Name: Key

Period: _____

Linear Motion Review

10

mv = m *times* v

F/a = F divided by a

$T_2 + T_1 = T_2$ plus T_1

mv = m time v

ΔD/ΔT = ΔD divided by ΔT

Match the variables with the quantities.

1. a = 43 m/s2
2. S or v = m/s
3. D = 45 meters
4. F = 22 Newtons
5. T = sec

sec

m/sec

43 m/s²

45 meters

22 newtons

Equation: S = ΔD/ΔT; solve for ΔD.

$\Delta D = S \cdot \Delta T$

If Δv = $v_2 - v_1$, solve for v_2:

$v_2 = \Delta V + V_i$

If p = mv, solve for m.

$m = \frac{p}{V}$

If a = ΔV/ΔT, solve for ΔT:

$\Delta T = \frac{\Delta V}{a}$

What do you need to know in order to find an object's speed?

You need the distance an object traveled in a certain amount of time

What does Δ mean (and give the formula)?

Δ = Final − initial

An object has a velocity of 5 m/s and starts 0 m away from you.

A) How far does it travel each second? 5m (sec)

B) Where is it after 1 second? 5m

C) Where is it after 2 seconds? 10m

D) Where is it after 5 seconds? 25m

E) How far does it travel between seconds 7 and 8? 5m

5 6 7 8 9 (5m)

Which has the faster speed? Car A or Car B?

Both go the same distance, but Car B gets there sooner. Car B

In the same amount of time, Car A goes farther. Car A

$T_A = T_B$, but $D_A < D_B$. Car B

A car travels 35 m in 5 secs. Calculate its speed.

G- S, d = 35m, t = 5sec

R-

C- S = 35m/5sec

E- S = d/t

S = 7m/s

Car 1 is going 20 m/s. Car 2 is going 30 m/s.

Which one travels 100 m first? Car 2

Which one can travel a greater distance? Depends on Time

Which one travels farther in more time? Car 1

A bike goes 12 m/s for 6 seconds. Calculate how far the bike traveled.

~~Variables:~~ G

S 12m/s

d ?

t 6sec

~~Formula:~~ E

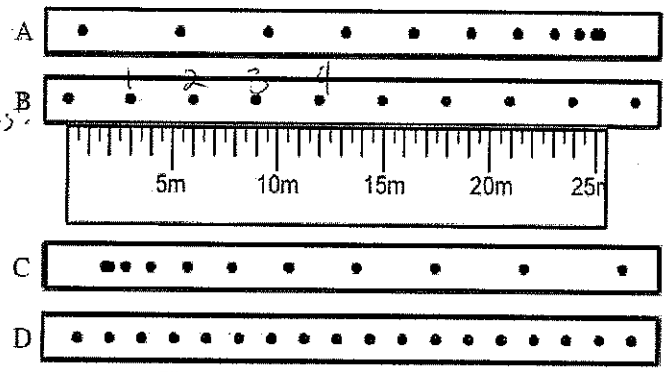
S = d/t

~~Solution:~~ R

d = S · t

C

d = 12m/s · 6sec = 72m



velocities: V ↑ V ↓

Inverse relationship

Choose which of the above object's motion applies to the following (can be more than one):

E Vi = 0

A Decelerating

B, D, E Constant speed

A Is stopping

C Positive acceleration

B, D At constant velocity

A Vf = 0

ACE Accelerating

BD Acceleration = 0

C Distance is increasing

C Starts at rest

ABCD Constant direction

A Negative acceleration

B B Vi = Vf

For object B above:

A) If there is 1 second between each dot, when did the object reach 12 m? 4sec

B) Find the speed of object B.

S, d 12m, t 4sec

S = d/t S = 12m/4sec = 3 m/s

For the following problems, show all work and steps.

A plane stops from 300 mph in 15 seconds. Calculate the planes acceleration.

$a = \frac{\Delta V}{t}$

$\Delta V = V_f - V_i$

a ?

ΔV 0m/hr − 300m/hr

t 15sec

$a = \frac{-300 m/hr}{15 sec} = 20 m/hr/sec$

A bike going 3 m/s ends up going 9 m/s after 2 seconds. Calculate the bike's acceleration.

$a = \frac{\Delta V}{t}$

a ?

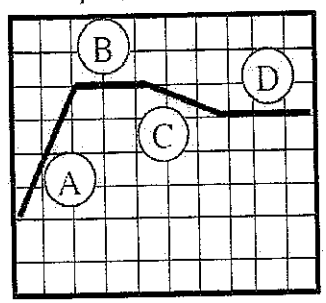
ΔV 9m/s − 3m/s

t 2sec

$a = \frac{6 m/s}{2 sec} = 3 m/s^2$

Speed (S) or Velocity (V)	Scalar (S) or Vector (V)
V A car travels 10 m/s left.	S 10 m/s.
S A bird flies 20 m/s.	V 60 mph toward Austin.
V A bike goes 10 m/s toward town.	V Direction matters.

