



GURUKUL 
Pvt. Industrial Training Institute

Making Youth Employable Through Skill Development

Manglam City, Govindpura, Kalwar Road, Jhotwara, JAIPUR

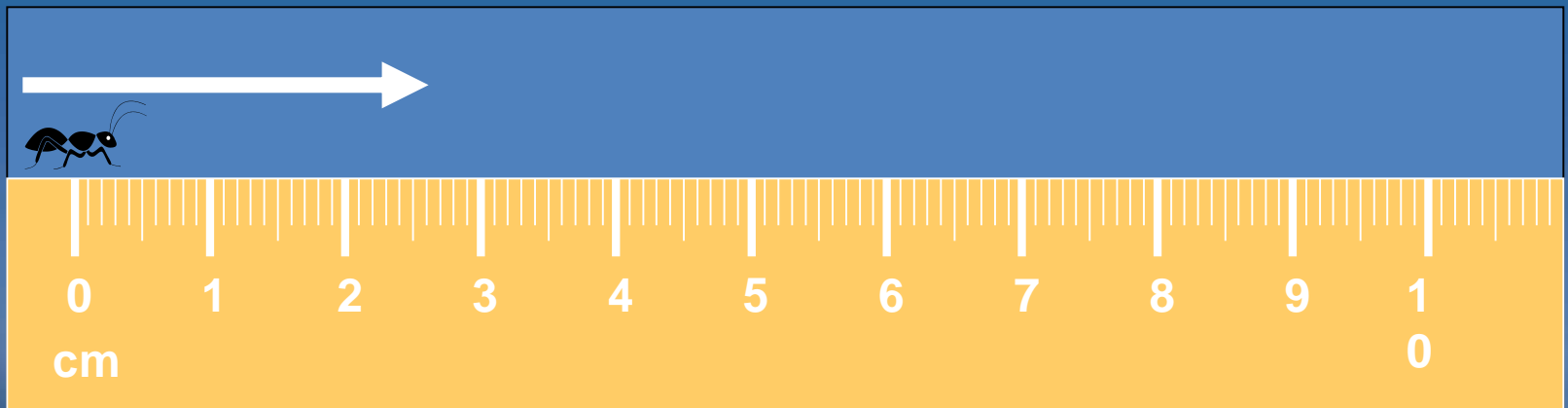
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Distance, Displacement, Speed, and Velocity



Distance

- Distance (d) – how far an object travels.
 - Does *not* depend on direction.
- Imagine an ant crawling along a ruler.

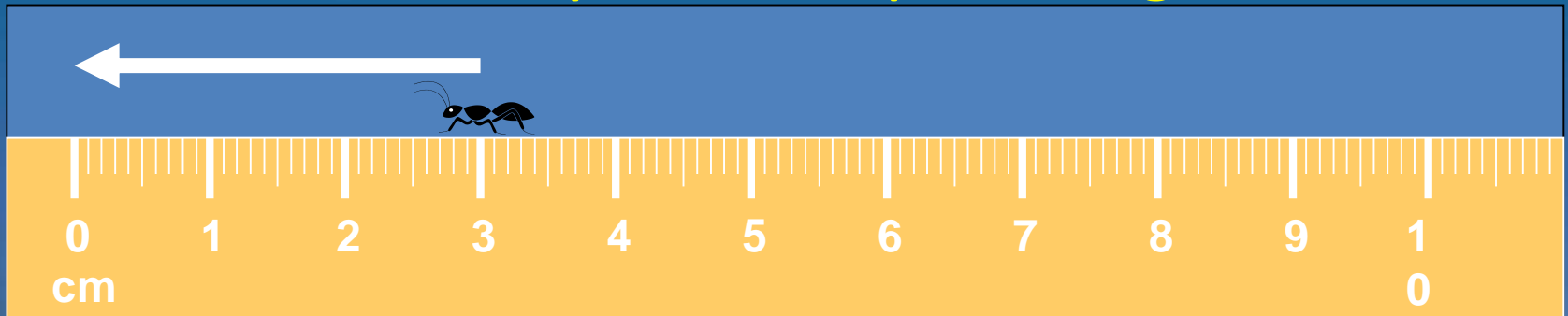


- What *distance* did the ant travel?
 - $d = 3 \text{ cm}$



Distance

- Distance does not depend on direction.
- Here's our intrepid ant explorer again.

