

2.1. Lever Systems

2.2 Planes and Axes of Movement

Name _____

Class _____

My PE Classroom:

This booklet will guide pupils through all of the content required for this topic.

Any time you see a box such as this, take a look for videos, advice and links to extra documents and resources.

This booklet can also be printed as a 'pupil booklet' and 'teacher answer booklet'.



Topic	Description from Specification	Pupil comments – How confident do you feel on this topic?
2.1.1	First, second and third class levers and their use in physical activity and sport	
2.1.2	Mechanical advantage and disadvantage (in relation to loads, efforts and range of movement) of the body's lever systems and the impact on sporting performance	
2.2.1	Movement patterns using body planes and axes: sagittal, frontal and transverse plane and frontal, sagittal, vertical axes applied to physical activities and sporting actions	
2.2.2	Movement in the sagittal plane about the frontal axis when performing front and back tucked or piked somersaults	
2.2.3	Movement in the frontal plane about the sagittal axis when performing cartwheels	
2.2.4	Movement in the transverse plane about the vertical axis when performing a full twist jump in trampolining	

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It is important that, as pupils, you understand the specification.

Use the 'pupil comments' section to state how confident you feel for each topic. This will help you decide on which areas require the most revision.

What do you think of when you hear the word 'lever'?

How do you think parts of your body can be referred to as levers?

Every lever has 3 components. Use the words below to fill in the gaps.

A **fulcrum** – The _____ around which the lever _____

A **load** – The _____ of the thing that you want to _____

An **effort** – The _____ that is applied by the user of the _____ system

force axis move force lever rotates

Think about a darts player throwing a dart. What would be the...

Fulcrum: _____

Load: _____

Effort: _____



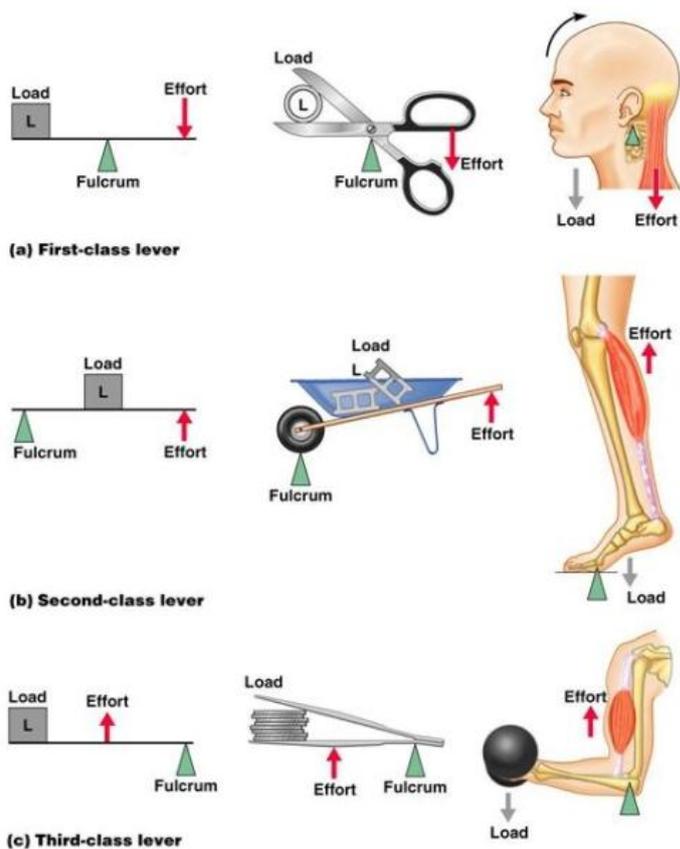
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Video: Click on the image below to find out about lever systems...



Different Classes of Lever:

Levers are classified as either **First Class**, **Second Class** or **Third Class** according to the placement of the fulcrum, load and effort.



1st Class = **Fulcrum** in the middle

2nd Class = **Load** in the middle

3rd Class = **Effort** in the middle

To remember what is in the middle you simply need to think FLE. Think 'FLY LITTLE ELF' to remember this.

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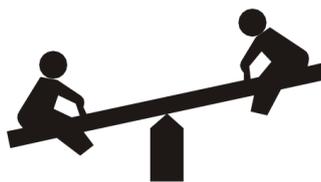
Exam Tip:

On any question on analysing levers always discuss which part of the system is in the middle

First Class Levers: Load – Fulcrum - Effort

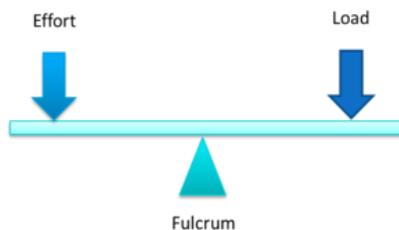
In this lever system the fulcrum sits in the middle, between the load and the effort.

