The sand in a long-jump pit serves two purposes. First, it enables measurement of the distance of the jump by marking the jumper's landing. Second, it cushions the landing of the jumper. Give a mechanical explanation for how the sand "cushions" the landing of the jumper.

Step 1:

A high-jumping competitor is given a cushion or a mound of sand to land on during an athletic competition.

This is done to protect the athlete from harm should he fall after landing from a high leap.

As a result, the athlete avoids harm and the cushion or sand slows down their movement.

If we land on a hard surface, such as a cement floor, his momentum will be decreased to zero in a very brief period of time, increasing the rate of change of momentum, which will result in a strong opposing force acting on the athlete.

This may result in severe harm.

Step 2:

The jumper takes more time to halt when he lands on a soft surface, such as a cushion or sand. Because there will be less force acting on the athlete, his rate of change of momentum will be slower.

During impact, the sand has a negative effect on the jumper. It exerts a force on the jumper while being displaced, which lowers the jumper's energy. The sand's displacement lessens the jumper's force of impact.