Planes and axes of movement

Movement patterns and the bodies planes and axes
Learning Outcomes

• Be able to name the three planes of movement and the three axes of rotation.

• Be aware of sporting movements that take place along a plane.

• Be aware of sporting movements that take place around an axis.
Planes and Axes Explained

• To describe the direction and characteristics of movements used in different sports, we refer to **planes** and **axes** of motion.

• Human movement takes motion in a **plane** and about an **axis**
Planes and axes of movement

To help explain movement, the body can be viewed as having a series of imaginary slices/glass panes running through it.

These are referred to as planes of movement.
Planes

1. The **sagittal plane** is a vertical plane that divides the body into **right** and **left** sides.

Movement along this plane tends to be forwards or backwards, like walking, running, somersault.
Planes

2. The **frontal plane** is also a vertical plane but this divides the body into **front** and **back**.

Movement along this plane could include star jumps or cartwheels.
Planes

3. The **transverse plane** is a horizontal plane that divides the body into upper and lower halves.

Movement along this plane includes an ice skating spin.
Axes of the body

Axes are like invisible skewers running through the body.

All movements rotate around one of the axes.

- Vertical axis
- Sagittal axis
- Frontal axis
Axes of the body

Vertical axis runs through the body vertically from the top to bottom.
Axes of the body

Sagittal axis runs through the body horizontally from the left to right.
Axes of the body

Frontal axis runs through the body horizontally from the back to front.
Planes & Axes of the body combined

Movement in the **sagittal plane** about the **frontal axis** allows for front somersaults/forward roll.
Planes & Axes of the body combined

Movement in the **frontal plane** about the **sagittal axis** allows for cartwheels.
Planes & Axes of the body combined

Movement in the **transverse plane** about the **vertical axis** allows for a 360 degree twist.
Label the following levers components.

Describe the 3 levers in the body (use diagrams to help illustrate your answer)

Explain the term ‘mechanical advantage’

Which class of lever always has a mechanical disadvantage?
Apply it! What has stuck with you?

Planes and axes of movement

Name the 3 planes of movement

Describe the 3 axes of movement.

Describe the planes and axes in use for athletes performing a front somersault

Analyse a cartwheel movement using the correct planes and axes in use.
Practice it!

Exam questions
1. Which one of the following describes a first class lever system? (1)

A  The load is at the right-hand end of the lever
B  The fulcrum is in the middle of the lever system
C  The load and the fulcrum are at the same point on the lever
D  The load is in the middle of the lever
Practice it!

Exam questions

2. Which one of the following describes a second class lever system? (1)

A  The load is at the right-hand end of the lever
B  The fulcrum is in the middle of the lever
C  The load is in the middle of the lever
D  The load and the fulcrum are at the same point on the lever

3. Label the lever system below (4)

Lever class = ____________________________

___________  ___________

___________  ___________

___________
4. Which one of these shows how to calculate the mechanical advantage of a lever?

A  Effort arm x weight (resistance) arm
B  Effort arm ÷ weight (resistance) arm
C  Effort arm + weight (resistance) arm
D  Effort arm - weight (resistance) arm
Practice it!

Exam questions
5. Analyse how the following parts of the lever system allow the weight trainer in Figure 5 to lift the weight.

(i) Fulcrum

(ii) Effort
Practice it!

Exam questions

6. Figure 4 shows a basketball player jumping to execute a shot. Draw the lever system which operates at the ankle joint in the space below. Label the fulcrum, effort and load. (1)
Practice it!

Marks Scheme:

1. B
2. C
3.i) Third class lever
4. B
5. One mark for linking bone or muscle to component of lever system and one mark for linking this to its use in the biceps curl to lift the weight. For example: Fulcrum – elbow is the fulcrum (1) which allows the arm to bend/flex (1) Effort – biceps muscle provide the effort (1) which allows the weight lifter to lift the weight (1)
Practice it!

Marks Scheme:

6. Award one mark for labelling the effort, load / resistance and fulcrum in the correct order.
Exam questions
1. Figure 1 shows one plane and one axis of the human body. The plane is represented by the square. The axis is represented by the dotted line.

Identify the plane and axis shown in Figure 1.

A  Sagittal plane and transverse axis
B  Frontal plane and longitudinal axis
C  Transverse plane and transverse axis
D  Transverse plane and longitudinal axis
Practice it!

Exam questions
2. Which one of the following statements is false? (1)

(A) The movement at the elbow joint during a biceps curl is an example of flexion and extension.

(B) The deltoid at the shoulder joint during a biceps curl is an example of a fixator.

(C) Most of the lever systems that provide movement in sport are examples of third class levers.

(D) An example of a second class lever is a tennis player using their elbow joint during a forehand shot.
Practice it!

Exam questions
3. The dancer in the picture below has performed a movement that has passed through the frontal plane. (1)

Is this statement **true** or **false**?
Practice it!

Marks Scheme:

1. D

2. (D) – An example of a second class lever is a tennis player using their elbow joint during a forehand shot

3. False