

- When air resistance is not taken into account, released objects will experience acceleration due to gravity, also known as freefall.
- Projectile motion can be predicted and controlled using kinematics equations.
- During projectile motion, velocity in the x-direction remains constant; while velocity in the y-direction changes at a constant rate due to gravity.
- Design problems can be solved by individuals or in teams.
- Engineers use a design process to create solutions to existing problems.
- Design briefs are used to identify the problem specifications and to establish project constraints.
- Working in a team requires effective communication, clear responsibilities, and attention to interpersonal relationships.
- Design teams conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.
- Effective presentations are the result of preparation, are tailored to suit the purpose and audience, and are improved by attending to posture, gestures, appearance, eye contact, and time constraints.

Knowledge and Skills

Knowledge: Students will:

- Describe freefall motion of a projectile as having constant velocity in the horizontal direction and uniformly accelerating motion in the vertical direction.
- Know the purpose of each part of a design brief.
- Describe a step-by-step, iterative design process.

Skills: Students will:

- Calculate distance, displacement, speed, velocity, and acceleration from data.
- Design, build, and test a machine that efficiently channels mechanical energy when friction and limited input energy are significant constraints.
- Calculate acceleration due to gravity given data from a free-fall trajectory.
- Calculate the x- and y-components of a projectile motion.
- Determine the angle needed to launch a projectile a specific range given the projectile's initial velocity.
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AGENDA / ACTIVITIES /

Closure

The following techniques may be utilized:

- The teacher will lead a classroom discussion to check for understanding and clarify misunderstandings.
- The teacher may ask students to reflect on the outcomes from the lesson.
- The teacher may ask students if they met and how they met the learning objectives for the lesson.
- The teacher may ask students to demonstrate what was learned.
- Teacher and students may play Kahoot! (or some other type of game) to check for mastery.
- Student will share why the lesson is important via guided questions.
- Student will complete some sort of exit ticket.

Assignments and Assessments

The students will:

- Practice active listening skills while observing the teacher-led PowerPoint presentations.
- Complete *Project 4.2.1 Self-Propelled Vehicle Design*.
- Complete *Project 4.2.2 Projectile Motion*.
- Complete the *Project 4.2.2 Projectile Motion Data Sheet*.
- Complete *Project 4.2.3 Ballistic Design (VEX)*.
- Complete the *Project 4.2.3 Ballistic Design Data*.
- Complete the *Lesson 4.2 Test*.

Homework

The students will:

- Complete assignments that were not completed in class.
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