June 19, Week 3

Today: Chapter 4, Newton's Third Law

Homework #3 is due tomorrow.

Problem #1 had a typo in it. Both ships have velocities that are in miles per hour.

Second Law II

$$\overrightarrow{\mathbf{a}} = \frac{\Sigma \overrightarrow{\mathbf{F}}}{m}$$

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Units: Newton is a unit simplification.

$$ma$$

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$$\boxed{N = kg \cdot m/s^2}$$

Second Law Examples

Example: A 6860-N car is in free-fall, what it its mass?

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$$\boxed{w = mg}$$

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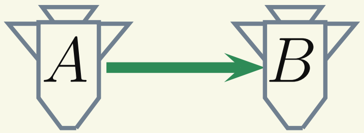
(a) 

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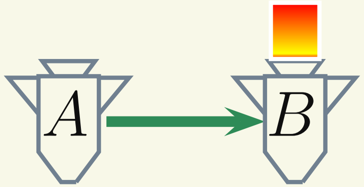

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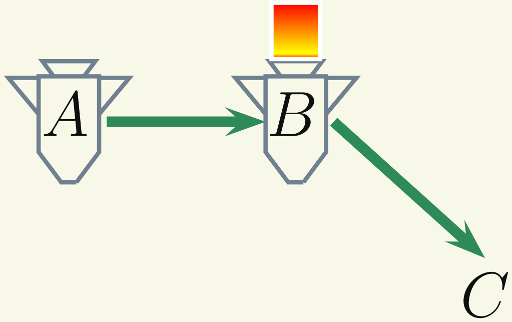

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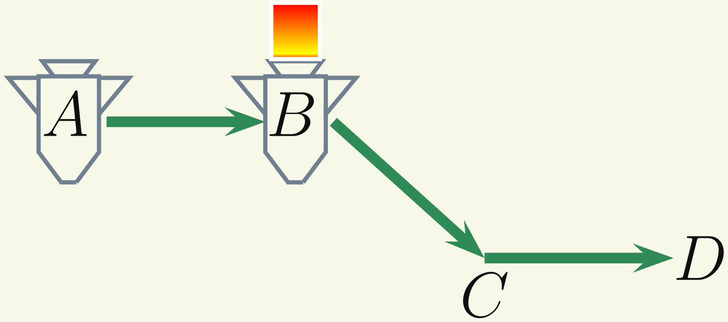

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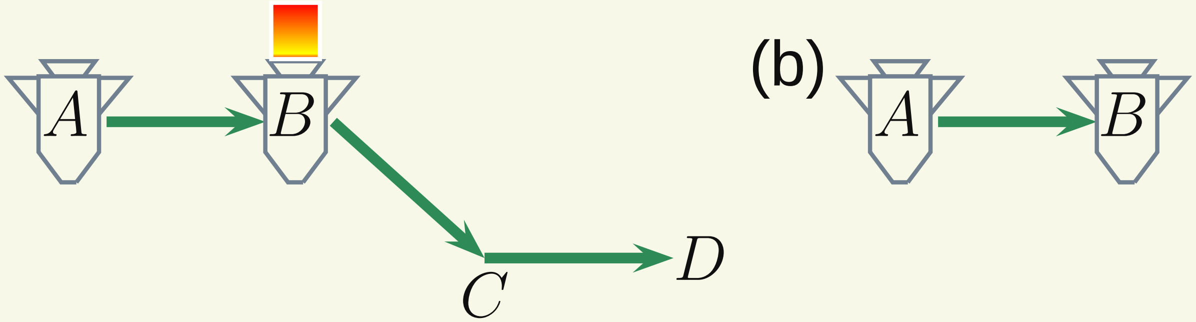

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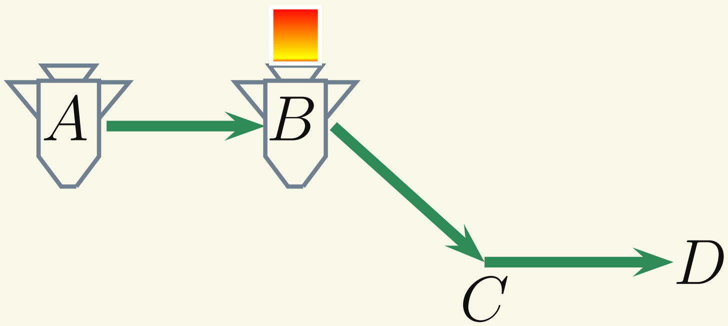

