A+ Computer Science
January 2013 –Packet 2
Computer Science Competition
Hands-On Programming Set

I.   General Notes

1. Do the problems in any order you like. They do not have to be done in order from 1 to 12.

2. All problems have a value of 60 points.

3. There is no extraneous input. All input is exactly as specified in the problem. Unless specified by the problem, integer inputs will not have leading zeros. Unless otherwise specified, your program should read to the end of file.

4. Your program should not print extraneous output. Follow the form exactly as given in the problem.

5. A penalty of 5 points will be assessed each time that an incorrect solution is submitted. This penalty will only be assessed if a solution is ultimately judged as correct.

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Number	Name
Problem 1	Killer Bunny
Problem 2	Knights Who Say Ni
Problem 3	The Quest For The Holy Grail
Problem 4	Bring Out Yer Dead!
Problem 5	The Bridge Of Death
Problem 6	The French
Problem 7	Witch!
Problem 8	The Black Knight
Problem 9	Fetch Me A Shrubbery!
Problem 10	Where Is It?
Problem 11	The Hour Is Upon Us
Problem 12	One…two…five!

Good luck!

1. Killer Bunny

Program Name: KillerBunny.java   Input File: none

Write a program to output the image below.

Input
There is no input for this problem

Output
Output the 20x25 character bunny as shown below.

Example Input File
```
No input
```

Example Output To Screen

```
6666666666666666666666666
6666666666/|666666__66666
666666666/ |666,-~ /66666
66666666Y :|66// /666666
66666666|  |6/( .^6666666
66666666>-"~"-v/666666666
6666666/      Y666666666
666666jo  o   |666666666
66666( ~T~    j666666666
666666>.'-`  _./6666666666
66666/   "~"  |6666666666
6666Y     _,  |6666666666
666/| ;-"~ _  l6666666666
66/ l/ ,-"~    \666666666
66\//\/      .- \66666666
666Y       /   Y*666666
666l       I    !6666666
666]\      _\   /"\66666
66(" ~----( ~   Y.  )6666
6666666666666666666666666
```

2. Knights Who Say Ni

Program Name: Knights.java   Input File: knights.dat

In order to remain members of The Knights Who Say Ni, each knight must say Ni at least 17 times in any social engagement. However, their clan has grown so large, that they are now having trouble recognizing who is actually from The Knights Who Say Ni and who are just fans of The Knights Who Say Ni. The Knights Who Say Ni would like you to help them recognize their fellow members from their fans.

Input
An integer N representing the number of data sets to follow. The string before the ':' represents the person's speaking name. The string after the ':' is what they are saying in conversation. All conversations will be separated by a '-'.

Output
If the person throughout the entire conversation says 'Ni' 17 or more times, output '*name* is a member of the Knights Who Say Ni'. If they say Ni more than once but less than 17 times, output '*name* is a fan of Knights Who Say Ni'. If they say Ni zero times, output '*name* does not say 'Ni'. Output should be in alphabetical order by name.

Assumptions
No Knight will say 'Ni' greater than $2^{32} - 1$ times in a conversation. To count, the word 'ni' must be said. The word Senile doesn't count as saying the word Ni just because Ni occurs within it. Names will not have spaces.

Example Input File
```
3
Ben: Ni, ni, Ni, You know that can't be right, George.
George: Yes, but I see no flaw! Ni!
Ben: Ni, Ni, Ni, Ni, Ni, Nay good sir! Ni! Ni! Ni!
George: I'm right, quit arguing! Ni!
Ben: Never. Ni! Ni! Ni!
Jonnah: Why are you saying that? It's annoying!
Ben: Ni! Ni! Ni! Ni! We are the Knights Who Say Ni!
-
Jonnah: Whatever, loser. Go dwell in your forrest.
George: Don't make fun of my friend! Knights Who Say Ni are just fine!
Jonnah: Your mother was a hamster, and your father smelt of elderberries!
George: You take that back!!
Jonnah: You are just as good as them. Terrible.
-
Ben: Quit your bickering, Ni, Ni, Ni, Ni!
Jonnah: I have no time to deal with your nonsense, Ni-Boy.
Ben: You have insulted a Knight, Ni, you shall fetch me something of worth! Ni! Ni! Ni!
George: You show 'em what the Knights Who Say Ni are really about!!
Ben: Ni! Ni! I shall. The time has come where the Knights Who Say Ni will prevail! Ni! Ni! Ni!
Ni! Ni! Ni!
```
Example Output To Screen

```
Ben is a member of the Knights Who Say Ni.
George is a fan of Knights Who Say Ni.
Jonnah does not say Ni.

George is a fan of Knights Who Say Ni.
Jonnah does not say Ni.

Ben is a member of the Knights Who Say Ni.
George is a fan of Knights Who Say Ni.
Jonnah does not say Ni.
```