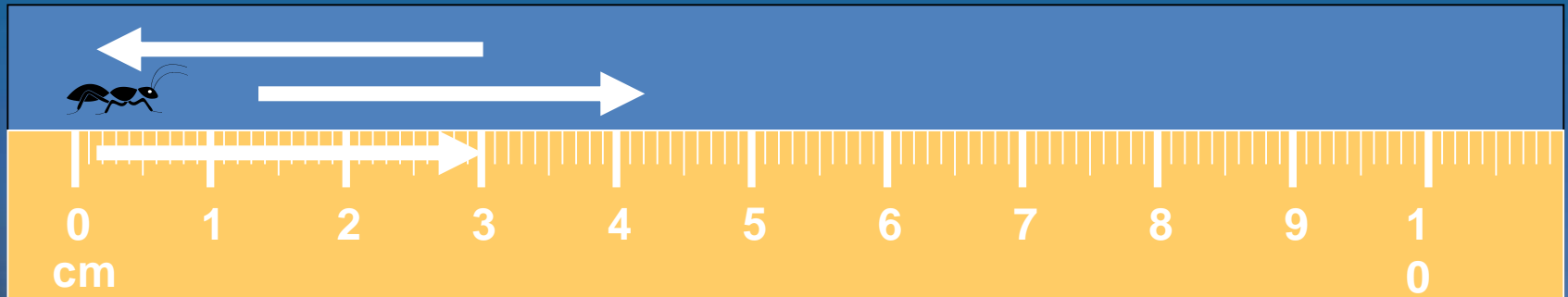


- Now what distance did the ant travel?
– $d = 3 \text{ cm}$
- Does his direction change the answer?



Distance

- Distance does not depend on direction.
- Let's follow the ant again.



- What distance did the ant walk this time?
- $d = 7 \text{ cm}$



Displacement

- Displacement (Δd) – difference between an object's final position and its starting position.
 - Does depend on direction.
- Displacement = final position – initial position
- $\Delta d = d_{\text{final}} - d_{\text{initial}}$
- In order to define displacement, we need directions.
- Examples of directions:
 - + and –
 - N, S, E, W
 - Angles



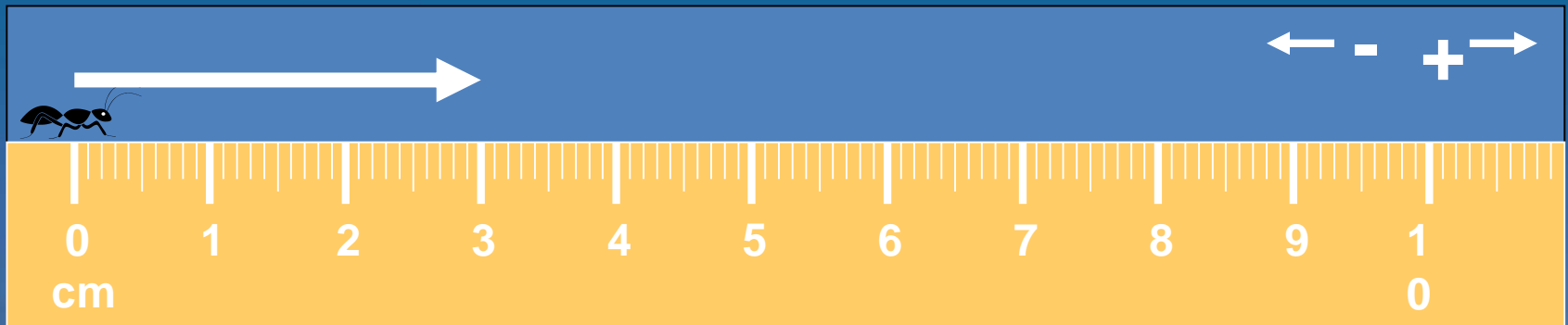
Displacement vs. Distance

- Example of distance:
 - The ant walked 3 cm.
- Example of displacement:
 - The ant walked 3 cm EAST.
- An object's distance traveled and its displacement aren't always the same!



Displacement

- Let's revisit our ant, and this time we'll find his displacement.

