MULTIPLE REPRESENTATION PROBLEM SOLVING - 20ACP (FALLING APPLE 2 - 1B2A)

A falling apple, starting from rest, falls a distance of 8.00 m before hitting a spongy **Problem:** surface. If the apple comes to a complete stop in .05 s after hitting the spongy surface, what acceleration does the apple feel due to the spongy surface. (A) Pictorial Representation Construct a pictorial representation of the situation described in the problem. Include: a coordinate axis, • a sketch that shows the object at the initial and final situations for each part of the problem, symbols that represent the known values of kinematic quantities at these times, and a symbol representing the • unknowns that you wish to determine. (B) Physical Representation Construct a separate motion diagram for the object during each part of the problem. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in your pictorial representation. (C) Math Representation Choose one or more of the kinematic equations that relate the variables involved in the problem. This equation describes the way in which these variables are related to each other. (D) Solution Use the results of the previous calculation and other information in the pictorial representation to determine the unknown. (E) Evaluation Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct?

Is the magnitude reasonable?

MULTIPLE
1B2A)REPRESENTATION
PROBLEMPROBLEMSOLVING- 20BCP(FALLING
APPLE
A PPLE
A falling apple, starting from rest, falls a distance of 5.75 m before hitting a spo

Problem: A falling apple, starting from rest, falls a distance of 5.75 m before hitting a spongy surface. If the apple sinks 5.00 cm into the spongy surface, what acceleration does the apple feel due to the spongy surface.

	, the spongy surface.
(A) Pictorial	
Representation	
Construct a pictorial representation	
of the situation described in the	
problem. Include:	
• a coordinate axis ,	
• a sketch that shows the object at	
the initial and final situations	
for each part of the problem	
for each part of the problem,	
• symbols that represent the known	
values of kinematic quantities at	
these times, and	
• a symbol representing the	
unknowns that you wish to	
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Construct a separate motion diagram	
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check the signs of the quantities in	
your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic	
equations that relate the variables	
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these variables are related to each	
otner.	
(D) Solution	
Use the results of the previous	
calculation and other information in	
the nictorial representation to	
determine the university of the	
determine the unknown.	
(E) Evaluation	
• Does the sign of the answer agree	
with the direction of the arrow	
in the motion diagram?	
• Is the unit of the answer correct?	
• Is the magnitude reasonable?	
- is the magnitude reasonable?	

MULTIPLEREPRESENTATIONPROBLEMSOLVING-20CCP(ACCELERATOR-1B2A)Problem:In a 100-m linear accelerator, an electron is accelerated to 1.0 percent the speed of light in 40 m before it coasts 60 m to the target. (a) What is the electron's acceleration during the first 40 m? (b) How long does the total "flight" take?

) How long does the total	ingit take:
(A) Pictorial		
Representation		
Representation		
 Construct a pictorial representation of the situation described in the problem. Include: a coordinate axis , a sketch that shows the object at the initial and final situations for each part of the problem, symbols that represent the known values of kinematic quantities at these times, and a symbol representing the unknowns that you wish to determine. 		
(B) Physical		
Representation		
Representation		
Construct a separate motion diagram		
for the object during each part of the		
problem. Use the directions of the		
arrows in the motion diagrams to		
check the signs of the quantities in		
your pictorial representation		
jour pretoriur representation.		
(C) Math Danagantation		
(C) Main Representation		
Choose one or more of the kinematic		
equations that relate the variables		
involved in the problem. This		
equation describes the way in which		
these variables are related to each		
other		
(D) Solution		
Use the results of the previous		
calculation and other information in		
the pictorial representation to		
determine the unknown.		
(F) Evaluation		
• Does the sign of the answer agree		
with the direction of the arrow		
in the motion diagram?		
• Is the unit of the answer correct?		
• Is the magnitude reasonable?		

