

Physical Science

5th Block

Day 1

Motion—changing position

Velocity—speed in a particular direction

Speed—time rate of change of position

Acceleration—speeding up

Deceleration—slowing down

Motion Examples:

2. How far would a car move if it traveled 15 m/s for 3 s?

- a) 5 m b) 15 m c) 30 m d) 45 m

$$V = 15 \frac{\text{m}}{\text{s}} \quad t \cdot V = \frac{d}{t} \cdot t$$

$$t = 3 \text{ s}$$

$$d = ?$$

$$d = V \cdot t$$

$$= 15(3)$$

$$d = 45 \text{ m}$$

____ 3. Speed that does not change is called ____.

a) velocity

b) terminal velocity

c) constant velocity

d) acceleration

____ 4. Which of the following is accelerating? ⁽⁺⁾

- a) a car traveling 10 m/s and slows to 5 m/s
- b) a car traveling 10 m/s and speeds up to 15 m/s
- c) a car moving at 10 m/s
- d) a car at rest

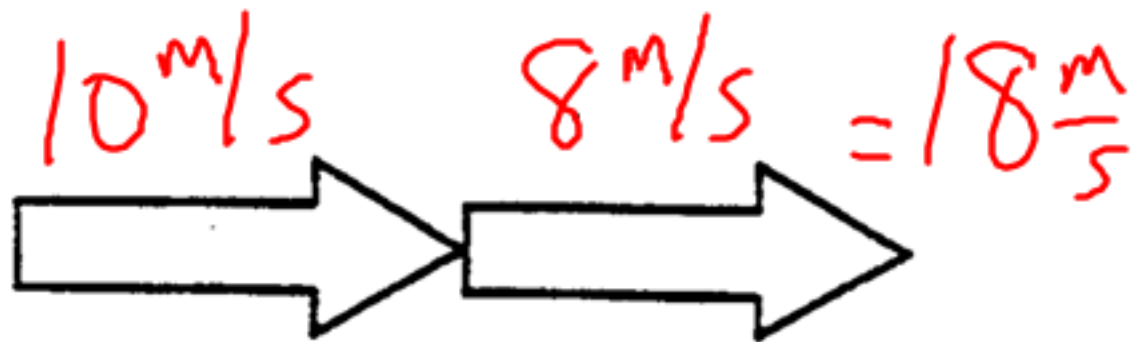
* Actually a.) is also accelerating (but it is -a)

___ 1. What is the speed of an object traveling 200 m in 20 s?

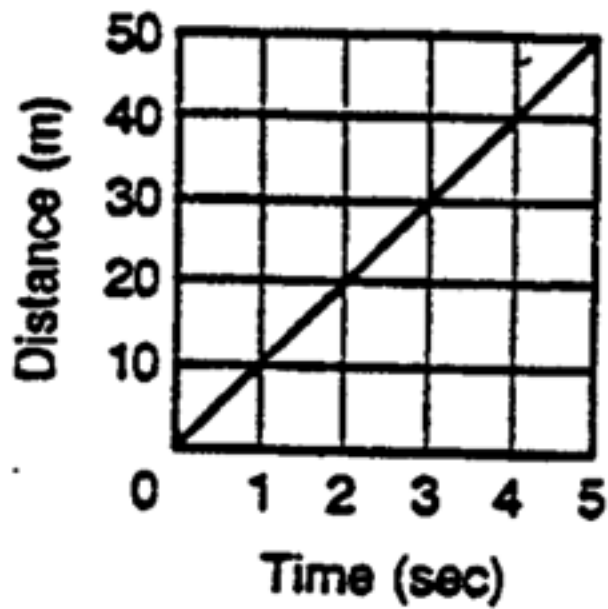
- a) 5 m/s **b) 10 m/s** c) 15 m/s d) 20 m/s

$$d = 200 \text{ m} \quad V = \frac{d}{t}$$
$$t = 20 \text{ s} \quad = \frac{200 \text{ m}}{20 \text{ s}}$$
$$V = ?$$

