## June 26, Week 4

Today: Chapter 6, Circular Motion

Homework Assignment #4 -Due Tomorrow.

Homework Assignment #5 - Due Monday, July 7 at 5:00PM.

No office hours next Friday.

## Objects in Contact

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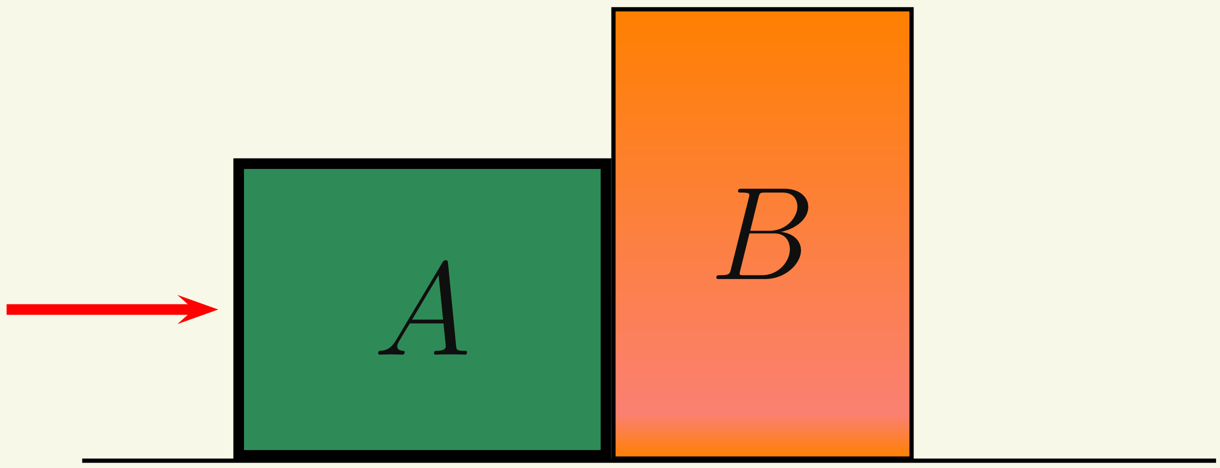

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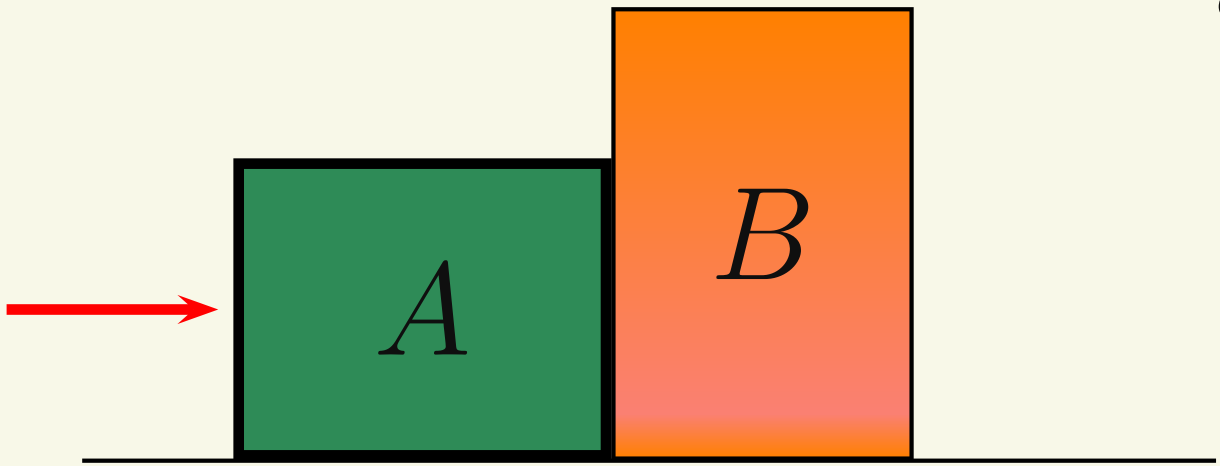


$$a_A = a_B$$

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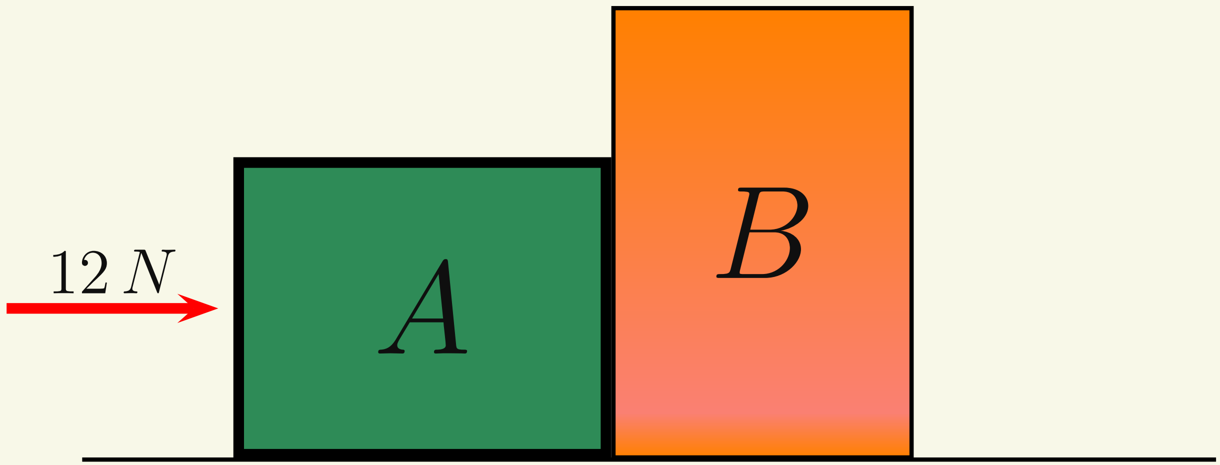
A $5$-$kg$ mass $A$ is placed in front of a $7$-$kg$ mass $B$ on a frictionless table. If a $12\,N$ force is applied to mass $A$, what is the acceleration of the masses?



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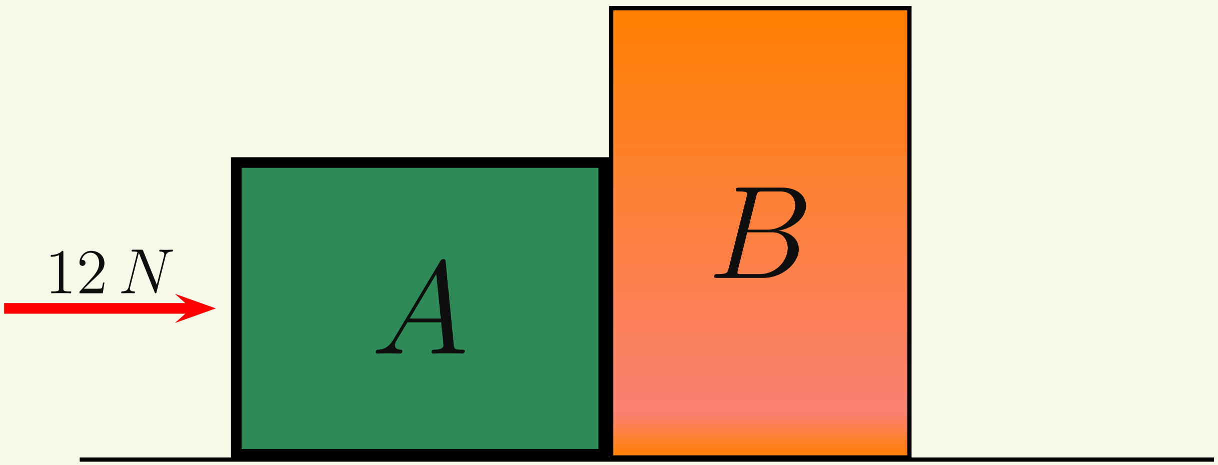


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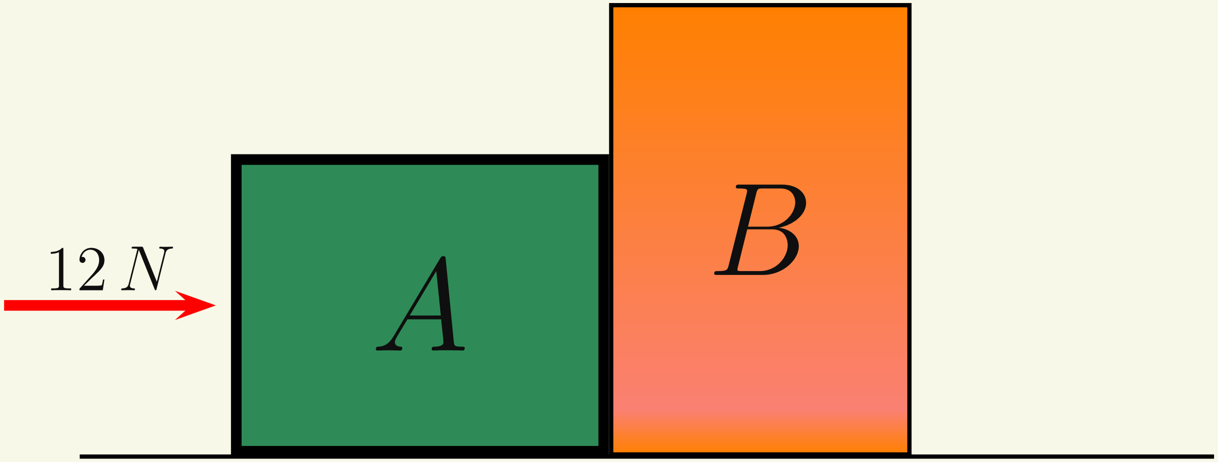


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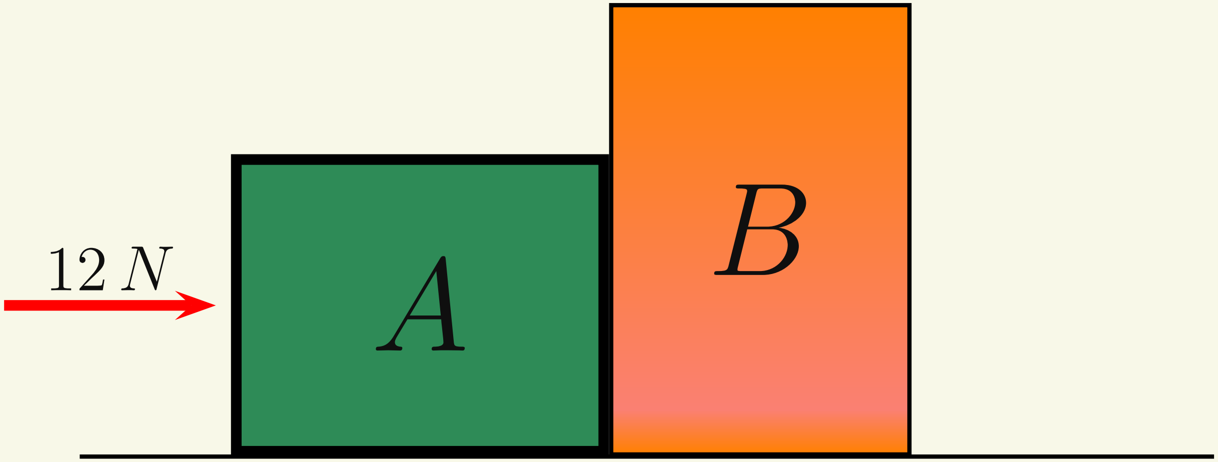


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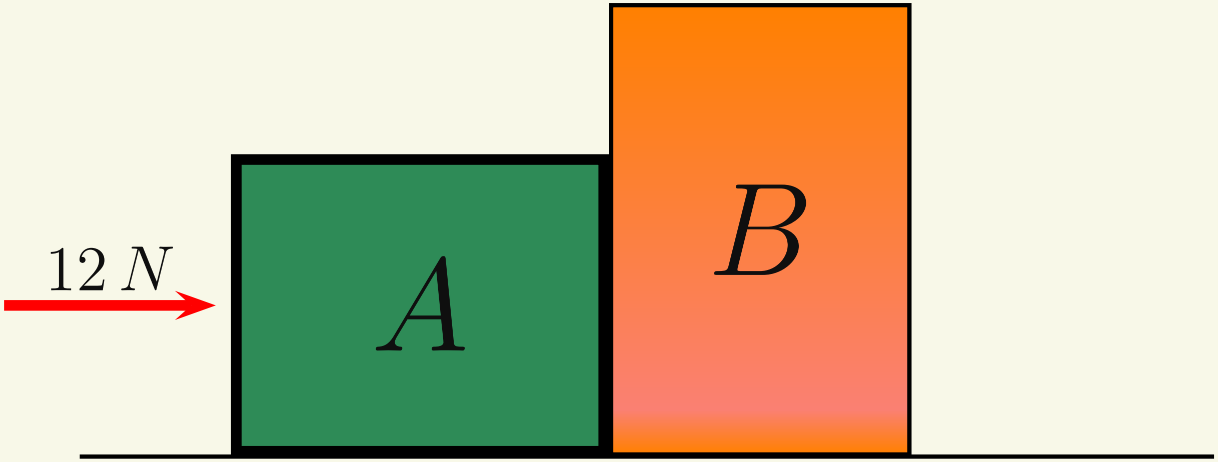