MULTIPLE REPRESENTATION PROBLEM SOLVING - 20DCP (MODEL ROCKET -1B2A)

Problem: A model rocket start before it runs out of	ing from rest on the ground can accelerate at 4.50 m/s^2 for 3.2 s fuel. It then coasts straight upward until it reaches maximum
height. (a) How hig	h does it go? (b) How long does it take to reach this height?
(A) Pictorial	
Representation	
 Construct a pictorial representation of the situation described in the problem. Include: a coordinate axis , a sketch that shows the object at the initial and final situations for each part of the problem, symbols that represent the known values of kinematic quantities at these times, and a symbol representing the unknowns that you wigh to 	
(B) Physical	
Representation	
Construct a separate motion diagram for the object during each part of the problem. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic equations that relate the variables involved in the problem. This equation describes the way in which these variables are related to each other.	
(D) Solution	
Use the results of the previous calculation and other information in the pictorial representation to determine the unknown.	
(E) Evaluation	
 Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? 	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 21ACP (SPRINTER - 1B2A)

Problem: JR can accelerate at an average rate of 2.8 m/s^2 , but can not run faster than 10 m/s. In what minimum time can he run the 100 m dash? (A) Pictorial Representation Construct a pictorial representation of the situation described in the problem. Include: a coordinate axis, • a sketch that shows the object at the initial and final situations for each part of the problem, • symbols that represent the known values of kinematic quantities at these times, and a symbol representing the ٠ unknowns that you wish to determine. (B) Physical Representation Construct a separate motion diagram for the object during each part of the problem. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in your pictorial representation. (C) Math Representation Choose one or more of the kinematic equations that relate the variables involved in the problem. This equation describes the way in which these variables are related to each other. (D) Solution Use the results of the previous calculation and other information in the pictorial representation to determine the unknown. (E) Evaluation • Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? Is the magnitude reasonable?

MULTIPLEREPRESENTATIONPROBLEMSOLVING-21BCP(JUMPER-1B2A)Problem:A person jumps from a fourth-story window15.0 m above a firefighter's safety net. The survivor stretches the net 1.0 m before coming to rest. What was the average deceleration experienced by the survivor when she was slowed to rest by the net?

deceleration experies	need by the survivor when she was slowed to rest by the net.
(A) Pictorial	
Representation	
Representation	
 Construct a pictorial representation of the situation described in the problem. Include: a coordinate axis , a sketch that shows the object at the initial and final situations for each part of the problem, symbols that represent the known values of kinematic quantities at these times, and a symbol representing the unknowns that you wish to determine. 	
(D) Dharainal	
(B) Physical Representation	
Construct a separate motion diagram for the object during each part of the problem. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic equations that relate the variables involved in the problem. This equation describes the way in which these variables are related to each other.	
(D) Solution	
Use the results of the previous calculation and other information in the pictorial representation to determine the unknown.	
(E) Evaluation	
 Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? Is the magnitude reasonable? 	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 22ACP (SPEEDING CAR - 1B2A)

			_
Problem:	A speeding car is tra	weling at 25 m/s when the driver slams on the brake. The	
	braking acceleration	is 4.5 m/s^2 . The braking car travels 50 m before hitting a	
	barrier If the barrie	r creates a braking acceleration of 25 m/s ² how far does the car	
	compress the barrier	r?	
		· ·	⊨
(A) Pictol			
Kepresent	ation		
Constants			
of the situatio	n described in the		
problem Inc	lude		
 a coordina 	te axis		
 a sketch th 	hat shows the object at		
the initia	l and final situations		
for each	part of the problem,		
• symbols th	hat represent the known		
values of	kinematic quantities at		
these tim	es, and		
• a symbol 1	representing the		
unknown	is that you wish to		
(P) D hygi	e.		-
(D) Fliyst	cal		
Represent			
Construct o s	parata motion diagram		
for the object	during each part of the		
problem. Use	e the directions of the		
arrows in the	motion diagrams to		
check the sign	ns of the quantities in		
your pictorial	representation.		
(C) Math	Representation		
Choose one o	or more of the kinematic		
equations that	t relate the variables		
involved in th	e problem. This		
equation desc	ribes the way in which		
these variable	s are related to each		
(\mathbf{D}) Solut	ion		-
(D) Solut	1011		
Use the result	ts of the previous		
calculation ar	ad other information in		
the pictorial r	epresentation to		
determine the	unknown.		
(E) Evalu	ation		
• Does the s	ign of the answer agree		
with the	direction of the arrow		
in the mo	outon diagram?		
 Is the unit 	nitude reasonable?		l

MULTIPLEREPRESENTATIONPROBLEMSOLVING-22BCP(DIVER-1B2A)Problem:A person jumps off a diving board 4.0 m above the water's surface into a deep pool.
The person's downward motion stops 2.0 m below the surface of the water.
Estimate the average deceleration of the person while under the water.