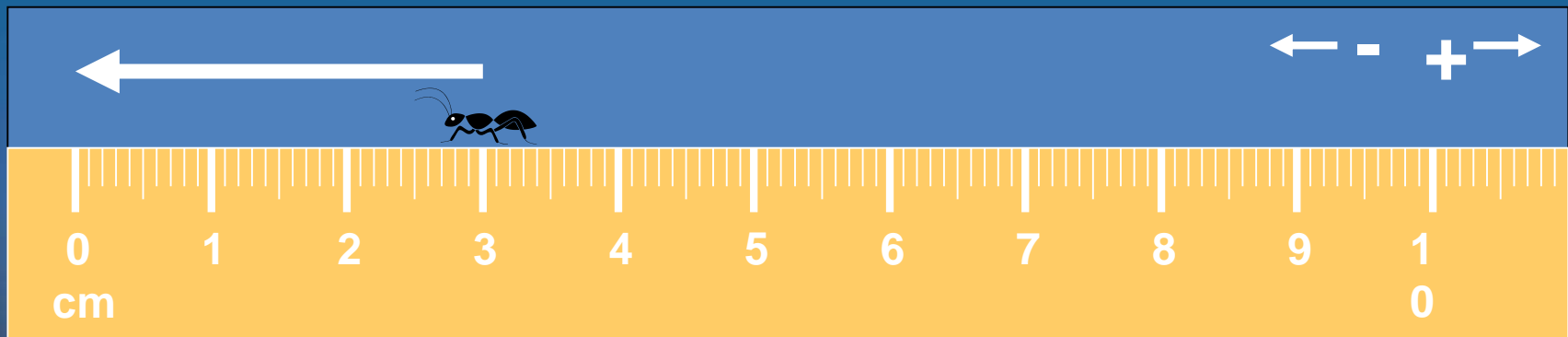


- Distance: 3 cm
- Displacement: +3 cm
 - The positive gives the ant a direction!



Displacement

- Find the ant's displacement again.
 - Remember, displacement has direction!

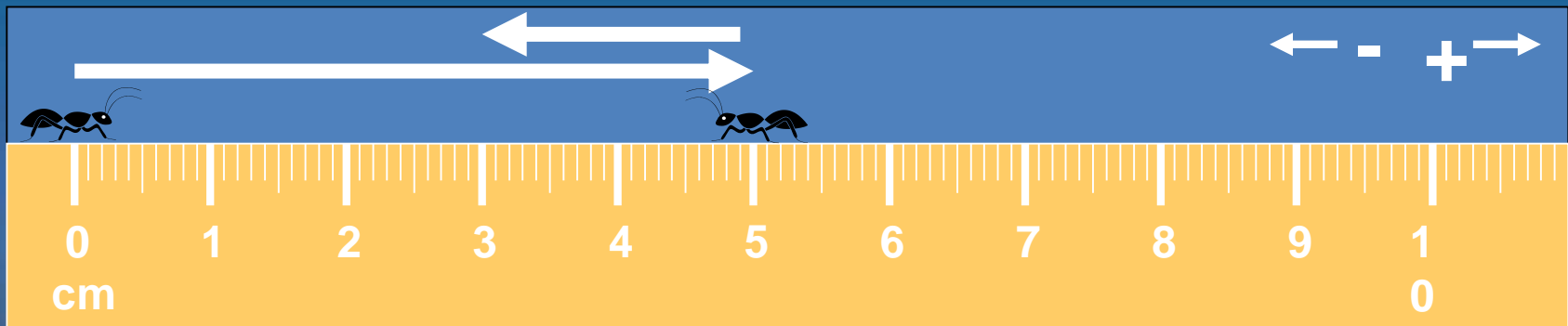


- Distance: 3 cm
- Displacement: -3 cm



Displacement

- Find the distance and displacement of the ant.

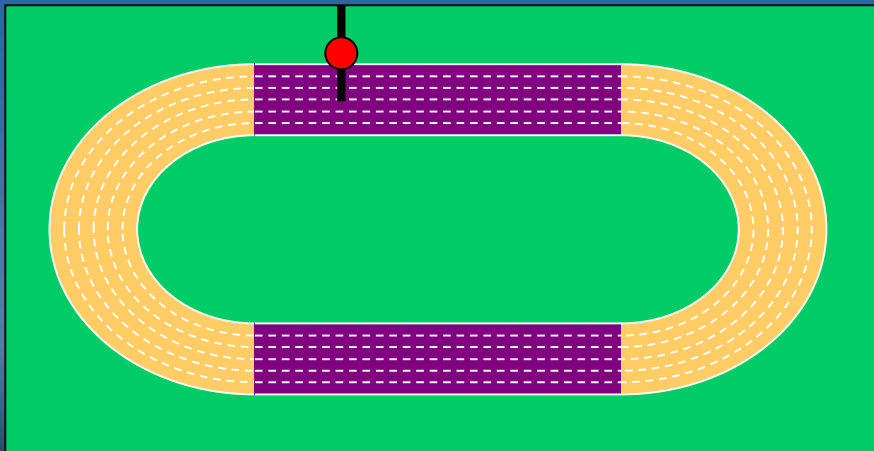


- Distance: 7 cm
- Displacement: +3 cm



Displacement vs. Distance

- An athlete runs around a track that is 100 meters long three times, then stops.
 - What is the athlete's distance and displacement?



- Distance = 300 m
- Displacement = 0 m
- Why?