For the pictures shown, fill in the table below.



Exercise/Activity	Load	Fulcrum	Effort

Can you think of any other first class lever systems?



Second Class Levers: Fulcrum – Load - Effort

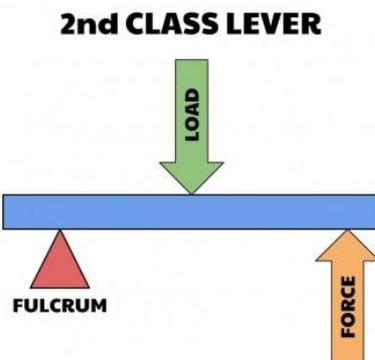
In this lever system, the load sits between the fulcrum and the effort

For the pictures shown, fill in the table below.



Exercise/Activity	Fulcrum	Load	Effort

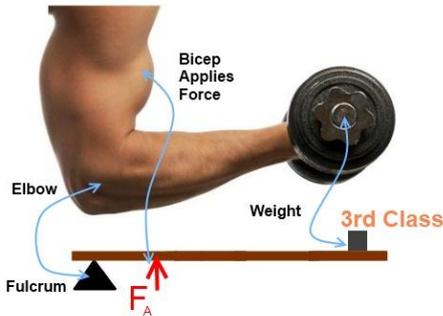
Can you think of any other second class lever systems?



Third Class Levers: Fulcrum – Effort - Load

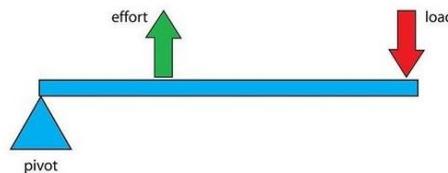
In this lever system, the effort is applied between the fulcrum and the load.

For the pictures shown, fill in the table below.



Exercise/Activity	Fulcrum	Effort	Load

Can you think of any other third class lever systems?



Hint - you must know the difference between each lever system and the location of the fulcrum, effort and load

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Resource: Now you know about different type of lever systems, have a go at the task below:

<https://mypeclassroom.com/wp-content/uploads/securepdfs/2018/02/Lever-Systems.pdf>

Advantages/Disadvantages of lever systems:

Class of lever	Advantage	Disadvantage
First Class	Mechanical Advantage – A large load can be lifted with relatively little effort, due to the effort ‘arm’ being long	Slower Movement Limited Flexibility
Second Class	Mechanical Advantage – A large load can be lifted with relatively little effort, due to the effort ‘arm’ being long	Slower Movement Limited Flexibility
Third Class	Fast Movement Large Range of Motion	Mechanical Disadvantage – Cannot lift as heavy a load with the same amount of effort, due to the effort ‘arm’ being short

Why is your head an example of a first class lever system? (3)



Analyse the first class lever system used at your head. (3)

Think about the word 'analyse' and what this question is asking

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Resource:

These two A3 posters are great revision tools for the classroom or for personal study.

<https://mypeclassroom.com/wp-content/uploads/2018/02/Lever-Systems-A3-Table.pdf>

<https://mypeclassroom.com/wp-content/uploads/2018/02/Lever-Advantages-A3-Table.pdf>

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Exam Tip:

Think about what makes up this lever system and what is in the middle.

Rowing is an example of which lever system? (1)



Analyse the role of this lever system in affecting a rowers' performance?

A bicep curl is an example of which type of lever system? (1)



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Give one advantage and one disadvantage of the lever system used when performing a bicep curl (2)

Planes & Axes of Movements:

Different sports often require different types of movement and positioning. For the following sports, in your own words describe the positioning of the body.

Tennis _____

Swimming _____

Trampolining _____

Planes:

Planes are theoretical divisions that divide the body into sections. There are three planes of motion in the body.

