Modeling Projectile Motion with Quadratics

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Instructions

Print or copy page 3 and 4 double sided.

Place the paper so the examples are face down.

Cut along the dotted lines to create flaps.

Flip and fold the flaps inwards.

Glue the foldable into notes or on a piece of construction paper.

Go through the foldable with your students.

Modeling Projectile Motion With Quadratics

Example 1

Projectile Motion Formula

Example 3

Example 2

Modeling Projectile Motion With Quadratics

Projectile Motion

The height of an object moving under the force of gravity, with no other forces acting on it, can be modeled by the following quadratic function.

$$h(t) = -16t^2 + v_0t + h_0$$

The variables in the function represent the following quantities:

$h(t)$ is the height of the object above the ground in feet.
t is the time in seconds.
v_0 is the initial velocity of the object in feet per sec
h_0 is the initial height of the object in feet.

1) A football is kicked from the ground with an initial velocity of 128 feet per second. Write an equation f projectile motion function, determine the m mum h of the football, and determine how many second ill take the football to reach the ground.

2) An object is shot with an i city o second into the air from a 80 Vrite ation for the projectile motion fu , deter the m um height of the object ter how m seconds ill take object gro

toy rocket is launched from a 48 ft high platform with an itial velocity of 88 feet per second. Write an equation for the projectile motion function, determine the maximum height of the rocket, and determine how many seconds it will take for the rocket to reach the ground.

Modeling Projectile Motion With Quadratics

Projectile Motion

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1) A football is kicked from the ground with an initial velocity of 128 feet per second. Write an equation for the projectile motion function, determine the maximum height of the football, and determine how many seconds it will take for the football to reach the ground.

$h(t) = -16t^2 +$

Maximum height

$t = \frac{-b}{2a} = \frac{-128}{2(-16)} = 4$ sec

$h(t) = -16t^2 +$

$= -16(4)^2 +$

$=$ feet

Time to reach the ground

$h(t) = 0$

$0 = -16t^2 + 128t$

$0 = -16t(t - 8)$

$-16t = 0 \quad t - 8 = 0$

$t = 0 \qquad t = 8$ sec

Max height 256 ft

Reaches the ground in 8 sec

2) An object is shot with an initial velocity of second into the air from a 80 platform. Write an equation for the projectile motion function, determine the maximum height of the object, determine how many seconds it will take for object to ground.

$h(t) = -16t^2 + 64t + 80$

Maximum height

$t = \frac{-b}{2a} = \frac{-64}{2(-16)} = 2$ sec

$h(t) = -16t^2 + 64t + 80$

$h(2) = -16(2)^2 + 64(2) + 80$

$= -64 + 128 + 80$

$= 144$ feet

Time to reach the ground

$h(t) = -16t^2 + 64t + 80$

$0 = -16t^2 + 64t + 80$

$0 = -16(t^2 - 4t - 5)$

$0 = -16(t - 5)(t + 1)$

$-16 = 0 \quad t - 5 = 0 \quad t + 1 = 0$

$t \neq 0 \qquad t = 5 \qquad t = -1$

Max height = 144 ft in 2 sec

Reaches the ground in 5 sec

A toy rocket is launched from a 48 ft high platform with an initial velocity of 88 feet per second. Write an equation for the projectile motion function, determine the maximum height of the rocket, and determine how many seconds it will take for the rocket to reach the ground.

$h(t) = -16t^2 + 88t + 48$

Maximum height

$t = \frac{-b}{2a} = \frac{-88}{2(-16)} = 2.75$ sec

$h(t) = -16t^2 + 88t + 48$

$h(2) = -16(2.75)^2 + 88(2.75) + 48$

$= -121 + 242 + 48$

$= 169$

Time to reach the ground

$h(t) = -16t^2 + 88t + 48$

$0 = -16t^2 + 88t + 48$

$0 = -8(2t^2 - 11t - 6)$

$0 = -8(2t + 1)(t - 6)$

$-16t = 0 \quad 2t + 1 = 0 \quad t - 6 = 0$

$t = 0 \qquad t = -\frac{1}{2} \qquad t = 6$

Max height = 169 ft in 2.75 sec

Reaches the ground in 6 sec