Ancients Round: Answers

1a 550

1b 7/1000000

1c 24859.82 /4 967 = approx 5

2a fortune=plus; debt=minus

2b (1,3), (6,17), should I give bonuses for(35,99), (204,577), (1189,3363).... or take marks off for not reading the q properly???

3 16, 48

4 1^3 + 12^3 = 9^3 + 10^3

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Ancients Round: Info (from http://www-groups.dcs.st-and.ac.uk/~history/BiogIndex.html)

Aryabhata the Elder
Born: 476 in Kusumapura (now Patna), India
Died: 550 in India

Aryabhata gave an accurate approximation for pi. He wrote in the Aryabhatiya the following:-

"Add four to one hundred, multiply by eight and then add sixty-two thousand. the result is approximately the circumference of a circle of diameter twenty thousand. By this rule the relation of the circumference to diameter is given."

How accurate is this, in the form n/1000000 (where n is an integer)

This gives p = 62832/20000 = 3.1416 which is a surprisingly accurate value. In fact pi = 3.14159265 correct to 8 places. If obtaining a value this accurate is surprising, it is perhaps even more surprising that Aryabhata does not use his accurate value for pi but prefers to use v10 = 3.1622 in practice.

He gave the circumference of the earth as 4 967 yojanas and its diameter as 1 5811/24 yojanas. Since 1 yojana = 5 miles this gives the circumference as 24 835 miles, which is an excellent approximation to the currently accepted value of 24 902 miles. He believed that the apparent rotation of the heavens was due to the axial rotation of the Earth. This is a quite remarkable view of the nature of the solar system which later commentators could not bring themselves to follow and most changed the text to save Aryabhata from what they thought were stupid errors!

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Brahmagupta
Born: 598 in (possibly) Ujjain, India
Died: 670 in India

The product or quotient of two fortunes is one fortune.
The product or quotient of two debts is one fortune.
The product or quotient of a debt and a fortune is a debt.
The product or quotient of a fortune and a debt is a debt.

Brahmagupta also solves quadratic indeterminate equations of the type ax^2 + c = y^2 and

$ax^2 - c = y^2$.
For example he solves $8x^2 + 1 = y^2$ obtaining the solutions (x,y) = (1,3), (6,17), (35,99), (204,577), (1189,3363), ...

For the equation $11xI^2+ 1 = y^2$ Brahmagupta obtained the solutions (x,y) = (3,10), (161/5,534/5), ...
He also solves $61x^2 + 1 = y^2$ which is particularly elegant having x = 226153980, y = 1766319049 as its smallest solution.

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Bhaskara II
Born: 1114 in Vijayapura, India
Died: 1185 in Ujjain, India

Bhaskara is also known as Bhaskara II or as Bhaskaracharya, this latter name meaning "Bhaskara the Teacher".

Equations leading to more than one solution are given by Bhaskaracharya:-

Example: Inside a forest, a number of apes equal to the square of one-eighth of the total apes in the pack are playing noisy games. The remaining twelve apes, who are of a more serious disposition, are on a nearby hill and irritated by the shrieks coming from the forest. What is the total number of apes in the pack?

The problem leads to a quadratic equation and Bhaskaracharya says that the two solutions, namely 16 and 48, are equally admissible.

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Srinivasa Aiyangar Ramanujan

Born: 22 Dec 1887 in Erode, Tamil Nadu state, India
Died: 26 April 1920 in Kumbakonam, Tamil Nadu state, India

Srinivasa Ramanujan was one of India's greatest mathematical geniuses. He made substantial contributions to the analytical theory of numbers and worked on elliptic functions, continued fractions, and infinite series.

1729 is known as the Hardy-Ramanujan number after a famous anecdote of the British mathematician G. H. Hardy regarding a hospital visit to the Indian mathematician Srinivasa Ramanujan. In Hardy's words:[1]
‟ I remember once going to see him when he was ill at Putney. I had ridden in taxi cab number 1729 and remarked that the number seemed to me rather a dull one, and that I hoped it was not an unfavorable omen. "No," he replied, "it is a very interesting number; it is the smallest number expressible as the sum of two cubes in two different ways."

Numbers such as

$$1729 = 1^3 + 12^3 = 9^3 + 10^3$$

that are the smallest number that can be expressed as the sum of two cubes in n distinct ways have been dubbed taxicab numbers. 1729 is the second taxicab number (the first is $2 = 1^3 + 1^3$). The number was also found in one of Ramanujan's notebooks dated years before the incident.

(http://en.wikipedia.org/wiki/1729_(number))