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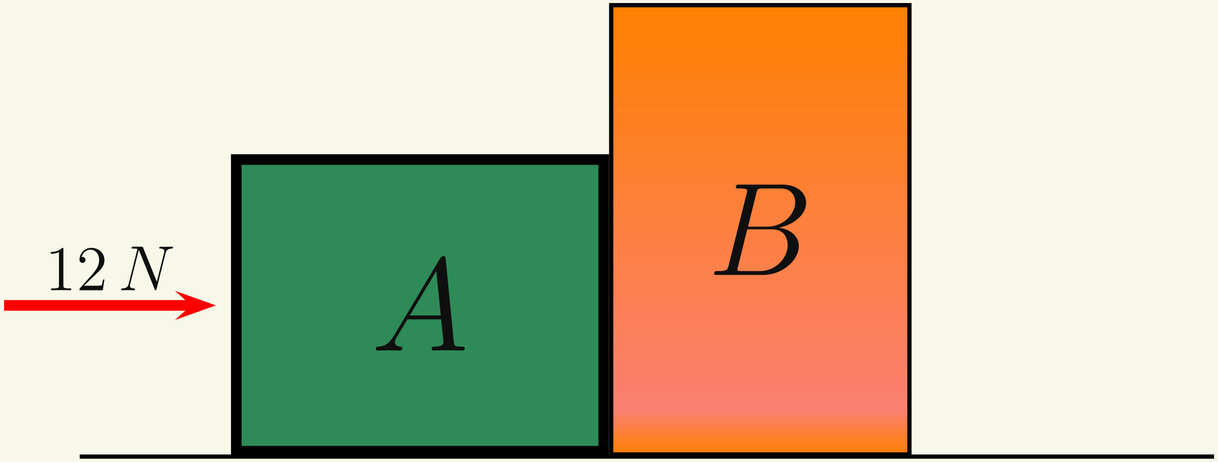


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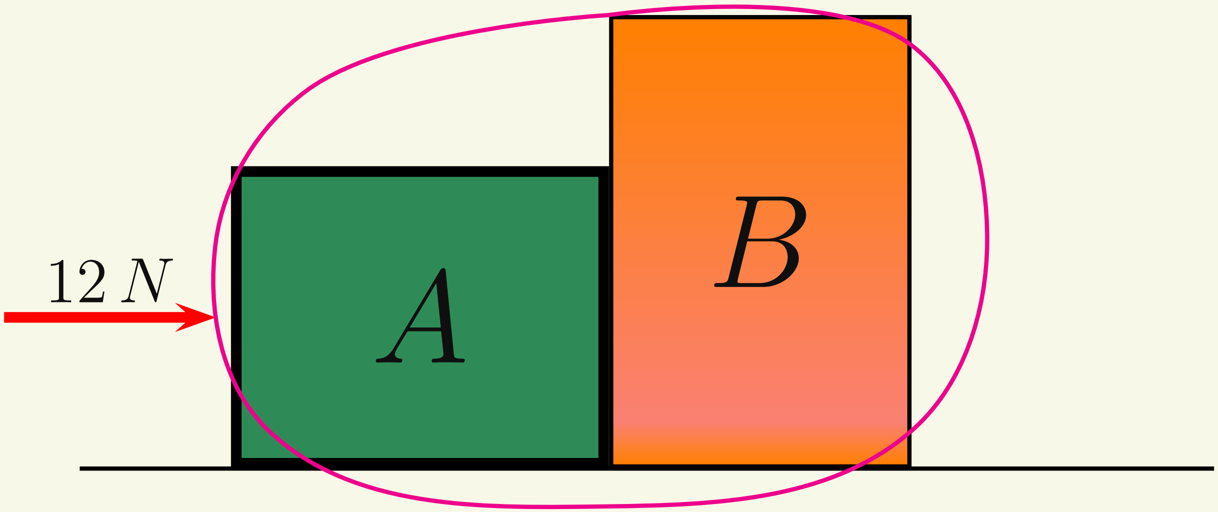


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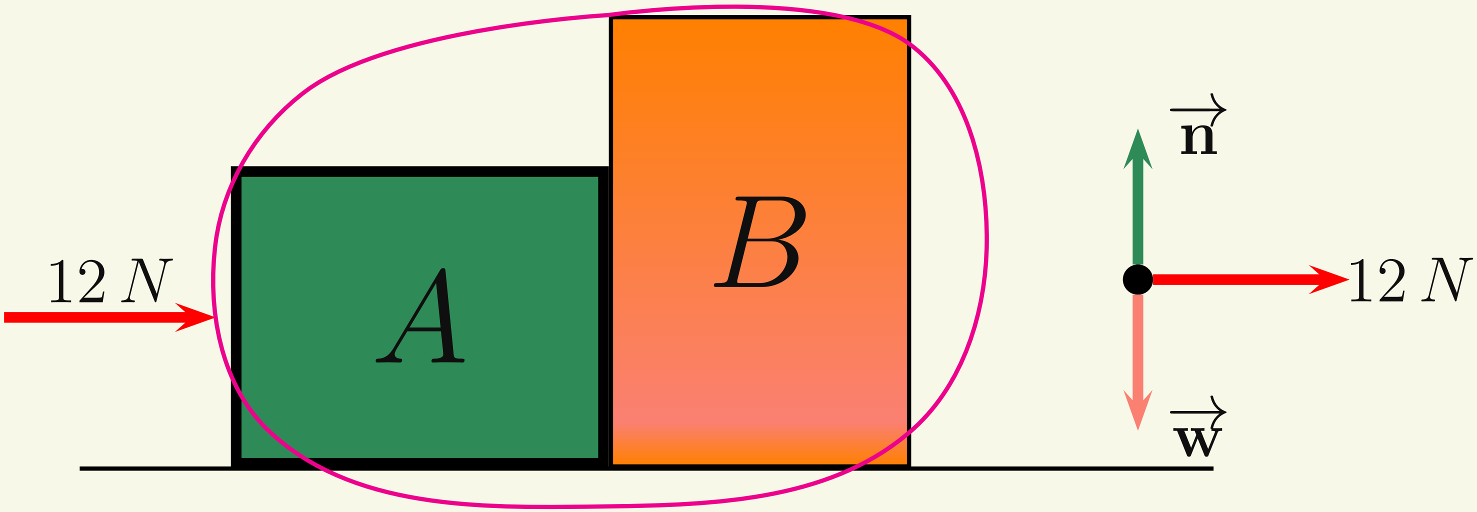


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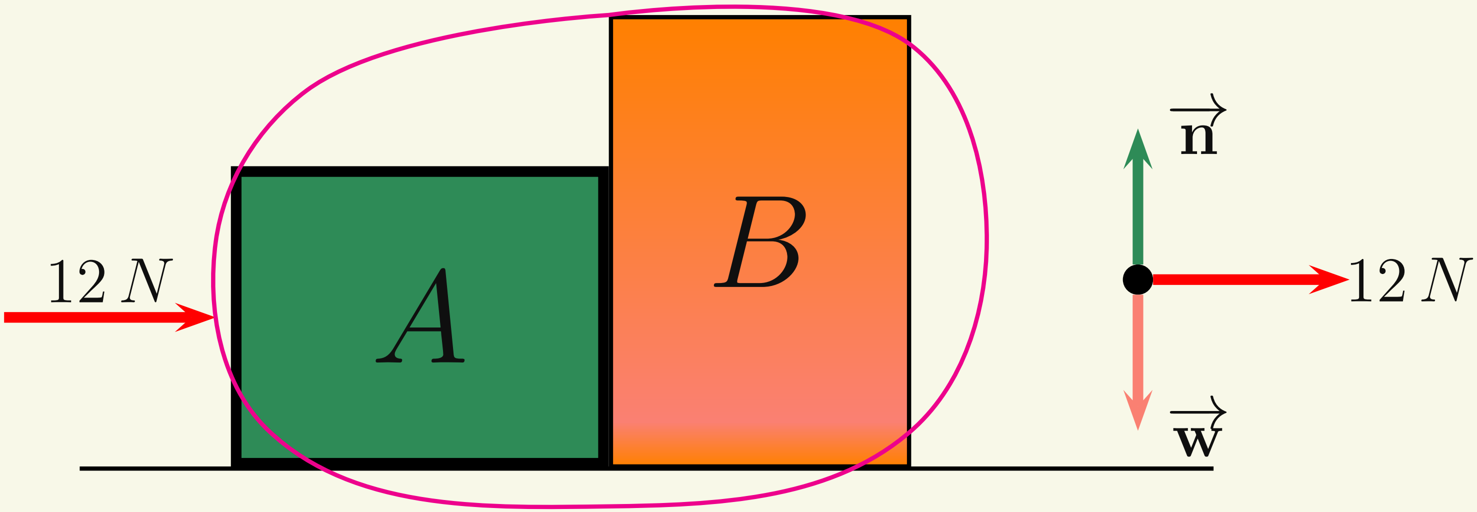


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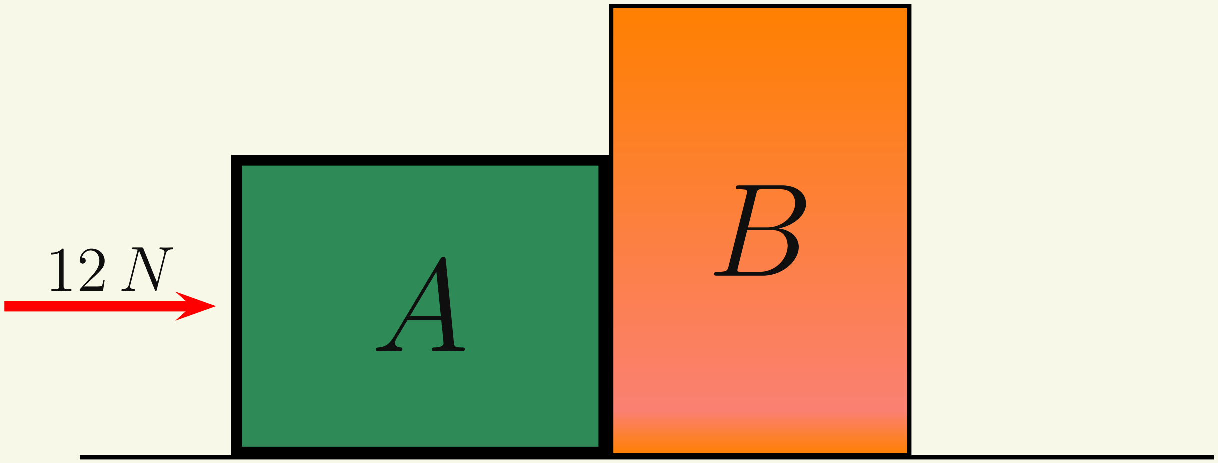

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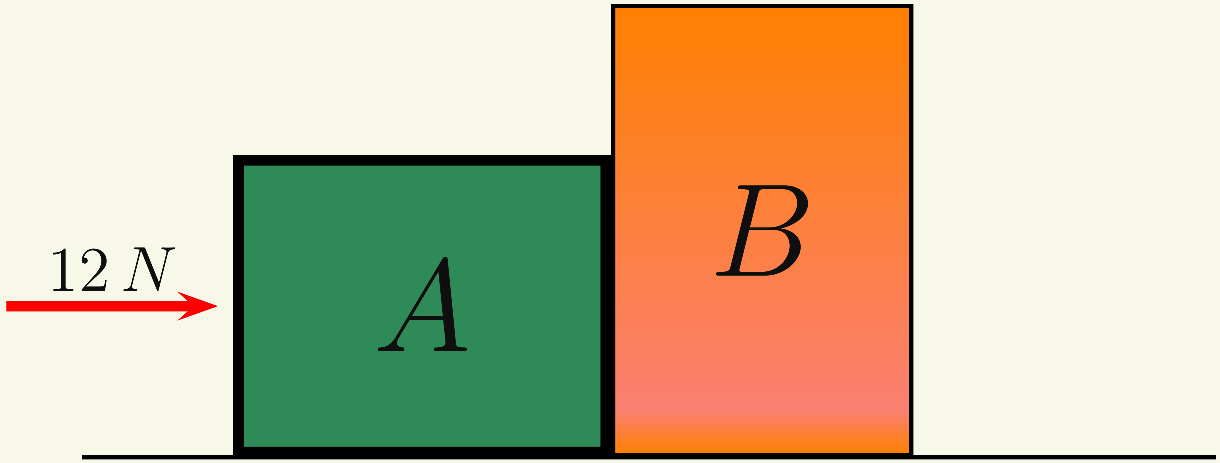


