MULTIPLE REPRESENTATION PROBLEM SOLVING-80A CP(BICYCLE JUMP)

Problem: A child wants to ride his bicycle off the end of a horizontal sidewalk landing on the ground 1 m below. The fastest the child can pedal the bicycle is 15 m/s. (a) How far from the end of the sidewalk will the child land on the ground? (b) How long will be child be in the air before landing on the ground?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A tiger leaps horizontally from a 6.5 m high rock with a speed of 3.5 m/s. How far from the base of the rock will she land? Ignore air resistance.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A movie stunt driver on a motorcycle speeds horizontally off a 50.0 m high cliff. How fast must the motorcycle leave the cliff top to land on level ground below, 90.0 m from the base of the cliff where the cameras are? Ignore air resistance.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A diver running 1.8 m/s dives out horizontally from the edge of a vertical cliff and 3.0 s later reaches the water below. How high was the cliff, and how far from its base did the diver hit the water?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: The average thrust created by the first stage engine of a model rocket is 50 N. The rocket has an average weight of 10 N with a burn time of 2 s. The rocket is initially fired vertically upward. When the rocket reaches maximum height, a second engine is fired creating a horizontal velocity (only) of 50 m/s. Where does the rocket land relative to its launch point. Assume it was lauched on a horizontal plain.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: The pilot of an airplane traveling 180 km/h wants to drop supplies to flood victims isolated on a patch of land 160 m below. The supplies should be dropped how many seconds before the plane is directly overhead?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A child is standing on the edge of a cliff overlooking a river. The cliff is 8 m above the edge of the river and the river is 20 m wide where the child is located. If the child can throw a rock with a speed of 20 m/s, will the rock make it across the river?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A child is standing on the edge of a cliff overlooking a river. The cliff is 12 m above the edge of the river and the river is 25 m wide where the child is located. With what horizontal speed will the child have to throw the rock for it to make it across the river?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A child is standing on the edge of a cliff overlooking a river. The cliff is 8 m above the edge of the river and the river is 20 m wide where the child is located. If the child can throw a rock with a speed of 20 m/s, (a) what will be the rock's velocity and position after 1 second? (b) What will be the rock's speed and direction when it strikes the ground (or water)?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A ball is thrown horizontally from the roof of a building 45.0 m tall and lands 24.0 m from the base. What was the ball's initial speed.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A hunter aims directly at a target (on the same level as the gun) 75.0 m away. If the bullet leaves the gun at a speed of 180 m/s, by how much will it miss the target?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A rifle is aimed horizontally at a target 40 m away. The bullet hits the target 2 cm below the aiming point. (a) What is the bullet's time of flight? (b) What is the muzzle velocity of the rifle?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-83C CP(ELECTRON)

Problem: In a cathode-ray tube, a beam of electrons is projected horizontally with a speed of 1.0×10^9 cm/s into the region between a pair of horizontal plates 2.0 cm square. An electric field between the plates causes a constant downward acceleration of the electrons of magnitude 1.0×10^{17} cm/s^2. Find (a) the time required for the electrons to pass through the plates, (b) the vertical displacement of the beam in passing through the plates, and (c) the velocity of the beam as it emerges from the plates.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING-83D CP(CAR JUMP)

Problem: A stunt driver wants to make his car jump over eight cars parked side by side below a horizontal ramp. With what minimum speed must he drive off the horizontal ramp? The vertical height of the ramp is 1.5 m above the cars, and the horizontal distance he must clear is 20 m.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A car traveling at 25 m/s runs off a cliff that is 100 m above the ocean. (a) How far from the base of the cliff does the car travel horizontally before it hits the ocean? (b) With what velocity does the car hit the ocean?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: Spymaster Paul, flying a constant 215 km/h horizontally in a low-flying helicopter, wants to drop secret documents into his contact's open car which is traveling 155 km/h on a level highway 78.0 m below. At what angle (to the horizontal) should the car be in his sights when the packet is released?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: An object is thrown with an initial velocity of 30 m/s at an angle of 45° above the horizontal. If the initial and final heights of the object is 0 m, how far does the object go?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-85B CP(FOOTBALL)

Problem: A football is kicked at ground level with a speed of 18.0 m/s at an angle of 35.0° to the horizontal. (a) How much later does it hit the ground? (b) How far does it go?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING-85C CP(SHOTPUT)

Problem: A shotputter throws the shot with an initial speed of 15.5 m/s at a 34.0° angle to the horizontal. Calculate the horizontal distance traveled by the shot if it leaves the athlete's hand at a height of 2.20 m above the ground.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

