The 6ᵗʰ Annual Newport News Computer Challenge

Wednesday, February 28, 2007

Team Packet

Java
Problems

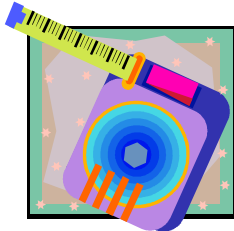**The 6th Annual Newport News Computer Challenge**

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Java Problems

Distance 3D ~ 10 points

The Chinese Animal Zodiac
      Year Problem ~ 10 points

The Chinese Animal Zodiac
      Age Problem ~ 20 points
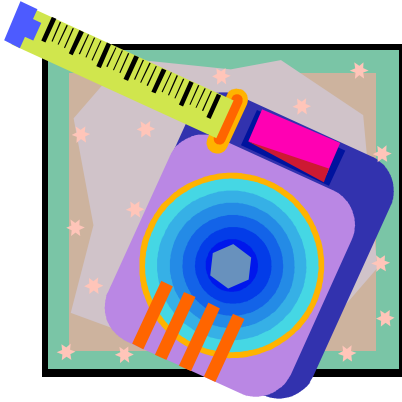   (possible 5 extra points)

Long Multiplication ~ 20 points
      (possible 5 extra points)

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Distance 3D (10 points)

Write a Java console program that calculates the distance between a pair of points on a three dimensional Cartesian coordinate system.

The distance *d* between two points, (*x*1,*y*1,*z*1) and (*x*2,*y*2,*z*2), on a three dimensional Cartesian coordinate system is

$$d = \sqrt{\left(x1-x2\right)^2 + \left(y1-y2\right)^2 + \left(z1-z2\right)^2}$$

Input Specification

Enter each of the six integer coordinates three per line. The first three integers represent the coordinates of one point on the coordinate system. The second three integers represent another point on the same system.

Output Specification

After entering the coordinates, output a line that says "The distance from (x,y,z) to (a,b,c) is d.ddd" where x,y,z,a,b, and c stand for the actual integers input by the user and d.ddd stands for the distance between those two points with three decimal places displayed (0's if needed) and rounded to the nearest thousandth.

Sample runs

```
Enter the three coordinates of the first  point: 0 0 0
Enter the three coordinates of the second point: 0 0 0
The distance from (0,0,0) to (0,0,0) is 0.000

Enter the three coordinates of the first  point: 1 -2 3
Enter the three coordinates of the second point: 1 -2 4
The distance from (1,-2,3) to (1,-2,4) is 1.000
```