3. The Quest for the Holy Grail

Program Name: Quest.java   Input File: quest.dat

King Arthur is on a quest to find the Holy Grail. Obviously, he is having some trouble, and would like you to show him the path. However, there are some obstacles. King Arthur cannot traverse any location that is adjacent to a Killer Rabbit. He also cannot walk through canyons. All other spaces that are on the map can be traveled by King Arthur. Given a map with the location of the King Arthur, the obstacles, and the Holy Grail, show the shortest path to the grail with O's.

K – killer rabbit: King Arthur cannot walk here or any space adjacent
- canyon: King Arthur cannot walk here
. – empty space : King Arthur can walk here
A – King Arthur: King Arthur is currently standing here
H – the Holy Grail: King Arthur would like to be here.

Input
An integer N representing the number of data sets to follow and a 10x10 character matrix representing a map. Maps will be separated by a '-'

Output
A 10x10 character matrix of the map with the highlighted shortest path.

Assumptions
There will always be a Holy Grail and a King Arthur located on the map. There will always be a path to the Holy Grail. Adjacent is defined in this problem as the 4 characters surrounding K (neither King Arthur nor the Killer Rabbit can move diagonally). There can be multiple shortest paths, as long as it as one of the shortest, it is correct. Note, there may not always be a rabbit on the map.

Example Input File

```
2
..........
..A.......
..........
.....K..#.
........#.
######..#.
........#.
........#.
...H....#.
..........
_
......###.
..........
.###......
...#......
...#.....H
...#......
...K.#####
.........#
.#####...#
......A..#
```

Example Output To Screen

```
..........
..AOOOOO..
.......O..
.....K.O#.
......OO#.
######O.#.
...OOOO.#.
...O....#.
...H....#.
..........

......###.
OOOOOOOOOO
O###.....O
O..#.....O
O..#.....H
O..#......
O..K.#####
O........#
O#####...#
OOOOOOA..#
```

4. Bring Out Yer Dead!

Program Name: NotDead.java   Input File: notdead.dat

When John the Graver is asking to collect peoples' dead, sometimes people bring him people who aren't dead! Since he is in a rush, he wants you to write a program to check. If someone brings him a body and the body says 'I'm not dead yet!" reject the person, otherwise, keep them.

Input
An integer N representing the number of data sets to follow. A string of what the person says, if they do not say anything, this field will say "<nothing>".

Output
The string accepted is the body is accepted or rejected if the person is rejected.

Assumptions
The only thing a person can say is <nothing> or "I'm not dead yet!"

Example Input File
```
4
<nothing>
I'm not dead yet!
I'm not dead yet!
<nothing>
```

Example Output To Screen
```
Accepted
Rejected
Rejected
Accepted
```

5. The Bridge of Death

Program Name: Bridge.java   Input File: bridge.dat

If you do not know, when one is to cross the Bridge of Death, the must answer the Keeper, "these questions three." The Keeper gets to ask three questions, and if they do not know the answer, then they get launched into the pit. The traveler Sir Robin is up next. Your job is to write a program that will simulate in what scenarios Sir Robin will make it over the bridge. You will be given a dictionary for all of Sir Robin's knowledge. If the question asked of him by the Keeper is not in Sir Robin's dictionary, Sir Robin will be thrown into the pit. If all three questions are in Sir Robin knowledge, then Sir Robin will make it over the bridge.

Input
The first 50 lines will be the knowledge of Sir Robin, followed by an integer N representing the number of data sets to follow. Each data set will have 3 questions that the keeper asks Sir Robin.

