Kinematics Review Checklist

Vectors and Scalars

1.1.0A – Give examples of vectors and scalars; and recognize the difference between them.

What two parts does a vector have? Which of these parts comprises a scalar?

| magnitude and direction | | magnitude only |

Which of the following are vectors? Which are scalars?
- (a) distance
- (b) displacement
- (c) speed
- (d) velocity
- (e) acceleration
- (f) time

a. scalar	d. vector
b. vector	e. vector
c. scalar	f.. scalar

Distance and Displacement

1.1.1A – Explain the difference between distance an

Two men leave the same house at the same time. Bill walk
then four blocks south. Joe walks three blocks east, then o

- Sketch a diagram of the their paths.
- Which man travels the greater distance?
- Which man finishes his trip with the greater displ

Bill	Joe
dist = 6	dist = 4
disp = 2	disp = 3.2

Explain how it is possible for a person to travel a great dista
final displacement of zero.

| It must start and end in the same place |

Two people travel from New York City to Boston. One person travels by plane, the other by car. Which person probably travels the greater distance during this trip? Compare the displacements of the two people assuming that they both start at JFK Airport and finish at Logan Airport.

| Same displacement – driver probably travels much greater distance. |
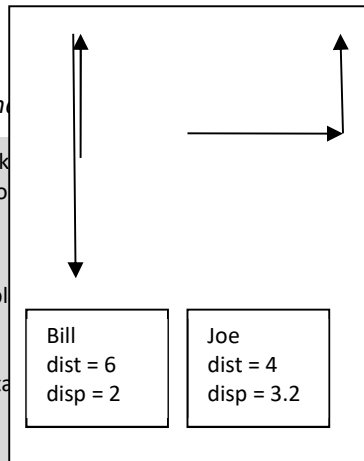
1.1.1B – Interpret graphs of distance or displacement vs. time. Use the graphs to determine average speed; displacement; or distance traveled.
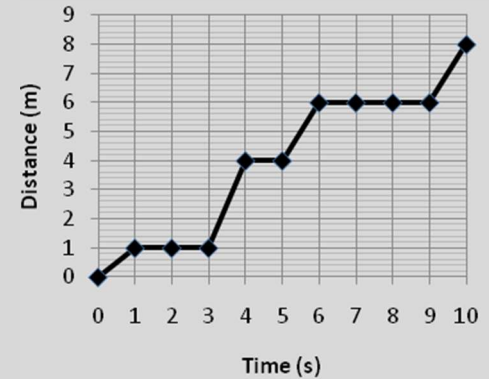
The graph below shows the distance traveled by an object as a function of time.

During what time interval(s) was…

The object [3 - 4 s] speed greatest?

The o[...]

| 1 – 3, 4 -5, 6 – 9 s |

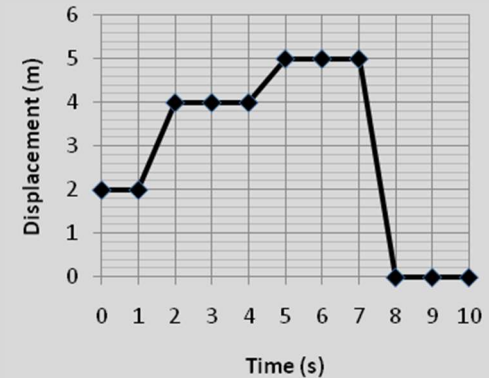How far did the object travel between 3 a[5 m]conds?

The graph below shows an object's displacement as a function of time.

What was the object's direct[west]l during the time interval 7 to 8 seconds?

How f[...]bject travel[6 m]and 8 seconds?

What was the object's average[2 m/s]ng the time int[...] seconds?

What is[0 m]s final position

Speed and Velocity

1.1.1C – Explain the difference between speed and velocity. Use equation to determine average speed or velocity.

Two cars leave the same house at the same time. During the same interval of time: the first car travels three blocks east then three blocks west; while the secor

The first car has a greater average speed by a velocity of 0. The second car has a greater average velocity.

ce!)
Which car had the greater average velocity?   (look at displacement!)

A cat moves 15 meters east in 5 seconds. What was its average speed?

3 m/s

A fish swims 20 meters south in 10 seconds. What was its average velocity?

2 m/s south or -2 m/s

A jogger takes a three mile run. The first mile takes him 10 minutes to complete, the second mile takes him 11 minutes to complete, and the third takes him 9.5 minutes to complete. Determine his average speed.

0.1 mi/min

An object begins with a speed of 6 meters per second and speeds up to 10 meters per second in 4.0 seconds. What is the object's average speed during these 4.0 seconds?

8 m/s

The graph below shows the speed of an object as a function of time.

During what time interval(s) was...

The   ed   5 -7 s   gre

The   eleration   gre   7 – 8 s

The   hoving?   8 – 9 s

How far did the object tra   0 and 4   7 m   sed

The graph below shows an object's velocity as a function of time.

Wh   2 m/s   bject's
spe   econds?

Du   e interval
wa   4 – 8 s   hoving to
the left?

What was the object's
ave   1.5 m/s   uring the
tim   o 2
seconds?

What was the object's
ac   -2 m/s²   ing the
interval 3 to 4 seconds?

