

## → RIDDLE #2

### ESA's NEO Coordination Centre

#### Asteroid Day Special

We are living in times where conspiracy theories are very fashionable. See how easy it is to come up with your own theory: there are extraterrestrials living on Planet X that has a period of 104.7 years around our Sun. Each time their planet passes through its aphelion, they throw a massive rock towards the Earth. So the Earth is hit by such a rock exactly every 104.7 years. When it happened the last but one time, it created quite a massive explosion in 1908 in the Tunguska region. We assume today that the asteroid had a size of about 40 m. And now we commemorate this event every year on 30 June as Asteroid Day.

The last event was the explosion of an asteroid of almost 20 m over Chelyabinsk on 15 February 2013 where about 1500 people went to hospital because they got hurt by the massive shock wave of the detonation of the asteroid right above their city.

Now we have to prepare for the next blow of the extraterrestrials, which should happen about 38216 days (104.7 years) later. Having a look at the [Risk Page of ESA's Planetary Defence Office](#), we find that there are about 1063 objects listed that could hit the Earth in the next hundred years, i.e. about 0.2 impact risks per week. But have a look, in the week after the calculated impact date, there is a cluster of risk objects!

And here comes the riddle:

- Calculate the size of the asteroid that Planet X will throw at us and that will hit us in year 2222. To do this, assume that the mass of the rocks they throw towards the Earth is directly proportional to their economic power. Assume that the economic power follows the law  $GNP = A \cdot t^2 + B \cdot t + C$ . Derive the coefficients based on the data points you get from 1908, 2013 and 2117. (N.B.: for 2117, add up all possible impactors that are listed in the risk page within 7 days of the predicted return date).
- Bonus questions #1: what is the minimum travel time of the asteroids that will hit us in 2117?
- Bonus questions #2: assuming now that the rocks' travel time is always equal to Planet X's period, when did or will economic recession on Planet X end?

Please, send your responses before the proposed deadline to the following e-mail: [neocc@ssa.esa.int](mailto:neocc@ssa.esa.int). Use as subject of your e-mail: "Riddle #2 – solution". Moreover, please let us know if you would prefer not to have your name included in the list of correct replies.