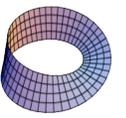
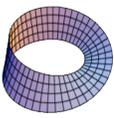


Projectiles – Simple Projectiles

- * A ball is kicked from a point P on horizontal ground with a speed of 20 m/s at 45° to the horizontal. The ball strikes the ground at Q. Find
 - the time it takes the ball to travel from P to Q
 - $|PQ|$, the distance from P to Q.
- * A particle is projected from a point on horizontal ground with an initial speed of 58 m/s at an angle β to the horizontal, where $\tan \beta = \frac{20}{21}$.
 - Find the initial velocity.
 - Calculate the time taken to reach the max height.
 - Calculate the max height.
 - Find the range.
 - Find the two times at which the height of the particle is 75 m.
- * A particle is projected with initial velocity $72\vec{i} + 30\vec{j}$ m/s from the top of a straight vertical cliff of height 35 m. It strikes the horizontal ground at P. Find
 - the time taken to reach the max height
 - the max height of the particle above ground level
 - the time of flight
 - $|OP|$, the distance from O to P
 - the speed of the particle as it strikes the ground.
- * A straight vertical cliff is 45 m high. A projectile is fired horizontally with an initial speed of x m/s from the top of the cliff. It strikes the level ground at a distance of $30\sqrt{3}$ m from the foot of the cliff. Find the **exact** value of x .
- * A particle is projected from a point on horizontal ground with an initial speed of 25 m/s at an angle $\tan \beta$ to the horizontal where $\tan \beta = \frac{3}{4}$.
 - Find the initial velocity of the particle.
 - Calculate the time taken to reach the max height.
 - Calculate the max height of the particle above ground level.
 - Find the range.
 - Find the speed and direction of the particle after 3 seconds of motion.
- * A projectile is fired with initial velocity $14\vec{i} + 10\vec{j}$ m/s from the top of a vertical cliff of height 40 m.
 - Calculate the time taken to reach the max height.
 - Calculate the max height of the projectile above ground level.
 - Calculate the time it takes the projectile to travel from the max height to the ground.
 - Find the range.
 - Find the speed of the projectile as it strikes the ground.
- * A particle is projected from a point on a level horizontal plane with initial velocity $10\vec{i} + 36\vec{j}$ m/s, where \vec{i} and \vec{j} are unit perpendicular vectors in the horizontal and vertical directions respectively. Find
 - the time it takes to reach the max height
 - the max height
 - the two times when the particle is at a height of 50 m
 - the speed with which the particle strikes the plane.
- * A straight vertical cliff is 125 m high. A projectile is fired horizontally with an initial speed of u m/s from the top of the cliff. It strikes the level ground at a distance 656.6 m from the foot of the cliff. Find the value of u .
- * A straight vertical cliff is 45 m high. Projectile P is fired horizontally directly out to sea from the top of the cliff with a speed of 20 m/s. At what distance from the foot of the cliff does projectile P hit the sea?
- * A golfer hits a ball from a point O on level horizontal ground with an initial speed of 40 m/s inclined at an angle $\tan^{-1} \frac{4}{3}$. As the ball is descending it strikes a 12 m tall tree. How far away is the ball from the golfer at O?



Source(s):

- <http://www.MathsGrinds.ie/>
- <http://www.examinations.ie/>

Further Information:

- Questions marked with an asterisk * are past Leaving Cert Exam questions.

Answers:

- 2.9 s
 - 40.8 m
 - 11.5 m
 - 61.2 m
- $42\vec{i} + 40\vec{j}$
 - 4.1 s
 - 81.6 m
 - 342.9 m
 - 5.3 s and 2.9 s
 - 25 m/s and 36° downward
- 3.1 s
 - 80.9 m
 - 4.6 s
 - 327.9 m
 - 73.5 m/s
- $7\sqrt{6}$
- $20\vec{i} + 15\vec{j}$ m/s
 - 1.5 s
- 1.0 s
 - 45.1 m
 - 3.1 s
 - 57.8 m
 - 32.9 m/s
- 3.7 s
 - 66.1 m
 - 1.9 s and 5.5 s
 - 37.4 m/s
- 130 m/s
- 60.6 m
- 150 m