(more sample runs on next page...)

```
Enter the three coordinates of the first  point: 1 2 3
Enter the three coordinates of the second point: 4 5 6
The distance from (1,2,3) to (4,5,6) is 5.196


Enter the three coordinates of the first  point: 18 22 72
Enter the three coordinates of the second point: -122 -144 99
The distance from (18,22,72) to (-122,-144,99) is 218.826
```
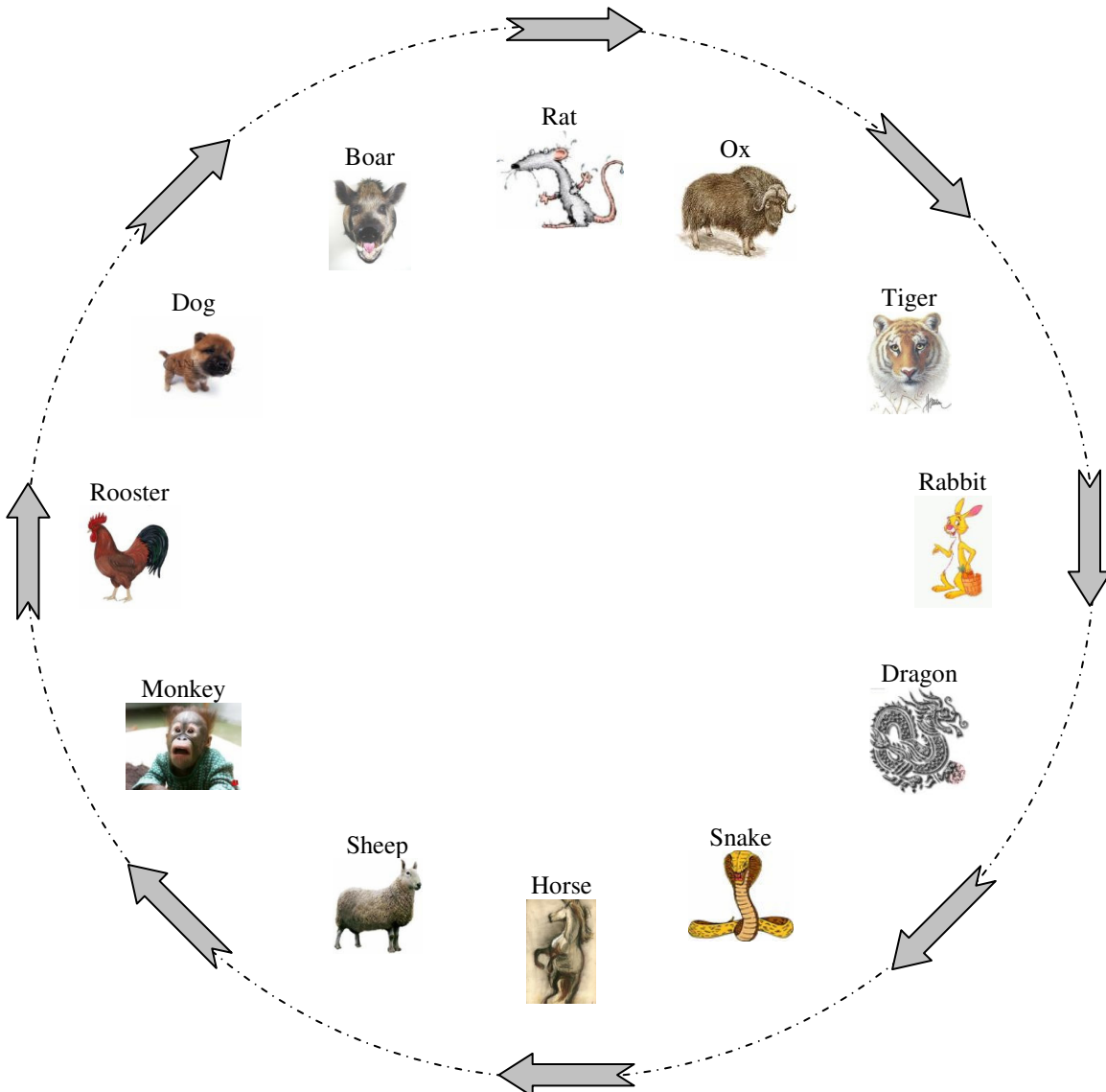
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The Chinese Animal Zodiac Year Problem (10 points)

In the Chinese Animal Zodiac calendar, the years, for which we use numbers, are designated by twelve animals, beginning with the Rat:

Years are called "Year of the Rat", "Year of the Ox", etc.

When the "Year of the Boar" is reached, the next year is "Year of the Rat" again and the cycle repeats.

Although the Chinese New Year falls on different days yearly, somewhere between late January and early February based on the cycles of the moon, for the purposes of this problem, we will assume that Chinese Animal Zodiac years correspond exactly to years on our Western calendar (so years begin on January 1).

1996 was "The Year of the Rat".

Write a Java program that allows the user to input a Western numerical year from 1500 to 2999 inclusive and then outputs the Chinese Animal Zodiac year in the format used in the sample run below. Use "was", "is", or "will be" properly. Replace "Sample" with your school's name.

Input repeats until a year outside the given range is entered.

Sample run:

```
Program to convert a Western Year
to a Chinese Animal Zodiac Year.
By the Java team from Sample High School.

Enter a year (1500-2999, any other year to quit): 1500
1500 was the Year of the Monkey
Enter a year (1500-2999, any other year to quit): 2006
2006 was the Year of the Dog
Enter a year (1500-2999, any other year to quit): 2007
2007 is the Year of the Boar
Enter a year (1500-2999, any other year to quit): 2008
2008 will be the Year of the Rat
Enter a year (1500-2999, any other year to quit): 2999
2999 will be the Year of the Sheep
Enter a year (1500-2999, any other year to quit): 3000
Press any key to continue . . .
```

P.S.—This problem calls for a console application. You get no extra points for using a GUI.

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The Chinese Animal Zodiac Age Problem (20 points)
(5 extra points for a GUI, see end for conditions)

This problem uses the same Chinese Animal Zodiac described in detail in the Chinese Animal Zodiac Year Problem.

The animal signs also serve a useful social function for finding out people's ages. Instead of asking directly how old a person is, people often ask what is his or her animal sign. This would place that person's age within a cycle of 12 years, and with a bit of common sense, we can deduce the exact age.

Given a person's age (under 100 years old) as one of these descriptions:

Description	Years Old
child	1 to 12 years old
teenager	13 to 19 years old
twenty-something	20 to 29 years old
thirty-something	30 to 39 years old
etc. through ninety-something	

and given the Chinese Animal Zodiac year in which the person was born and the current Chinese Animal Zodiac year, tell the person's exact age. Remember to include the fact that in China, when a baby is born, it is considered to be 1 year old.