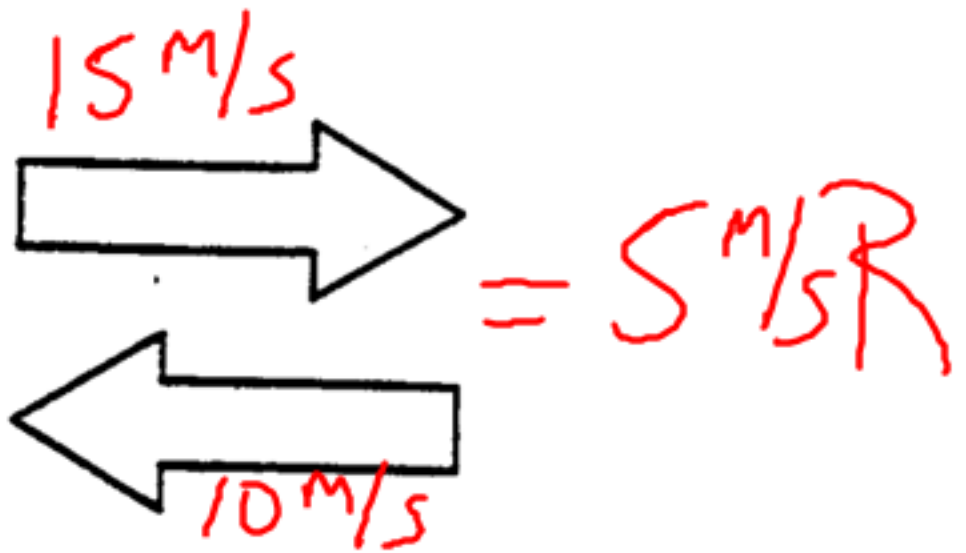
$$\underline{V = 10 \text{ m/s}}$$



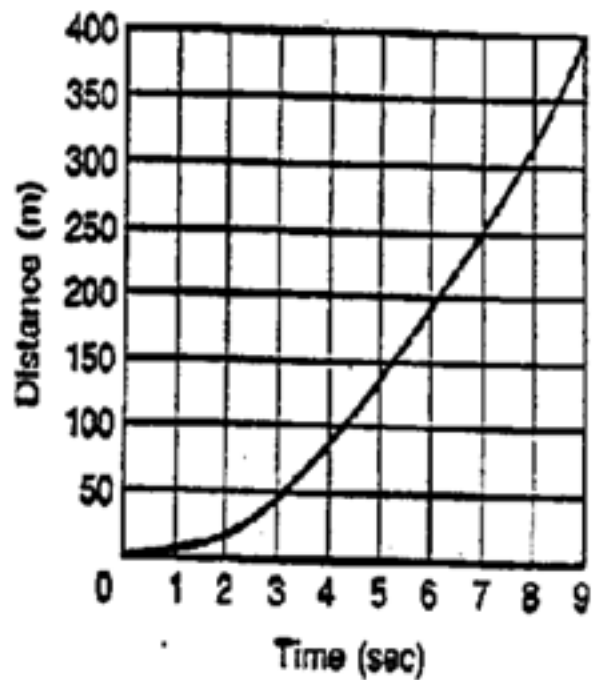
1. Same Velocity
(Add Them)



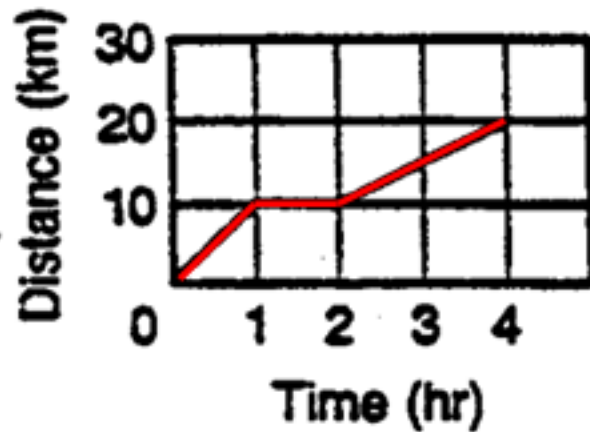
2. Constant Velocity



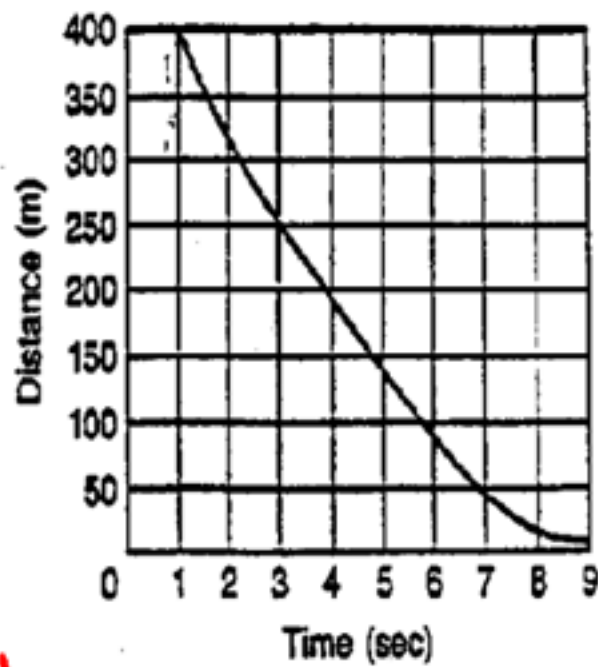
3. Opposite Directions
(subtract them)



