Projectile Motion Problems

Name _____

Date _____ Period _____

When an object is projected forward at an inclination of θ from the horizontal, traveling at an initial velocity v_o , the motion of the object is referred to as projectile motion.

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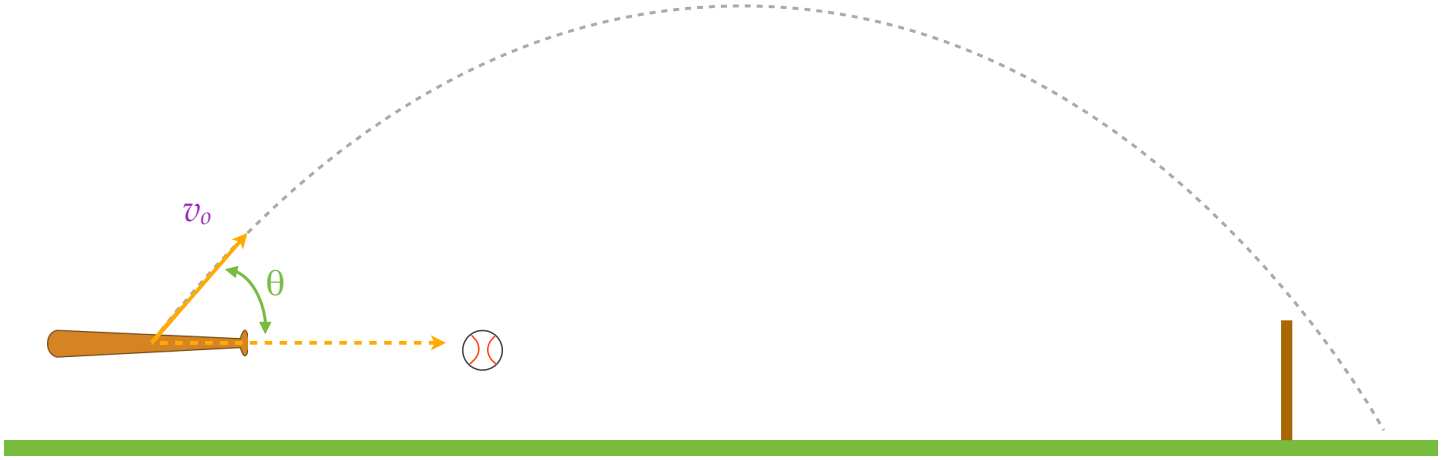

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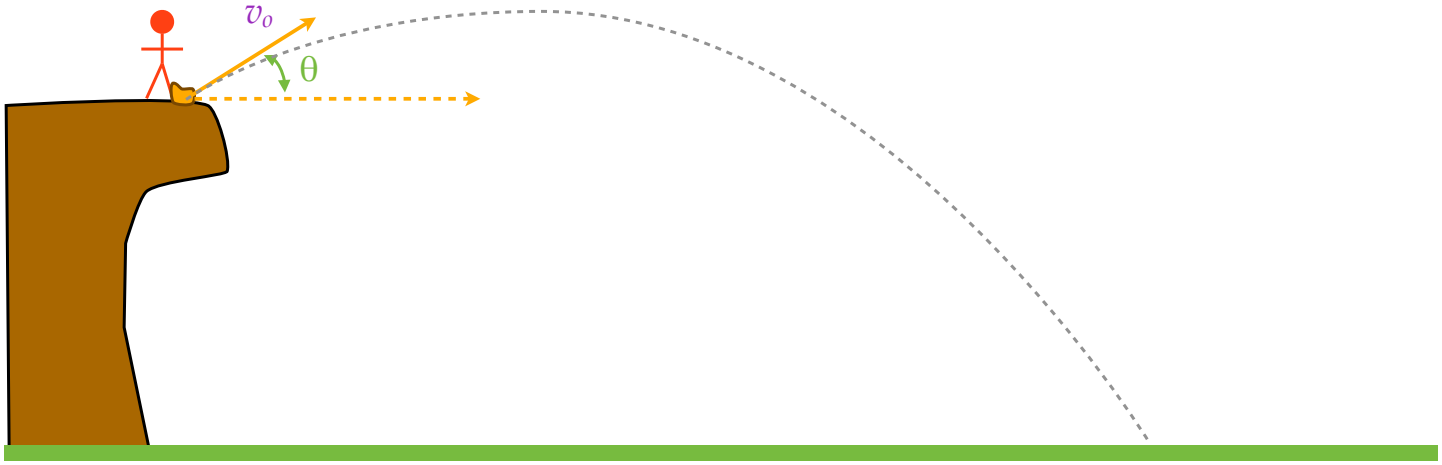


When an object is projected forward at an inclination of θ from the horizontal, traveling at an initial velocity v_o , the motion of the object is referred to as projectile motion.