Samples:
A "child" born in the "Year of the Ox" and it is now the "Year of the Dog" is 10 years old.
A "teenager" born in the "Year of the Ox" and it is now the "Year of the Rabbit" is 15 years old.
A "thirty-something" person born in the "Year of the Ox" and it is now the "Year of the Rat" is 36 years old.

Be careful! Some combinations are not possible. For example, if a teenager was born in the "Year of the Rat" and it is now the "Year of the Dog", the teenager could only be 11 or 23 and thus could not be a teenager according to our chart. In such cases, your program should report "Not Possible!".

A sample run is provided on the next page.

Sample run:

```
The Chinese Zodiac Age Problem.
By the Java team at Sample High School.

Age Descriptions:
0 – child                    1 to 12 years old.
1 – teenager                13 to 19 years old.
2 – twenty-something        20 to 29 years old.
3 – thirty-something        30 to 39 years old.
4 – forty-something         40 to 49 years old.
5 – fifty-something         50 to 59 years old.
6 – sixty-something         60 to 69 years old.
7 – seventy-something       70 to 79 years old.
8 – eighty-something        80 to 89 years old.
9 – ninety-something        90 to 99 years old.
Enter your age description. (0-9) 5
Chinese Animal Zodiac Years.
0 – Year of the Rat
1 – Year of the Ox
2 – Year of the Tiger
3 – Year of the Rabbit
4 – Year of the Dragon
5 – Year of the Snake
6 – Year of the Horse
7 – Year of the Sheep
8 – Year of the Monkey
9 – Year of the Rooster
10 – Year of the Dog
11 – Year of the Boar
Enter the Chinese Zodiac year in which you were born. (0-11) 10
Enter the current Chinese Zodiac year. (0-11) 2

A fifty-something person born in the Year of the Dog
and it is now the Year of the Tiger
is 53 years old.

Press any key to continue . . .
```

Wants 5 extra points? Solve this problem using a GUI interface with 3 combo boxes for user input of age description and Chinese zodiac years, and you may have them PROVIDED your program solves the problem correctly including detecting impossible combinations. And no partial credit either. In other words, if we find an error, you don't get any extra points for your GUI. Application or Applet— your choice.

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Long Multiplication (20 points)
(5 extra points for a GUI, see end for conditions)

Given two positive integers in either order, display the problem as long multiplication, each line correctly right-justified. The smaller integer should always be displayed as the multiplier. For example, to display 34 times 1024:

```
 1024          multiplicand
   34          multiplier
 ----
 4096          partial products
3072
-----
34816          product
```

To get maximum points: Partial products equaling zero should be omitted. If the multiplier is a single digit, no partial products should be displayed. The length of the first dashed line (if there) should equal the number of digits in the multiplicand or the first partial product, whichever is larger. The length of the dashed line over the product should equal the number of digits in the product. Input should continue until at least one zero is entered. Negative numbers should be rejected. Do not worry about other invalid input. Do not worry about overflow.

```
Long Multiplication.  By the Java team at Sample High School.
Please enter two positive integers to multiply, either one zero to quit.
-1 1234
Please enter two positive integers to multiply, either one zero to quit.
1234 23456

     23456
      1234
     -----
     93824
     70368
    46912
   23456
   --------
   28944704

Please enter two positive integers to multiply, either one zero to quit.
20304 102

     20304
       102
     -----
     40608
   20304
   -------
   2071008
```

```
Please enter two positive integers to multiply, either one zero to quit.
1234 3

   1234
      3
   ----
   3702

Please enter two positive integers to multiply, either one zero to quit.
0 5

Press any key to continue...
```

Wants 5 extra points?   Solve this problem using a GUI interface with 2 text fields for user input of the two positive integers and a text area (with a fixed-width font) to display the solution. The user should click a button to test the two numbers and calculate. If either number is invalid (0 or less), an appropriate pop-up message box should be displayed. Don't worry about quitting if it is zero. An exit button is also optional. Remember, you don't get any extra credit unless your program works perfectly, including detecting bad input (as described in the problem above). And no partial credit either. In other words, if we find an error, you don't get any extra points for your GUI. Application or Applet—your choice.

