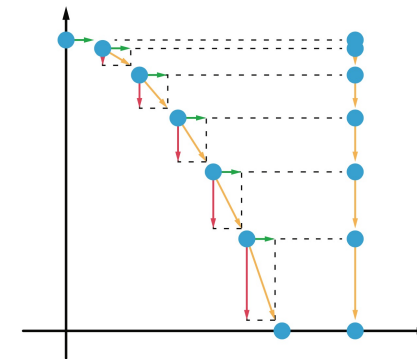


Projectile Motion

- Projectiles
- Components of motion
- Types of projectiles
- Gravity and projectiles
- Projectiles with $V_i = 0$
- Practice
- Projectiles with V_i not = 0
- Practice



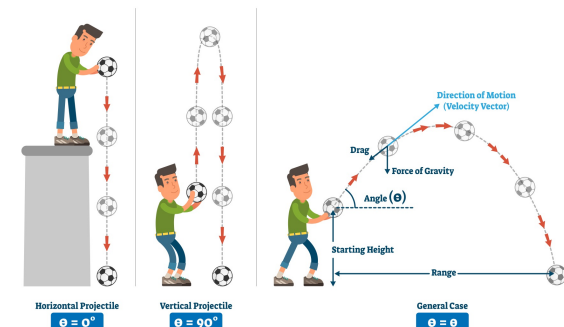
$$a = \frac{v_f - v_i}{\Delta t}$$

$$d = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$d = \frac{1}{2} (v_i + v_f) \Delta t$$

$$v_f^2 = v_i^2 + 2a\Delta d$$

$$\Delta d = v_f \Delta t - \frac{1}{2} a (\Delta t)^2$$



Preview File

Please enjoy this preview of your Student Version of the presentation. Please note within this sample file:

- Some slides appear blank because they have been removed
- Student versions have portions of the text removed which is given in the teacher version and appear as _____ which the students are to fill in
- Other slides may have on them, this represents writing that has been removed on this sample

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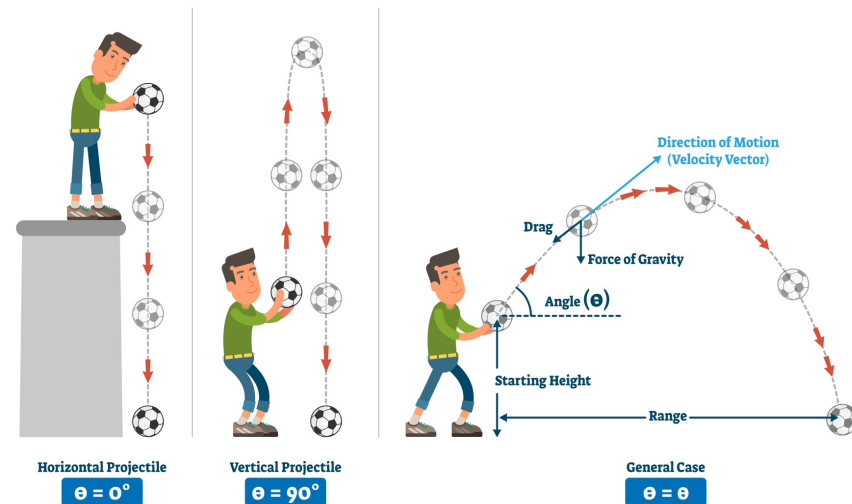


Projectiles

The most common example of an object moving in two-dimensions where only the force of gravity and air resistance are acting on it.