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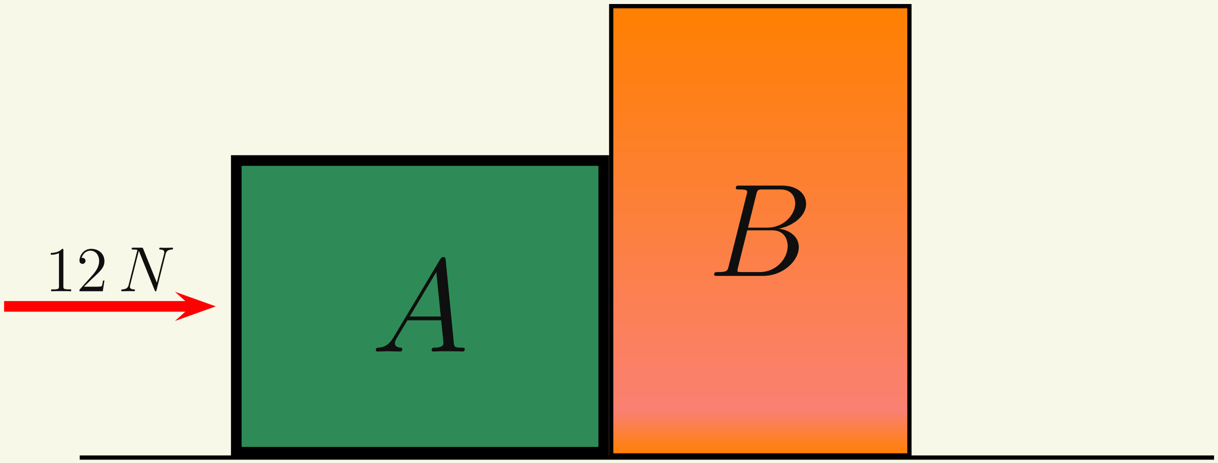


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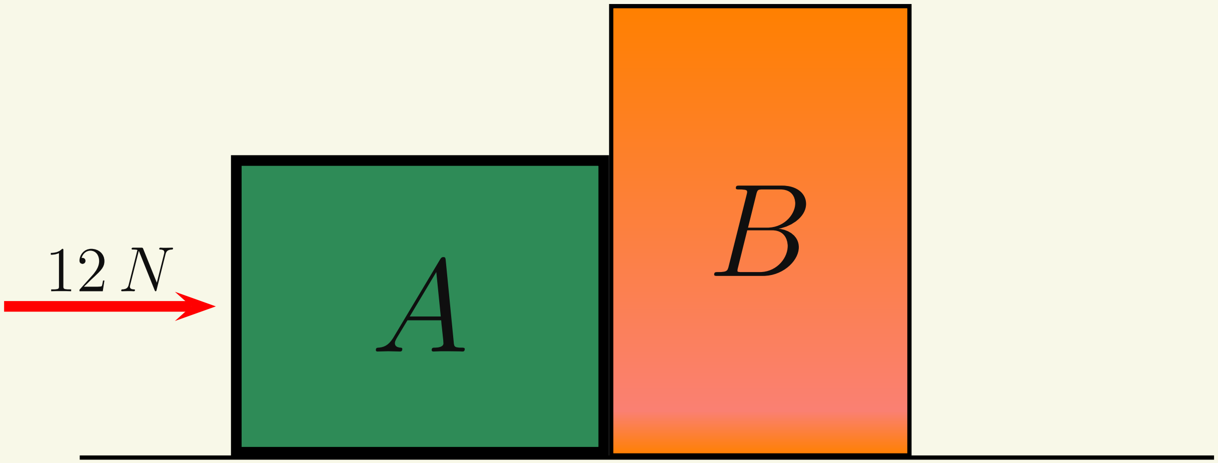


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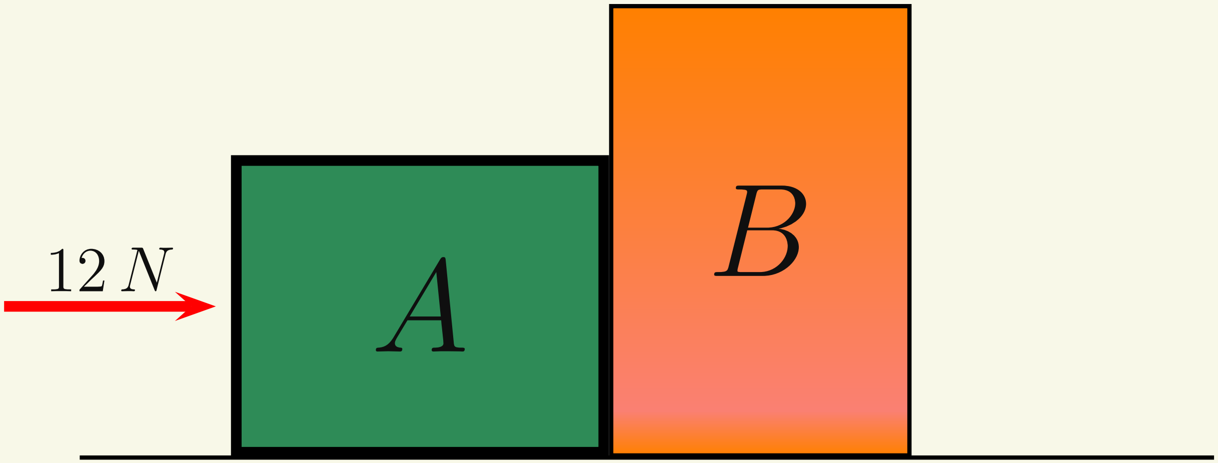


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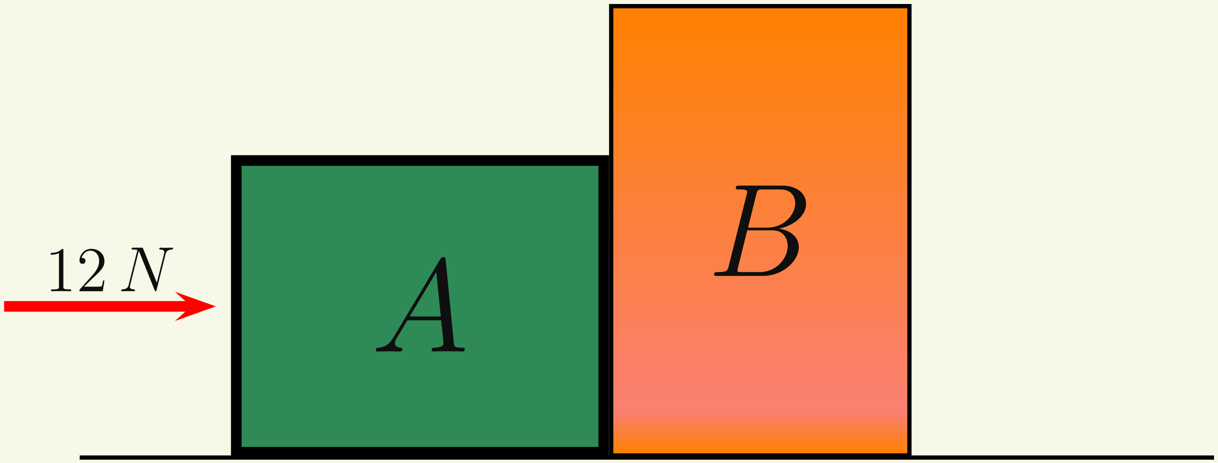


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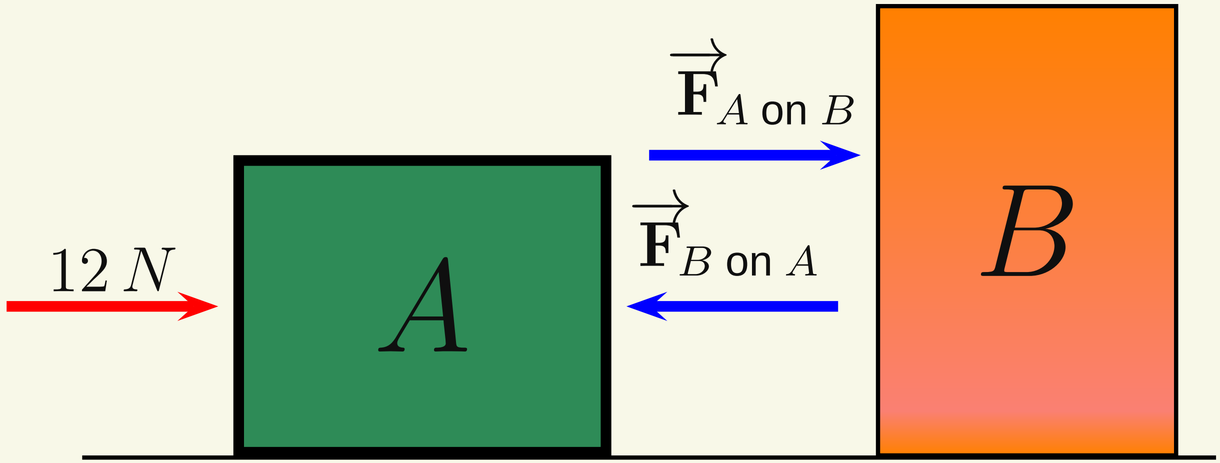


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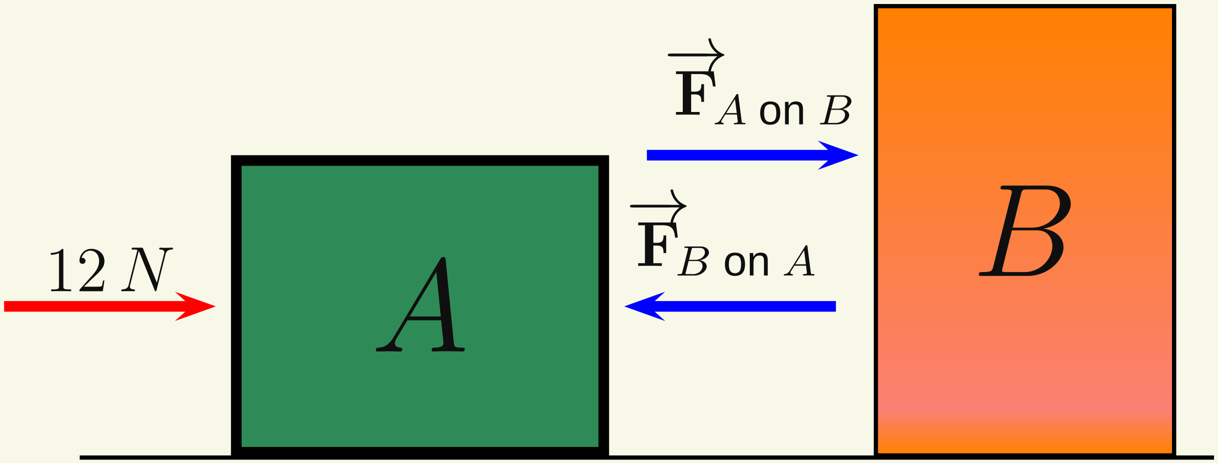


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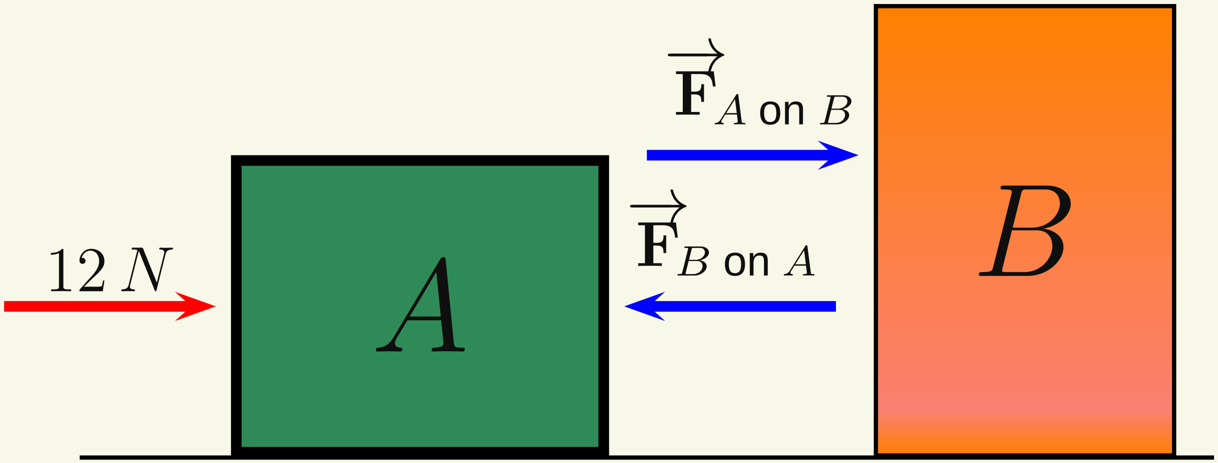


(d) $7\,N$

$$\sum F_x = ma_x \Rightarrow 12\,N - F_{B \text{ on } A} = (5\,kg)\,(1\,m/s^2)$$