Estimate the average	
(A) Pictorial	
Representation	
Construct a pictorial representation of the situation described in the problem. Include:a coordinate axis ,	
 a sketch that shows the object at the initial and final situations for each part of the problem, symbols that represent the known 	
 values of kinematic quantities at these times, and a symbol representing the 	
unknowns that you wish to determine.	
(B) Physical Representation	
Construct a separate motion diagram for the object during each part of the problem. Use the directions of the	
arrows in the motion diagrams to check the signs of the quantities in	
your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic equations that relate the variables involved in the problem. This equation describes the way in which these variables are related to each other.	
(D) Solution	
Use the results of the previous calculation and other information in the pictorial representation to determine the unknown.	
(E) Evaluation	
 Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? 	
• Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 23ACP (CAR TRIP 1 - 1B2A)

Problem: A car can accelerate at the rate of 3.5 m/s². If the car started at rest and must not exceed a maximum speed of 35 m/s, what minimum time does it take the car to cover a distance of 300 m?

a distance of 300 m	
(A) Pictorial	
Representation	
Construct a pictorial representation	
of the situation described in the	
problem. Include:	
• a coordinate axis,	
• a sketch that shows the object at	
the initial and final situations	
for each part of the problem,	
• symbols that represent the known	
values of kinematic quantities at	
these times, and	
• a symbol representing the	
unknowns that you wish to	
determine.	
(B) Physical	
Representation	
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Construct a separate motion diagram	
for the object during each part of the	
problem Use the directions of the	
arrows in the motion diagrams to	
check the signs of the quantities in	
your pictorial representation	
(C) Math Representation	-
(C) Math Representation	
Choose one or more of the kinematic	
equations that relate the variables	
involved in the problem. This	
equation describes the way in which	
these variables are related to each	
other.	
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(D) Solution	
Use the results of the previous	
calculation and other information in	
the pictorial representation to	
determine the unknown.	
(E) Evaluation	
• Does the sign of the answer agree	
with the direction of the arrow	
in the motion diagram?	
• Is the unit of the answer correct?	
• Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 24ACP (CAR TRIP 2 - 1B3A)

Problem: A car can decelerate at the rate of 3 m/s². If the car is going 25 m/s and takes 1.5 s to start braking, what minimum time does it take the car to stop? How far did it go during this process?

during this process?	
(A) Pictorial	_
Representation	
Representation	
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Construct a pictorial representation	
of the situation described in the	
problem. Include:	
• a coordinate axis.	
• a sketch that shows the object at	
the initial and final situations	
for each next of the nucleum	
for each part of the problem,	
• symbols that represent the known	
values of kinematic quantities at	
these times, and	
 a symbol representing the 	
unknowns that you wish to	
determine	
(B) Physical	-
Representation	
Construct a separate motion diagram	
for the object during each part of the	
problem. Use the directions of the	
arrows in the motion diagrams to	
check the signs of the quantities in	
your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic	
equations that relate the variables	
involved in the problem. This	
equation describes the way in which	
these variables are related to each	
other.	
(D) Solution	
Use the results of the previous	
calculation and other information in	
the pictorial representation to	
determine the unknown.	
(F) Evaluation	
• Does the sign of the answer agree	
with the direction of the arrow	
in the motion diagram?	
• Is the unit of the answer correct?	
• Is the magnitude reasonable?	
0	_

MULTIPLE REPRESENTATION PROBLEM SOLVING - 25ACP (FALLING WOMAN - 182A)

Problem: A person fell 20.5m	from the top of a building, landing on the top of a metal
ventilator box, whic	h she crushed to a depth of .50 m. The person survived without
serious injury. What	at acceleration (assumed uniform) did she experience during the
collision?	
(A) Pictorial	
Representation	
Construct a pictorial representation	
of the situation described in the	
problem. Include:	
 a coordinate axis , a sketch that shows the object at 	
• a sketch that shows the object at the initial and final situations	
for each part of the problem	
 symbols that represent the known 	
values of kinematic quantities at	
these times, and	
• a symbol representing the	
unknowns that you wish to	
determine.	
(B) Physical	
Representation	
Construct a separate motion diagram	
nor the object during each part of the	
arrows in the motion diagrams to	
check the signs of the quantities in	
your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic	
equations that relate the variables	
involved in the problem. This	
these variables are related to each	
other	
(D) Solution	
Use the results of the previous	
calculation and other information in	
the pictorial representation to	
determine the unknown.	
(E) Evaluation	
• Does the sign of the answer agree	
with the direction of the arrow	
 Is the unit of the answer correct? 	
 Is the magnitude reasonable? 	