Speed vs. Time



Which graph segments fit the following:

Constant speed: B, D

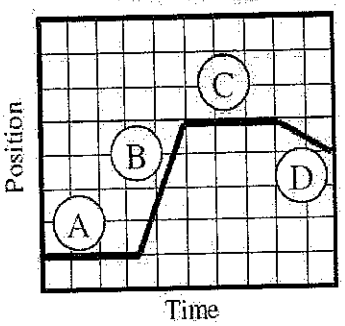
Negative acceleration: C

Positive Acceleration: A

Slowing down: C

Acceleration = 0: B, D

Position vs. Time



Which graph segments fit the following:

At rest: A, C

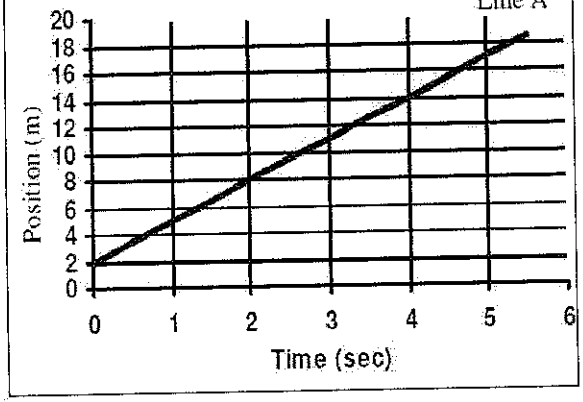
Fast speed: B

Slow speed: D

Going backwards: D

Going forward: B

Position vs. Time



Which is the independent variable? Time (s)

Which is the dependent variable? Position (m)

Where was the object at 4 seconds? 14m

Where did the object start? 2m y-intercept

When did the object reach 8 meters? 2sec

Find the slope of the graph (*show work*)

$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8m - 2m}{2sec - 0sec} = \frac{6m}{2s} = 3\ m/s$

What does the slope you just found stand for? Speed or Velocity

An object accelerates at 10 m/s². Answer the following:

A) If it starts at rest, how fast is it going after 1 second?

10 m/s

B) After 2 seconds, how fast is it going?

10m/s x 2 = 20 m/s

C) If it starts at 5 m/s, how fast would it be going after 1 second?

5m/s + 10m/s · 1sec = 15m/s

For the following problems, show all work and steps.

A 4 kg object is moving 6 m/s *to the left*. Calculate momentum.

P = m · v

P ?
m 4kg
v -6m/s

P = 4kg · -6m/s

P = -24kgm/s

A 10 kg object has 58 kgm/s of momentum. Find its velocity.

P = m · v

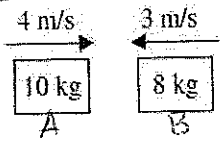
P 58kgm/s
m 10kg
v ?

V = P/m

V = 58kgm/s / 10kg

V = 5.8 m/s

Find the net momentum of the two objects at the right.



$\Sigma P = P_A + P_B$

$P_A = 40\text{kgm/s}$ $P_B = -24\text{kgm/s}$

40 kgm/s − 24 kgm/s = 16 kgm/s

P_A = 10kg 4m/s P_B = 8kg 3m/s

If two objects have a net momentum of 45 kgm/s before they collide, how much momentum will they have after they collide?

45 kgm/s

An astronaut is by herself in space. All she has is a box of tools. How can she get to her ship that is to her left?

throw her tools to the right

How is it possible that two moving objects can collide and stop moving? Their momentums are = opposite, so the cancel

A 200 kg cannon shoots a 2 kg cannonball. If the ball ends up going 300 m/s to the right:

A) If they are both at rest beforehand, what is Σp_{before}?

0 kgm/s

B) What is Σp_{after}?

0 kgm/s

C) Is the ball's final p positive or negative ($p_{ball\ A}$)? right +

D) Is the cannon's final p positive or negative ($p_{cannon\ A}$)? left −

E) Find the velocity of the cannon afterwards ($v_{cannon\ A}$)?

$\Sigma P_B = \Sigma P_A$

$0 = \Sigma P_B + \Sigma P_A$

$0 = 2kg \cdot 300m/s + 200kg \cdot V_A$

$0 = 600kgm/s + 200kg \cdot V_A$

$\frac{-600\ kgm/s}{200\ kg} = \frac{200kg\ V_A}{200\ kg}$

$V_A = -3\ m/s$

Number these from most (1) to least (5) momentum.

Fast car	Fast truck	Fast plane	Fast hammer	A mountain
3	2	1	4	5