*Or* $$F_{A \text{ on } B} = (7\,kg)\,(1\,m/s^2)$$

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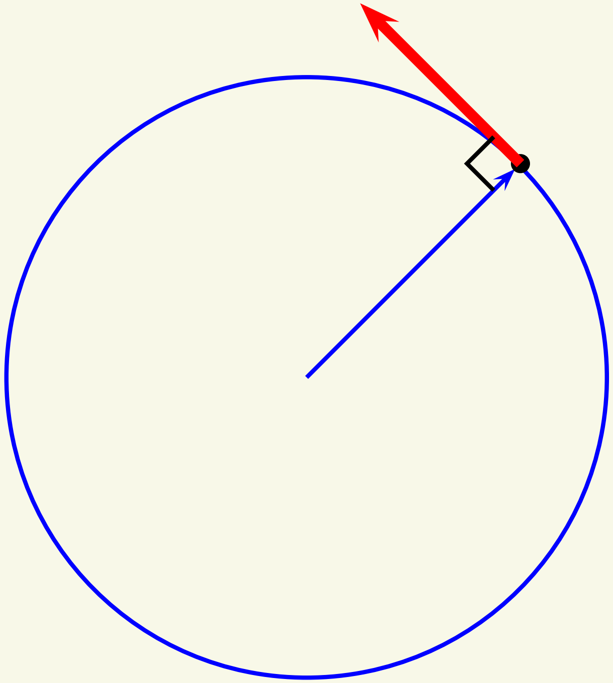

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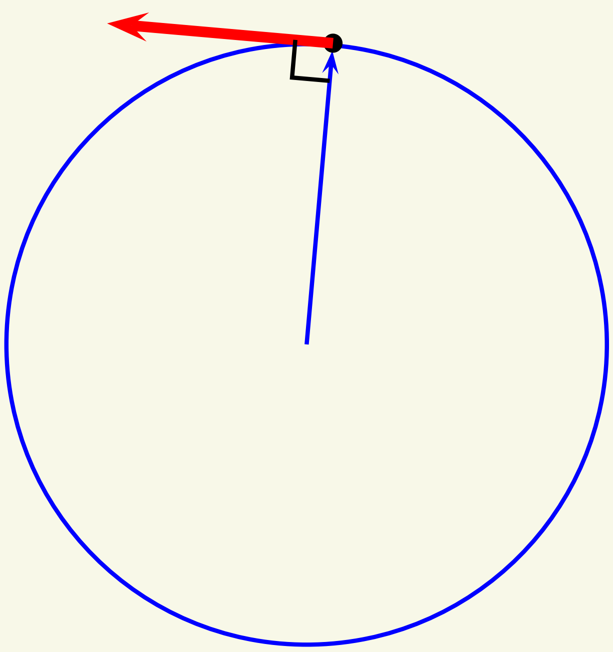

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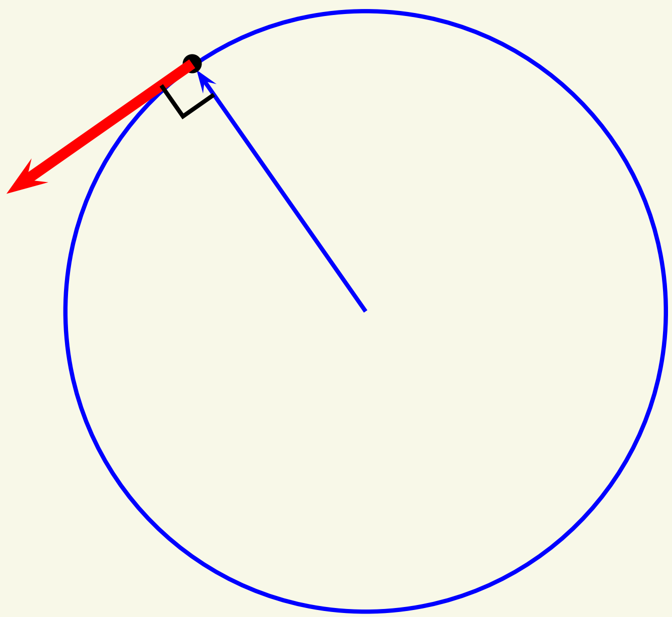

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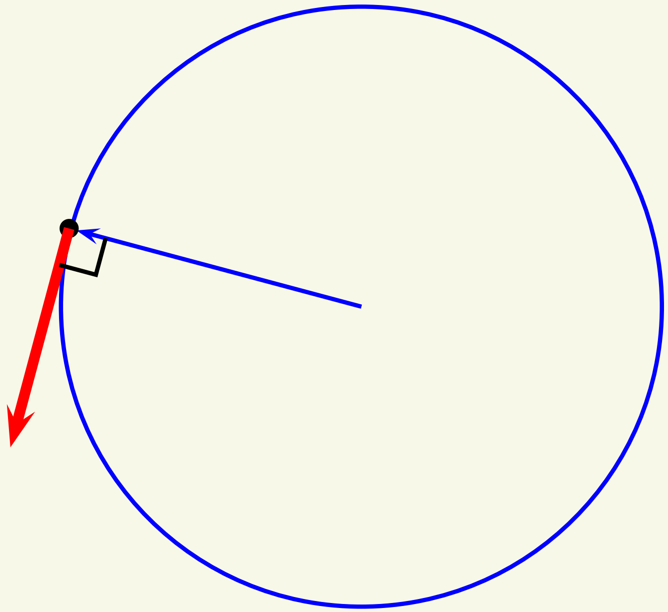

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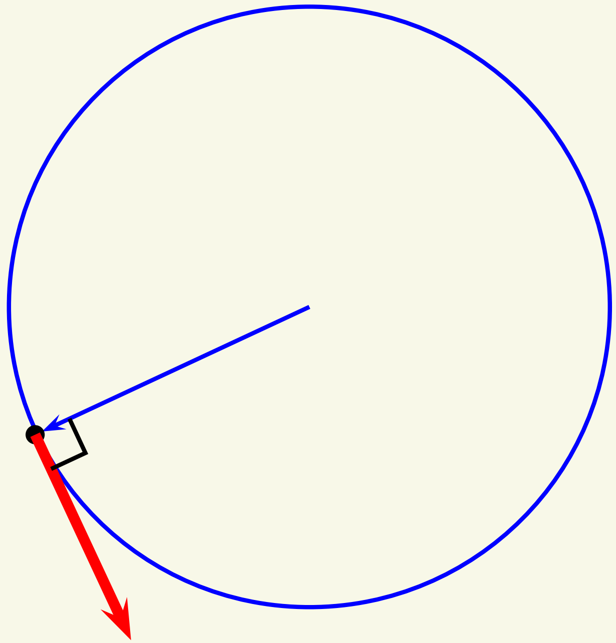

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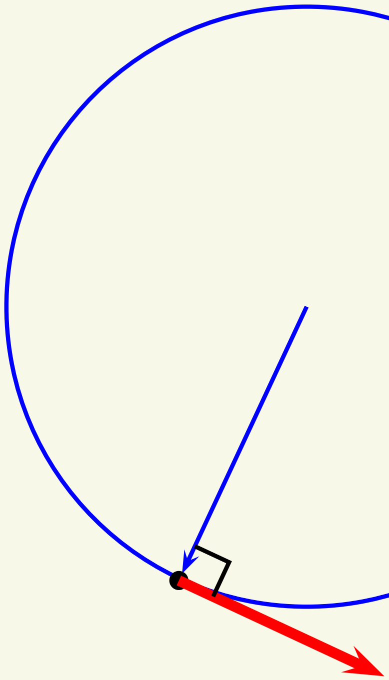

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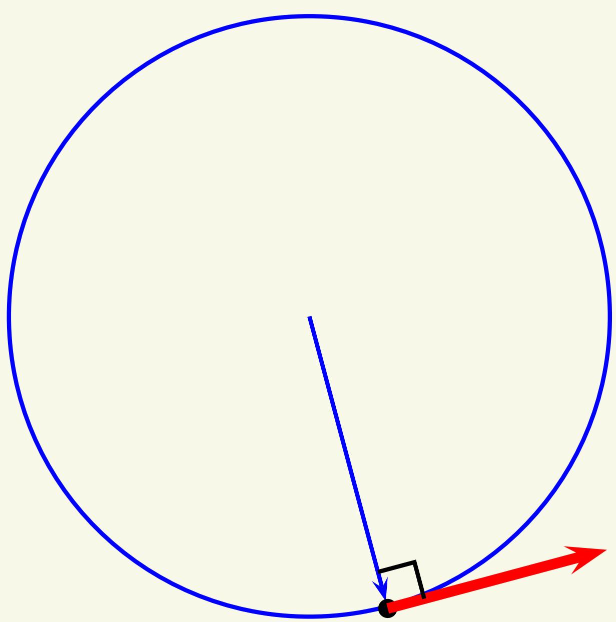

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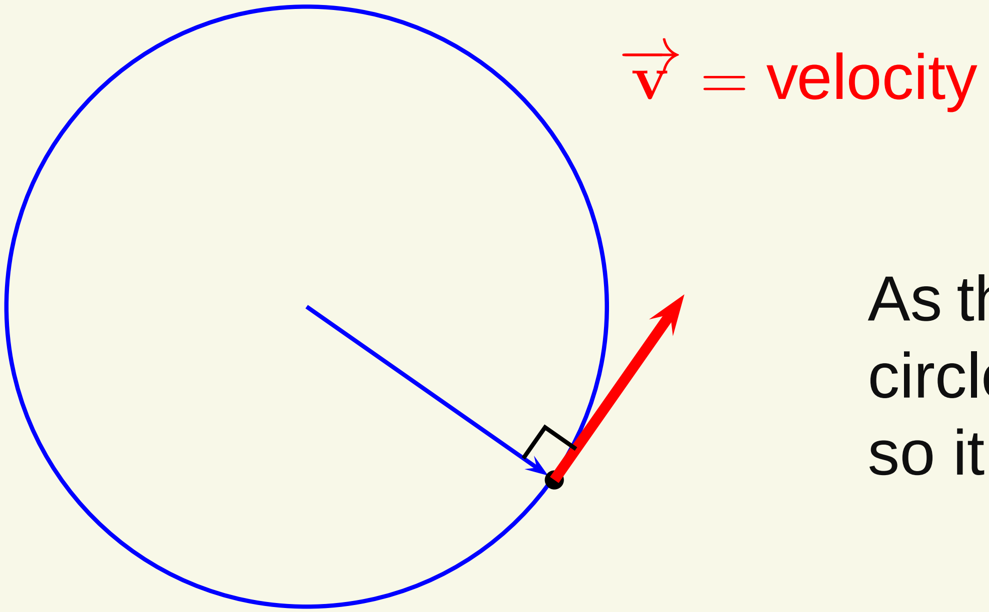


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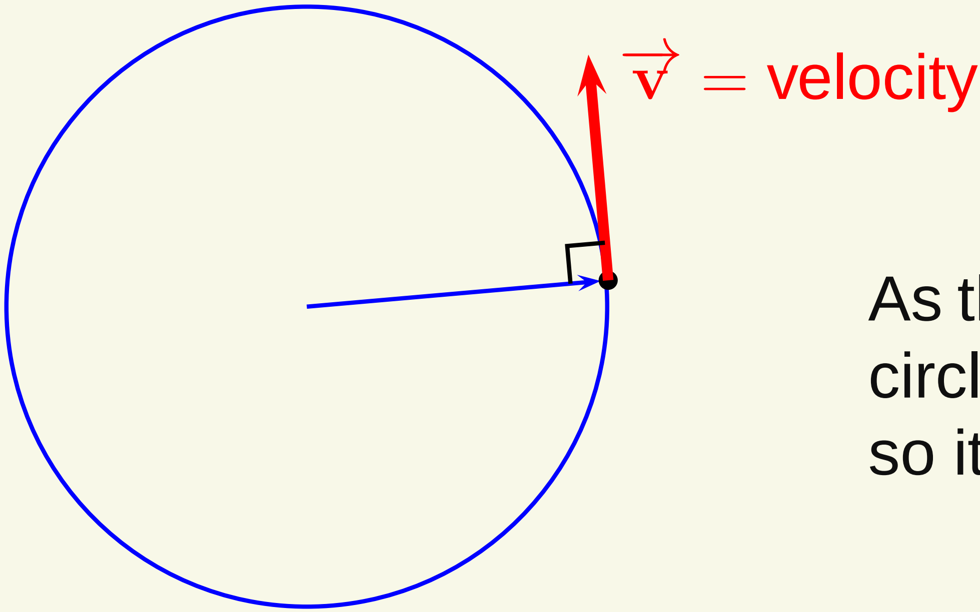