Output
For each question, output the answer only if it is in Sir Robin's knowledge. If all three are answers are successfully output for each set of three questions, also output "Sir Robin can cross the bridge." At any point an answer is not in his knowledge, output "Sir Robin gets thrust into the pit." and proceed to the next set of questions. There should be a blank line between each output set.

Assumptions
Sir Robin will be the only traveler. Sir Robin's Knowledge will be of the form. "Question? Answer"

Example Input File
```
What is your name? Sir Robin
What is your favorite color? Red
What weighs the same as a duck? A witch
What is your quest? To seek the Holy Grail
Who is King of the Britons? Sir Arthur
Who keeps the Holy Hand Grenade? Brother Maynard
What is the frozen land? Nador
What is the surface are of a brick? 79cm squared
What does Karoke mean in Japanese? empty orchestra
How many hours a day do cats sleep? 16 - 18 hours
What is the fear of teeth? Odontophobia
Who is the bravest Knight of them all? Sir Robin
What is the most money ever paid for a cow in auction? 1.3 million pounds
Which king of cards does not have a mustache? The King of Hearts
What is the only mammal that can't jump? Elephants
What textile are the Austriallian $100 note made of? plastic
What percentage of atoms in your body are replaced every year? 98%
Which do you burn more calories at sleeping or watching tv? sleeping
What was the first product to have a barcode? Wrigley's Gum
Which season do children grow fastest in? Spring
At what number are the measurements of Celcius and Fahrenheit equal? -40
How many toothpicks can be created from a cord of wood? 7.5 million
What are the things at the end of shoelaces called? Aglets
What was the occupation of Charlie Brown's father? A barber.
What is stressed spelled backwards? Desserts
What is the name of the tone that American car horns are in? F
What 3 western names are most known in China? Jesus Christ, Richard Nixon, and Elvis Presley
Who was the fastest public speaker in the world? President Kennedy
What was a bagpipe made of in Middle Ages? Skin of sheep
Which car gets more miles per gallon, stick or automatic? Stick
How many sesame seeds on average are there on a McDonalds BigMac bun? 178
Who knows who built the Taj Mahal? No one
How far can a skunk spray? 10 feet
What family are Almonds a member of? Peach
What direction do bats turn when leaving a cave? left
How many eyelids do camels have? 3
What would Beethoven do when he sat to write music? pour water over his head
Which month in recorded history did not have a full moon? February 1865
```

```
What mammal has no vocal cords? Giraffes
What human bone is harder than concrete? Femur
Which side of a coin is more likely, heads or tails? tails
What country bans cheating on grades by law and jailtime? Bangledesh
Who invented scissors? Leonardo Di Vinci
What is Los Angeles's full name? El Pueblo de Nuestra Senora la Reina de los Angeles de
Porciuncula
What American State has a one syllable name? Maine
What color of tooth brush is preferred most? Blue
Is non-dairy creamer flammable? Yes
What percentage of bones are in your feet? 25%
How long does it take the average person to fall asleep? 7 minutes
How many times per day does the average human laugh? 15 times
2
What is the name of the tone that American car horns are in?
What 3 western names are most known in China? Jesus Christ, Richard Nixon, and Elvis Presley
What color of tooth brush is preferred most?
What is the capital of Assyria?
What percentage of bones are in your feet?
What human bone is harder than concrete?
```

Example Output To Screen
```
F.
Jesus Christ, Richard Nixon, and Elvis Presley.
Blue.
Sir Robin can cross the bridge.

25%.
Sir Robin gets thrust into the pit.
```
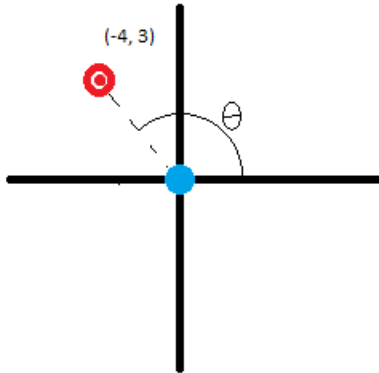
6. The French

Program Name: French.java   Input File: french.dat

The French are antagonizing King Arthur. They are trying to launch cannonballs at him. Consider the cannon to be a position (0,0) and King Arthur's position to be (x, y) in the coordinate plane, where x, y can be negative.