1. The Sagittal Plane:

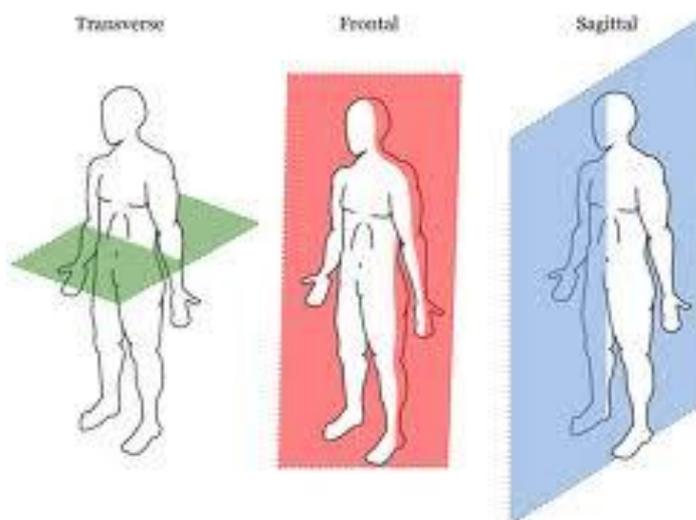
Splits the body down the middle resulting in a _____ side and a _____ side.

2. The Frontal Plane:

Divides the body so that there are _____ and _____ sections.

3. The Transverse Plane (AKA Horizontal Plane):

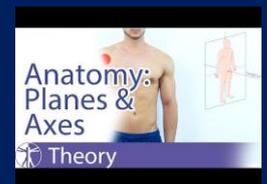
Divides the body across the middle (horizontally), giving a _____ section and a _____ section.



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Video:

Find out about planes and axes of movement here....



Underneath each of the pictures shown above, write down one of the following phrases to describe the movement possible within the plane. Think about how the person could move and **still keep the plane intact**:

- Forward or backward
- Side to side
- Rotational

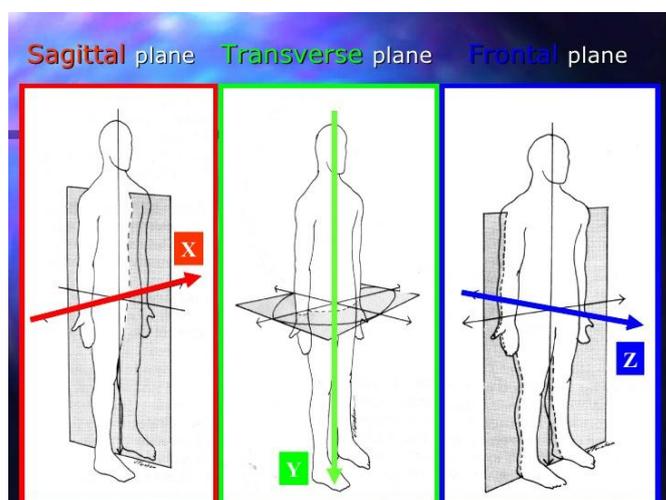
Use the table below to select the plane of movement for each exercise/sporting action:

Exercise/Action	Plane
Walking	
Side Bends	
Side Stepping	
Jogging	
360 degree twist	

Axes:

The joints in our bodies rotate around one of three different axes. These axes allow rotation to take place in one of the planes.

There are three different axes:



- 1. The Frontal Axis:**
From hip to hip
- 2. The Vertical Axis:**
Vertical line - top to bottom
- 3. The Sagittal Axis:**
Stabs through the body

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Resource:

Test your knowledge on planes and axes by completing the following resource.

<https://mypeclassroom.com/wp-content/uploads/2018/02/Planes-Axes-Diagrams.pdf>

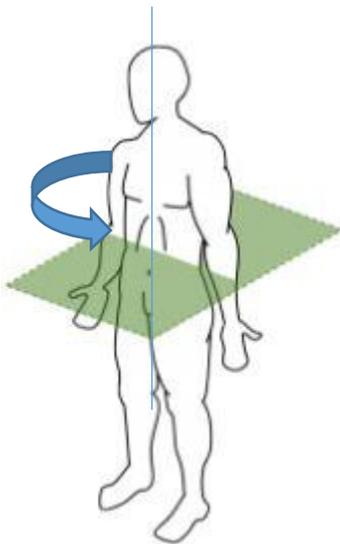
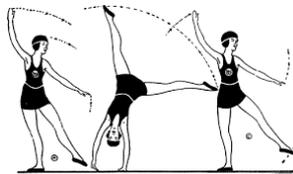
Use the table below to state the plane and axes present during each movement/action.