4. Accelerating

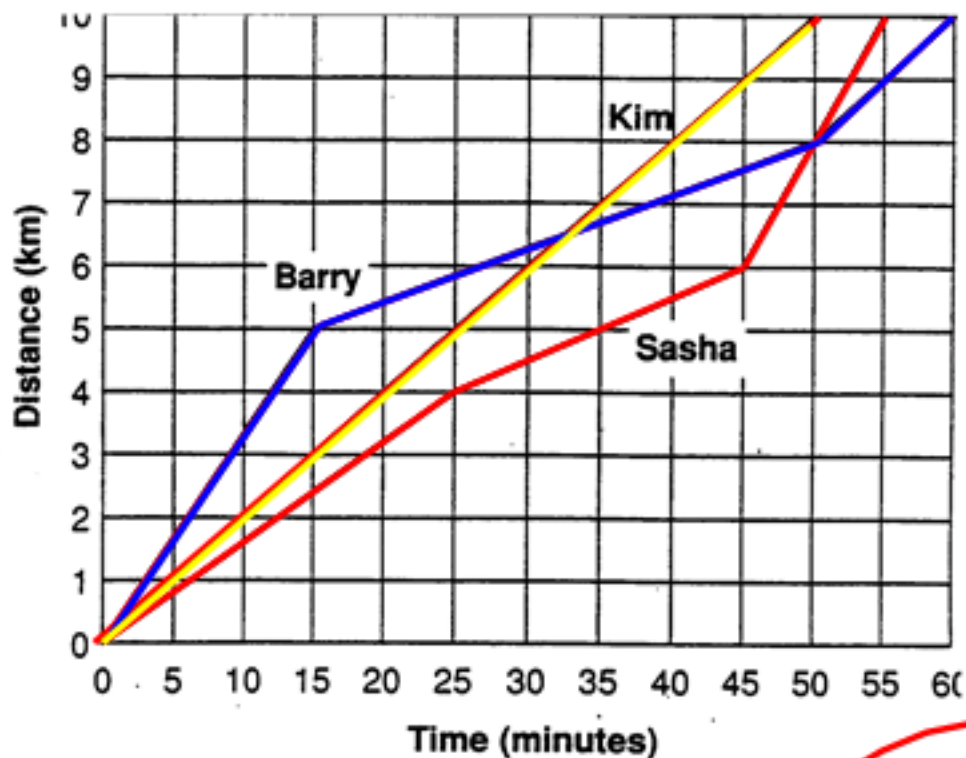


5. Avg. Velocity



6. Accelerating
(Decelerating)

Distance Time Graph



Which person was moving at a constant velocity? **Kim**

Which person won this race? **Kim**

What was the winning time? **50 minutes**

What was the average velocity of Kim? $\frac{10}{50} = 0.2 \frac{\text{km}}{\text{min}}$