Sir Arthur is at the red target, the French at are the blue. Tell the French at what velocity (v) and angle (in degrees) to turn the cannon (**Θ**).

Given (x,y) and:

Φ (radians) = $\tan^{-1}\left(\frac{y}{x}\right)$

And

v = $\sqrt{r\,g}$

And

r = $\sqrt{x^2 + y^2}$

g = 9.81

And

Θ (degrees) = $\phi \times \frac{180}{\pi}$

Input
An integer N representing the number of data sets to follow. Each data set will have the x and y position of King Arthur. (in meters, they are French after all)

Output
The velocity (in meters per second) that the French need to fire the cannon and at what angle they should turn it to antagonize King Arthur (to 5 decimal places)

Assumptions
Angles below the x axis will be negative.
From physics, you may recognize that this model assumes the cannon is at a 45 degree angle to the ground, assume the cannon cannot move from this position.

Example Input File
```
3
-4 3.0
3 -4
0 15
```

Example Output To Screen
```
Velocity: 7.00357 m/s Angle: 143.13010 degrees
Velocity: 7.00357 m/s Angle: -53.13010 degrees
Velocity: 12.13054 m/s Angle: 90.00000 degrees
```

7. Witch!

Program Name: Witch.java   Input File: witch.dat

The villagers burn witches. Why do they burn? Because they are made of wood. How can you tell if they're made of wood? They float in water. What else floats in water? A Duck. So logically, if she weighs the same as a duck, she is a witch.

Given the weight of the duck and the weight of the woman, determine if she is a witch.

Input
An integer N representing the number of data sets to follow. Each data set will have the weight of the duck followed by the weight of the woman.

Output
The phrase, "WITCH!" if she's a witch and "NOT A WITCH!" if she's not.

Assumptions
None for this problem.

Example Input File
```
3
120.2 120.2
5.2 150.3
5.3 8.2
```

Example Output To Screen
```
WITCH!
NOT A WITCH!
NOT A WITCH!
```

8. The Black Knight

Program Name: Black.java   Input File: black.dat

The Black Knight fights with the strength of many men, 190 to be exact. When he fights a man at any given time he has 190 times the strength of that man. Calculate the Black Knights strength in various battles.

Input
An integer N representing the number of data sets to follow. Each data set will have the strength of the man the Black Knight is currently fighting.

Output
The strength of the Black Knight in the current battle.

Assumptions
Warning, the Black Knights strength may exceed 2^63 – 1.

Example Input File
```
3
5
25225252522
100000000000000000000000000000000000000000000000000000000000000000000000
```

Example Output To Screen
```
The Black Knight's strength is 950.
The Black Knight's strength is 4792797979180.
The Black Knight's strength is 1900000000000000000000000000000000000000
00000000000000000000000000000.
```

9. Fetch Me A Shrubbery!

Program Name: shrubbery.java   Input File: shrubbery.dat

The Knights Who Say Ni have asked Sir Arthur to fetch them a shrubbery. He has given many qualifications. The Head of the Knights Who Say Ni have asked for a shrubbery that looks nice, and is not too expensive, and is as large as possible. There are many, many shrubberies in the world, and Sir Arthur doesn't have time to browse all of them.

Given the database of shrubberies, sort them based upon Sir Arthurs Request.

Remember he wants the LARGEST size, the SMALLEST price, and the LARGEST nice value.

Input
An integer N representing the number of data sets to follow. Each data set will have an integer Q representing the number of shrubberies to follow. Each shrubbery listing will have a string name followed by an integer rating of niceness, a decimal price, and decimal representing volume. At the end of the Q lines will be either the word "NICE", "PRICE", "SIZE" based upon which ever Sir Arthur is requesting.

Output
The shrubberies, by name, in order specified by Sir Arthur.

Assumptions
Sir Arthur can only request for shrubberies by size, price, or nice-ness. The number of shrubberies will not exceed 100. Decimal numbers will have no more than 5 digits after the decimal. There should be an empty line between data sets.