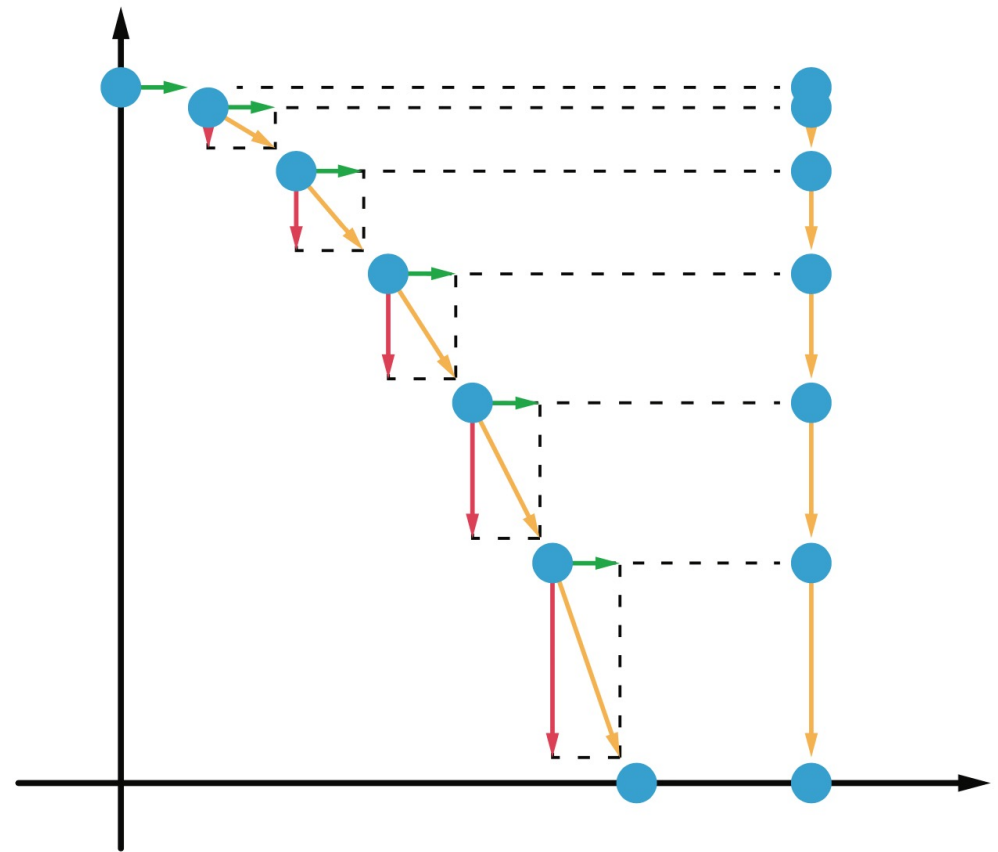
Example. Baseball, cannonball, snowboarder



Components of motion

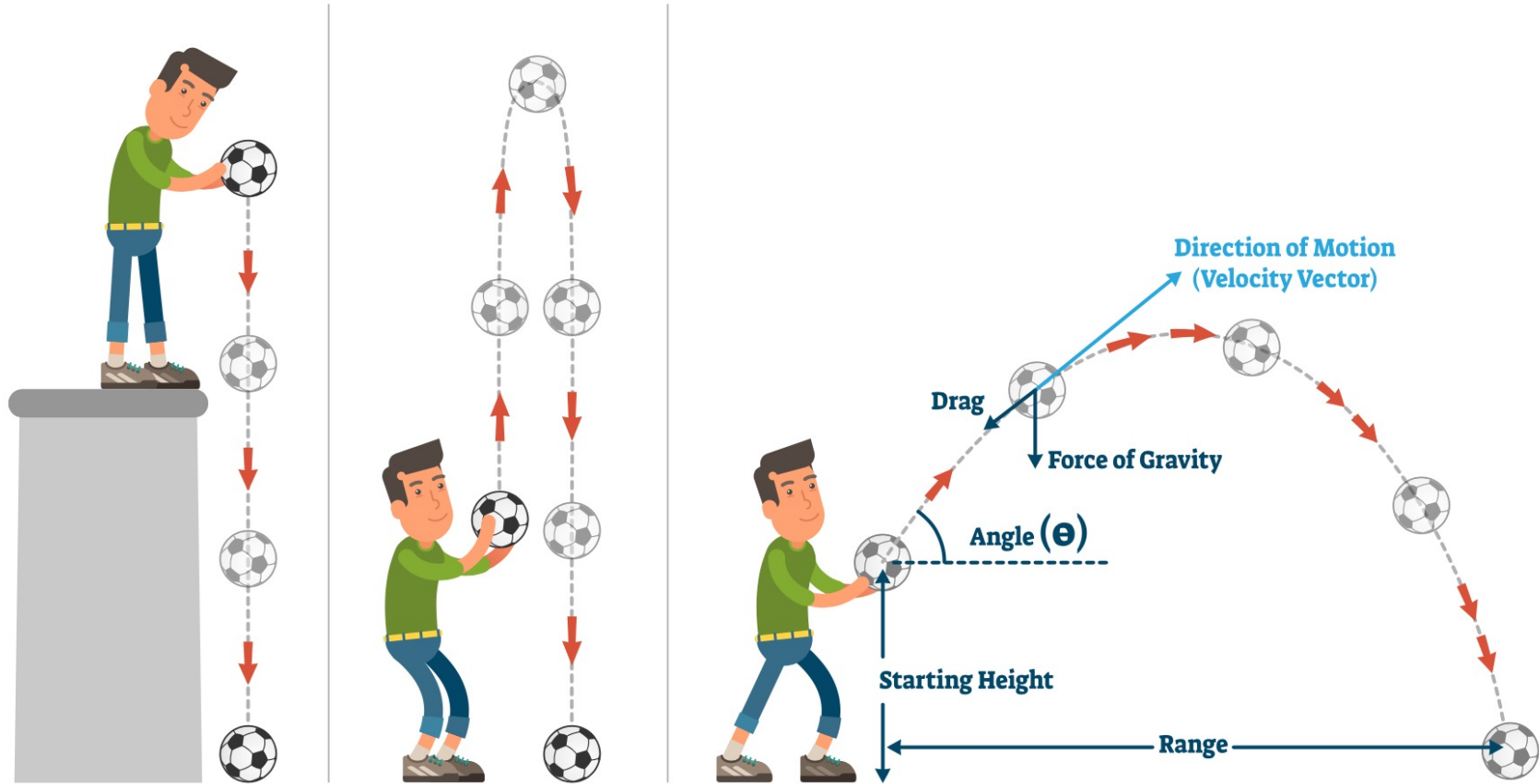
The two balls reach the lowest position at the same instant even though one was projected horizontally.