Na
wh   2 -3, 5 – 7, 8 – 10 s

Acceleration

1.1.1E – Explain the difference between velocity and acceleration. Use equations to determine acceleration; starting velocity; ending velocity; or time. Understand what the terms "from rest"; "comes to a stop"; "comes to rest" mean in terms of kinematics.

☐

An object begins from rest and reaches a velocity of +10 meters per second while accelerating for 4.0 seconds. Determine the acceleration of the object.

| 2.5 m/s² |

A car moving at 2.0 meters per second speeds up at a rate of 5.0 meters per second² for 4.0 seconds. What is the final speed of the car?

| 22 m/s |

An object begins with a velocity of 20 meters per second west and comes to a stop within 4.0 seconds. Determine the direction and magnitude of the acceleration that acted upon this object.

| 5 m/s² east |

An object with a velocity of 6.0 meters per second north accelerates south at a rate of 5.0 meters per second² for 3.0 seconds. What is the final speed of the object? In which direction is the object moving after 3.0 seconds?

| 9 m/s south |

Kinematics Equations

1.1.1F – Use equations to determine distance; displacement; speed; velocity; acceleration; or time.

☐

How far does an object travel if it starts from rest and accelerates at a rate of 2.0 meters per second² for 6.5 seconds?

| 42.25 m |

What is the final speed of a cart that begins with a velocity of +3.0 meters per second if it accelerates at a rate of +1.5 meters per second² while traveling +25 meters?

| 9.2 m/s |

At what rate does an object accelerate if it changes its speed from 3.0 meters per second to 5.0 meters per second while traveling a distance of 4.0 meter?

| 2 m/s² |

How long does it take for an object to reach a velocity of 2.0 meters per second north if it begins with a velocity of 8.0 meters per second south and accelerates north at a rate of 4.0 meters per second²?

| 2.5 s |

Freefall and Vertically Thrown Objects

1.1.2 – Explain the behavior of objects in freefall (in the absence of air resistance.). Understand the terms "dropped" and "maximum height".

☐

What speed will a ball reach if it falls from rest for 3.0 seconds?

| 29.43 m/s |

How far will a dropped object have fallen after 2.0 seconds?

| 19.62 m |

What maximum height will an object reach if it thrown directly upward with a speed of 15 meters per second? How long will it take to reach this height?

| 11.5 m |

What is the height of an object that is thrown upward with a speed of 20 meters per second 1.5 seconds after it is thrown?

| 19 m |

An object is thrown directly upward with a speed of 25 meters per second. How long will it take to come back to the position from which it was released?

| 5.1 s |

How long does it take for an object that is dropped from the top of a 45 meter high building to reach the ground?
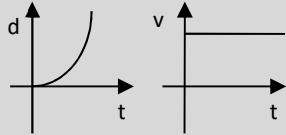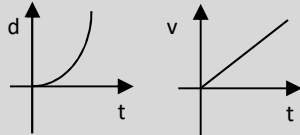
| 3.03 s |

One-Dimensional Kinematics Graphs

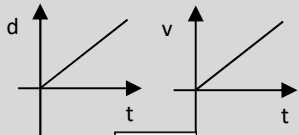*1.1.3A – Relate graphs of: distance/displacement vs. time; speed/velocity vs. time; and acceleration vs. time*

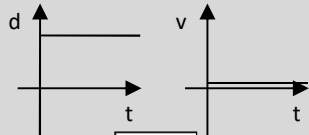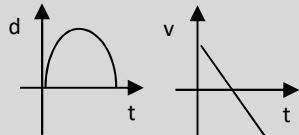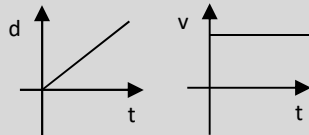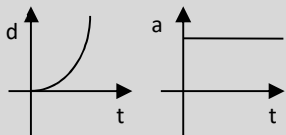Which sets of graphs could describe the motion of the same object?

d / v — no

d / v — yes

d / v — no

d / v — yes
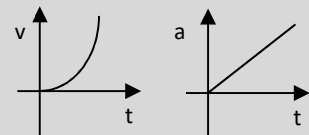
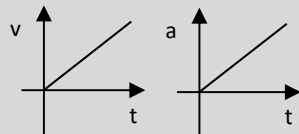d / v — yes
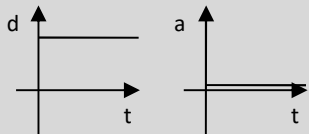
d / v — yes

d / a — yes

v / a — yes

v / a — no

d / a — yes

1.1.3B – Identify graphs of distance/displacement, speed/velocity, or acceleration that describe specific conditions.

Which graph would best represent…

(a) speed vs. time for an unmoving object B

(b) displacement vs. time for an object moving with a constant speed C

(c) speed vs. time for a decelerating object D

(d) distance vs. time for an object with increasing speed E

(e) velocity vs. time for an object with a constantly increasing displacement A

(f) acceleration vs. time for an object that is moving at a constant spee B

(g) displacement vs. time for an object that is moving toward its point of origin D

(h) acceleration vs. time for an object that is increasing its speed at a constant rate A

A   B   C   D   E   F