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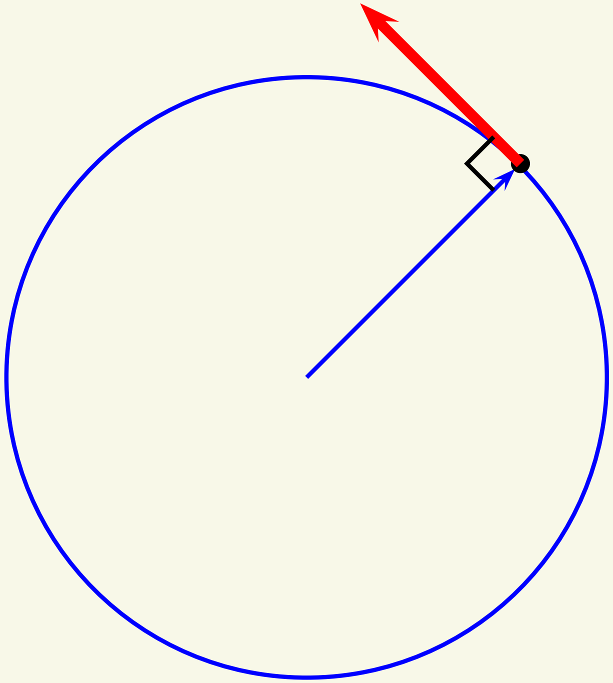

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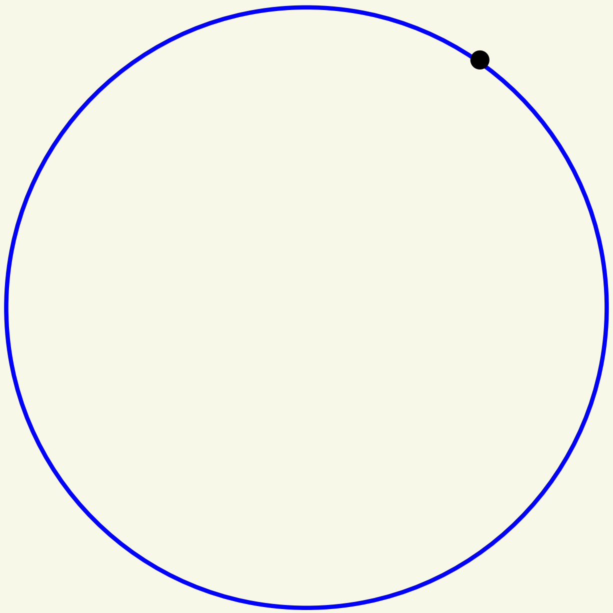

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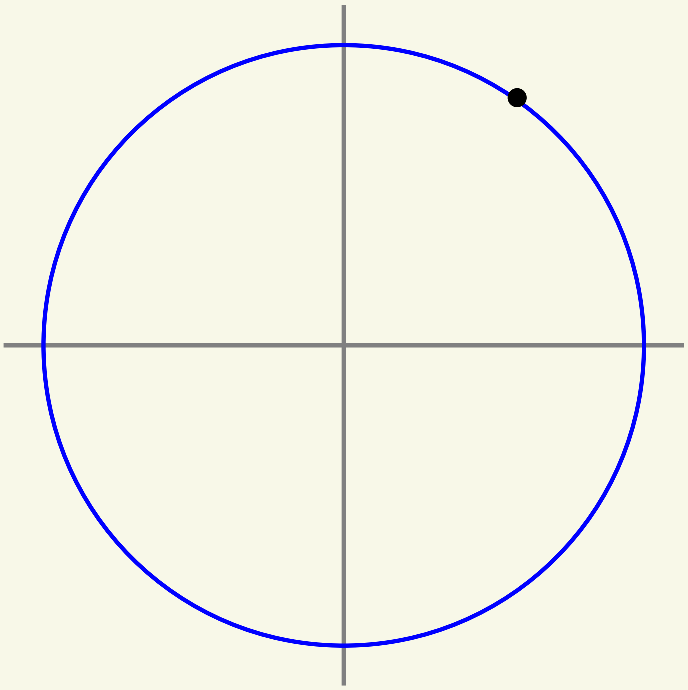

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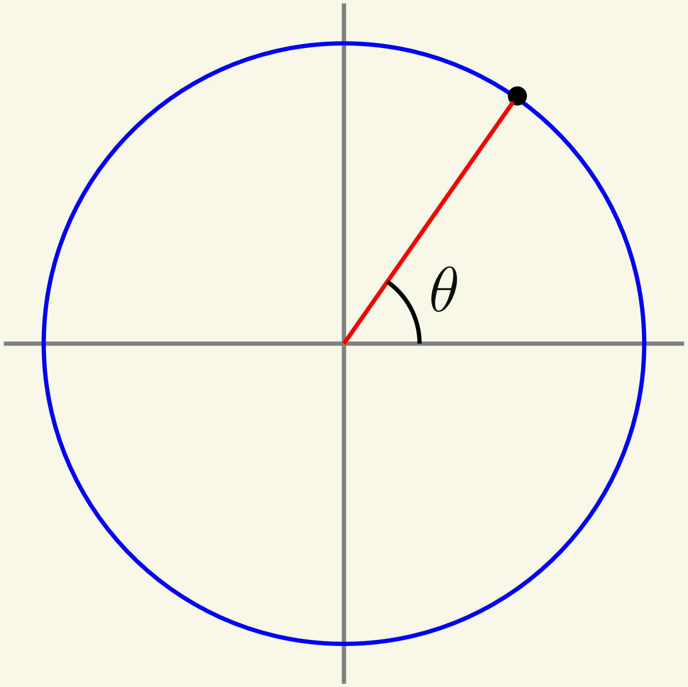

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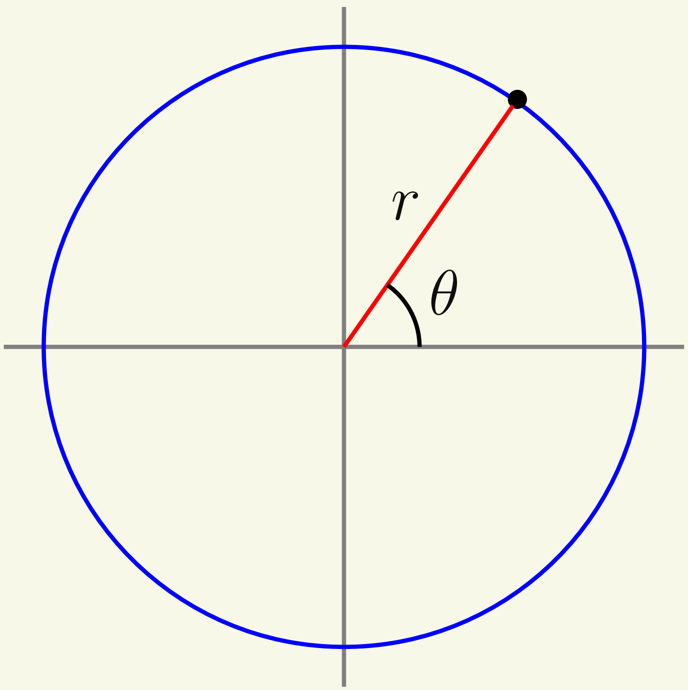


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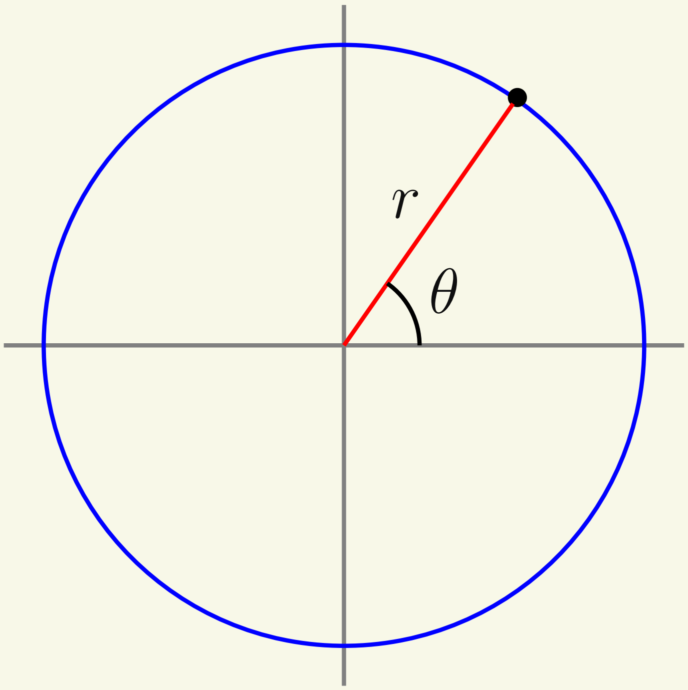


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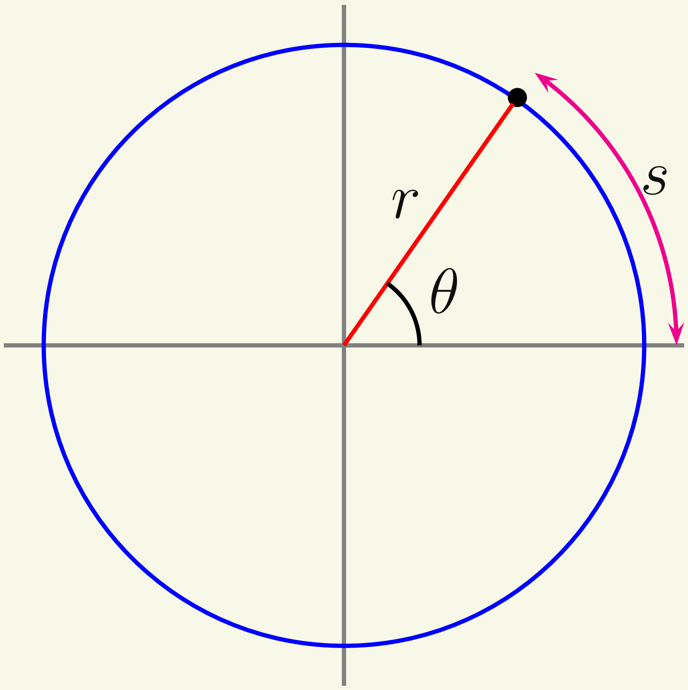


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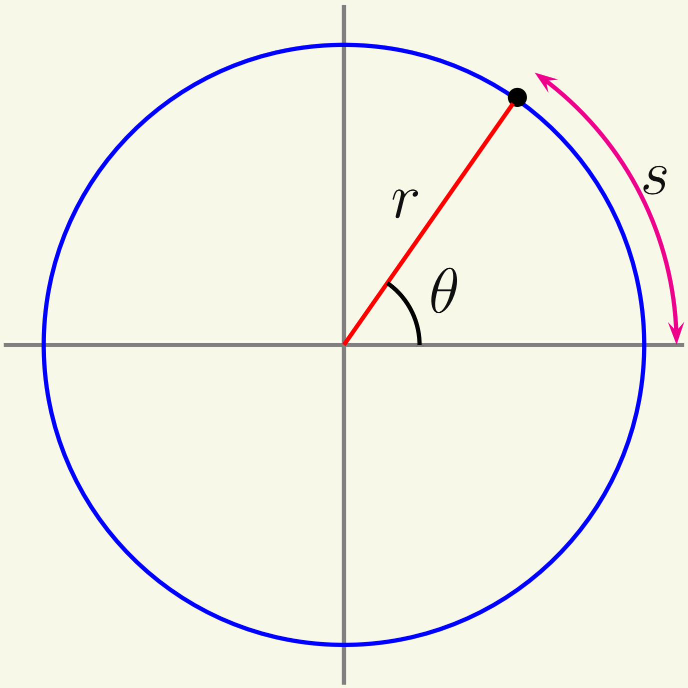


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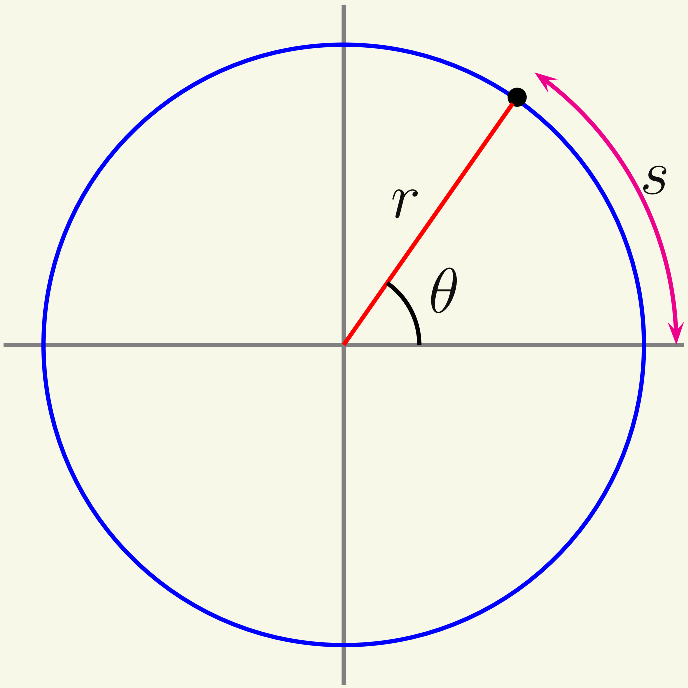