Both balls had a $v_i = 0$ and both experienced free fall.



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Projectiles



The only force acting on this projectile is gravity which acts downwards causing a downwards acceleration.

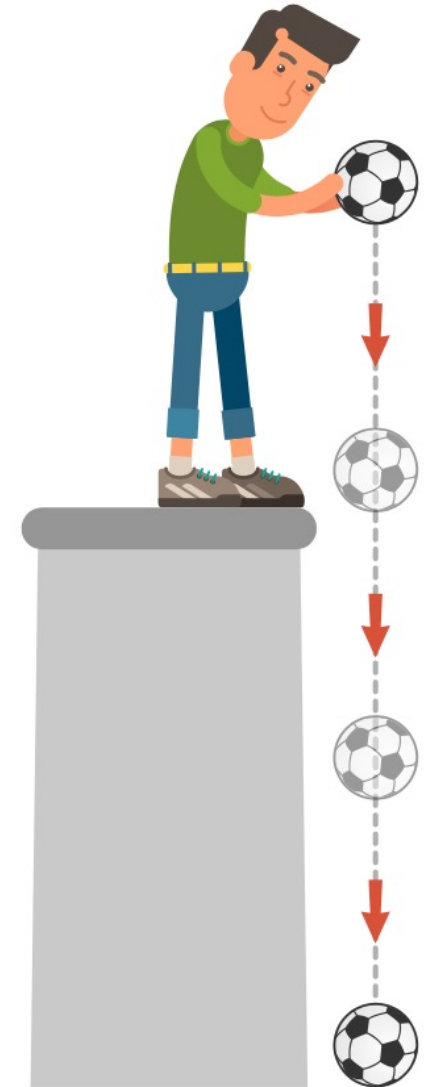
Recall

- A force is not required to keep an object in motion
- Forces cause acceleration
- In the case of projectiles...
 - _____
 - (neglecting air resistance for now)

Gravity and Projectiles

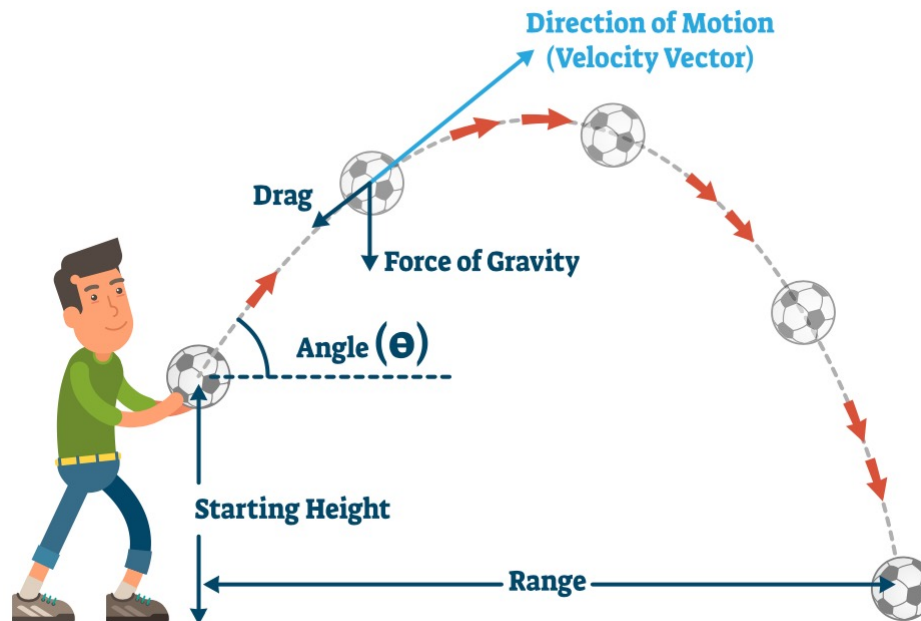
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- Gravity causes a vertical acceleration downward at 9.8m/s^2