MULTIPLEREPRESENTATIONPROBLEMSOLVING - 26ACP(SUBWAY - 1B3A)Problem:A Metro train in Washington D.C. starts from rest and accelerates at 2.0 m/s² for a
time interval of 12s. The train then travels at a constant speed for 60s. The speed of
the train then decreases for 12s until it comes to a stop. How far did the train travel
during this trip?

during uns urp?	
(A) Pictorial	
Representation	
Representation	
Construct a pictorial representation	
of the situation described in the	
problem. Include:	
 a coordinate axis , 	
 a sketch that shows the object at 	
the initial and final situations	
for each part of the problem,	
• symbols that represent the known	
values of kinematic quantities at	
these times, and	
• a symbol representing the	
unknowns that you wish to	
determine.	
(B) Physical	
Representation	
Representation	
Construct a construct and in the second	
Construct a separate motion diagram	
for the object during each part of the	
problem. Use the directions of the	
arrows in the motion diagrams to	
check the signs of the quantities in	
your pictorial representation.	
(C) Math Representation	
Choose one or more of the kinematic	
equations that relate the variables	
involved in the problem. This	
equation describes the way in which	
these variables are related to each	
other.	
(D) Solution	
Use the results of the previous	
calculation and other information in	
the pictorial representation to	
determine the unknown	
actorninie die unknown.	
(E) Evaluation	
• Does the sign of the answer agree	
with the direction of the arrow	
in the motion diagram?	
In the unit of the answer correct?	
• Is the unit of the answer correct?	
 is the magnitude reasonable? 	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 30ACP (TWO VEHICLE PROBLEM)

Problem: Ken is traveling at 20 m/s in his car when he passes a police car sitting on the side of the road. If the police car starts accelerating at 3 m/s² as soon as Ken passes, how far will Ken travel before the police car passes him? Assume Ken maintains his speed.

speed.	
(A) Pictorial	=
Representation	
Construct a pictorial representation	
of the initial situation and the final	
situation. Include:	
• a sketch that shows the cars at the	
initial and final situations,	
• symbols that represent the known	
values of kinematics quantities	
at these times, and	
 a symbol representing the 	
unknown that you wish to	
determine.	
(B) Physical	
Representation	
Construct separate motion diagrams	
for the Ken's car and for the police	
car. Use the directions of the arrows	
in the motion diagrams to check the	
signs of the quantities in the	
pictorial representation.	
(C) Math Representation	—
(C) Main Representation	
Write an equation that could be used	
to determine the position of Ken's	
car at any time after the initial time	
Write an equation that could be used	
to determine the position of the	
police car at any time after the initial	
time.	_
(D) Solution	
Ken's car and the police car, if	
continuing to move as indicated,	
pass each other. Use the equations	
above to determine the time at which	
mey are at the same position.	
(E) Evaluation	
 Does the sign of the answer agree 	
with the direction of the arrow	
in the motion diagram?	
• Is the unit of the answer correct?	
• Is the magnitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 30BCP (TWO VEHICLE PROBLEM)

Problem:	A car, initially at rest the car starts, a truck starts to move slowe time will the car and	t, accelerates toward the east at 2.0 m/s ² . At the same time that 500 m east of the car and moving at 32 m/s toward the west er losing speed at a rate of 2.0 m/s ² . At what position and at what truck pass each other?
(A) Pictor	rial	
Construct a p	ation	
of the initial s	situation and the final	
situation. Inc	lude:	
• a sketch th	at shows the cars at the	
 symbols the 	a final situations, nat represent the known	
values of	kinematics quantities	
at these t	imes, and	
 a symbol i 	representing the	
determine	e.	
	-	
(B) Physic Represent	cal	
Representa		
Construct sep	arate motion diagrams	
for the Ken's	car and for the police	
in the motion	diagrams to check the	
signs of the q	uantities in the	
pictorial repre	esentation.	
(C) Math	Representation	
Write an equa	tion that could be used	
to determine	the position of Ken's	
car at any tim	he after the initial time.	
Write an equa	tion that could be used	
to determine	the position of the	
police car at a	any time after the initial	
time.	ion	
(D) Solut	IOII	
Ken's car and	the police car, if	
continuing to	move as indicated,	
above to deter	rmine the time at which	
they are at the	e same position.	
(E) Evalu	ation	
• Does the s	ign of the answer agree	
with the d	direction of the arrow	
• Is the unit	of the answer correct?	
• Is the mag	nitude reasonable?	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 30CCP (TWO VEHICLE PROBLEM)

