

The 7<sup>th</sup> Annual Newport News Computer Challenge Wednesday, March 5, 2008

# **Team Packet**

# Java Problems



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## Java Problems



The Chinese Animal Zodiac Year Problem ~ 10 points



Freddie's Chair ~ 20 points

The Chinese Animal Zodiac Age Problem ~ 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, (x1,y1,z1) and (x2,y2,z2), on a three dimensional Cartesian coordinate system is

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

# **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



## 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.

Java ~ Newport News Computer Challenge 2008 Page 1 of 2 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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## Freddie's Chair (20 points)

On certain days in Freddie's math class when too many students were absent due to SOL testing, Mrs. Magillicuddy would have the students who were left in class play a game she called "Chair Elimination".

The game of "Chair Elimination" works like this: The center of the room is cleared and students arrange their chairs in a circle in the center of the room, one for each student participating in the game, all chairs facing inward with nobody sitting in the chairs. Chairs are numbered in a clockwise direction starting with one and ending with the number of chairs.

The game leader (in this case, Mrs. Magillicuddy) randomly picks two numbers. The first number, called the "starter number", is a number of one of the chairs. The second number, called the "elimination number", is a number between 3 and 100 inclusive.

The game leader announces the two numbers and students are then told, "Ladies and gentlemen, have a seat," at which point everyone scrambles for a chair. The person who ends up in the chair whose number is the "starter number" is called the "starter".

Beginning with the "starter", students count aloud and clockwise around the circle. The "starter" says "one", the person to the immediate left of the "starter" says "two", the person to the immediate left of the person who said "two" says "three", and so forth. When some unfortunate student says the "elimination number", that student must get up, pick up his or her chair, and leave the circle. Chairs are scooted inward slightly to tighten up the circle again. The person who was on the immediate left of the person who got eliminated becomes the new "starter" and the counting process begins with "one" again. When all persons except one have been eliminated, the last remaining person becomes the winner.

Mrs. Magillicuddy always had plenty of great prizes for winners in this game such as pencils, pens, candy bars, and sometimes even a shiny new Susan B. Anthony silver dollar. But one day everyone realized that Freddie was winning almost all the time so Mrs. Magillicuddy said they couldn't play "Chair Elimination" anymore and that they had to do worksheets instead. What nobody realized was that Freddie had a programmable earring into which he could enter the number of chairs, the "starter number", and the "elimination number" and then calculate the number of the chair that would win. He would then quickly make his best effort to sit in that chair before anyone else.

Your job is to write the program that Freddie used to win. Please reject invalid input and only output the winning chair.

Samples: 10 chairs, starter number 4, elimination number 5 The eliminated chairs in order of elimination are 8 3 9 5 2 1 4 7 10 and the winning chair is 6. You may receive up to 15 points for a program that runs correctly as specified and an additional 5 points (for a total of 20 points) if your program uses a GUI.

15 chairs, starter number 9, elimination number 17

The eliminated chairs in order of elimination are 10 13 2 7 15 9 6 8 14 11 1 3 5 12 and the winning chair is 4.

Java ~ Newport News Computer Challenge 2008 Freddie's Chair ~ Page 1 of 1



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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:

	1
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 3 - thirty-something 20 to 29 years old. 30 to 39 years old. 4 - forty-something 40 to 49 years old. 5 - fifty-something 50 to 59 years old. 6 - sixty-something 7 - seventy-something 60 to 69 years old. 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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#### 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 $$	
Enter the three coordinates of the second point: 1 –2 4 $$	
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	3
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.	
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

#### Freddie's Chair (20 points)

	Max Points
Heading displays program name.	1
Prompts for number of chairs.	1
Rejects invalid number of chairs (1 or less).	1
Prompts for starter number.	1
Rejects invalid starter numbers (0 or less, greater than number of chairs).	1
Prompts for elimination number.	1
Rejects invalid elimination numbers (out of range of 3 to 100 inclusive).	1
Accepts all three valid numbers without crashing.	1
Displays winning chair	
for all four samples below, 6 points	6
for at least two samples below, 3 points	
Follows directions by only outputting the winning chair and not displaying the list of eliminated chairs. (No points	1
unless at least two samples display the winning chair.)	1
Uses GUI	5
TOTAL	20

#### 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