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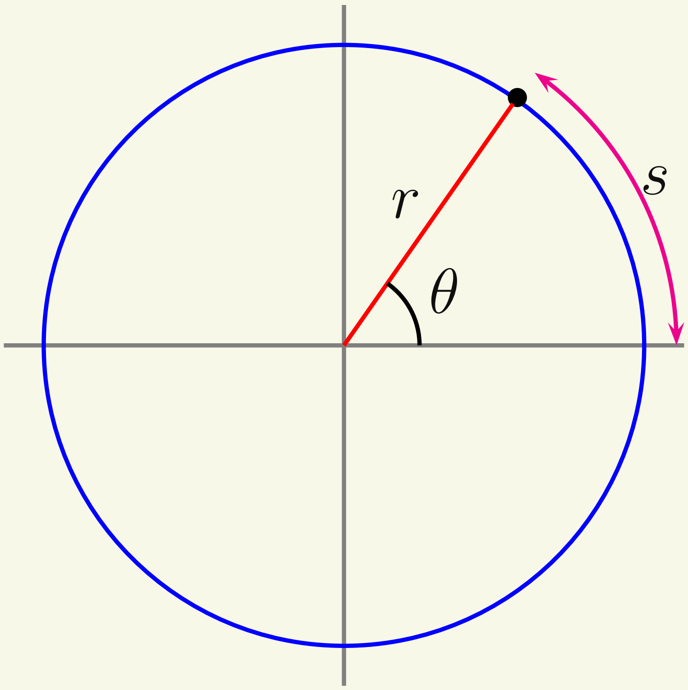


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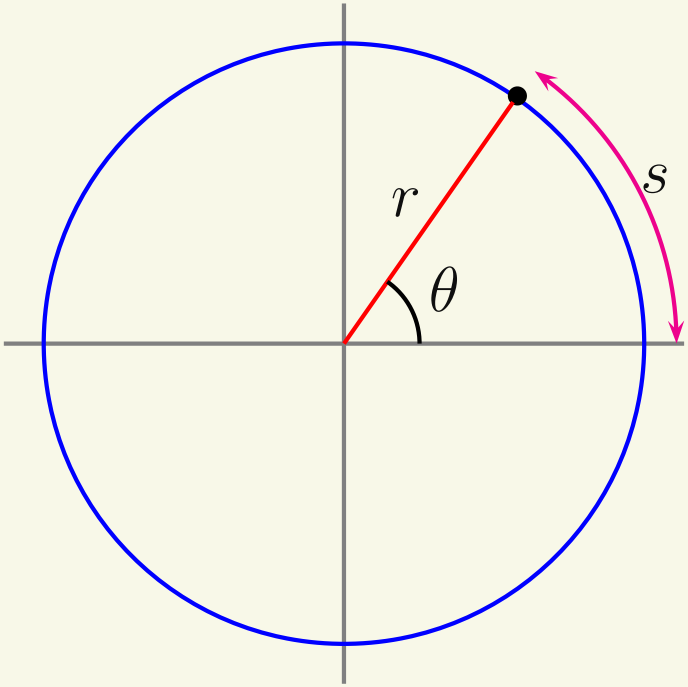


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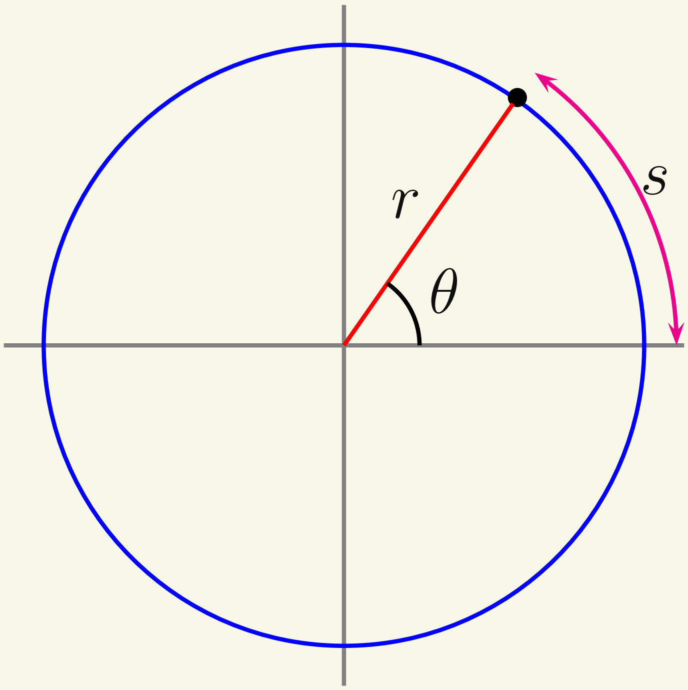


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Example: Convert $30°$, $45°$, and $90°$ to radians.
Convert $1\, rad$ to degrees

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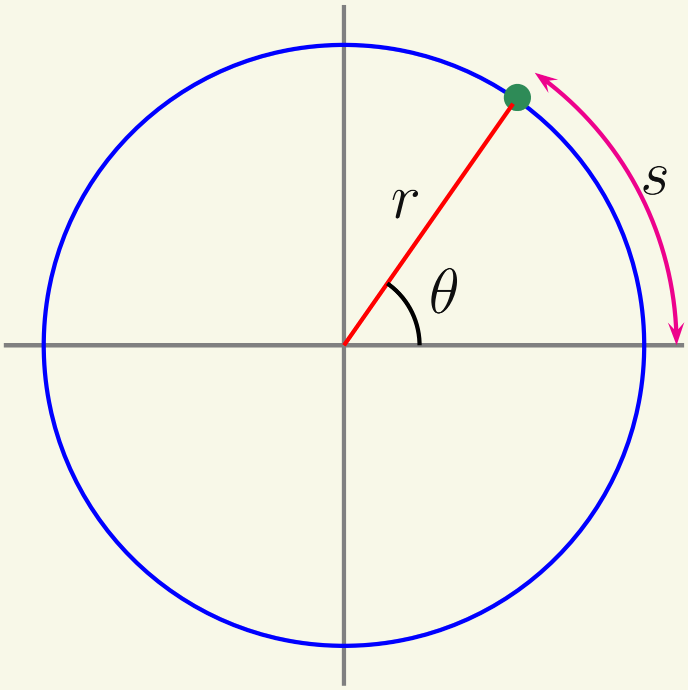


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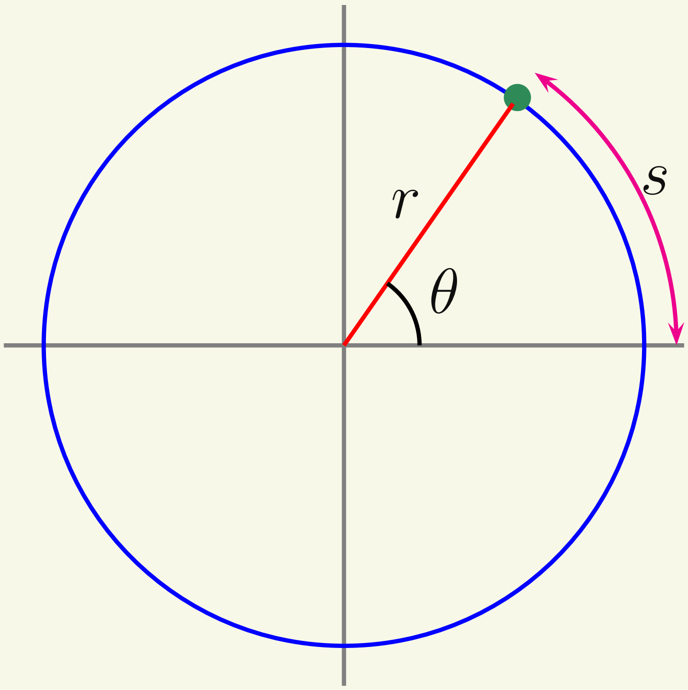


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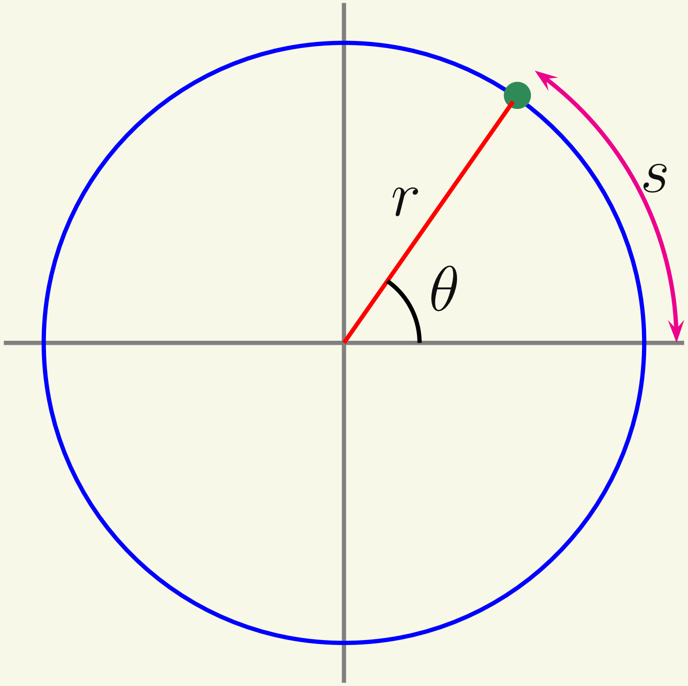


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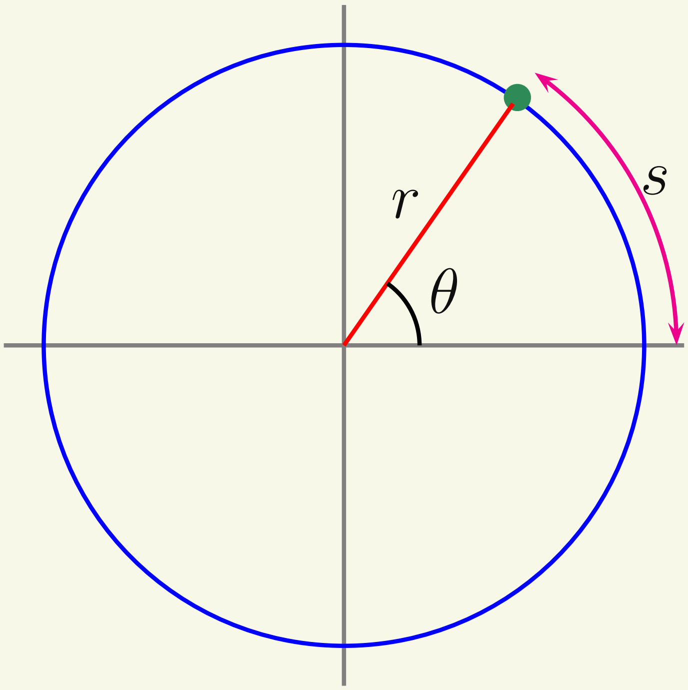


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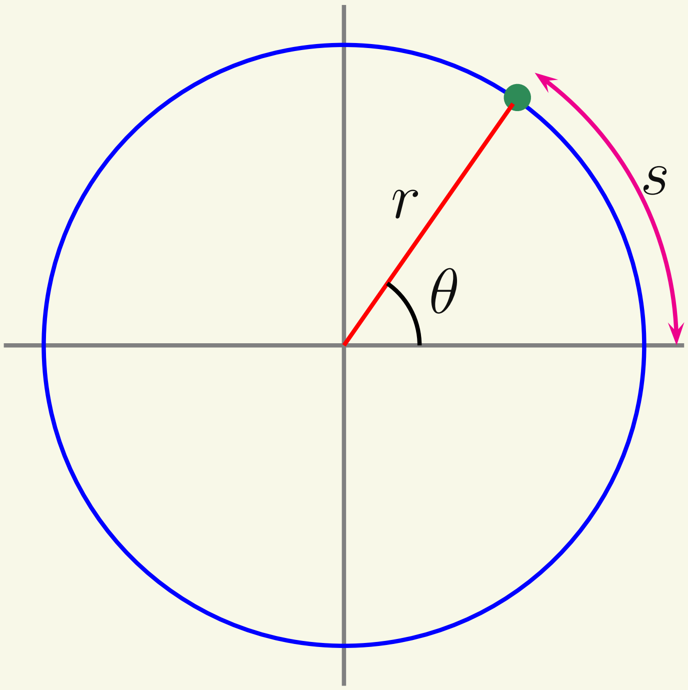