Problem:	Two cars with dummy passengers start from rest at opposite ends of a 100 m long automobile test facility. A Chevy Malibu on the right accelerates toward the left at 5.0 m/s^2 . A Ford Taurus on the left accelerates toward the right at 6.0 m/s^2 . At what position should cameras be aimed to record the front ends of the cars as they collide?	
(A) Pictor	rial	
R onrosontotion		
Construct a p	ictorial representation	
of the initial situation and the final		
situation. Include:		
• a sketch th	nat shows the cars at the	
initial an	d final situations,	
 symbols the symbols of the symbols of	hat represent the known	
values of	kinematics quantities	
at these t	imes and	
• a symbol i	representing the	
unknowr	that you wish to	
datarmin		
determine	<i>.</i>	
י ית (D)		
(B) Physic	cal	
Kepresent	ation	
Construct sep	arate motion diagrams	
for the Ken's	car and for the police	
car. Use the o	directions of the arrows	
in the motion	diagrams to check the	
signs of the a	uantities in the	
nictorial repre	exentation	
pietoriai iepie	Solitation.	
(C) Math	Representation	
(C) Muth	Representation	
Write on equa	tion that could be used	
write an equa	the manific and Wards	
to determine	the position of Ken's	
car at any tim	he after the initial time.	
Write an equa	ation that could be used	
to determine	the position of the	
police car at c	any time after the initial	
time	any time after the initial	
(D) Solut	ion	
Ken's car and	the police car, if	
continuing to	move as indicated.	
pass each other. Use the equations		
above to determine the time at which		
they are at the same position		
they are at the same position.		
(E) Evaluation		
• Does the s	ign of the answer agree	
with the direction of the arrow		
in the motion diagram?		
• Is the unit of the answer correct?		
• Is the magnitude reasonable?		

• Is the magnitude reasonable?

MULTIPLE REPRESENTATION PROBLEM SOLVING - 30DCP (TWO VEHICLE PROBLEM)

Problem:	Bob is driving down the interstate highway going 25 m/s. Jill is 75 m behind Bob and also doing 25 m/s. If Jill accelerates at the rate of 1.5 m/s^2 , (a) how long will it		
	take her to be direct	ly opposite Bob (assume she is in a parallel lane)? (b) How far	
	has she traveled duri	ing this period?	
(A) Pictor	rial		
Represent	ation		
Construct a pictorial representation			
of the initial situation and the final			
situation. Include:			
• a sketch that shows the cars at the			
initial and final situations,			
 symbols that represent the known values of kinematics quantities 			
at these times, and			
 a symbol representing the 			
unknown	that you wish to		
determine	2.		
(D) DL	1		
(B) Physic Depresent	cal		
Kepresenta			
Construct con	arata motion diagrams		
Construct separate motion diagrams			
car. Use the o	lirections of the arrows		
in the motion	diagrams to check the		
signs of the q	uantities in the		
pictorial repre	esentation.		
(C) Math	Representation		
	1		
Write an equa	tion that could be used		
to determine	the position of Ken's		
car at any tim	e after the initial time.		
Write an equa	tion that could be used		
to determine	the position of the		
police car at a	any time after the initial		
time.	•		
(D) Solut	ion		
Kan's our and	the police car if		
continuing to	move as indicated		
pass each oth	er. Use the equations		
above to deter	rmine the time at which		
they are at the	e same position.		
(E) Evalu	ation		
• Does the sign of the answer agree			
with the direction of the arrow			
in the motion diagram?			
 Is the unit of the answer correct? Is the magnitude response in the ? 			
• Is the magnitude reasonable?			

