



MODEL QUESTIONS FOR PRELIMS

1. You have heard of Hardy-Ramanujan numbers. They are the numbers that can be expressed as the sum of cubes of whole numbers in two different ways. The smallest among those is 1729, expressed as the sum of cubes of 1 and 12 and 9 and 10. There is an interesting story behind the origin of these numbers. The mathematical notation for the n th Hardy-Ramanujan number is ' $Ta(n)$ '. What does ' Ta ' stand for here?
2. I am a metal discovered in 1885, silvery greyish white in color. At room temperature during the summer season in Delhi, I am a liquid, but you cannot drink me. When you pour me onto a can of Coca-Cola, i melt through creating a hole, who am I?



3. 'Hans X' was widely recognized for his research in sedimentary transport and to honor his outstanding contribution to hydraulic engineering, the American society of civil engineers established the 'Hans X' award in 1988. Identify 'X' (**X is the father of Hans and a Nobel laureate**) You will get the same answer if you are finding the

connection between the following images.



4. X syndrome describes a woman in authority who treats subordinate females worse than males purely because of their gender. **X is an adult form of an insect, and von Frisch first described the unique mode of communication of these insects.** Recently many scientific studies showed electromagnetic radiation from mobile towers badly affects these insects' communication. What is X (X contains two words, the first word has five letters, and the second one has three letters)?
5. The unintuitive shape of this entity differs from the commonly assumed “perfect” shape due to a feature known as its eccentricity. **A 17th-century German polymath was the first to make predictions regarding this shape, refuting the predictions by another 16th-century Polish scientist.** Both were highly influential in early but fundamental scientific developments in their field in Western society. The actual shape helps account for interactions from other peripheral objects – the perfect shape would occur only if the interactions were one-pronged alone. What are we talking about? Also, identify both scientists.

Answers:

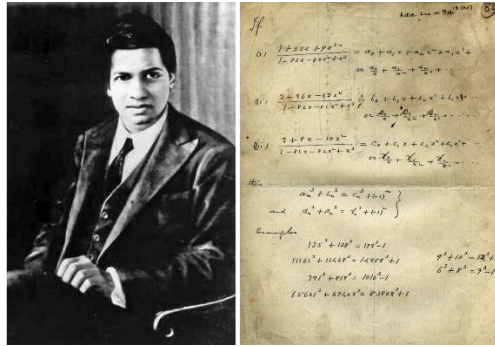
1. Taxicab numbers.

This is the story. The mathematical legend Srinivasa Ramanujan was in hospital in London. His friend and another mathematician G.H Hardy visited him.

Hardy: The number of the taxi I came here was not good. It is 1729.

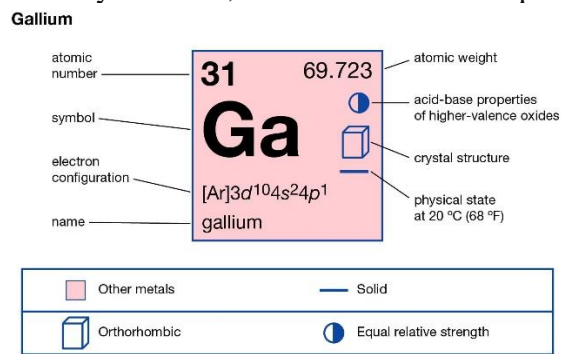
Ramanujan: No, it is a very special one. It is the lowest number can be expressed as the sum of the cubes of two different whole numbers in two ways.

Ramanujan said this very quickly when he heard the taxicab number 1729. Later these numbers are known as Hardy-Ramanujan numbers or Taxicab numbers.



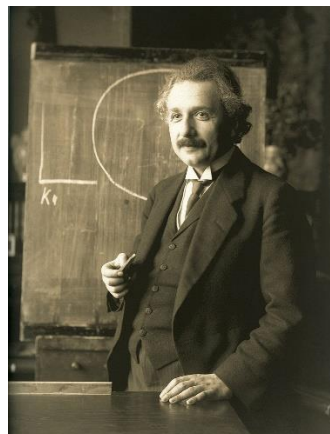
2. Gallium.

31st element of the periodic table. It has a melting point of 29.76 degree Celsius and if you try to take it in your hand, it will melt to form liquid state.



3. Albert Einstein.

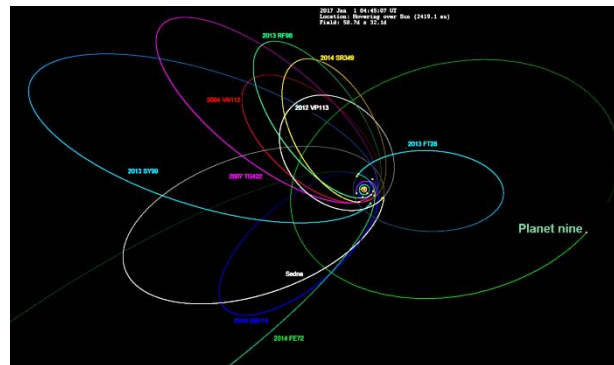
Hans Albert Einstein was the second son of Albert Einstein and you can see his gravestone in the first image. The second image shows the 99th element of periodic table, Einsteinium, named after Albert Einstein. The third image is of the famous Indian Physicist S.N Bose, and the Bose-Einstein condensate, the 5th state of matter is very famous.



4. Queen Bee Syndrome.

Queen bee syndrome is first defined by C. Tavriss, G.L Staines and T.E Jayaratne in 1973. Waggle dance is the figure eight dance of honey bee used for their communication. Read more about it if you are interested to know more.

5. Planetary orbits are elliptical rather than circular. Johann Kepler and Nicolaus Copernicus



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