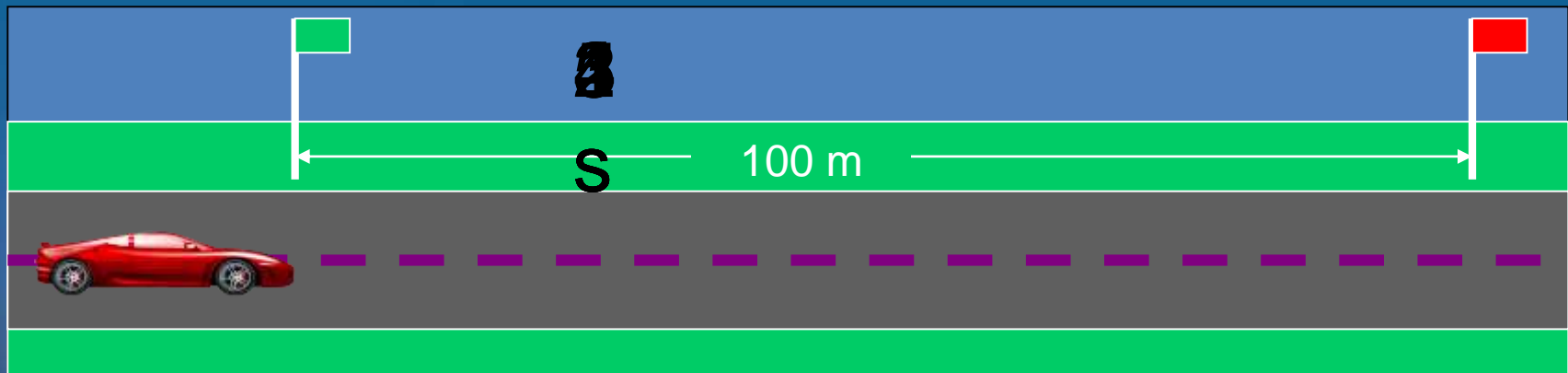
Speed

- Speed (s) – Rate at which an object is moving.
- speed = distance / time
- $s = d/t$
- Like distance, speed *does not* depend on direction.



Speed

- A car drives 100 meters in 5 seconds.



- What is the car's average speed?
 - $s = d/t$
 - $s = (100 \text{ m}) / (5 \text{ s}) = 20 \text{ m/s}$



Speed

- A rocket is traveling at 10 m/s. How long does it take the rocket to travel 30 m?





Speed

- A racecar is traveling at 85.0 m/s . How far does the car travel in 30.0 s ?





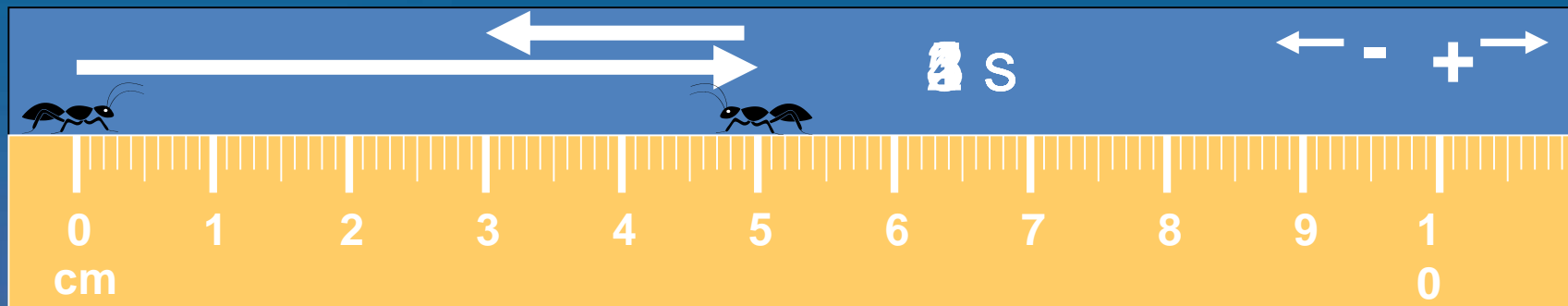
Velocity

- Velocity (v) – speed with direction.
- velocity = displacement / time
- $v = \Delta d / t$
- Has magnitude and direction!
 - Magnitude – a measure that has a value



Pulling It All Together

- Back to our ant explorer!



- Distance traveled: 7 cm
- Displacement: +3 cm
- Average speed: $(7 \text{ cm}) / (5 \text{ s}) = 1.4 \text{ cm/s}$
- Average velocity: $(+3 \text{ cm}) / (5 \text{ s}) = +0.6 \text{ cm/s}$



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The End

Thanks