Which cyclist lost this race? **Barry**

Barry

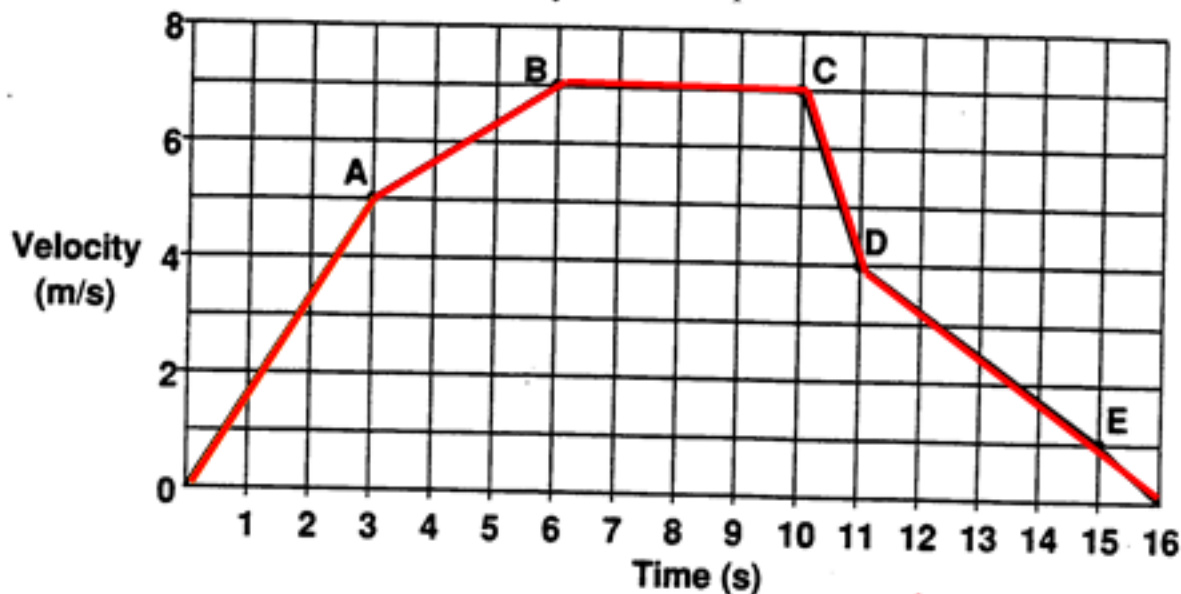
Kim

50 minutes

$$\frac{10}{50} = 0.2 \frac{\text{km}}{\text{min}}$$

$$0.2 \frac{\text{km}}{\text{min}}$$

Velocity Time Graph



What is the acceleration between A and B.

$$\frac{2}{3} = 0.67 \text{ m/s}^2$$

What is the acceleration between B and C.

$$\frac{0}{3} = -3 \text{ m/s}^2$$

What is the acceleration between C and D.

$$\frac{-3}{4} = -0.75 \text{ m/s}^2$$

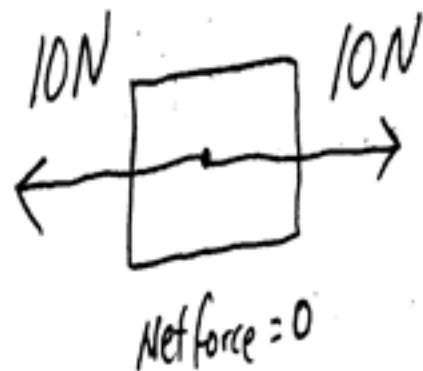
What is the acceleration between D and E.

What is the displacement of the car between B and C.

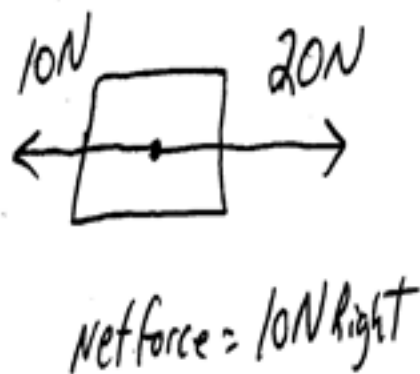
$$v = 7 \text{ m/s} \quad d = ? \quad t = 4 \text{ s}$$

$$v = \frac{d}{t} \quad v \cdot t = d = 7 \cdot 4 = 28 \text{ m}$$

Balanced force



Unbalanced force



Balanced forces produce a net force = 0 and therefore no change in motion

Unbalanced forces produce a net force = some # and therefore a change in motion.

Newton's Laws of Motion:

1st Law--An object at rest stays at rest and an object in motion stays in motion unless acted on by some *unbalanced* force!!