$x = (v_o \cos \theta)t$

v_o = initial velocity

θ = angle with horizontal

t = time (seconds)

$y = -\frac{1}{2}gt^2 + (v_o \sin \theta)t + h$

g = earth's gravity constant

$g \approx 32$ ft/sec^2 or 9.8 m/sec^2

t = time (seconds)

v_o = initial velocity

θ = angle with horizontal

h = initial height of the object

Bob hits a golf ball with an initial velocity of 160 ft/sec at an angle of 30°.

$$x = (v_o \cos \theta)t \qquad y = -\frac{1}{2}gt^2 + (v_o \sin \theta)t + h$$

Find the equations to describe the x and y position of the ball relative to time.

Bob hits a golf ball with an initial velocity of 160 ft/sec at an angle of 30°.

$$x = 80\sqrt{3} \cdot t \qquad y = -16t^2 + 80t$$

How long is the ball in the air? Set $y = 0$, solve for t

$y = 0$ means the ball is on the ground

Bob hits a golf ball with an initial velocity of 160 ft/sec at an angle of 30°.

$x = 80\sqrt{3} \cdot t$ $y = -16t^2 + 80t$

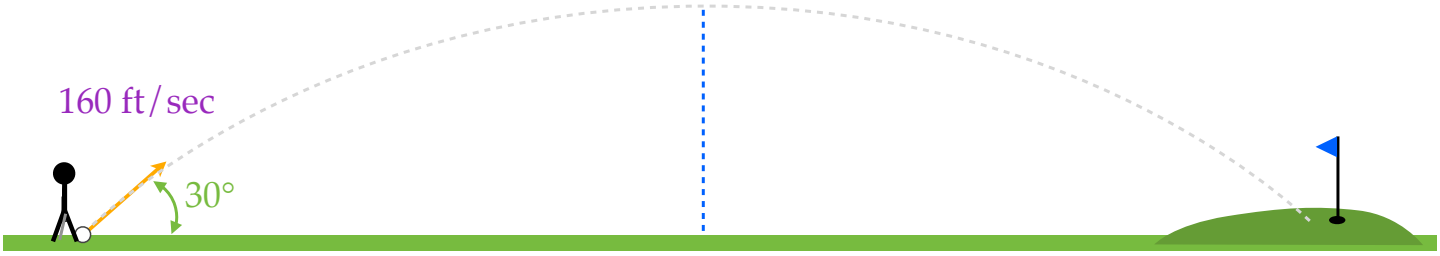
How long is the ball in the air? The ball is in the air for 5 sec

Bob hits a golf ball with an initial velocity of 160 ft/sec at an angle of 30°.

$x = 80\sqrt{3} \cdot t$ $y = -16t^2 + 80t$

When is the ball at its maximum height? Find vertex of $y = -16t^2 + 80t$

What is the balls maximum height?



Bob hits a golf ball with an initial velocity of 160 ft/sec at an angle of 30°.

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How far does the ball travel from Bob? Find x when $t = 5$ sec

