WORKSHEETS FOR PUPILS

Name of activity	Estimated time needed	Difficulty of activity	Age of children for whom the activity is suitable	Tools and used materials	Objective of activity
Comet	20 – 30 minutes	medium	14 – 15	encyclopaedia, atlas or internet, calculator, spreadsheet	concept of comet, tail, movement around the sun
Minor Planet Velocity	30 – 40 minutes	very hard	14 – 15	encyclopaedia, atlas or internet, calculator, spreadsheet	3. Kepler's law, unit conversions
Energy	20 – 30 minutes	medium	14 – 15	paper, computer, calculator	law of conservation of mechanical energy, kinetic and positional energy
Impact Craters	20 – 30 minutes	medium	14 – 15	metre ruler, calculator, spreadsheet, graph paper	work with map, kinetic energy, volume, weight, density
Gravitational Force	20 – 30 minutes	medium	14 – 15	calculator, spreadsheet, graph paper	gravitational force, sphere volume, unit conversions

Worksheet 4: IMPACT CRATERS

Practical Exercise: This activity is focused on measuring the dimensions of real impact craters on the Earth's surface using Mapy.cz or Google Maps. Craters vary in size, from small (hundreds of metres) to very large (over 100 km). The impacts created by these craters have caused various climate changes; small impact affected only the local area, while larger impacts could have had changes of a global nature.

For each crater, find its location on the map, measure the dimensions and area of the impact crater, and determine the state in whose territory the impact crater is located. The location of the crater is given by latitude and longitude.

Practical Exercise: Calculation of Kinetic Energy of Impact
The Chicxulub Crater was formed by the impact of a rocky body (density = 2,700 kg m^{-3}) with a diameter of 17.5 km.
Calculate the volume of the body. Assume that the body is round.

Practical Exercise: Calculate the mass of the body that formed the Chicxulub Crater.

Practical Exercise: Calculate how much kinetic energy was released on impact if the body was moving at a speed of 20 km s^{-1}.

Name of Impact Crater	Latitude	Longitude	Size (km)	Area (km^2)	State
Barringer's Crater This crater was formed 50,000 years ago by the impact of an iron meteorite.	35°02' N	111°01' W			
Manicouagan One of the largest preserved impact craters, it was formed more than 200 million years ago.	51°23' N	68°42' W			
Clearwater Lakes These two impact craters were created by the impact of a pair of minor planets on the Earth's surface.	56°13' N	74°30' W			
Chicxulub Crater This impact crater is difficult to find. It was formed 66 million years ago by the impact of a meteorite of 10 km. The impact has released a lot of energy, climate change and the extinction of many species ocurred.	21°24' N	89°31' W			
Upheaval Dome This crater has all	38°26' N	109°54' W			

the features of a typical impact crater – central peak, inner crater and outer concentric impact rings.					
Gosses Bluff This impact crater was formed more than 140 million years ago by the impact of a 1 km minor planet. The central circle is not the edge of the crater, it lies much further.	23°50' S	132°19' E			
Tenoumer There are two more around the crater, which are easy to find, the first is 166 km in azimuth 27°, the second 376 km in azimuth 219°. The crater was formed 20,000 years ago.	22°55' N	10°24' W			
Vredefort A crater composed of several rings. Age 2 billion years. Meteorite with a size of 10 km.	27°00' S	27°30' E			