WORKSHEETS FOR PUPILS

Activity name	Estimated duration	Difficulty of activity	Age of children for which activity is suitable	Aids and material	Objective of activity
Trajectory of dwarf planets	20 – 30 minutes	medium	14 – 15	encyclopedia, atlas or the Internet, calculator, spreadsheet	summary of distances and dimensions of dwarf planets, calculations of various distances
Dwarf planet's set	20 – 30 minutes	medium	14 – 15	encyclopedia, atlas or the Internet, calculator, spreadsheet	work with graph, calculation of equation
Model of trajectory	20 – 30 minutes	medium	14 – 15	paper, computer, calculator	making trajectory model, work with models
What is your weight?	20 – 30 minutes	medium	14 – 15	1 metre long ruler, calculator, spreadsheet, graph paper	average figure, gravitational factor, jump height, order of objects

Worksheet 4: WHAT'S YOUR WEIGHT?

Exercise: In this exercise we will test how planet's mass influences a high jump.

Instructions:
1. Pupils will create groups of three.

2. One pupil in the group holds a one metre long ruler vertically to the floor in such a way that the root of the ruler's scale touches the floor.

3. Another pupil in the group watches the scale and notes down the height of the jump of the third pupil in the group.

4. The third pupil in the group jumps up next to the ruler. The height of the jump is noted down and repeated all together three times. From the three heights the average jump height is calculated and written in the form and will be considered the jump height on Earth.

5. Pupils will change their roles in the group, that means that each of them will jump and his/her average jump height on Earth will be noted down.

Table 1: Calculation of average jump height on Earth

Jump	Try #1	Try #2	Try #3	Average jump
Height (cm)				

6. Calculate average jump height in other locations in the Solar System with the help of Table 2.

7. Complete Table 3 by writing down planets, the Sun and dwarf planet Pluto and the height of your jump based on the mass of the object from the least massive object to the most massive object.

8. Create a bar chart with jump heights, ordering the objects ascending according to the object mass.

Table 2: How jump height is influenced by mass of an object of Solar System

Object	Mass of object of Solar System (× 10^{23} kg)	Average jump height on Earth (cm)	Conversion factor for jump height	Jump height on object (cm)
Sun	19 900 000		×0.036	
Mercury	3.3		×2.63	
Venus	48.7		×1.11	
Earth	59.7		×1	
Moon	0.73		×5.88	
Mars	6.42		×2.63	
Ceres	0.0094		×34.5	
Jupiter	19 000		×0.40	
Saturn	5 680		×0.91	
Uranus	868		×1.11	
Neptune	1 020		×0.88	
Pluto	0.13		×16.7	

Use the above stated masses to order Solar System objects from the least massive object to the most massive object and write them in the Table below. In the table, write also the jump height of every listed object.

Table 3: Order of Solar System objects according to mass

Solar system object	Jump height on object

Use the data from the tables above and create a bar or a line chart which will compare the mass of the objects of the Solar System and the height of your jump. On the vertical axis, order the objects from the least massive object to the most massive object.

Which object of the Solar System is it possible to jump highest on and on which object the jump height is lowest?

Why is it possible to jump higher on Mercury than on Neptune?

If you would want to break the world record in the high jump which object of the Solar System would you chose and why? On which objects of the Solar System would you be able to break the existing world record in the high jump?