Projectiles with Upward v_i

Projectiles travel with a parabolic trajectory because the downward force of gravity accelerates them _____



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The 5 Kinematic Equations

You will use the 5
Kinematic Equations to
solve your projectile
motion problems

$$a = \frac{v_f - v_i}{\Delta t}$$

$$d = v_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$d = \frac{1}{2} (v_i + v_f) \Delta t$$

Remember to always

- state what you have
- state what you need
- draw a diagram

$$v_f^2 = v_i^2 + 2a\Delta d$$

$$\Delta d = v_f \Delta t - \frac{1}{2} a (\Delta t)^2$$

Check Your Understanding

A ball is thrown off a balcony and has an initial velocity of 18 m/s horizontally. Determine the vertical position change of the ball at $t = 1.0$ s.

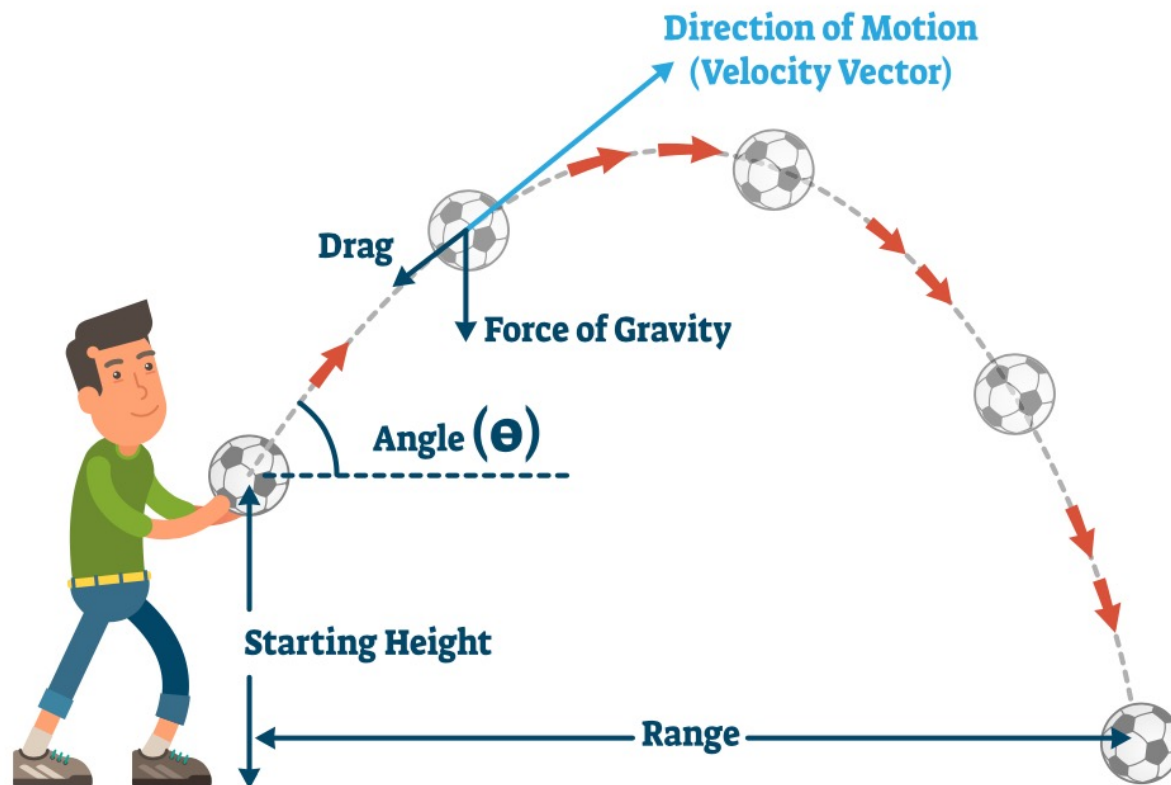
Check Your Understanding

A child travels down a water slide, leaving it with a velocity of 4.2 m/s horizontally as shown below. The child then experiences projectile motion, landing in a swimming pool 3.2 m below the slide.

- a) For how long is the child airborne?
- b) Determine the child's horizontal displacement while in the air.
- c) Determine the child's velocity upon entering the water.

Analyzing More Complex Projectile Motion

The same kinematics equations can be used to analyze problems where the initial velocity is at some angle to the horizontal, $v_{iy} \neq 0$.



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Check Your Understanding

A medieval prince trapped in a castle wraps a message around a rock and throws it from the top of the castle wall with an initial velocity of 12 m/s [42° above the horizontal]. The rock lands just on the far side of the castle's moat, at a level 9.5 m below the initial level. Determine the rock's

- a) time of flight.
- b) width of the moat.
- c) velocity at impact.

Homework Questions

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Homework Questions

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Homework Questions

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