

07-01

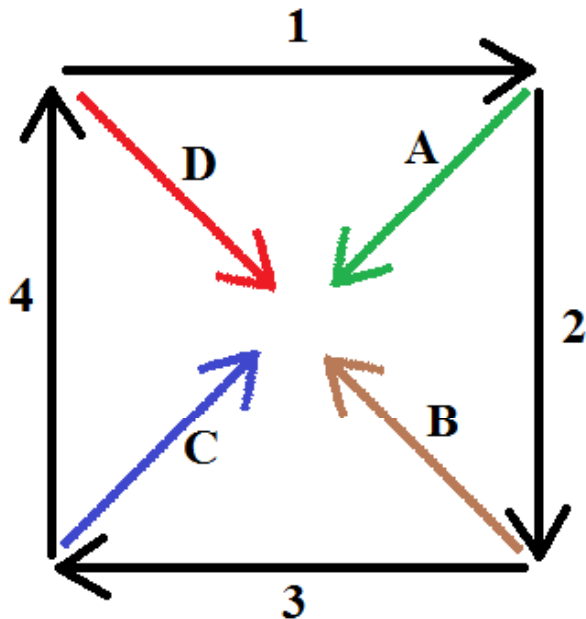
Circular Motion Centripetal Acceleration Force

Acceleration and circles

- The rate of velocity change
- Can you go in a circle without accelerating?
Why or why not?

Direction of acceleration

- Think about times when you change direction going around the block....
- What direction do you accelerate?
- Is there a pattern?



What is Δv ?
(How did V change?)

Direction path change	Velocity change	Direction of velocity change
Point A 1→2	Lost East Got South	SW (losing East same as gaining West)
Point B 2→3	Lost South Got West	NW
Point C 3→4	Lost West Got North	NE
Point D 4→1	Lost North Got East	SE

Centripetal acceleration

- Centripetal means “center seeking”
- Can't move in a circle without push/pull toward center
- Centripetal force is real; centrifugal force is an illusion (1st law illusion)
- Earth moves in a circle, anything pulling it toward center?
- Ever fling something tied to a rope in a circle?
 - Can ropes push?
 - What does “not pushing” prove?
- Center-directed force is Centripetal Force

$$a_c = v^2/r \quad F_c = ma_c$$

What units for a_c ? (do dimensional analysis)

Computation Example

- “Physics girl” (Anyone want this title? Anyone?) wants to fling the Ball ‘O Death around in a circle tied to a wire rope. If the BOD has a mass of 11 kg and she can fling with 600 N of force (tension) and the rope is 2 m long,
 - How fast can she fling it? (kinda hard, **10.4 m/s**)
 - How much sag will there be in the rope? (**10.4° below horizon**...sorta hard...okay, these difficulty ratings are totally arbitrary)

Find the centripetal force

- Circular motion always requires a force toward the center of the circle it moves in, find what's pushing or pulling the circular mass in each of these cases:
 1. Venus revolves around the sun
 2. You fling a bottle over your head tied to a string
 3. A car makes a right turn
 4. A satellite orbits around earth
 5. Soccer player turns to her left
 6. You go in circles on a merry-go-round

Computation Example Praise

- Congratulations, it's official, You and “Physics girl” are both circular motion expert apprentices now!

