

ACTIVITY NO. - 2 - Let us Project

Subject	Physics
Class	XI
Chapter/Unit	Motion in a Plane
Topic	Projectile Motion
Time	15 minutes
Nature of Activity	Pair Work

What will I learn (Learning Outcome)?

To illustrate projectile motion.

Skills: Applying, Analyzing and Creating

What I have to do?

To demonstrate that

- the path of a projectile is parabolic in shape.
- range of a projectile depends on the angle of projection/launching

What do I require?

A small and light weight ball, water colors, white sheets, ruler, eraser and a cardboard/table.

What do I need to know?

A projectile is an object projected into space by the exertion of a force. The path of a projectile is parabola. Each projectile has a maximum height and range. Height is the vertical distance travelled by the projectile whereas the range is the horizontal distance. For any given speed, Height or Range can be maximized by changing the angle of projection.

➤ **Teacher's Activity**

Teacher will

1. ask students to recall the concept of projectile motion and how is it different from free fall.
2. make pairs of the students and will explain the steps of the activity.
3. ensure that each participant of the pair performs the activity on his/her own.

How will I proceed?

➤ **Student's Activity**

1. Take some water color in a bowl and mix water in it to make a thick solution.
2. Dip the ball in the bowl and ensure that it gets colored all over.
3. Place the white sheet on a cardboard/table and fix it.
4. At one end of the sheet place an eraser and keep a 15 cm range scale/ruler above the eraser(0 cm mark of the ruler to be placed on eraser and 15 cm mark to be on the sheet making an inclined plane)
5. Keep the ball at the 0 cm mark of the scale and release on the white sheet and observe the colored pattern formed on it as the balls moves.

6. Make sure that the fan is off while doing this activity (so that the motion of the ball is not affected)
7. Mark the starting point and end point of the motion of the ball and measure the distance between the two using a ruler.
8. Repeat steps 1 -7 by keeping the ruler at different angles with the horizontal axis (keeping the initial velocity same for each angle; which can be achieved by keeping the same slope/inclination).

What have I observed?

S. No.	Angle of Projection	Range (m)

What have I learnt?

- Path of a projectile is _____.
- Range of a projectile depends on its _____, keeping its initial velocity constant

What am I curious to learn?

- Let us observe the effect of angle of projection on the height of a projectile using the same apparatus.
- Let us throw a ball vertically upwards and observe if the ball falls at the same point from where it was thrown up? Can I explain my observation?

Let me evaluate myself

1. What is meant by a projectile?

2. What is the path of a projectile? Support your answer with a mathematical proof.

3. Derive the expressions for the Time of flight, Height and Range of a projectile. Using the expressions of Height and Range of a projectile, deduce the angle at which Height is maximum and the angle at which its Range is maximum.

4. If a projectile is thrown with an initial velocity 'u', making an angle θ with the horizontal, then for what value of θ both Range and Height will become equal?

5. An object is launched at a velocity of 20 m/s in a direction making an angle of 30° with the horizontal. What is the
- a) maximum height reached by the object?
 - b) total flight time of the object?
 - c) horizontal range of the object?
 - d) magnitude of the velocity of the object just before it hits the ground?
