

Projectile Motion

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Reflection

Torque

Reflection #2

Definition of Projectile Motion

Projectile motion is a form of **motion** where a particle (called a **projectile**) is thrown obliquely near the earth's surface, it moves along a curved path under the action of **gravity**.

Projectiles have velocities in 2 directions:

-Horizontal motion: Motion parallel to Earth's surface

-Vertical motion: The force of gravity pulling down on the object

Button Text

Basketball Physics



Jumping for basketball, throwing and leaping for a slam dunk, human body follows the principle of projectile motion.

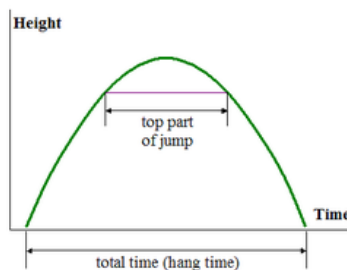
A basketball player can jump as much as 4 feet in the air (vertically). And the higher he jumps the greater the hang time (the total time he is airborne), and the greater the time he will appear suspended in mid-air during the high point of the jump.

Typically, there is a horizontal and vertical component in the jump velocity at take-off. The magnitude of the vertical component of the velocity at take-off will determine the time the player spends airborne (since gravity acts in the vertical direction and will act on the player to bring him back down). Thus, the vertical component of velocity, after take-off, will change with time.

affected by gravity.

The horizontal component of velocity remains constant throughout the jump since it is not

The figure below shows how a basketball player might travel as he makes a jump.



You can see that almost half the hang time is spent near the top of the arc.

The ball



The Basketball

The Basketball, during a free throw, is a projectile. A projectile is any object fired, thrown, or otherwise propelled object. A basketball relates to a projectile as the force exerted upon the basketball is a push. The basketball is then projected horizontally and vertically, causing, if the proper shooting technique is applied, the basketball to rotate, elevate, and finally swish through the net. The horizontal and vertical components are both independent, and therefore do not affect each other. The arch caused by the basketball is a result of the gravitational pull upon the basketball, and if a basketball was thrown without a gravitational pull acting upon it, the basketball would travel continuously without arching (this also relates to Newton's 1st law). Therefore, playing basketball in space would be an absurdity.



Motions

As mentioned above, projectiles not only undergo a vertical motion, but also undergo a horizontal motion and these perpendicular components of motions are independent of each other, which are discussed separately.

Vertical Launched Projectiles

When we have a ball in our hand, and we release it and let it fall to the ground (with gravity), its the vertical motion, and it will continuously travel downwards until it hits something or the ground. The mass does not effect the time and speed of the acceleration downward. The force of gravity depends on the masses of the two objects, the distance between their centres, and on something called the universal gravitational constant.

Free-Body Diagram of a Projectile

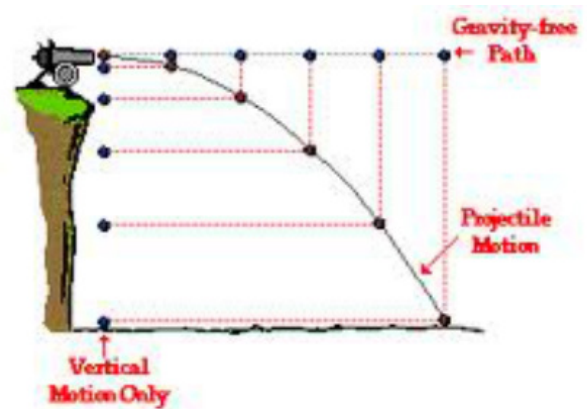


Horizontally Launched Projectiles

Consider

when a ball projected horizontally from a certain height. In the absence of gravity, the ball would continuously going horizontally at a constant speed (This is the law of inertia). Furthermore, if gravity is present, the ball would accelerate downward (the concept of free fall which gain speed of gravity with 9.8 m/s per second).

When gravity is present, the horizontal motion is not affected by the vertical motion (gravity), therefore, horizontal motion remain constant. While vertical motion keeps going downward.



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