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Java – Ruberic for Teams

Distance 3D (10 points)

	Max Points

Correct input/prompt:
Prompts and inputs 3 integers on one line and three on another.
Sample:
`Enter the three coordinates of the first  point: 1 -2 3`
`Enter the three coordinates of the second point: 1 -2 4`
	1

Output line is correctly formatted:
"`The distance from (x,y,z) to (a,b,c) is d.ddd`"
• Attempts to echo input (1)
  Values for all six points are there, but not correctly formatted.
• Correctly echoes input (1)
  Values for all six points are there and correctly formatted up to and including the word "is":
  "`The distance from (x,y,z) to (a,b,c) is`"
• Formats distance correctly (1)
  Three decimal places rounded to the nearest thousandth, padded with zeros if needed.
	3

Correct distance	6
TOTAL	10

Chinese Animal Zodiac Year Problem (10 points)

	Max Points
Heading displays program name and team name.	1
Correctly prompts user to enter a year from 1500 to 2999, any other year to quit.	1
Displays the correct answer for any valid western year. ("Rat", "Ox", etc.)	5
Displays the correct answer correctly formatted regardless of "was", "is", or "will be".	1
Displays the correct answer correctly formatted including "was", "is", or "will be".	1
If displays a correct answer for years in range, quits if any other year is entered.	1
TOTAL	10

Chinese Animal Zodiac Age Problem (20 points) Ruberic for Console Application

	Max Points
Heading displays program name and team name.	1
Displays the list of Age Descriptions.	1
Prompts for and accepts input for the Age Description.*	1
Displays the Chinese Animal Zodiac Years.	1
Prompts for and accepts input for the Chinese Animal Zodiac year of birth.*	1
Prompts for and accepts input for the current Chinese Animal Zodiac year.*	1
Calculates and displays the correct numerical age.	10
Calculates and displays the correct numerical age with correct echoing of input such as in the sample run.	2
Correctly detects impossible combinations and displays "Not Possible!"	2
TOTAL	20

* May use other methods of input besides input by numbers but the prompts must be very clear and user-friendly.

Chinese Animal Zodiac Age Problem (25 points) Ruberic for GUI Application

	Max Points
Displays program name and team name.	1
Combo box with list of Age Descriptions allows user to select an age description.	2
Combo box with Chinese Animal Zodiac Years (listed by animal name) allows user to select year of birth.	2
Combo box with Chinese Animal Zodiac Years (listed by animal name) allows user to select current year.	2
All three combo boxes appropriately labeled.	1
Calculates and displays the correct numerical age.	10
Correctly detects impossible combinations and displays "Not Possible!"	2
If solves the problem correctly including detecting impossible combinations, credit for GUI (no partial credit).	5
TOTAL	25

Long Multiplication (20 points) Ruberic for Console Application

	Max Points
Heading displays program name and team name.	1
Prompts for two positive integers, either one zero to quit.	1
Re-prompts if either integer is negative.	1
Quits if either integer is zero (provided it doesn't quit for other values).	1
Redisplays multiplicand and multiplier correctly formatted, right-justified, larger on top, with line of dashes drawn underneath. (Correctly right-justifying all three lines sets the right margin by which all other subsequent alignment is determined. If this margin is not correct, all alignment/indention points below are lost.)	1
Correctly displays all partial products on each line below.	5
Correctly displays all partial products on each line below, correctly indented from the right margin set previously.	4
Correctly draws a line of dashes and displays the product underneath the partial products.	2
Correctly draws a line of dashes and displays the product underneath the partial products, right-justified using the right margin set previously.	2
Partial products equaling zero are omitted.	1
If the multiplier is a single digit, no partial product is displayed and only one line of dashes is drawn.	1
TOTAL	20

Long Multiplication (25 points) – Ruberic for GUI Application

	Max Points
Displays program name and team name.	1
Two correctly labeled text fields allow user to input integers to be multiplied.	1
If either integer is 0 or less, an appropriate pop-up message box is displayed.	2
Otherwise, the solution is displayed in a text area as follows:	
Redisplays multiplicand and multiplier correctly formatted, right-justified, larger on top, with line of dashes drawn underneath. (Correctly right-justifying all three lines sets the right margin by which all other subsequent alignment is determined. If this margin is not correct, all alignment/indention points below are lost.)	1
Correctly displays all partial products on each line below.	5
Correctly displays all partial products on each line below, correctly indented from the right margin set previously.	4
Correctly draws a line of dashes and displays the product underneath the partial products.	2
Correctly draws a line of dashes and displays the product underneath the partial products, right-justified using the right margin set previously.	2
Partial products equaling zero are omitted.	1
If the multiplier is a single digit, no partial product is displayed and only one line of dashes is drawn.	1
If all solutions are fully correct, credit for using GUI (no partial credit).	5
TOTAL	25