

Athletics Masterclass: The Science of Movement

Learning objective: To understand the biomechanics and technical components of track and field events, applying mathematical precision to physical performance.

Max the monkey has been analysing the mechanics of athletics! Use the technical terms in the word bank to label the stages of an event, then solve the performance challenges. For the 'Justify' questions, use your knowledge of physics and balance to explain your reasoning.

Word bank: Acceleration · Velocity · Momentum · Trajectory · Aerobic capacity · Kinetic energy · Extension · Flexion

1. Max is observing a sprinter. Explain why the sprinter leans forward during the initial 'drive phase' rather than standing upright immediately. Justify your answer using the concept of force. (3 marks)

2. In the long jump, a jumper's 'trajectory' is crucial. Compare and contrast how a lower launch angle versus a higher launch angle would affect the final distance of the jump. (3 marks)

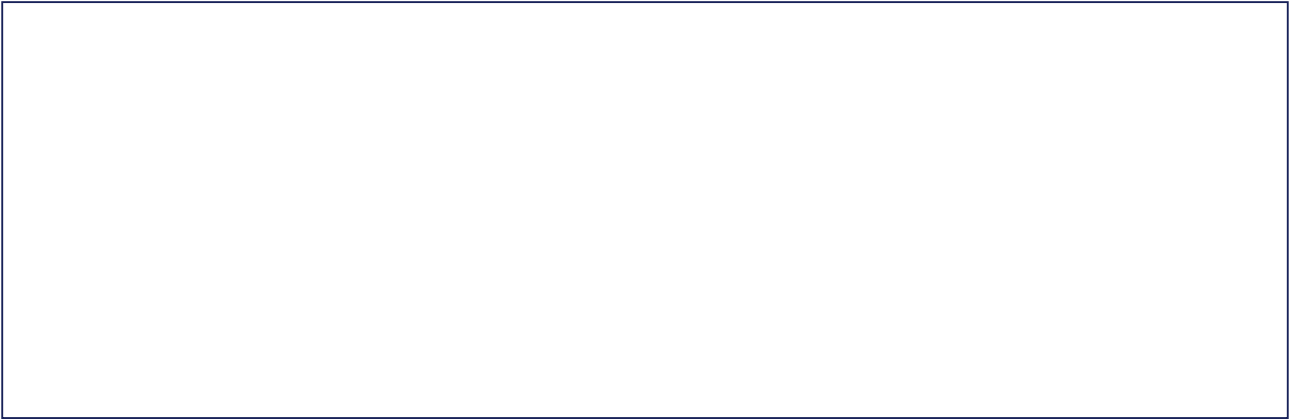
3. Leo the lion is training for the 800m race. What might happen if he starts at his maximum velocity rather than pacing himself? Link your answer to 'aerobic capacity'. (3 marks)

4. Calculate the total distance: If an athlete completes 4 laps of a 400m track and then adds a final 100m sprint, what is their total distance in kilometres? (2 marks)

5. If a relay baton costs £12.50 each and the school buys 8, but receives a discount of £5.00 off the total order, what is the final cost per baton? Show your working. (3 marks)

6. Explain why maintaining 'momentum' is vital for a javelin thrower during their approach run before the release. (2 marks)

Draw: Draw a diagram of an athlete mid-jump. Use arrows to label the 'Trajectory' and show where 'Kinetic energy' is being converted into movement.



Extension challenge: Design a new athletic event that combines two existing disciplines (e.g., jumping and throwing). Write a brief set of rules for your event and explain which physical attributes—such as speed, strength, or agility—are most important for success.