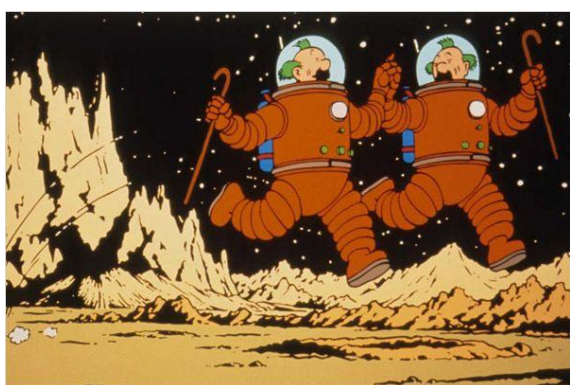## Gravitation on Earth, on the Moon and on Mars...

Aims : In this lesson you will…..

1. Think about the interplay between the different planets of our Solar System and gravity.

2. Learn how to use a tab to draw a graph

In the fifties a famous comic strip author had imagined the first steps of man on the moon.

During his adventure, we follow the "Captain" with his spacesuit who, unexpectedly managed to leap and reach a farther distance as previously planned.

Tintin, the journalist of the expedition, explains that it is due to the gravity on the Moon:
"We are six times lighter than on the Earth" he claims…
Fifteen years later, Neil Armstrong was the first to walk on the moon.

You tube: Tintin-*I'm walking on the Moon*

Data :
G : Constant of universal gravity :
$\quad$ G = $6,67.10-11 m^3 .kg^{-1} .s^{-2}$
Acceleration of gravity : g_T = 9,8 $N.kg^{-1}$
Mass of Tintin with his spacesuit: m = 80 kg.

Earth : R_{Earth} = $6,38.10^3$ km $\quad$ M_{Earth} = $6,0.10^{24}$ kg
Moon : R_{Moon} = $1,74.10^3$ km $\quad$ M_{Moon} = $7,3.10^{22}$ kg
March : R_{Mars} = $3,39.10^3$ km $\quad$ M_{Mars} = $6,4.10^{23}$ kg

I.   Relation between mass and weight :

Experimentation: Thanks to the equipment you will choose, try to find a simple relation between weight and mass.

Observations :

Mass m in kg					
Gravitation force Fg in N					

a) Draw the graph W = f(m) with Excel on a computer

b) What does the drawn graph look like?

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c) Conclusion: What is the relation between W and m?

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with **g** (acceleration of gravity on …………) = ……………..

II.   What do you think of Tintin's statement?

a)   Do you think the journalist is right? Please provide arguments with calculation.
b)   Which place would be the best to launch a satellite (TGO : Trace Gas Orbiter) to Mars :
     the Earth or the Moon?
c)   Rephrase Tintin's sentence if the mission was on Mars.