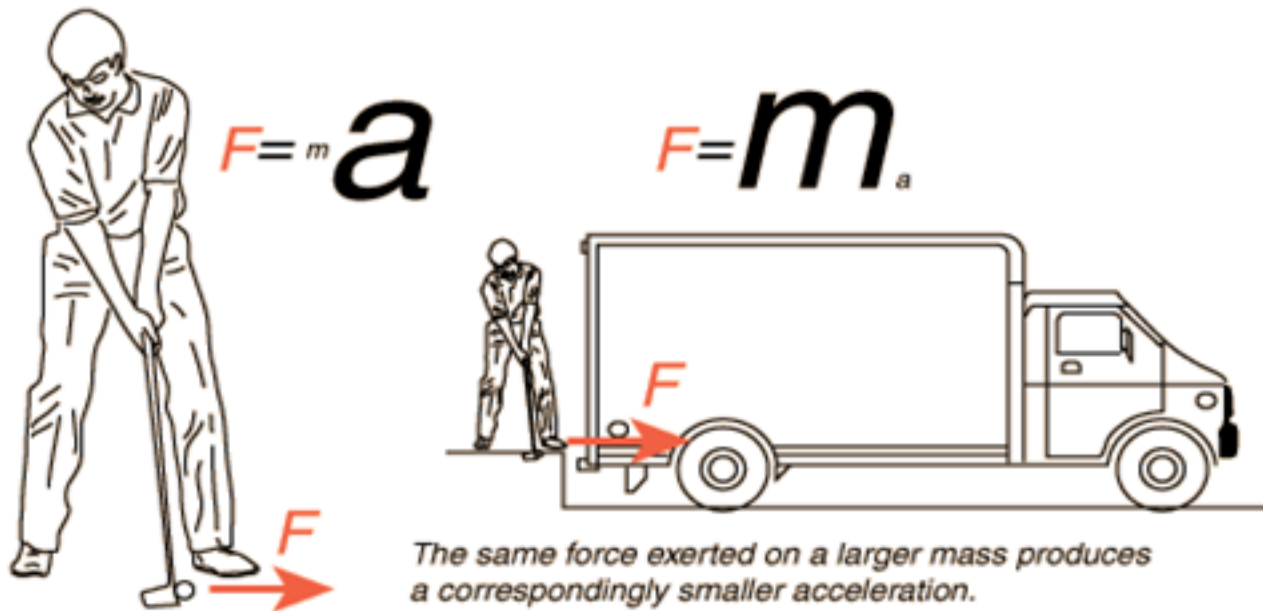
--Law of Inertia



Newton's Laws of Motion:

2nd Law--relates force, mass and acceleration!!

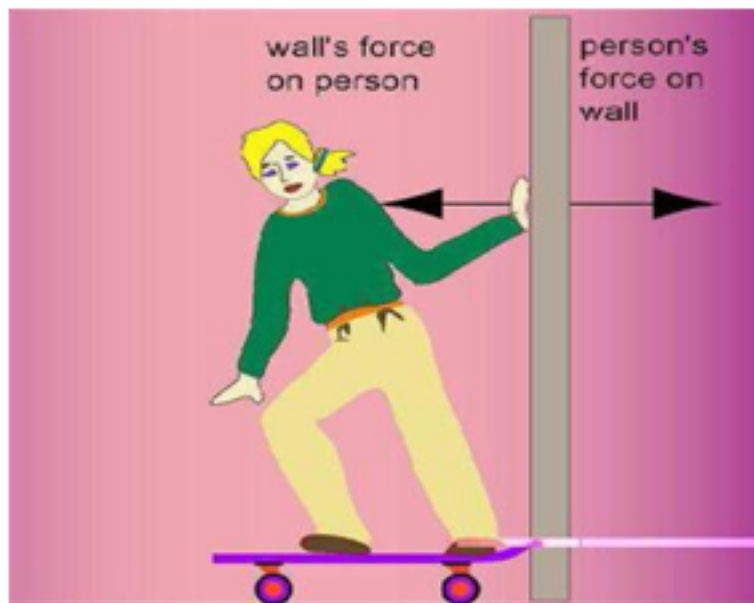
$$F = m \cdot a$$



Newton's Laws of Motion:

3rd Law--For every action, there is an equal but opposite reaction!!

***Forces always occur in pairs!!



Forces Examples:

___ 1. A force of 10 N accelerates an object at a rate of 2 m/s^2 . Find the mass of the object.

- a) 20 kg b) 10 kg c) 5 kg d) 2 kg

$$\begin{aligned} F &= 10 \text{ N} \\ a &= 2 \text{ m/s}^2 \\ m &= ? \end{aligned}$$

$$\begin{aligned} F &= m a \\ m &= \frac{F}{a} = \frac{10}{2} \\ m &= 5 \text{ kg} \end{aligned}$$

2. Find the weight of a person with a mass of 110 kg.

a) 10.78 N

b) 107.8 N

c) 1078 N

d) 10780 N

$$F_g = ?$$

$$m = 110 \text{ kg}$$

$$g = 9.80 \text{ m/s}^2$$

$$F_g = mg$$

$$= 110(9.8)$$

$$F_g = 1078 \text{ N}$$

___ 3. A force of 10 N acts on an object toward the north. A force of 25 N acts on the same object toward the south. What net force is exerted on the object?

- a) 35 N north b) 35 N south c) 15 N north d) 15 N south