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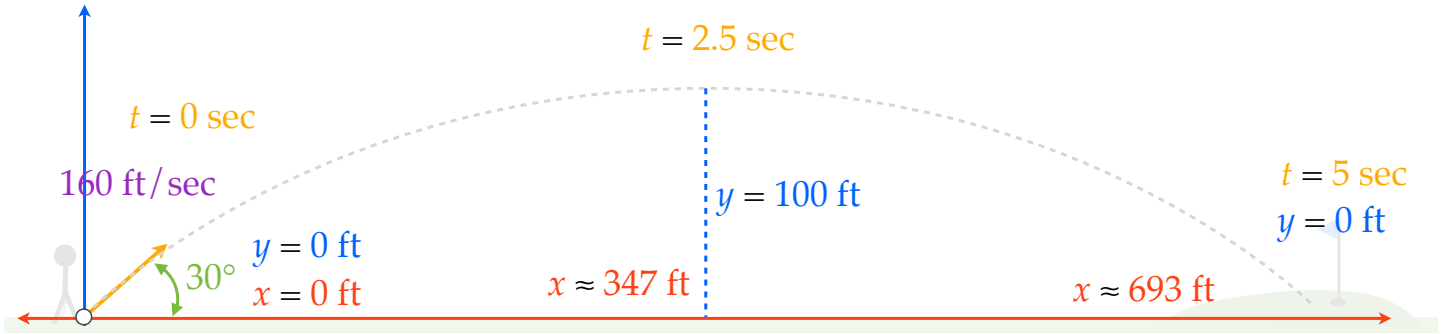
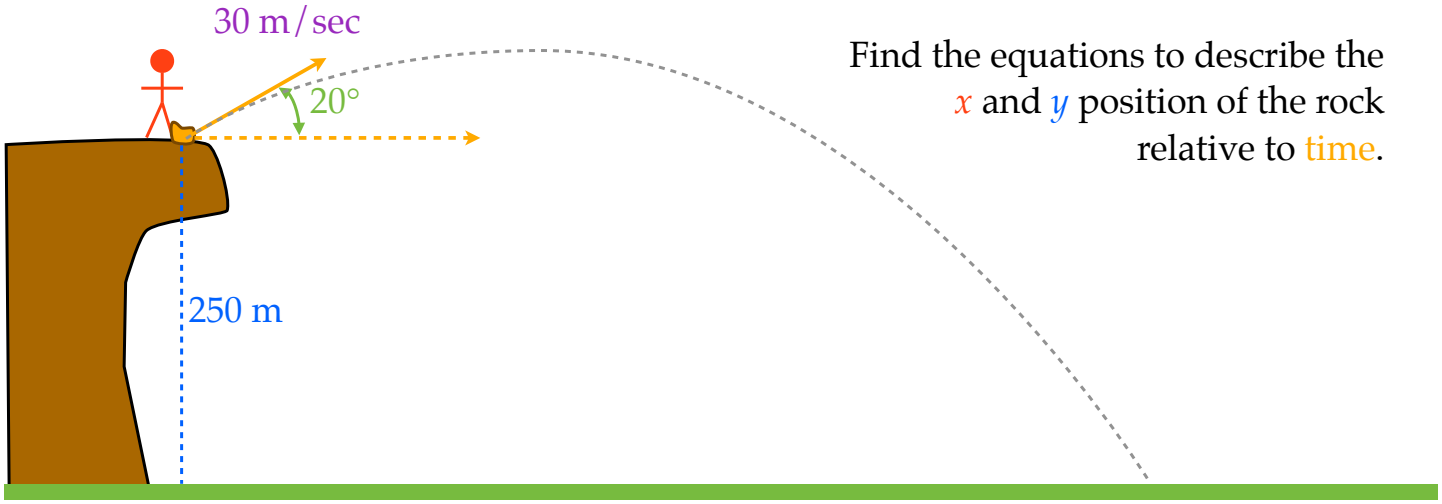


Bob kicks a rock off a cliff 250 m high with an v_o of 30 m/sec at an angle of 20°.