Problem: A howitzer fires a projectile with a velocity of 300 m/s at an angle of 35° above the horizontal. If the howitzer is on a level plain, (a) where does the projectile hit the plain? (b) How high does the projectile go? (c) What is the time of flight for the projectile? (d) What is the position and velocity of the projectile 25 s after being fired?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-86A CP(CANNON ON A HILL)

Problem: An old cannon fires a cannon ball with a velocity of 200 m/s at an angle of 45° above the horizontal. If the cannon is perched on a hill 10 m above a level plain, (a) where does the cannon ball hit the plain? (b) What is the position and velocity of the cannon ball 20 s after being fired?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: An object is thrown from an initial height of 10 m with an initial velocity of 20 m/s at an angle of 30° above the horizontal. If the final height of the object is 0 m, how far does the object go?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: A projectile is fired with an initial speed of 65.2 m/s at an angle of 34.5° above the horizontal on a long flat firing range. Determine (a) the maximum height reached by the projectile, (b) the total time in the air, (c) the total horizontal distance covered (the range), and (d) the velocity of the projectile 1.50 s after firing.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-86D CP(APPLE AND ARROW)

Problem: William Tell must split the apple atop his son's head from a distance of 27 m. When William aims directly at the apple, the arrow is horizontal. At what angle must he aim the arrow to hit the apple if the arrow travels at a speed of 35 m/s?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING-87A CP(THROWN BALL)

Problem: An object is thrown from an initial height of 10 m with an initial velocity of 30 m/s at an angle of 30° above the horizontal. If the final height of the object is 0 m, how far does the object go?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-87B CP(THROWN OBJECT 2)

Problem: A person is standing in a ravine 25 m below a level plain. The person throws an object with an initial velocity of 20 m/s at an angle of 30° above the horizontal. If the object lands on the level plain, how far does the object go?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: An outfielder is trying to throw out a runner at homeplate. The distance from the player to homeplate is 100 m. If the player throws the baseball at an angle of 45° above the horizontal, how fast should the player throw the baseball to get the out?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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Problem: When Babe Ruth hit a homer over the 7.5 m high right-field fence 95 m from home plate, roughly what was the minimum speed of the ball when it left the bat? Asssume the ball was hit 1.0 m above the ground and its path initially made a 38˚ angle with the ground.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-89A CP(DIVING AIRPLNE)

Problem: A plane, diving at an angle of 53.0° with the vertical, releases a projectile at an altitude of 730 m. The projectile hits the ground 5.00 s after being released. (a) What is the speed of the plane? (b) How far did the projectile travel horizontally during its flight? (c) What were the horizontal and vertical components of its velocity just before striking the ground?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING-89B CP(FIRING ON VILLAGE)

Problem: A cannon has a muzzle velocity of 285 m/s and is inclined 50° to the horizontal plane upon which it is located. The cannon is firing on a village located 125 m above the plane on a hill. (a) How far from the village does the cannon need to be located so that the projectile can hit the village? (b) How long does it take the projectile once fired to hit the village?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

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MULTIPLE REPRESENTATION PROBLEM SOLVING-89C CP(BASKETBALL)

Problem: A basketball leaves a player's hands at a height of 2.10 m above the floor. The basket is 3.048 m above the floor. The player likes to shoot the ball at a 38.0° angle. It the shot is made from a horizontal distance of 11.00 m and must be accurate to ±0.22 m (horizontally), what is the range of initial speeds allowed to make the basket?

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING-89D CP(FIRING AT CLIFF)

Problem: A projectile is launched from ground level to the top of a cliff which is 195 m away and 155 m high. If the projectile lands on top of the cliff 7.6 s after it is fired, find the initial velocity of the projectile (magnitude and direction). Neglect air resistance.

(A) Pictorial Representation Include: • a coordinate axis, • a sketch showing motion, • identify x and y quantities at key positions during the motion, and • a symbol representing the unknown(s) that you wish to determine.	
(B) Physical Representation Encircle the system (a vary important choice) in the above sketch. Then, construct a motion diagram and a force diagram for the system (and for each individual object of interest).	
(C) Math Representation and Solution Write an expression that might be used to determine the time interval that the projectile was in the air. Write an expression for the distance traveled in the horizontal direction during that time interval.	
(D) Evaluation • Does the sign of the answer agree? • Is the unit of the answer correct? • Is the magnitude reasonable?	