Movement/Action	Plane	Axes
Forward Roll		
Cartwheel		
Somersault		
Twist Jump		

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Exam Tip:

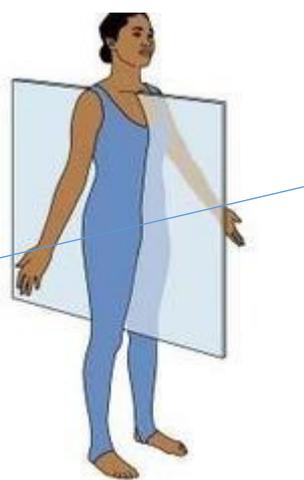
As per the specification these are the only movement actions that you need to understand in terms of axes of movement



Sample exam questions:

Identify the plane and axis shown in the figure on the left (1)

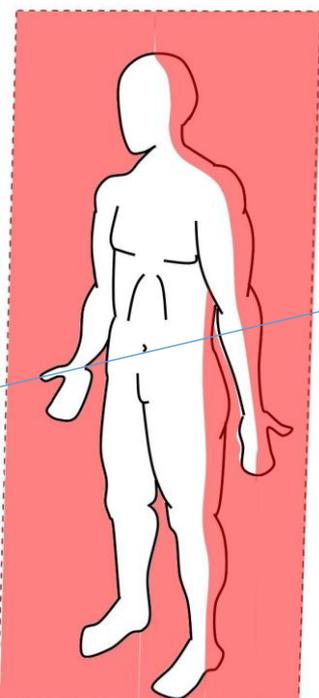
Give an example of a sporting action used at this plane and axis?



Sample exam questions:

Identify the plane and axis shown in the figure on the left (1)

Give an example of a sporting action used at this plane and axis?

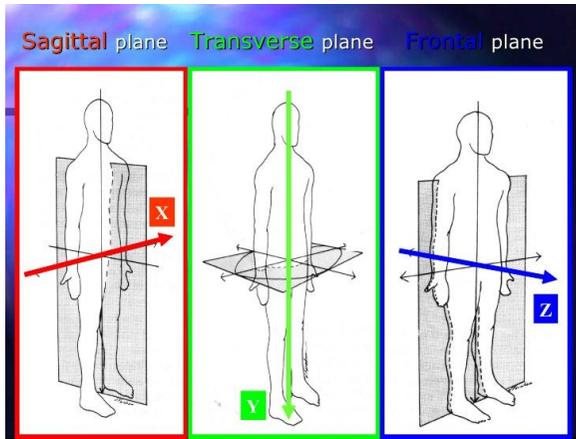


Sample exam questions:

Identify the plane and axis shown in the figure on the left (1)

Give an example of a sporting action used at this plane and axis?

Revision



Planes:

Sagittal = **Split** down the middle

Transverse = **Top** and bottom

Frontal = **Front** and back

Axes:

Frontal = **From** hip to hip

Vertical = **Vertical** line

Sagittal = **Stab** through the body

Frontal Axis

Vertical Axis

Sagittal Axis



Axis =



Forward Roll

Sagittal Plane and Frontal

Transverse Plane and

Vertical Axis = **Twist** Frontal

Plane and Sagittal Axis = **Cartwheel**

My PE Classroom:

Resource:

These two A3 posters are great revision tools for the classroom or for personal study.

<https://mypeclassroom.com/wp-content/uploads/securepdfs/2018/02/Planes-Axes-A3-Explanation-for-Wall.pdf>

<https://mypeclassroom.com/wp-content/uploads/securepdfs/2018/02/Planes-Axes-A3-Terms-for-Wall.pdf>

<p style="text-align: center;"><u>Planes</u></p> <p style="text-align: center;"><u>Axes</u></p> <p style="text-align: center;"><u>Sporting Action</u></p>	<p style="text-align: center;">Sagittal (Split down the middle)</p> <p style="text-align: center;">Frontal (From hip to hip)</p> <p style="text-align: center;">Forward Roll/Somersault</p>	<p style="text-align: center;">Transverse (Top and bottom)</p> <p style="text-align: center;">Vertical (Vertical line)</p> <p style="text-align: center;">Twist Jump</p>	<p style="text-align: center;">Frontal (Front and back)</p> <p style="text-align: center;">Sagittal (Stab through the middle)</p> <p style="text-align: center;">Cartwheel</p>
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Key Terms:

Fulcrum – The point around which the lever rotates

Load – The force of the thing that you want to move

Effort – The force that is applied by the user of the lever system

Mechanical Advantage – A large load can be lifted with relatively little effort

Mechanical Disadvantage – Cannot lift as heavy a load with the same amount of effort

Plane – An imaginary line dividing the body vertically into left and right sides

Axis - An imaginary line dividing the body vertically from front to back

My PE Classroom:

Now this topic is complete, click below to take part in a Kahoot quiz on the Musculo-Skeletal System

<https://create.kahoot.it/details/duplicate-of-levers-planes-and-axes/0a09e5ff-a46b-4af2-80b0-64363d93f3dd>

My PE Classroom:

Test yourself on the key terms from this topic