Example Input File
```
6
3
Shrub1 4 5.0 7
Shrub2 5 6 6.2
Shrub3 1 7 5
SIZE
3
Shrub4 4 5 7
Shrub5 5 6 6
Shrub6 1 7 5
PRICE
3
Shrub7 4 5 7
Shrub8 5 6 6
Shrub9 1 7 5
NICE
```
Example Output To Screen
```
Shrub1
Shrub2
Shrub3

Shrub4
Shrub5
Shrub6

Shrub8
Shrub7
Shrub9
```

10. Where is it?

Program Name: Where.java   Input File: where.dat

The Assyrians know where the Holy Grail is, and they would like to tell King Arthur, but they cannot communicate in English. They would like you to help them write a translation to get from Assyrian to English so they can instruct Sir Arthur to the location of the Holy Grail.

To get from English to Assyrian, the first syllable must be replaced according to the following chart, then suffixed with 'ay'.

English:	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Assyrian:	V	U	W	T	X	R	Y	Q	Z	P	O	SH	N	M
English:	O	P	Q	R	S	T	U	V	W	X	Y	Z	SH	GR
Assyrian:	H	I	G	J	L	E	K	D	C	B	A	F	GR	S

Given words in Assyrian, translate them to English for King Arthur.

Input
A paragraph of text in Assyrian.

Output
The same paragraph of text in English.

Assumptions
Assyrians and Britons do not need punctuation.

Example Input File
```
RIRSTAY AOUAY NUSTAY YOAY EOAY EHEAY XDGEAY HFAY EHEAY XARTHAY CHEREAY EHEAY
QEAVENSAY NEETAY QELLAY VNDAY EURNAY SHEFTAY PESUSAY NUSTAY QAVEAY EAKENAY
EHEAY SAILAY CITHAY QIMAY HNAY QISAY POURNEYAY UACKAY ZFAY AOUAY LTARTAY
QEREAY AOUAY QEADAY MORTHAY RORAY NANYAY TAYSAY VNDAY NANYAY MIGHTSAY VNDAY
AOUAY CILLAY RINDAY  EHISAY ILACEAY VFTERAY EHISAY POURNEYAY CESTAY UECOMESAY
XASTAY VNDAY XASTAY
```

Example Output To Screen
```
FIRST YOU MUST GO TO THE EDGE OF THE EARTH WHERE THE HEAVENS MEET HELL AND
TURN LEFT JESUS MUST HAVE TAKEN THE GRAIL WITH HIM ON HIS JOURNEY BACK IF YOU
START HERE YOU HEAD NORTH FOR MANY DAYS AND MANY NIGHTS AND YOU WILL FIND
THIS PLACE AFTER THIS JOURNEY WEST BECOMES EAST AND EAST
```

11. The Hour is Upon Us

Program Name: Hour.java   Input File: hour.dat

The King and his Knights are beginning to get impatient in their quest. They have begun going to different psychics to request when they will find the Holy Grail. However, they only answer in a number of days. Help the King and the Knights interpret this by turning it into a date.

Input
An Integer N representing the number of data sets to follow. Each data set will have the date they ask the psychic followed by the number of days the psychic says they will find the Holy Grail.

Output
The day of the week and the date that they will find the Holy Grail. (according to the Psychic)

Assumptions
The psychic will not answer with a number greater than 2^31- 1

Example Input File
```
5
10/12/1993 1
12/31/1993 1
1/1/1001 30
2/1/523 1000000000
2/28/1000 1
```

Example Output To Screen
```
Wed 10/13/1993
Sat 1/1/1994
Fri 1/31/1001
Tue 2/5/2738430
Thu 2/29/1000
```

12. One… two… five!

Program Name: One.java   Input File: one.dat

King Arthur wasn't exemplary at counting, especially when it came to the Holy Hand Grenade. For every multiple of three, King Arthur will say five.

Show how King Arthur will count to a certain number, m, given m.

Input
An Integer N representing the number of data sets to follow. Each data set will have a number that King Arthur will be counting to.

Output
The numbers King Arthur will say.

Assumptions
You will not be given a number m greater than 2^32- 1

Example Input File
```
3
3
6
12
```

Example Output To Screen
```
1, 2, 5
1, 2, 5, 4, 5, 5
1, 2, 5, 4, 5, 5, 7, 8, 5, 10, 11, 5
```