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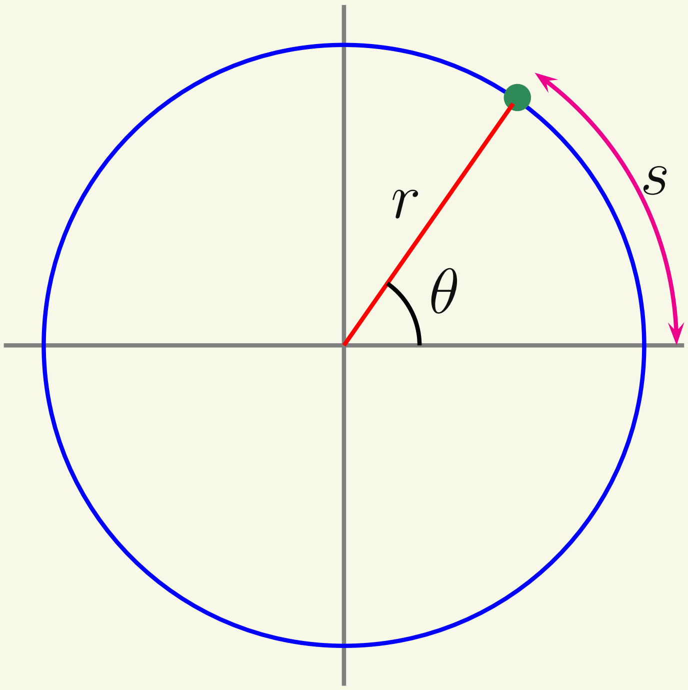


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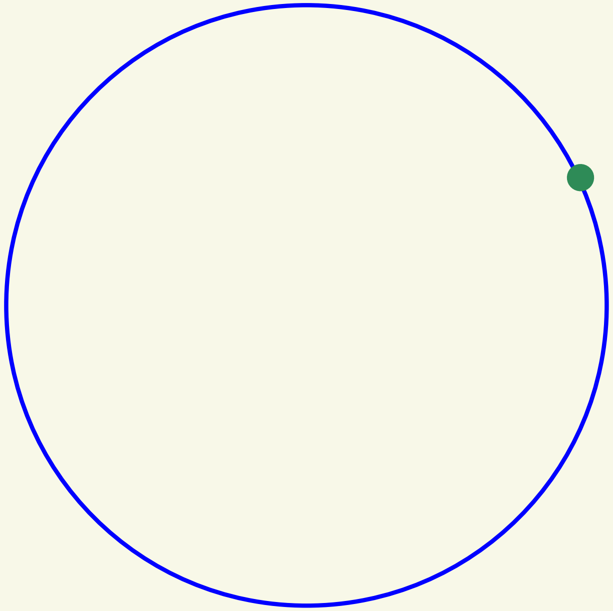
One other angle unit: the revolution($rev$) - one complete round trip

$$\boxed{1\,rev = 360^\circ = 2\pi\,rad}$$

# Angular Velocity

The rate at which a particle circles is given by its angular velocity, $\omega$.



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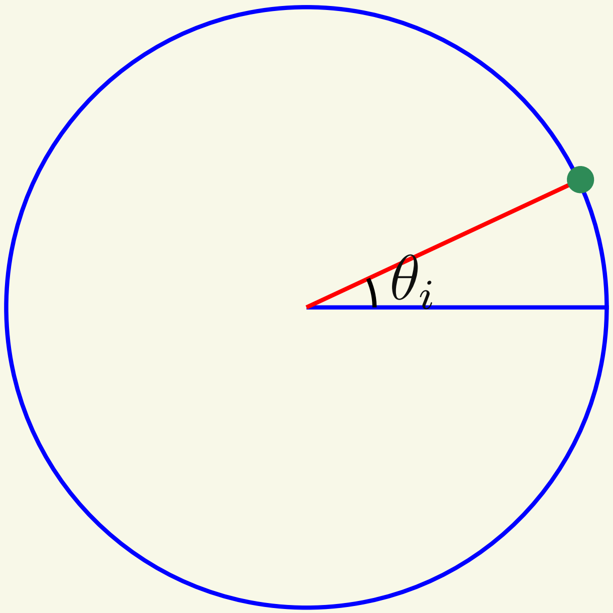

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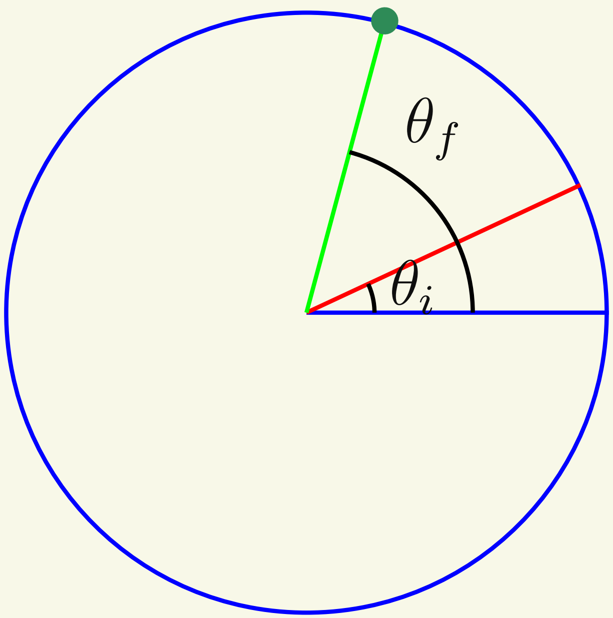

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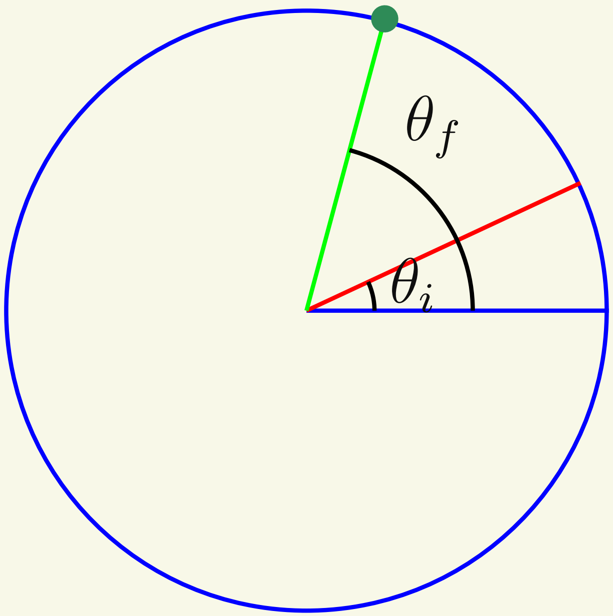


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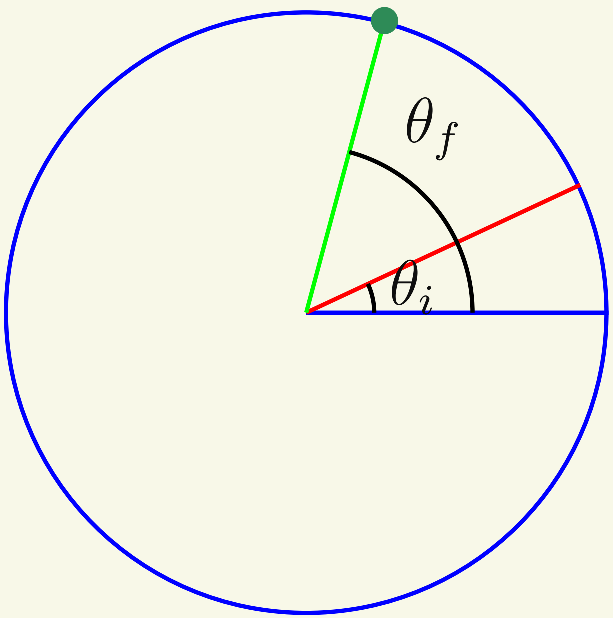


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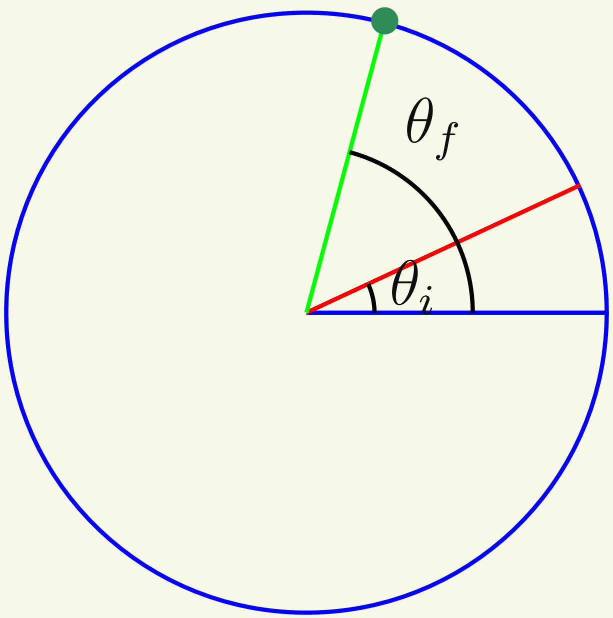


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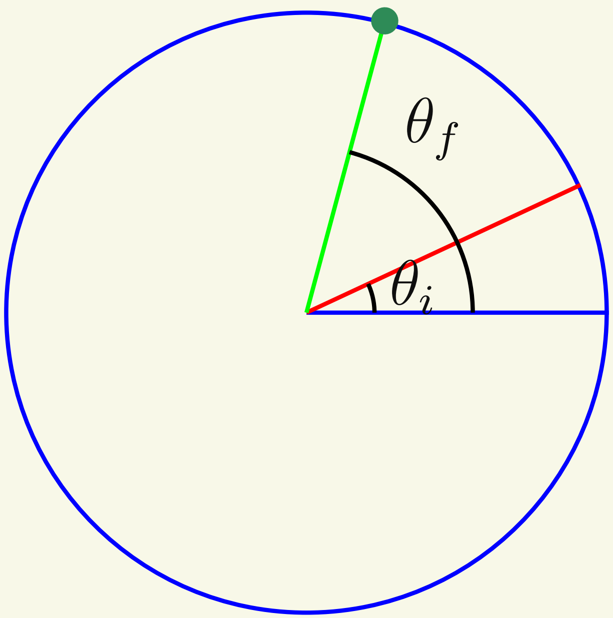


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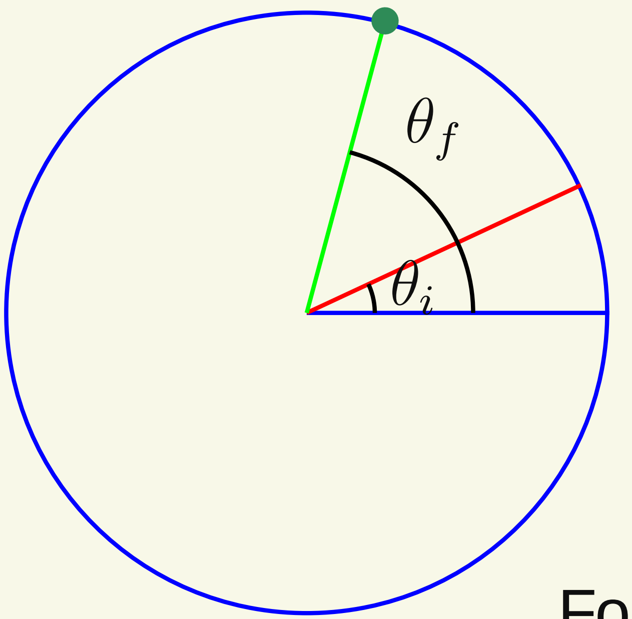


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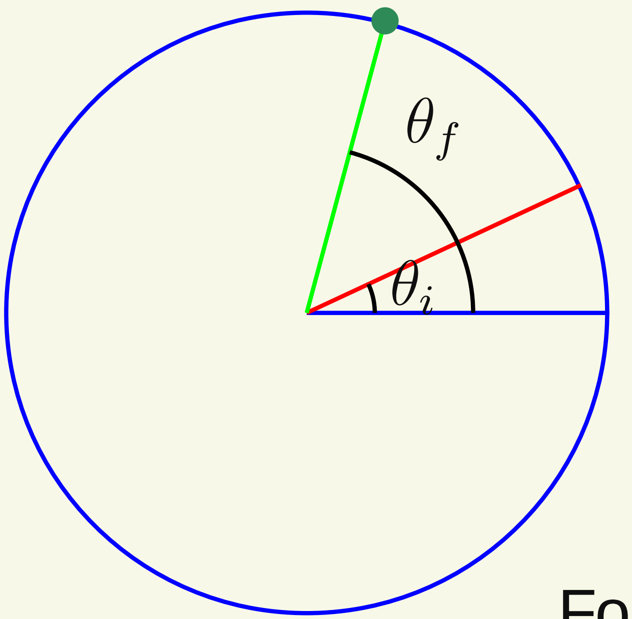


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By convention, $\omega$ is positive for counter-clockwise motion

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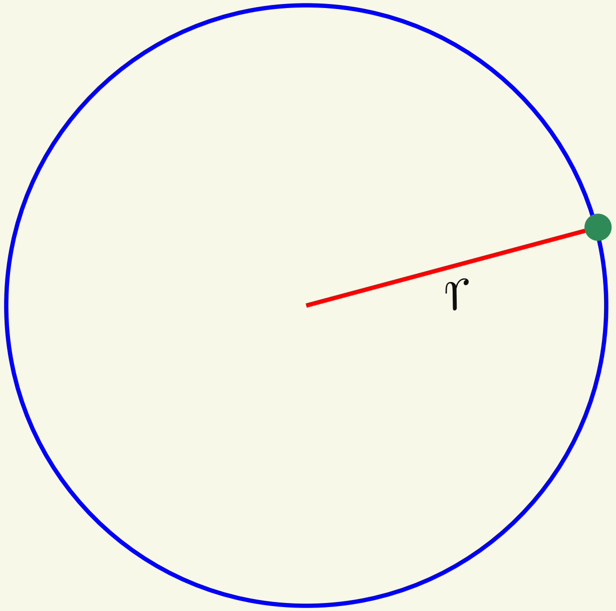