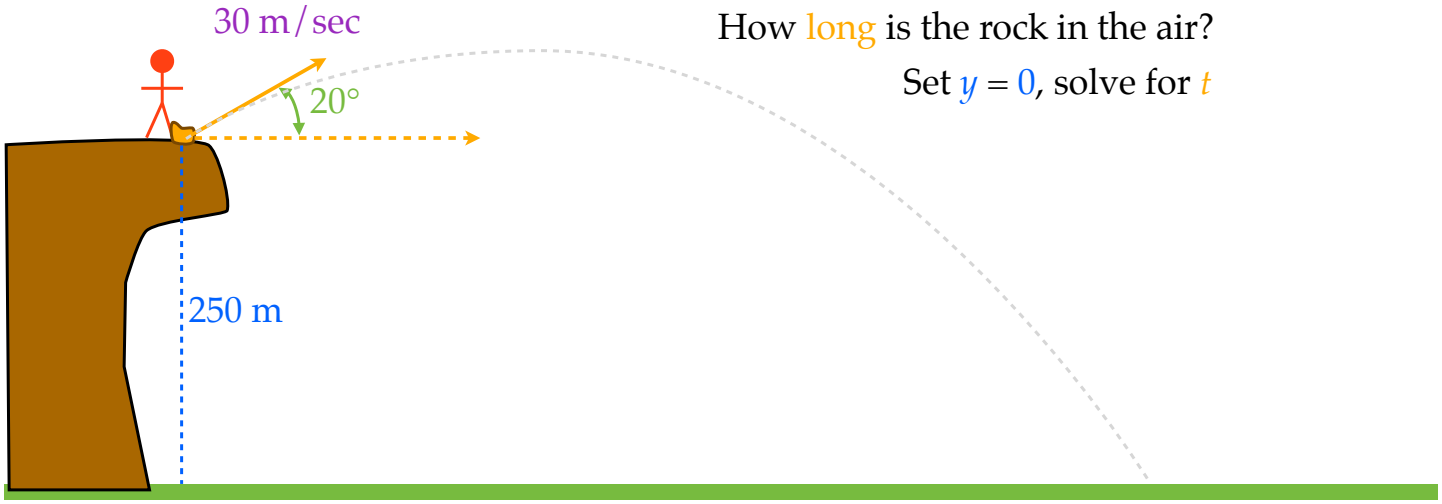
$x = (v_o \cos \theta)t$ $\quad$ $y = -\frac{1}{2}gt^2 + (v_o \sin \theta)t + h$



Find the equations to describe the x and y position of the rock relative to time.

Bob kicks a rock off a cliff 250 m high with an v_o of 30 m/sec at an angle of 20°.

$x \approx 28.2 \cdot t$ $\quad$ $y \approx -4.9t^2 + 10.3t + 250$



How long is the rock in the air?

Set $y = 0$, solve for t

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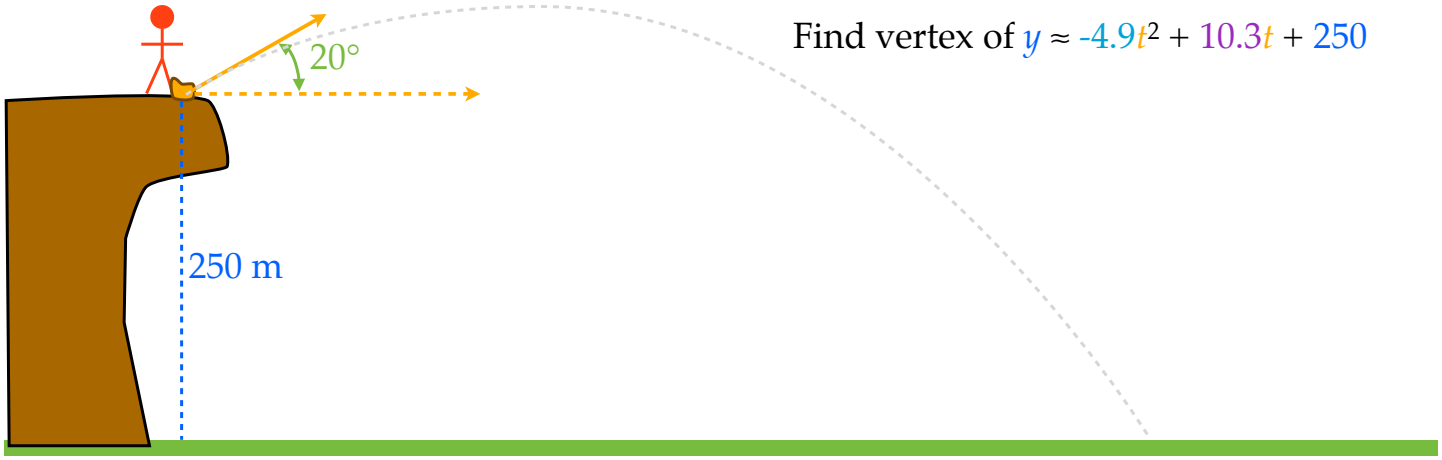

$x \approx 28.2 \cdot t$ $y \approx -4.9t^2 + 10.3t + 250$

When is the rock at its maximum height?

