# Do now

## Please get into the following groups:

| Group 1 | Group 2 | Group 3 | Group 4 | Group 5 |
|---|---|---|---|---|
| | | | | |

You will be competing in these teams in a variety of games to gain points for your teams!

# Let the games begin

Game 1 – Precision push

Game 2 – huff, puff and blow it away

Game 3 – Take your aim

Game 4 – It’s all in the difference

# Now the fun is out of the way..

As Freddie quite rightly said…..

ITS JUST PHYSICS!

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3.2.2.1

# Biomechanical principles - Newton's laws of linear motion

A Level PE Taster Session 2025

# First things first….

What is linear motion?

Motion in a straight or curved line with all body parts moving the same distance at the same speed in the same direction!

# Newton's three laws

First law – law of inertia

Second law – law of acceleration

Third law – law of action/reaction

# Newton's first law - inertia

**Think back to game 1 and game 2 that we played at the start of the lesson – what was happening? How might this relate to forces and motion?**

What is inertia? The resistance an object has to a change in its state of motion

If an object is at rest it will remain at rest unless acted on by a force

If an object is moving in one direction it will keep moving in that direction at the same **velocity** until another force is exerted upon it.

The greater the force the greater the change in motion

**Think back to the game again – relate it to the law of inertia!**

# Newton's second law - acceleration

**Think back to game 3 that we played at the start of the lesson – what was happening? How might this relate to forces and motion?**

Force = mass x acceleration

Acceleration is directly proportional to the magnitude of the force produced and is governed by the direction the force is applied

If **masses** remain constant then acceleration is equal to the size of the force causing it

**Think back to the game again – relate it to the law of inertia!**

# Newton's third law – action/reaction

**Think back to game 4 that we played at the start of the lesson – what was happening? How might this relate to forces and motion?**

To every action (force) there is an equal and opposite reaction (force)

Action and reaction are equal and opposite and always occur in pairs

Mostly centred around ground reaction force – the force exerted on the ground by the body in contact with it

**Think back to the game again – relate it to the law of inertia!**

# How can we apply this to sport? Lets start simple….

Task – choose a sport and state when each of the laws of motion are present within the sport.

On the following slide I have written an example for you that you can use as a framework……

# Application to sport

| | |
|---|---|
| Law of inertia | For a penalty flick in hockey the ball will remain on the spot unless it is hit by a player |
| Law of acceleration | When the player hits the ball to an opponent during the game the acceleration of the ball is directly proportional to the force applied onto it. The harder the player hits the ball the further and faster the ball will go in the direction that the force was applied |
| Law of action/reaction | When the goal keeper jumps up to make a save in the top corner of the goal they will apply force into the ground to gain height. At the same time the ground is exerting an upward force upon the goal keeper |

# More complex examples

How might this change for really specific examples.

1. A swimmer pushing off the starting blocks
2. A tennis player moving towards a ball in a rally

Task – apply the laws you feel are relevant for each scenario above and explain how the laws are responsible for motion

# Exam question

The final stage of an endurance race often involves a sprint finish.

Using Newton's Second Law of Motion, explain how an athlete is able to accelerate towards the finish line.

_____

_____

_____

_____

_____

_____

**(Total 3 marks)**

# Mark scheme

*3 marks for 3 of :*

Mass of runner is constant.
Force = Mass x Acceleration.

*Not f = ma – full terms only.*

Greater the force exerted on the floor, the greater the acceleration / momentum / proportional.
Force governs direction.
Force provided by muscular contraction.

*Do **not** accept 'legs'.*

Ground reaction force.

*must be in context / not GRF.*

[3]


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