MULTIPLE REPRESENTATION PROBLEM SOLVING - 31ACP (TWO RUNNER PROBLEM)

Mike and Jason are two runners in the 400 m dash. With 50 m left in the race, Problem: Jason is 5 m behind Mike with both runners having a speed of 10 m/s. If Jason starts his "kick" at this time with an acceleration of .4 m/s², who wins the race? (A) Pictorial Representation Construct a pictorial representation of the initial situation and the final situation. Include: a sketch that shows the runners at the initial and final situations, symbols that represent the known values of kinematics quantities at these times, and a symbol representing the ٠ unknown that you wish to determine. (B) Physical Representation Construct separate motion diagrams for the runners. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in the pictorial representation. (C) Math Representation Write an equation that could be used to determine the position of Jason at any time after the initial time. Write an equation that could be used to determine the position of Mike at any time after the initial time. Solution **(D)** Will the runners, if continuing to move as indicated, pass each other. Use the equations above to determine the time at which they are at the same position. (E) Evaluation • Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? Is the magnitude reasonable?

MULTIPLEREPRESENTATIONPROBLEMSOLVING- 31BCP(CAR AND TRAIN)Problem:An automobile traveling 95 km/h overtakes a 1.10 km long train traveling in the
same direction on a track parallel to the road. If the train's speed is 75 km/h, how
long does it take the car to pass it, and how far will be car have traveled in this time?

	car to pass it, and now far will be car have traveled in this time.
(A) Pictorial	
Representation	
 Construct a pictorial representation of the situation described in the problem. Include: a coordinate axis , a sketch that shows the object at the initial and final situations for each part of the problem, symbols that represent the known values of kinematic quantities at these times, and a symbol representing the unknowns that you wish to determine. 	
(D) Dharainal	
(B) Physical Representation	
Construct a separate motion diagram for the object during each part of the problem. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in your pictorial representation.	
(C) Moth Dopresentation	
Choose one or more of the kinematic equations that relate the variables involved in the problem. This equation describes the way in which these variables are related to each other.	
(D) Solution	
Use the results of the previous calculation and other information in the pictorial representation to determine the unknown.	
(E) Evaluation	
 Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? Is the magnitude reasonable? 	

MULTIPLE REPRESENTATION PROBLEM SOLVING - 32ACP (OBJECT AND BOAT PROBLEM)

Problem: An object falls from a bridge that is 30 m above the water. It falls directly into a small boat moving with constant velocity that was 15 m from the point of impact when the object was released. What was the speed of the boat?

when the object was released. What was the speed of the boat?				
 (A) Pictorial Representation Construct a pictorial representation of the initial situation and the final situation. Include: a sketch that shows the runners at the initial and final situations, symbols that represent the known values of kinematics quantities at these times, and a symbol representing the unknown that you wish to determine. 				
(B) Physical				
Representation				
Construct separate motion diagrams for the runners. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in the pictorial representation.				
(C) Math Representation				
Write an equation that could be used to determine the position of Jason at any time after the initial time. Write an equation that could be used to determine the position of Mike at any time after the initial time.				
(D) Solution				
Will the runners, if continuing to move as indicated, pass each other. Use the equations above to determine the time at which they are at the same position.				
(E) Evaluation				
 Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? Is the magnitude reasonable? 				

MULTIPLE REPRESENTATION PROBLEM SOLVING - 33ACP (FALLING OBJECTS PROBLEM)

Problem: Two objects begin a free fall from rest from the same height 1.0 s apart. How long after the first object begins to fall will the two objects be 10 m apart?				
 (A) Pictorial Representation Construct a pictorial representation of the initial situation and the final situation. Include: a sketch that shows the runners at the initial and final situations, symbols that represent the known values of kinematics quantities at these times, and a symbol representing the unknown that you wish to determine. 				
(B) Physical Representation				
Construct separate motion diagrams for the runners. Use the directions of the arrows in the motion diagrams to check the signs of the quantities in the pictorial representation.				
(C) Math Representation				
Write an equation that could be used to determine the position of Jason at any time after the initial time.				
Write an equation that could be used to determine the position of Mike at any time after the initial time.				
(D) Solution				
Will the runners, if continuing to move as indicated, pass each other. Use the equations above to determine the time at which they are at the same position.				
(E) Evaluation				
 Does the sign of the answer agree with the direction of the arrow in the motion diagram? Is the unit of the answer correct? Is the magnitude reasonable? 				