and B be the two players. The players play according to the rules below:

- A. The game begins by first deciding which of two ways (called the "win option") a player will win:
 - 1. taking the last stone
 - 2. forcing the opponent to take the last stone (by leaving only one stone on the board)
- B. On any given turn only the objects from one row may be removed. There is no restriction on which row or on how many objects you may remove.
- C. You cannot skip a move or remove zero objects or remove more objects than there are remaining in the row.
- D. Opponents take turns removing objects until there are none left.

Create a program to play the game of Nim.

- It should begin provide a way for the user to select the win option to be used.
- At all times, the screen should display the win option and whose whose turn it is (Player A or Player B).
- After each play, the game display should be updated accordingly (removing stones from the right, keeping them left-justified as shown, and changing the number of stones in the right-most column).
- And when someone wins, a message box should announce who won.



Drag and Release (30 points)

Solution name: DragRelease

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:

