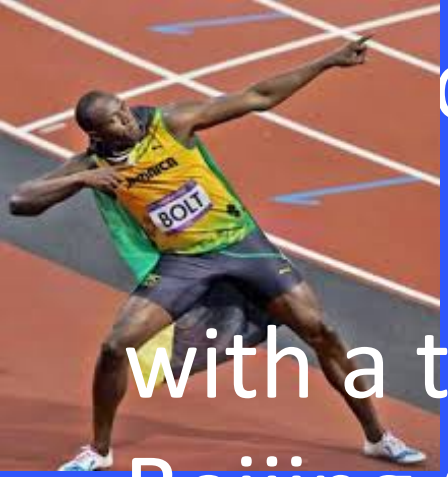
Jeopardy

Third Quarter Exam Speed through Newton

Usain Bolt Speed	?Mystery?	Graphing Motion	P is for Momentum	Sir Isaac
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500



Column1 – 100 Double Jeopardy

He first won the **100 meter** dash with a time of **9.69 seconds** at the Beijing Olympics in 2008. In track and field and in much of the world the victor of the 100 meter dash is often hailed the outright fastest alive.

What was his speed in mph? Round and report answer out to the 100^{ths} place.

Conversion factor: **1(m/s) = 2.24(mph)**

Column 1 – 100

Speed = distance / time S = d/t

S= 100meters / 9.69sec

S= 10.32m/s

10.32m/s x 2.24 = 23.12mph

$$\frac{1\text{m/s}}{10.32\text{m/s}} = \frac{2.24(\text{mph})}{(x)\text{mph}}$$

Column1 - 200

Most recently in Rio at the Summer 2016 Olympics he set a record best with a time of 19.19 seconds in the 200meter dash.

What was his speed? Round and report answer out to the 100^{ths} place.

Column1 – 200

Speed = distance / time S = d/t

S= 200meters / 19.19sec

S= 10.42m/s

Column1 - 300

- Following the Beijing Olympics, on 16 August 2009 at the World Championships in Berlin Bolt attained a record *speed* of **44.72 km/h** (**12.4 m/s** or **27.8 mph**), during the final 100 meter sprint. He attained this speed between the 60th and the 80th meter, which he covered in 1.61 seconds.
- Why is this record *speed* so different from the speeds calculated in class….?

Beijing 2008 10.32m/s or 23.11mph – 100m

London 2012 10.38m/s or 23.2mph – 100m

Column1– 300

- This is an instantaneous speed. Our speeds calculated in class were average speeds.

Column1– 400

Accurate describe (and/or) define average speed

Accurate describe (and/or) define constant speed

Accurate describe (and/or) define instantaneous speed

Column1– 400

Average speed is equal to the total distance traveled divided by the total time for a trip.

Speed at any instant in time is called instantaneous speed.

Constant speed is unchanging speed with no acceleration or deceleration.

Column1 - 500 Triple Play !!!

#1 What is the velocity of a plane that travels 3000miles from New York to California in 5.0 hours?

#2 What is the velocity of a plane that travels 2000 miles from California to Chicago in 4.0 hours?

#3 What is the velocity of a plane that travels 1200miles from New York to Florida in 2.5 hours?

Column1– 500

#1 New York to California - 6

#2 California to Chicago - 50

#3 New York to Florida – 48

Column2 - 100

What are the Standard International (SI) **units of speed** used most commonly around the world in speedometers of cars?

Further, explain why these units are appropriate, as opposed to for instance *inches per year.*

Answer 2 – 100

- kilometers per hour - km/hr

Not any of the following

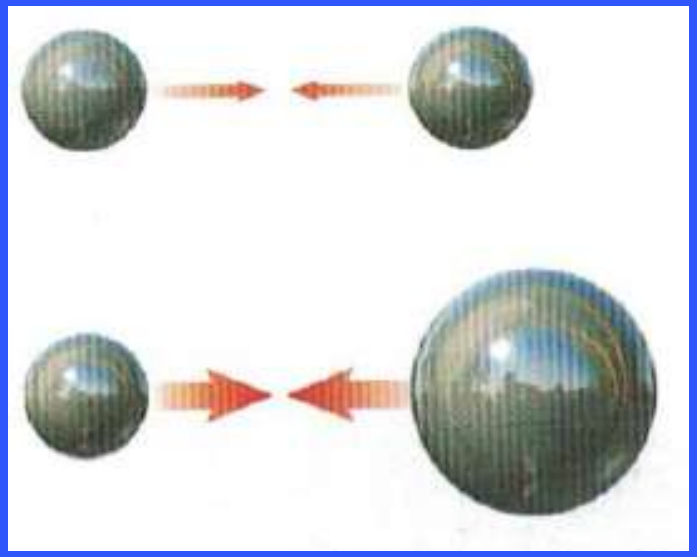
- feet per second – ft/s
- meters per mile – m/mile
- miles per hour

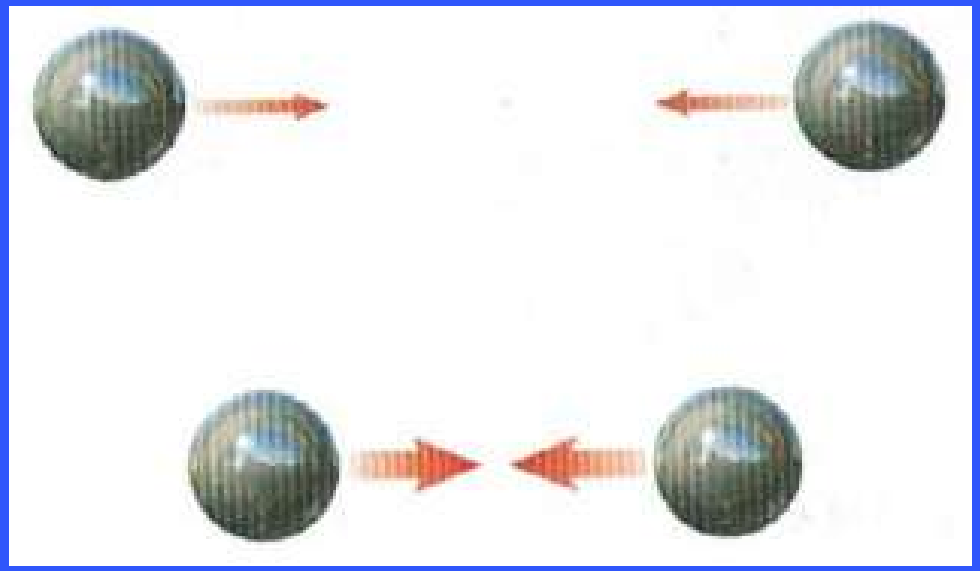
In cars we typically travel for durations of (hours) and cover distances of kilometers not inches.

Question 2 - 200

If the mass of either of the objects increases, *this* will likewise also increase.

If the objects get closure together *this* will likewise increase too.





Answer 2 – 200

- What is gravity?

Question 2 – 300

Here you see a time lapse image of two different objects falling .

Explain what you are seeing and why with at least two concrete details.

Answer 2 – 300

- This is due to the Universal Law of Gravitation.
- All object on earth fall at the same rate of acceleration
- Gravity may exert a different force (weight) on objects of different masses, but their rate of acceleration is a constant due to inertia.

Question 2 - 400

Say we have a hypothetical scenario where we compare Alert to Non-Alert Drivers. The average total time for an Alert driver to apply the breaks & stop is **5.2seconds**, verses **6seconds** for a non-alert driver. A car is traveling at 35mph or 51.3 ft/sec near school. They approach the cross walk between the school parking lot and plaza which is **150 feet away**. They must stop to avoid hitting you. Can they do so in time if non-alert? Find distance. Use Avg. Vel. of deceleration **25.6ft/s for speed**. Explain answer don't just tell me ###.

Answer 2 – 400

- D = S(T) 154ft = **25.6666ft/s (6sec)**

- The non-driver requires 154feet to stop their car.
- You are 150ft away. Not good!

Question 2 - 500

You intend to compete in a 5 kilometer fun run this spring. You are a little worried about how much time it will take though. You know you can run 3.1 miles in about 21 minutes and you want to predict your time for the 5 kilometer race. Your running coach tells you your speed is about 14.29km/hr.

What will your **time** likely be?

1mile = 1.609km Conversion factors

1km= 0.621mile Hint this is simply a proportion

Answer 2 – 500

$\frac{3.1\text{miles}}{1\text{mile}} = \frac{(x)\text{km}}{1.609\text{ km}}$ (x)= 4.987km rounds to 5km

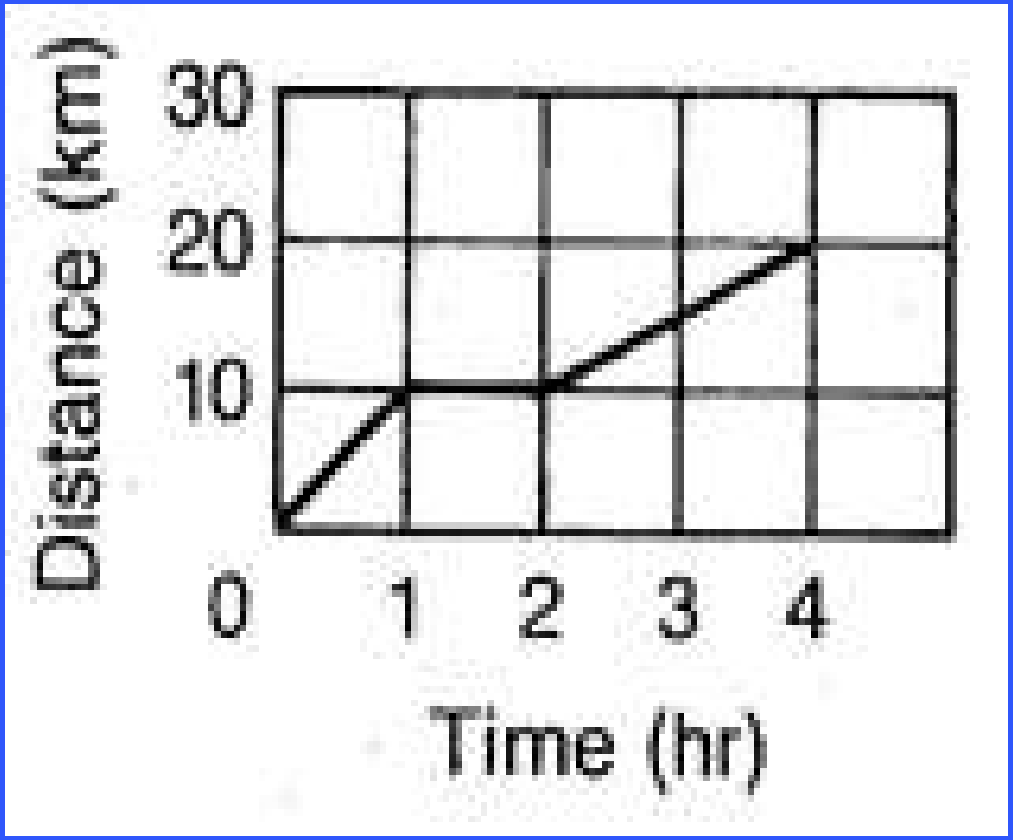
$\frac{0.621\text{miles}}{(x)\text{mile}} = \frac{1\text{ km}}{5\text{ km}}$ (x)= 3.1 miles

T= d/s T= 5km / 14.29(km/hr) T= 0.3498hours

T= 0.3498hours → times 60 = 21minutes

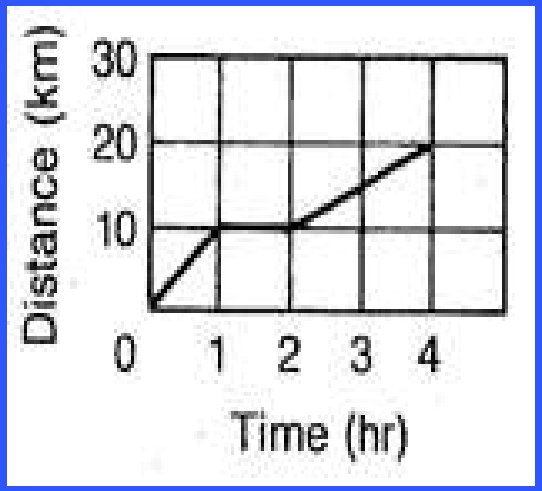
Question 3 - 100

Describe the type motion depicted in this graph.



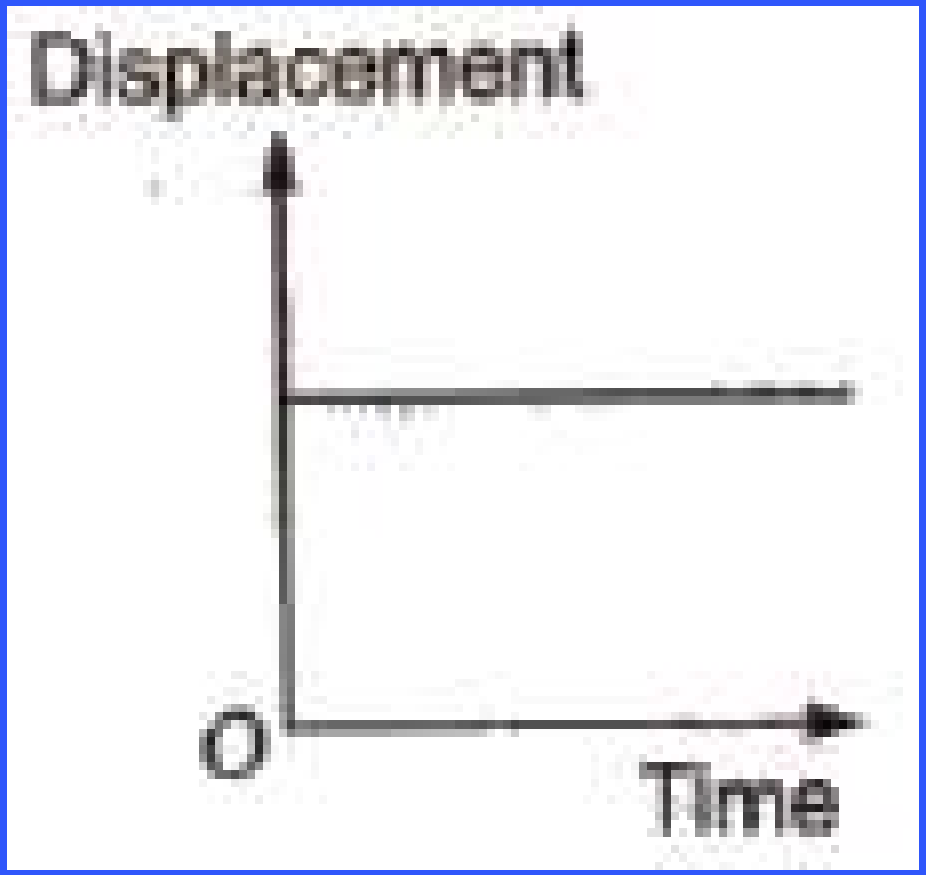
Answer 3 – 100

- Average Speed



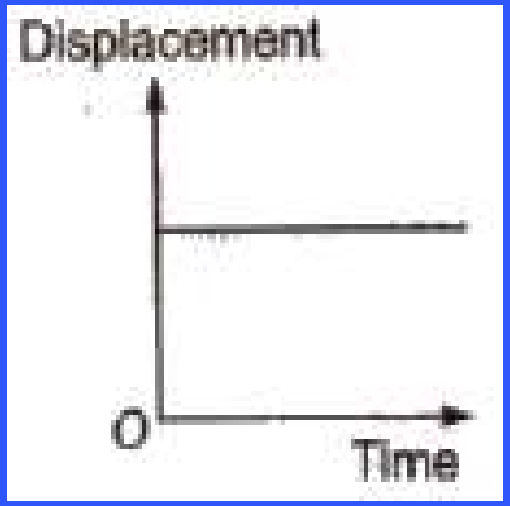
Question 3 - 200

Describe the type motion depicted in this graph.



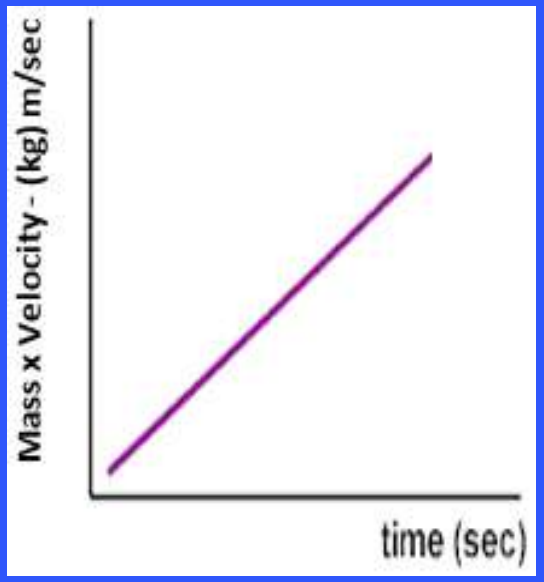
Answer 3 – 200

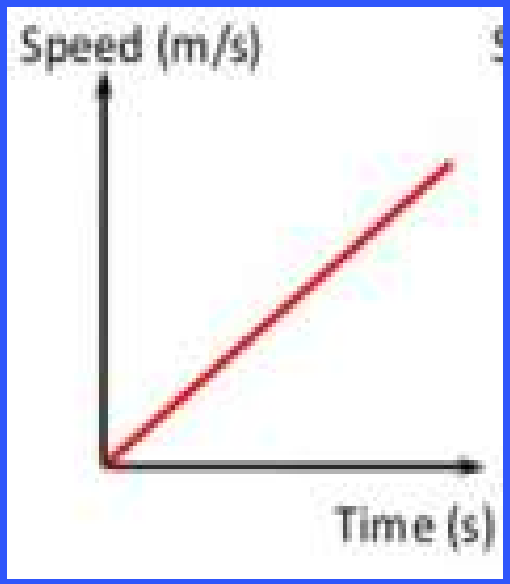
- No motion the object is stopped

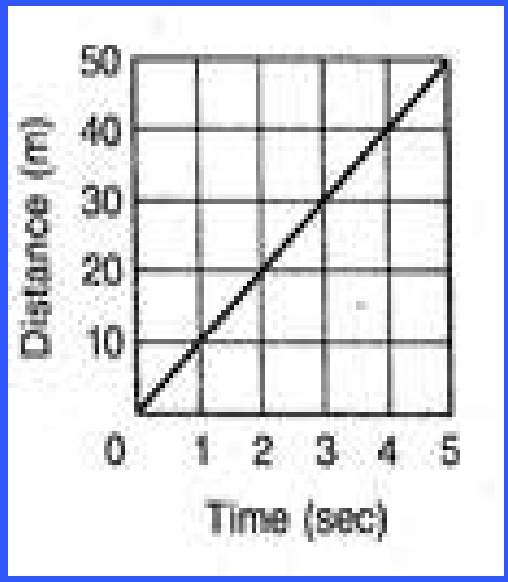


Question 3 – 300 Triple Play

#1 #2 #3

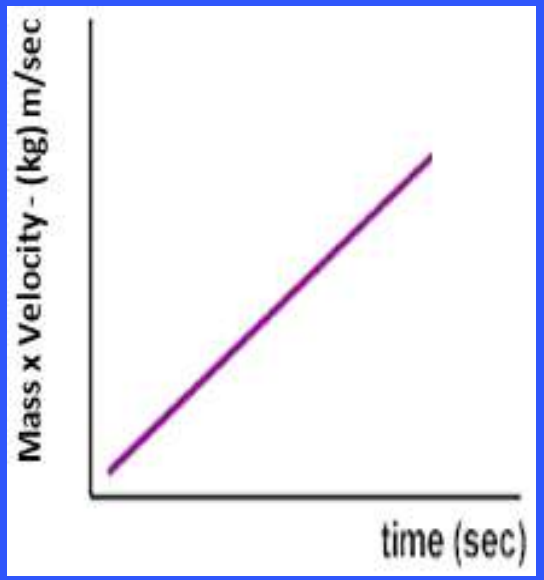




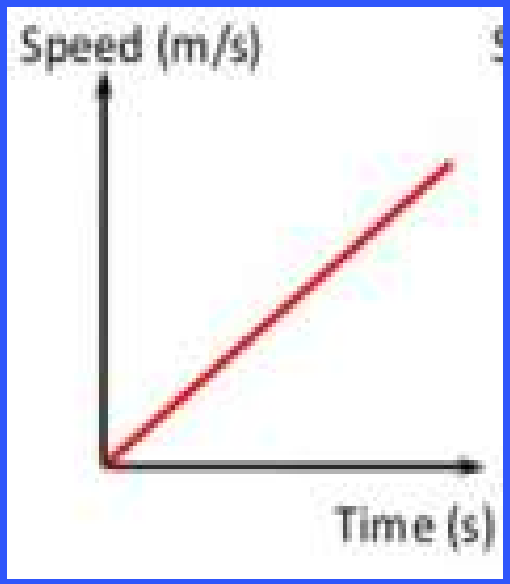


Answer 3 – 300 Triple Play

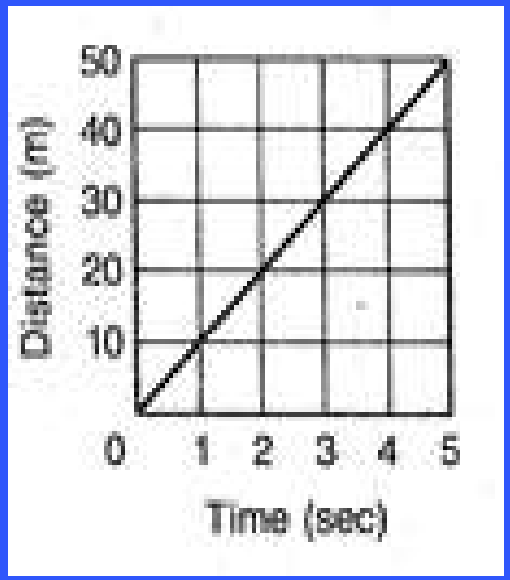
Momentum



Acceleration



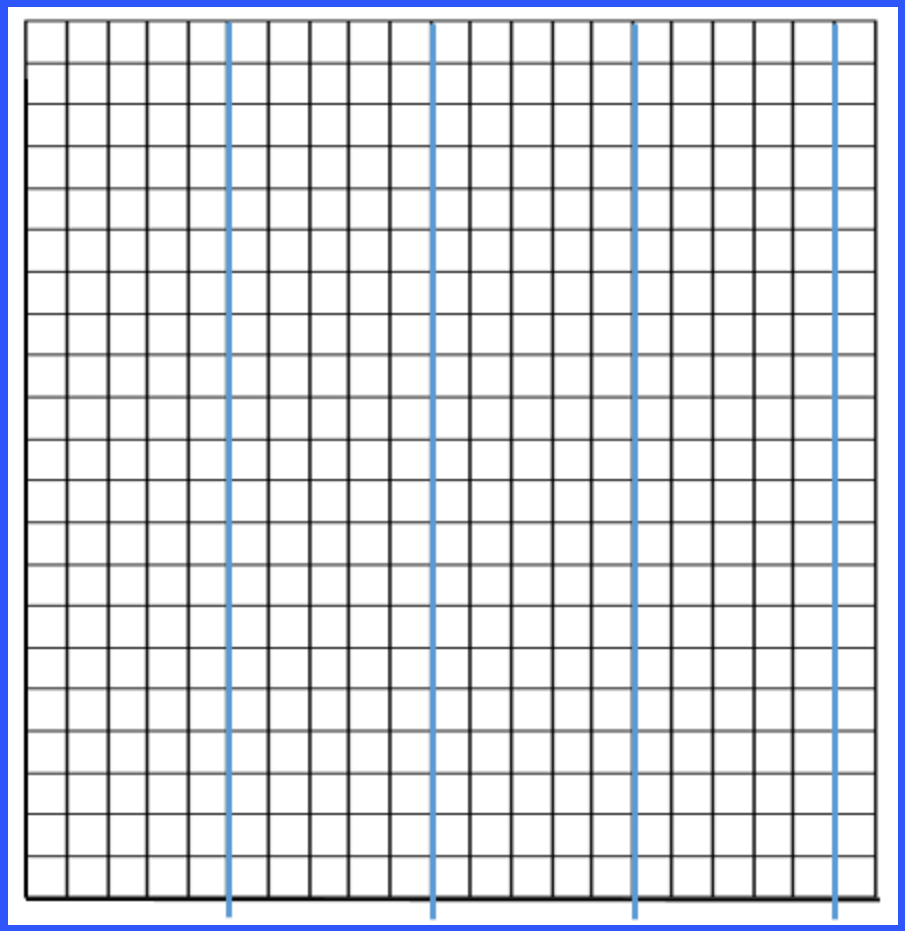
Constant Speed



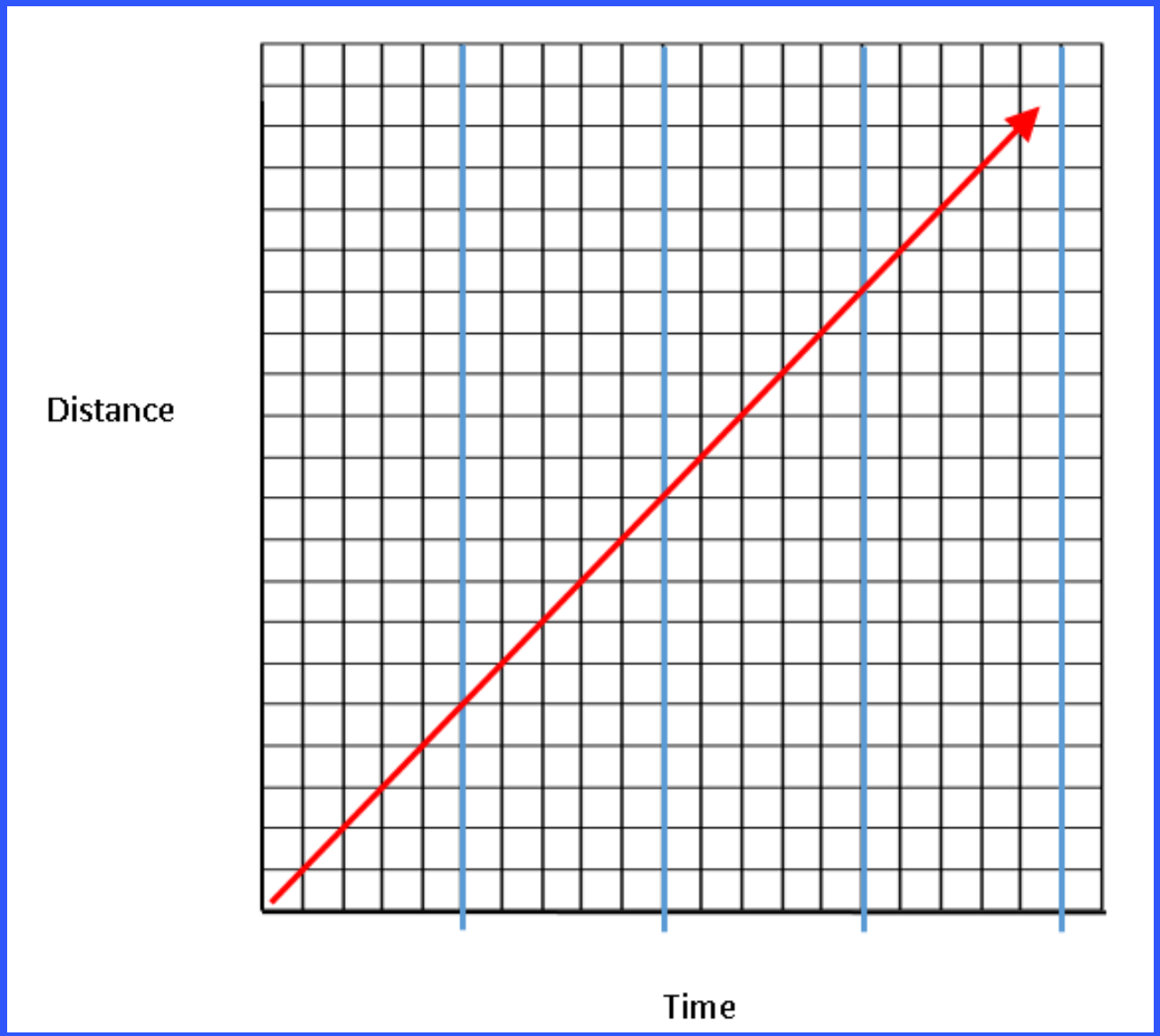
Question 3 - 400

A constant speed vehicle has traveled **20 feet** across the classroom floor in **4 seconds**.

Assume the speed truly was **constant**. **Complete the graph below.**



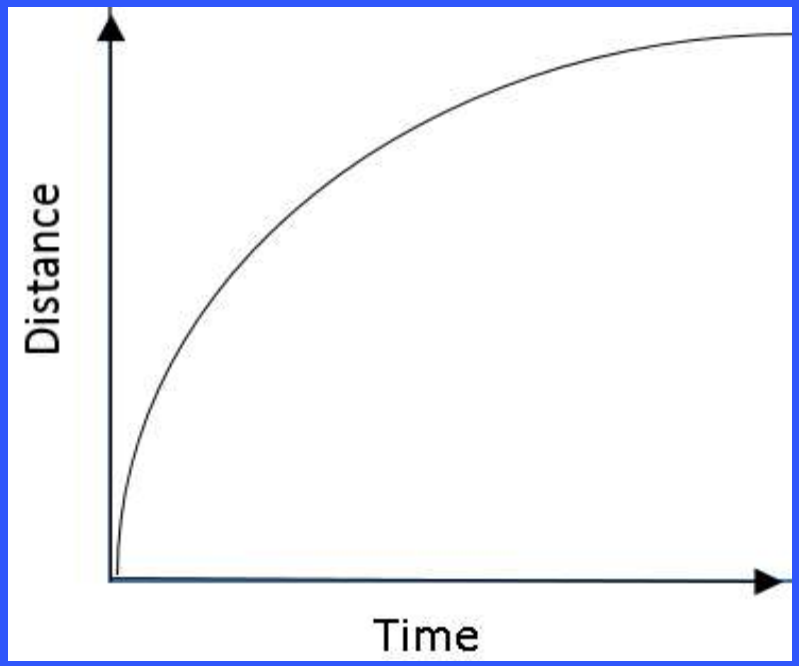
Answer 3 – 400

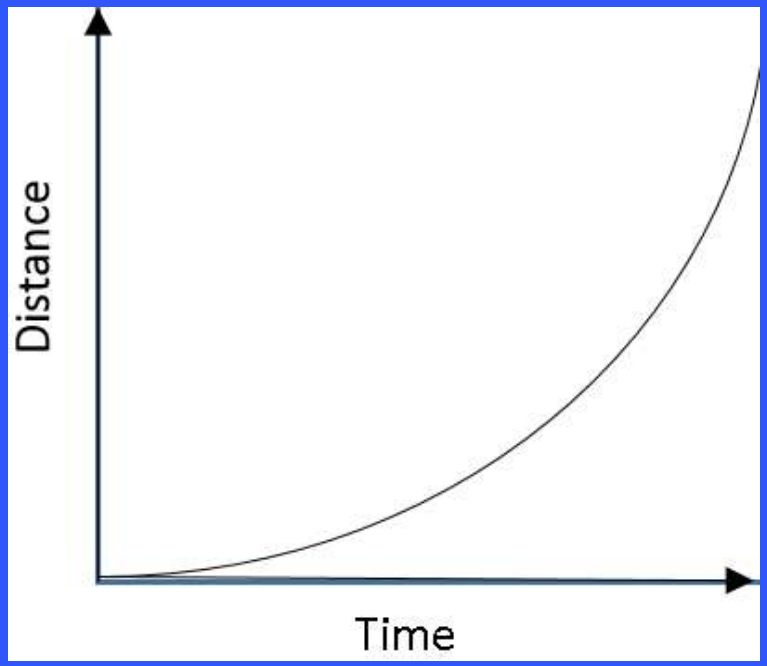


Question 3 - 500

What do these graphs represent?

Then explain why the lines are curved and how that represents this type of motion.





Answer 3 – 500

These graphs represent – deceleration & acceleration (+) Acceleration is represented with a curved line because the rate of change in distance covered with unit of time is increasing. This means as the slope of the line increases (gets steeper and steeper) it curves on our graph upward.

(-) Acceleration is just the opposite. Think about it, once the line curves to horizontal there is no more change in distance as time goes on meaning the object is stopped.

Question 4 - 100

- How do we solve for momentum?
- What is the formula? And give an example?

Answer 4 – 100

We must first know an object mass found with a triple balance and then calculate the speed.

P = Mass x velocity

Question 4 - 200

- Give an example of something w/ high momentum due to its mass.

- Give an example of something w high momentum due to its velocity

Answer 4 – 200

- Elephant
- Bullet

- 140kg football player running slow
- 120kg football player running fast

Question 4 - 300

- The momentum of an object can be influenced by all of the following things except…?

A. Changing the object's speed

B. Changing the objects mass

C. Converting the units while solving

D. Accelerating the object

E. Transfer of kinetic energy to another object

Answer 4 – 300

c. Converting the units while solving

Question 4 - 400

Acceleration

A plane prepares to land at LaGuardia Airport. It lowers the flaps, descends and goes from 600km/hr to 300km/hr in 30minutes. Calculate acceleration.

Answer 4 – 400

A = (Vf – Vi) / t note 30min -> 1/2hr

A = (300km/hr – 600km/hr) / 0.5hr

A= - 600km/hr squared

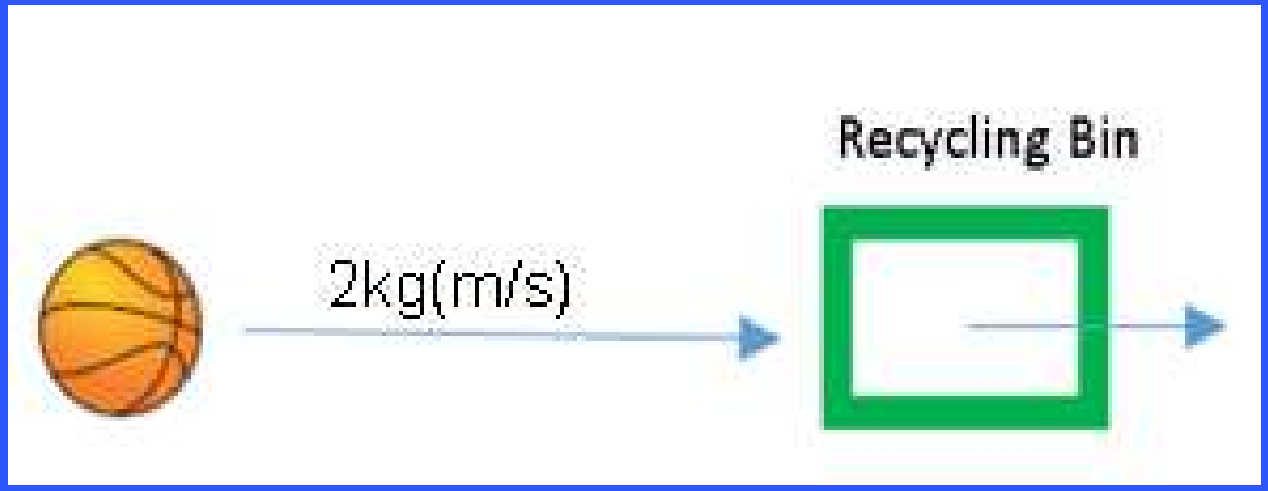
negative because decelerating

Question 4 - 500

The bin slides 1 meter in 1 seconds after being hit by the ball. It had a velocity of 1m/s to the right. The bin has a mass of 1kg.

Find the bin's momentum.

Then report how much momentum was transferred into the bin as the basketball collided with it.



Answer 4 – 500

P = M (V)

P = 1kg (1m/s)

P of the bin after being hit by the ball is 1kg(m/s)

If the ball hit the bin and had a momentum of 2kg(m/s) then half of that was transferred into the bin. 2kg(m/s) - 1kg(m/s) = 1kg(m/s)

Sir Isaac 5 – 100

The proper units of measure for calculating newtons are ____ and ____ .

Elaborate on why this is.

Why must they be these units?

Answer 5 – 100

The units are kilograms and meters per second squared. kg and m/s^2

Sir Isaac 5 – 200

- Balanced forces must always be opposite in _____

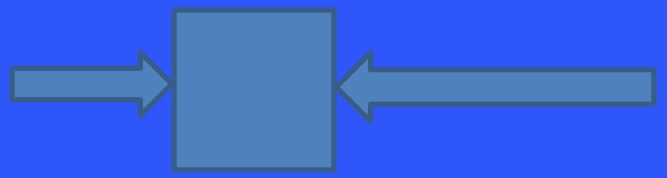
A. Direction
B. Magnitude (size of force)
C. Direction and magnitude
D. Penguin marching motion

And explain why?

Answer 5 – 200

C. Direction and magnitude (size of force)

Balanced *unbalanced*



Sir Isaac 5 – 300 Triple Play

It must be evident from your response that you know the **Law.**

1 or 2 **complete** sentences. **Use the terms. Try and not just recite the law but use it in a example sent.**

- Define /discuss Newton's 1st Law. Use the terms **rest, motion, and inertia.**
- Define /discuss Newton's 2nd Law. Use the terms **mass, force, and acceleration.**
- Define / discuss Newton's 3rd Law. Use the terms **equal, action and reaction.**

Answer 5 – 300

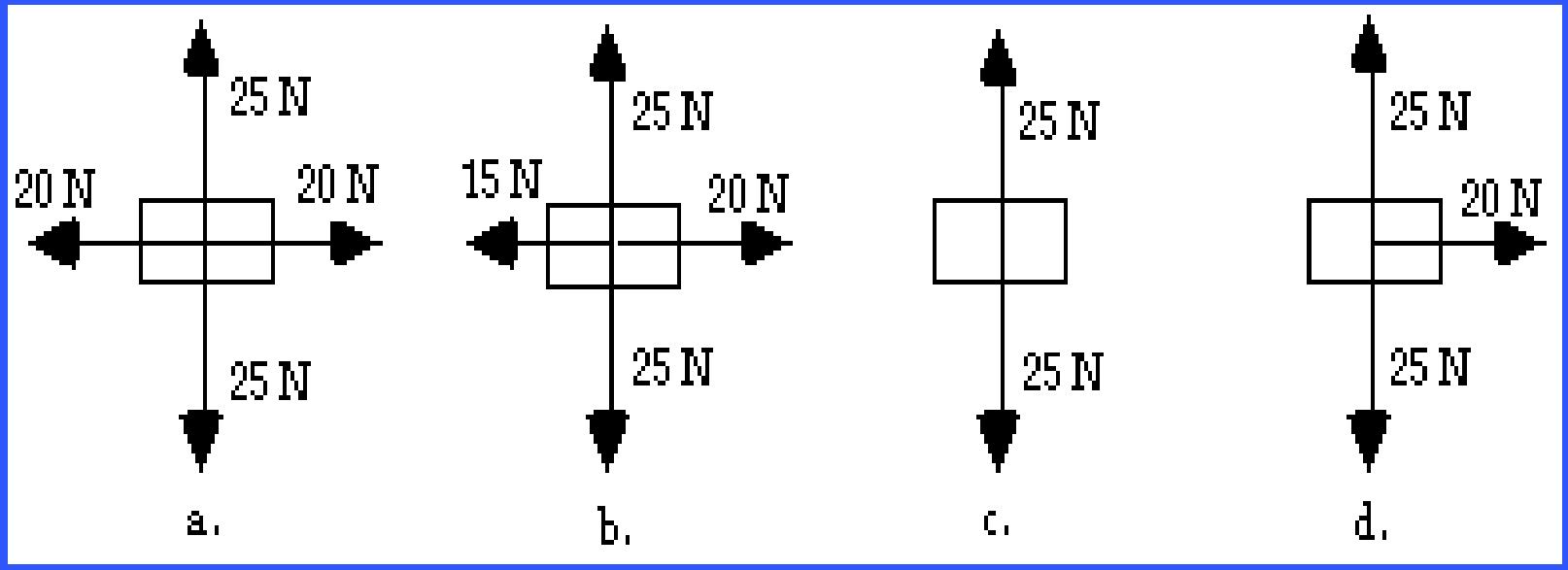
- Student provide verbal responses in class

Sir Isaac 5 – 400

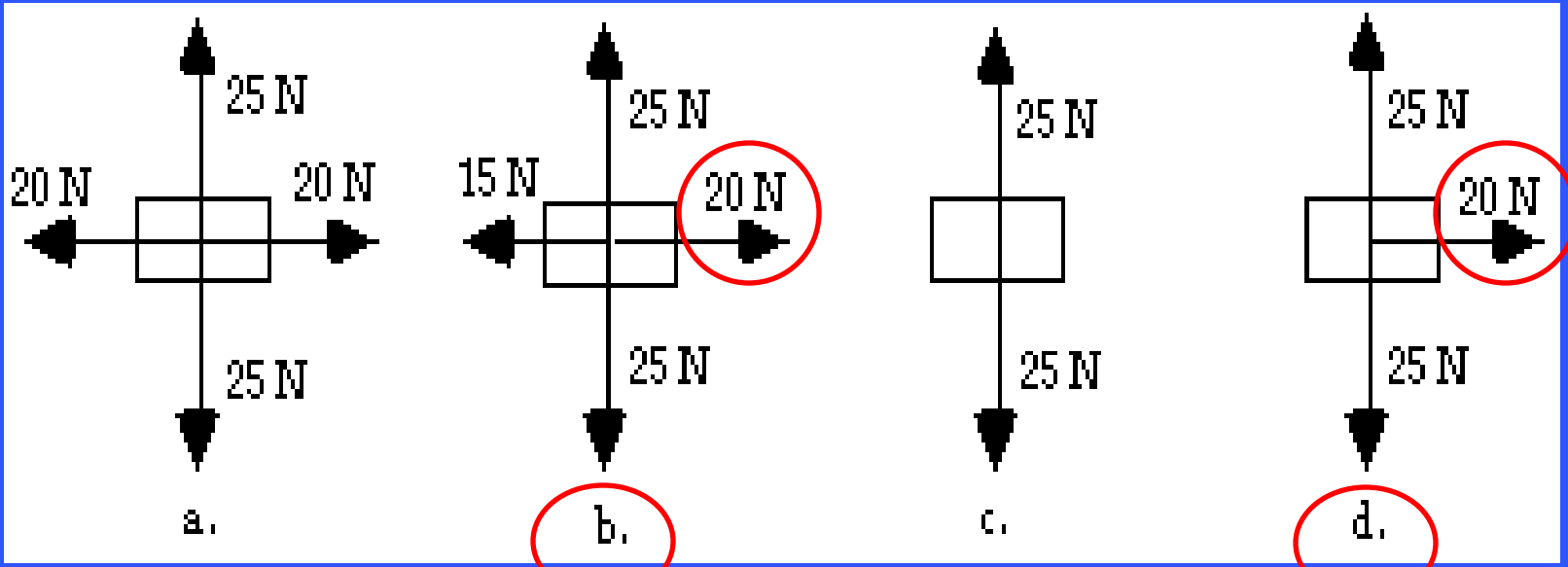
The net force in two of the below vector diagrams is clearly unbalance.

Which two are these?

What does that mean in terms of motion (specifically here)?



Answer 5 – 400



Sir Isaac 5 -500

- Commander David Scott drops a hammer (1.32kg) and a feather (0.02kg) on the moon during the Apollo 15 Mission at the same time and both hit the lunar surface at the same time.
- They both accelerate to the surface at the same rate of 1.6m/s² downward, but how much force does the hammer land with?
- Why do they hit the ground at same time on the moon but not on earth?

Answer 5 - 500

- F=M(A)
- F= 1.32kg (1.6m/s^2)
- F= 2.112N