Sequence 5: movement and interactions

Fiche de synthèse mobilisée (collection en français) :

- Fiche n°5 : mouvement et interactions, rappels de seconde

Sommaire des activités ETLV :

ACTIVITY 1: forces on a basketball

Objective: understanding how to place forces during a movement

DOCUMENT 1: throw of a basketball

A basketball has been thrown and one has taken images of its trajectory. One can detail six specific times:

- t_A: when the basketball player starts to throw
- t_B: when the ball leaves the player's hand
- t_C: when the ball reaches the summit of its trajectory
- t_D: when the ball first reaches the hoop
- t_E: when the ball leaves the hoop
- t_F: when the ball drops to the floor

Figure 1

Figure 2

On figure 1, the ball is in contact with the basketball player's hand.

On figure 2, the ball has left the hand of the player.

1. On document 1, label the position of the ball at times t_A, t_B, … , t_F.

   In the next question, air drag on the ball is neglected.

2. The system is considered as the basketball: B. In the table below, place and label the forces exerted on the ball during the different phases of the throw.

Between t_A and t_B	Between t_B and t_C	Between t_C and t_D	Between t_E and t_F
• B	• B	• B	• B

Acquiring vocabulary:

Using the previous documents, find a translation for the following expressions:

English	French
trajectory	
air drag	
forces exerted on …	

Activity summary

What you must remember:
- force
- trajectory

Skills linked to the curriculum**:**

Fiche(s) de synthèse mobilisée(s)	**Fiche n°5** : mouvements et interactions, rappels de 2nde
Type d'activité	→ Activité « papier »
Conditions de mise en œuvre	→ demi-groupe préférable mais classe entière possible → possibilité de donner à traiter à la maison
Matériel utilisé	→ aucun matériel
Place dans la séquence	→ début de séquence
Capacités mises en œuvre dans cette activité	**ANA** – **Associer** une force à une action exercée par un système extérieur. **REA** – **Représenter** une action par le vecteur-force en respectant la direction et le sens.

ACTIVITY 2: Olympic Games: let's dive!

Fiches de synthèse mobilisées (collection en français) :

- Fiche n°5 : mouvements et interactions, rappels de seconde

Sommaire des activités ETLV:

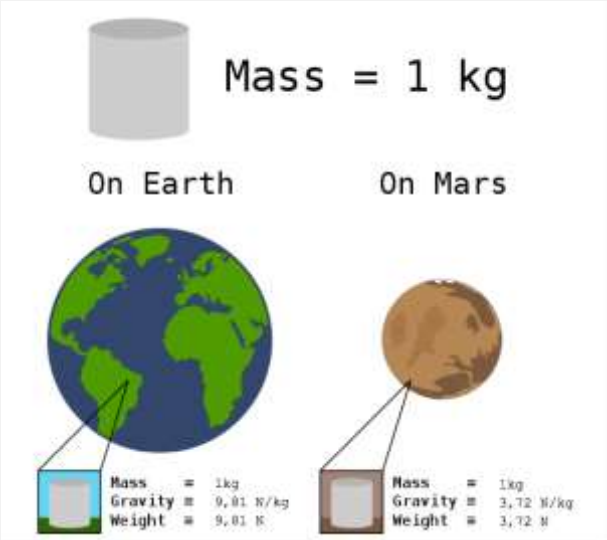
DOCUMENT 1: Diving: an Olympic Game!

Diving is the sport of jumping or falling into water from a platform while performing acrobatics such as somersaults and twists. This sport was first introduced in the Summer Olympic Games in 1904 which took place in Saint Louis (USA). In the Olympic Games, platform diving is from the 10-meter height! Diving, as an activity, has been dated around 500 BC according to a fresco found in a tomb in Paestum which was an ancient Greek city.

Source: The Tomb of the Diver, Paestum, 480-470 BC, Wikimedia commons

DOCUMENT 2: Gravity, Weight and … diving!

- Diving is possible because of **gravity**: with **gravity**, divers undergo a force pulling them down due to their mass. Around the earth, **a gravitational field** is responsible for the **strength** of **gravity** close to earth and pulls things with mass towards the earth: objects and living things.
- If the diver stands on the Moon, he will feel the gravity of the Moon pulling him down. If he stands on Mars, he will feel the gravity of Mars pulling him down as well. His mass will be the same as on Earth, however, his **weight** will be less on the Moon and on Mars. Why? Because the **gravitational field** strength on the Moon is about 1/6 of that on the Earth and the **gravitational field** strength on Mars is about 1/3 of that on the Earth.
- **Weight** is the force acting on the diver or an object more generally due to gravity and is measured in **Newtons**. Weight is related to the diver's **mass** (or the object's mass) and the **gravity** acting on that mass.
- Weight is calculated using the equation: **Weight** (P) = **mass** (m) x **gravitational field** strength (g)



Source: Wikimedia commons

DOCUMENT 3: Weight in water?

The diver's weight does not change in water, even though it seems to be the case. **Up thrust** is why objects appear to weigh less when immersed in a liquid such as water. Water exerts a force upwards the diver placed in it: this force is called **up thrust**. This force slows down the diver when he enters water and eventually brings him back to the surface. The up thrust of water is greater than the up thrust of air explaining why objects in general appear lighter in water.

Source: Wikimedia commons

1. Explain the invisible force that causes the diver to fall into water.
2. According to **document 2**, calculate the Moon's gravitational field strength "g_{Moon}".
3. The mass of the diver is 70 kg. According to **document 2**, calculate the diver's weight on the Earth and on Mars. Conclude.
4. Explain why astronauts take big steps/jumps on the Moon and therefore why they wear a spacesuit and moon boots.
5. If the Olympic games were held on the Moon in a large dome to provide air to breath and water, explain why it would be possible for a diver to perform a more sophisticated dive on the Moon.
6. According to **document 3**, explain why the diver appears to weigh less in water than he does in air.

Activity summary

What you must remember:

- **gravitational field strength**
- **weight measured in Newtons (N)**
- **mass in kilogram (kg)**
- **weight** (P) = **mass** (m) x **gravitational field** strength (g)
- **up thrust**
- **difference between mass and weight**

somersaults	sauts périlleux
gravitational field strength	Intensité du champ gravitationnel
up thrust	force de poussée
weight	poids = force (N)
to pull sb./sth. towards	tirer qqn/qqch vers

twists	torsions
mass	masse
strength	intensité/force
to pull sb./sth. down	entraîner qqn/qqch vers le bas
to bring back	ramener

Skills linked to the curriculum:

Compétences	Capacités à maîtriser	Où dans cette séquence ?
APP	Utiliser du vocabulaire spécifique	Activités 1 et 2
	Lire et comprendre des documents scientifiques	Activités 1 et 2
ANA	Mettre en lien des documents pour émettre des hypothèses en réponse à une question scientifique	Activité 2
COM	S'exprimer à l'écrit en utilisant le vocabulaire adapté	Activités 1 et 2
REA	• citer et exploiter l'expression du poids • exploiter la force de poussée	Activité 2