Find vertex of $y \approx -4.9t^2 + 10.3t + 250$

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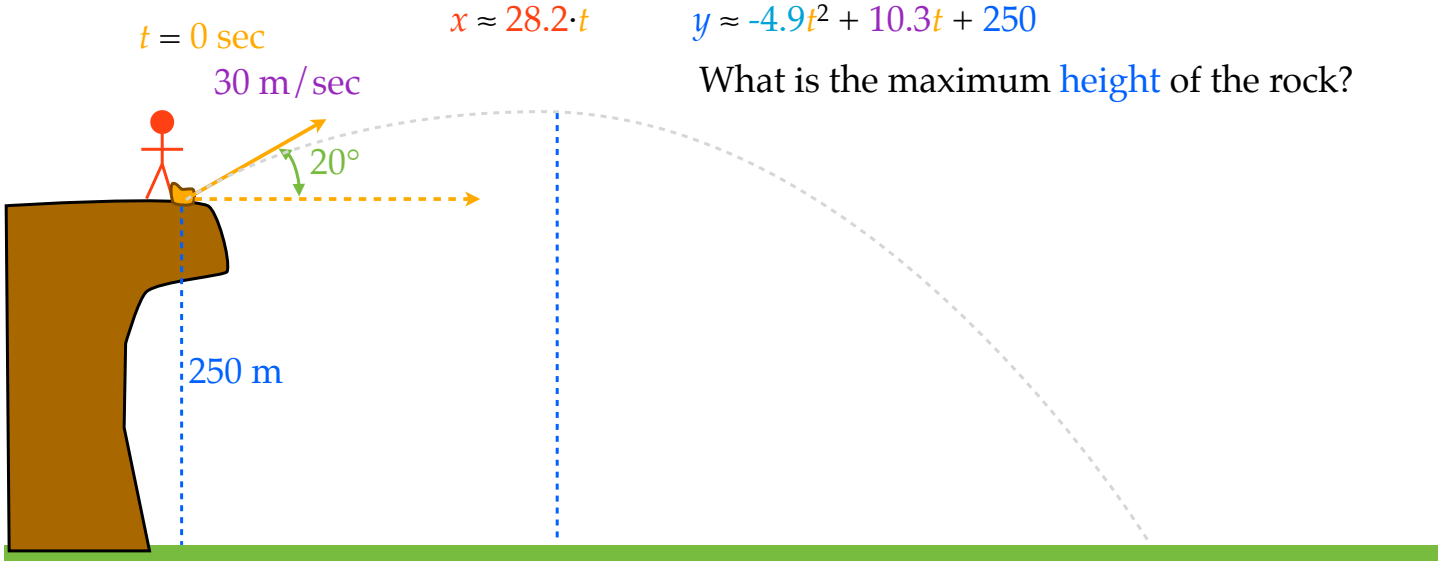

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What is the maximum height of the rock?