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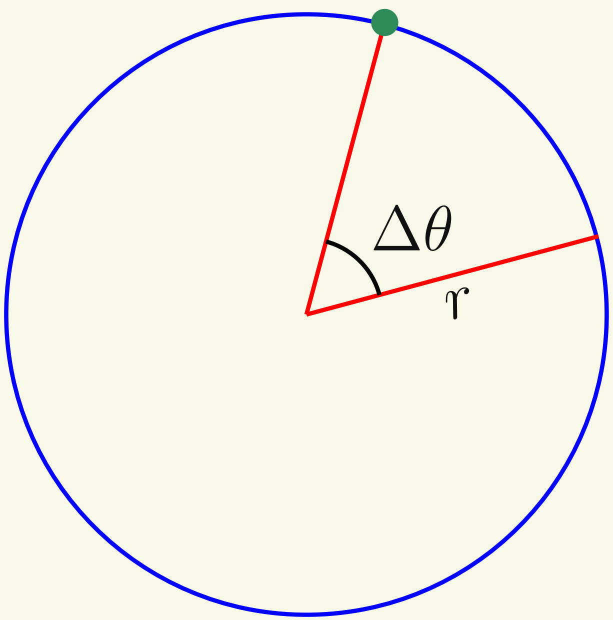

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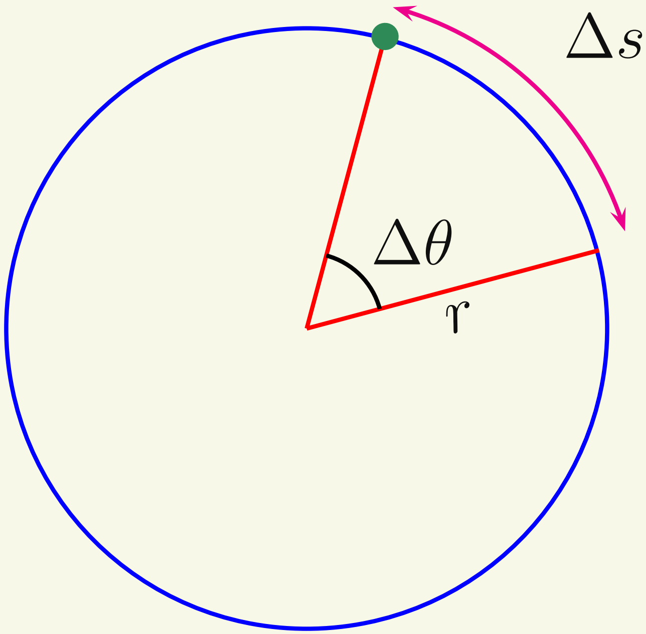


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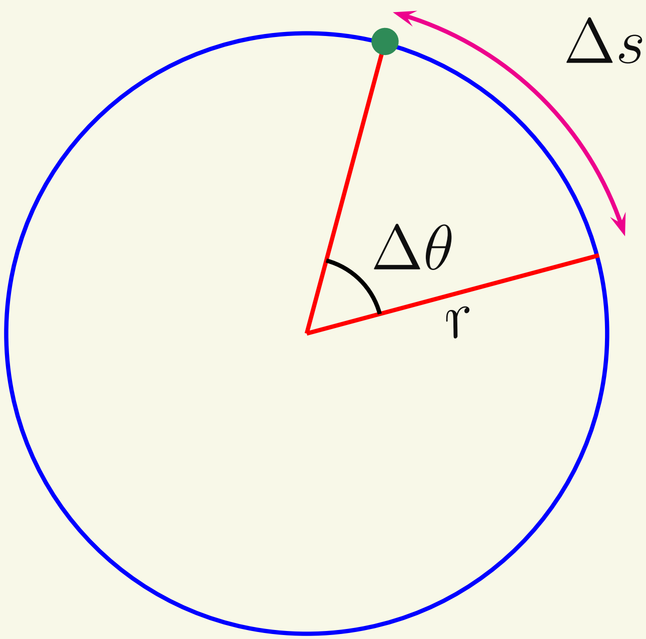


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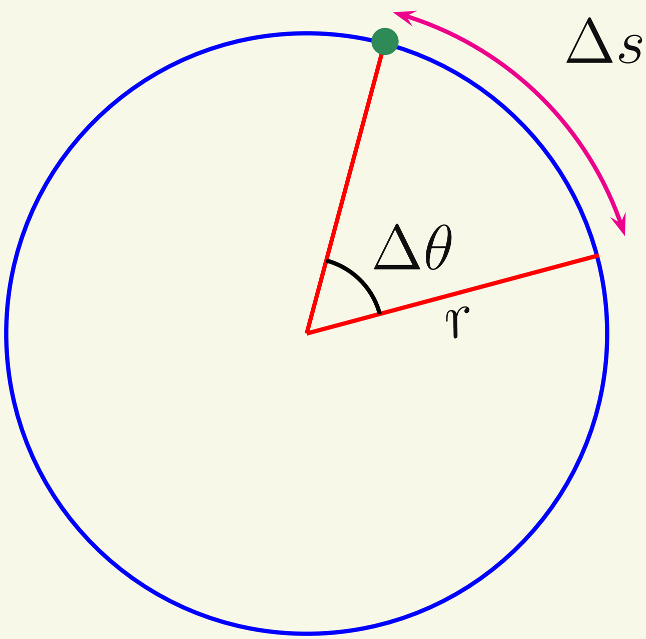


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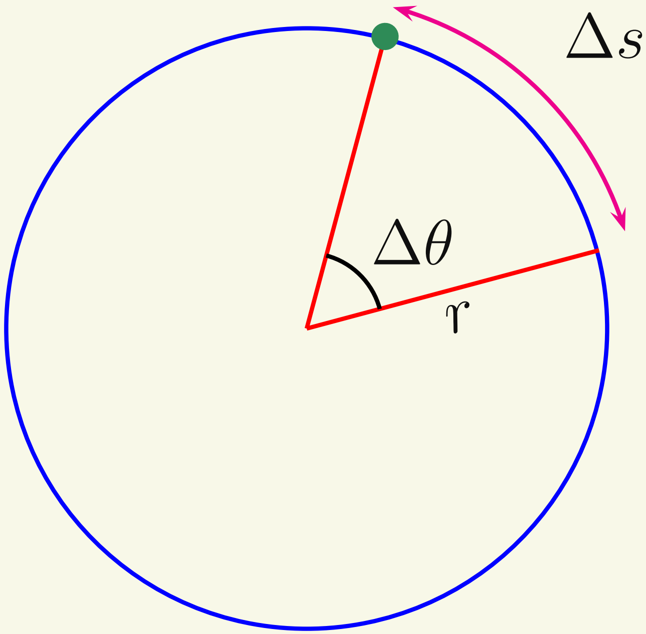


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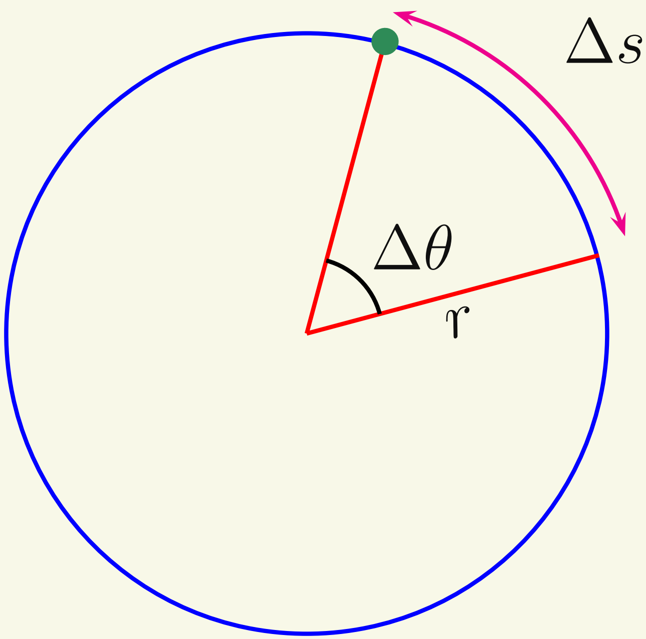


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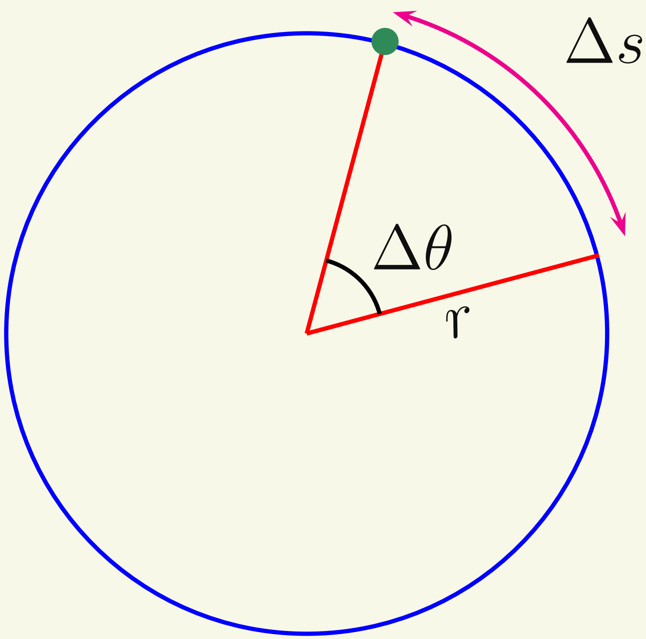


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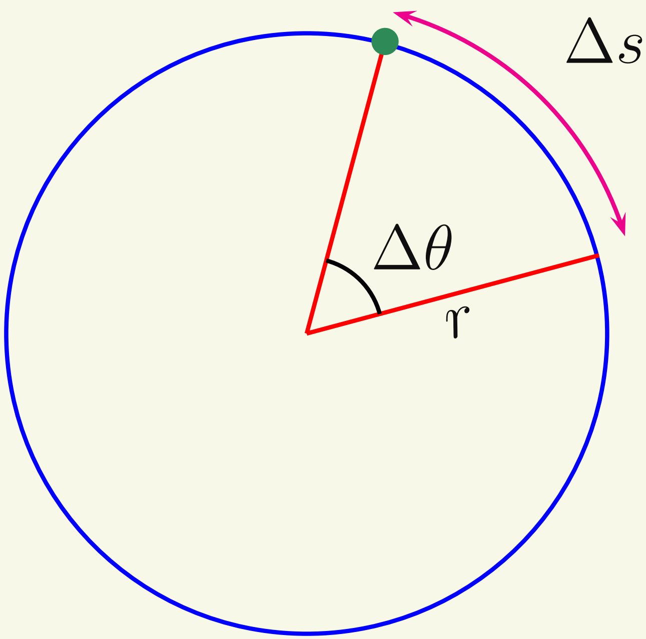


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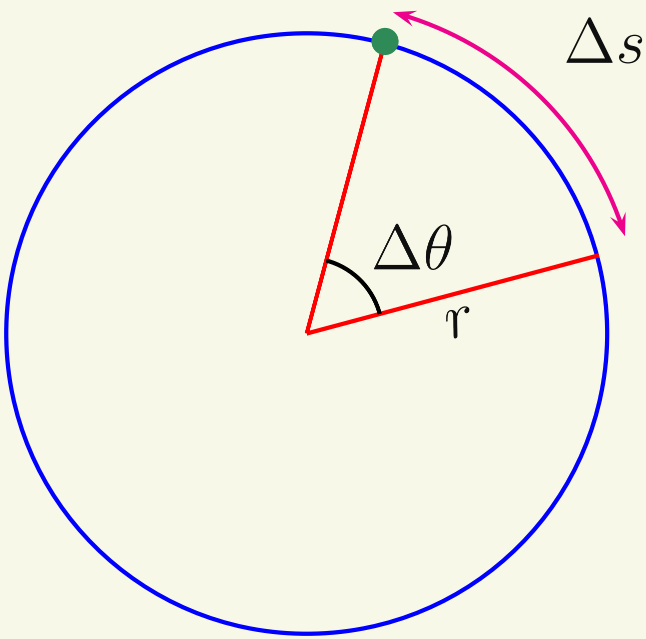


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$$v = \frac{r\Delta\theta}{\Delta t} = r\left(\frac{\Delta\theta}{\Delta t}\right) \Rightarrow \boxed{v = r\omega} \longleftarrow \omega \text{ must be in } rad/s$$

# Example

$$\boxed{v = r\omega}$$

Example: A ball on a string takes $3\,s$ to go around a circle. If the ball is $0.5\,m$ from the center, what is its linear velocity?