

The 5th Annual Newport News Computer Challenge Wednesday, March 1, 2006

Team Packet

Visual Basic Problems



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Some Like It Hot ~ 10 points

Slot Machine ~ 20 points

Maya Calendar ~ 30 points

Cross the Circles ~ 30 points



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Some Like It Hot! (10 points)



All you science whizzes out there are probably familiar with the Kelvin temperature scale, named after the British mathematician and engineer William Thomson Kelvin, who proposed it in 1848.

The Kelvin temperature scale starts with 0 degrees at "absolute zero", the temperature at which molecular energy is at a minimum and below which no temperature exists. Kelvin degrees are the same size as Celsius degrees and 0 degrees Kelvin corresponds to -273.15 degrees Celsius, so that water freezes at 273.15 degrees Kelvin (0 degrees Celsius) and water boils at 373.15 degrees Kelvin (100 degrees Celsius).

But are you familiar with the Rankine temperature scale (named after the Scottish engineer and physicist William John Macquorn Rankine, who proposed it in 1859)? ("Rankine" is pronounced "RANK-in".)

The Rankine temperature scale begins with 0 degrees at "absolute zero" just like the Kelvin temperature scale, except that its degrees are the same size as Fahrenheit degrees. So 0 degrees Rankine corresponds to -459.67 degrees Fahrenheit, water freezes at 491.67 degrees Rankine (32 degrees Fahrenheit), and water boils at 671.67 degrees Rankine (212 degrees Fahrenheit).

Design a Visual Basic program that allows the user to type a Rankine temperature into a text box. When a button is clicked, the equivalent temperatures in Fahrenheit, Celsius, and Kelvin are displayed using one or more labels placed on the form.

Use the equivalencies provided in this problem to create your conversion formulas.

All calculated temperatures should be displayed rounded to the nearest one hundredth of a degree.

Your program should reject invalid input.

Information source: answer.com



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Slot Machine (20 points)

You are to design a slot machine. When the user clicks a button displaying the word "Roll", the program randomly selects and displays any combination of three images from a total of six images that you select from Visual Basic's Assorted Bitmaps*. A cumulative score is also displayed based on the rules below. Only selected images should be visible on your form.

One of the images (you decide) is the "loser". If that image appears, the player loses all money. (Be sure to indicate which image it is.)



Another of the images (you decide) is a "wild card". If that image appears, it can match with any other image except the "loser". (Be sure to indicate which image it is.)

Scoring is as follows:

loser is displayed - lose all money
2 matches - win \$10 (unless loser is displayed)
3 matches - Jackpot! win \$100 (can't be losers)
all else, roll again

* if these files have not been installed on your computer, they will be provided for you at the beginning of the contest.



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Maya Calendar (30 points)



The Maya civilization used a 365 day long year, called *Haab*, which had 19 months. Each of the first 18 months was 20 days long, and the names of the months were *pop*, *uo*, *zip*, *zotz*, *tzec*, *xul*, *yaxkin*, *mol*, *chen*, *yax*, *zac*, *ceh*, *mac*, *kankin*, *muan*, *pax*, *kayab*, *cumku*. Instead of having names, the days of the months were denoted by numbers starting from 0 to 19 (using their vigesimal, or base 20, numbering system). The last month of *Haab* was called *uayet* and had 5 days denoted by numbers 0, 1, 2, 3, 4. The Maya believed that this month was unlucky, the court of justice was not in session, the trade stopped, people did not even sweep the floor.

For religious purposes, the Maya used another calendar in which the year was called *Tzolkin* (holly year). The year was divided into thirteen periods, each 20 days long. Each day was denoted by a pair consisting of a number and the name of the day. They used 20 names: *imix, ik, akbal, kan, chicchan, kimi, manik, lamat, muluk, ok, chuwen, eb, ben, ix, mem, kib, kaban, etznab, kawac, ajaw* and 13 numbers; both in cycles.

Notice that each day has an unambiguous description. For example, at the beginning of the year the days were described as follows:

1 imix, 2 ik, 3 akbal, 4 kan, 5 chicchan, 6 kimi, 7 manik, 8 lamat, 9 muluk, 10 ok, 11 chuwen, 12 eb, 13 ben, 1 ix, 2 mem, 3 kib, 4 kaban, 5 etznab, 6 kawac, 7 ajaw, and again in the next period 8 imix, 9 ik, 10 akbal...

Years (both *Haab* and *Tzolkin*) were denoted by numbers 0, 1, ..., where the number 0 was the beginning of the world. Thus, the first day was:

Haab: 0 pop 0 Tzolkin: 1 imix 0 (Format: *NumericalDayOfTheMonth Month Year*) (Format: *Number NameOfTheDay Year*)

Write a program to convert any date in the *Haab* calendar up to and including the year 9999 to its corresponding date in the *Tzolkin* calendar. Your program should either prevent or reject invalid input.

Sample conversions:

Haab	Tzolkin
0 pop 0	1 imix 0
5 kayab 500	7 kimi 703
8 zip 27	11 kan 38
0 pop 2006	5 chuwen 2816

Haab	Tzolkin
0 pop 1	2 kimi 1
3 uayet 1001	13 muluk 1406
14 cumku 9999	6 ok 14038
5 uayet 20	invalid input



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Cross The Circles (30 points)



A blank form starts the program. It has a non-default icon and its caption contains both the name of the program and the author (team/school).

The user draws a series of circles on the form by left-clicking, dragging, and releasing. When the mouse goes down, that is the center of a circle. When the mouse comes back up, that is one point on the circle and the circle is immediately drawn.

If any two circles have at least one point in common, then we say the "cross" each other.

For each series of circles:

- 1) The first circle is drawn in black.
- 2) On each subsequent circle:
 - a) If the newly drawn circle crosses any previously drawn circle, its color is red. Otherwise, it is black.
 - b) All previously drawn circles crossed by the newly drawn circle turn green.
 - c) All previously drawn green circles not crossed by the newly drawn circle turn blue (so black circles remain black until crossed).
- 3) Right-clicking anywhere on the form erases all circles and begins a new series of circles.