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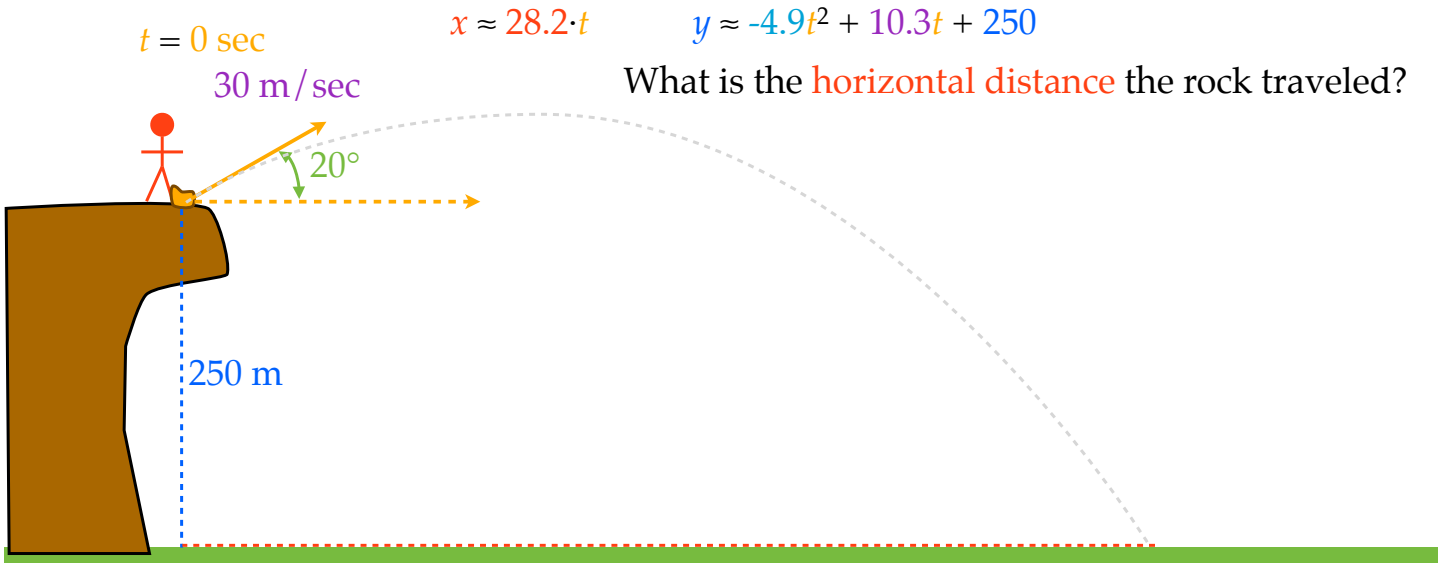
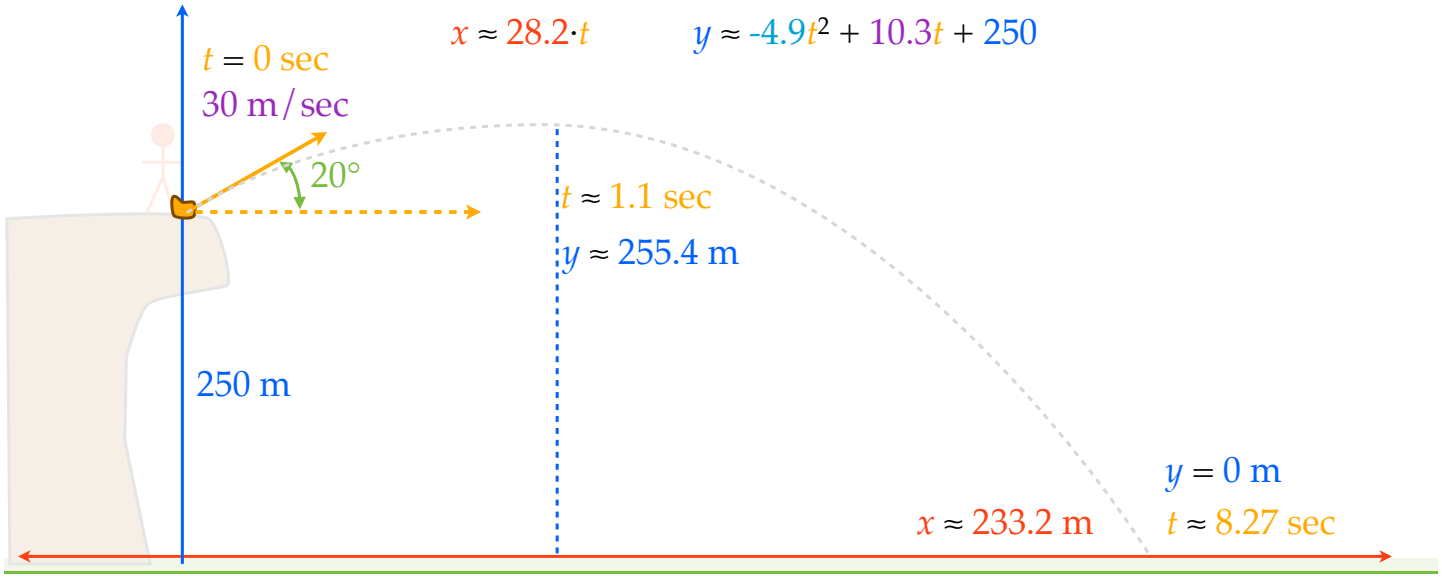


What is the horizontal distance the rock traveled?

Bob kicks a rock off a cliff 250 m high with an v_o of 30 m/sec at an angle of 20°.



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