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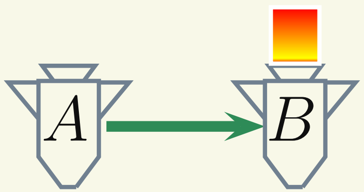

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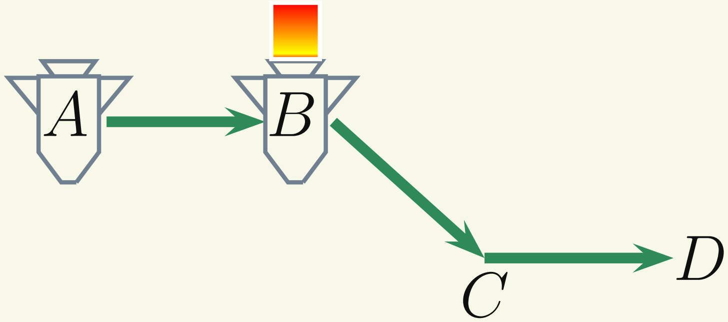

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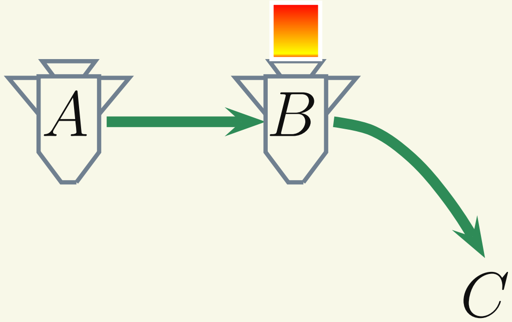

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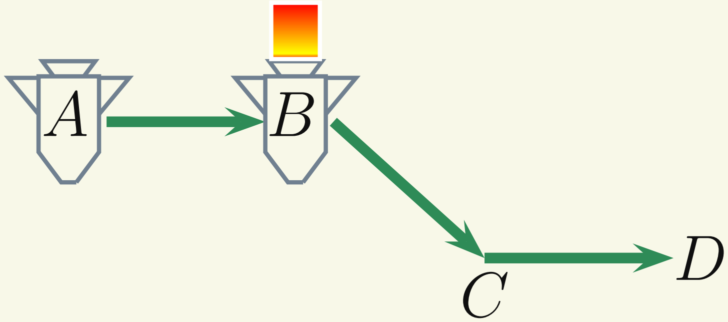

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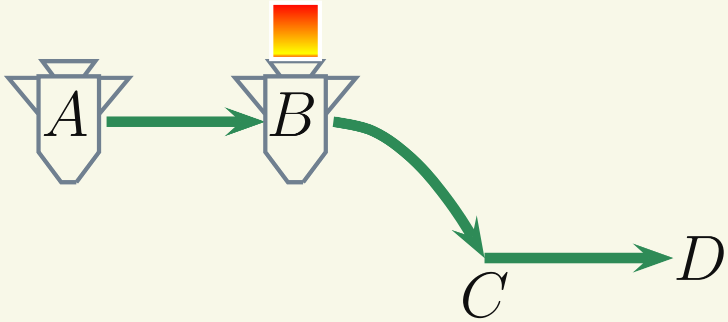

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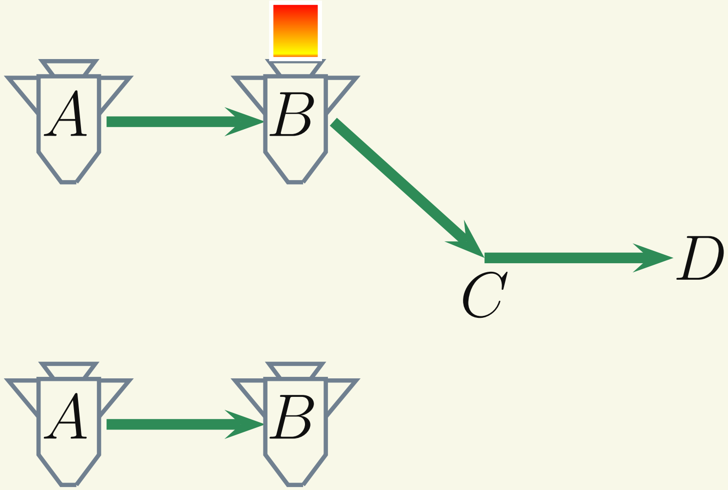

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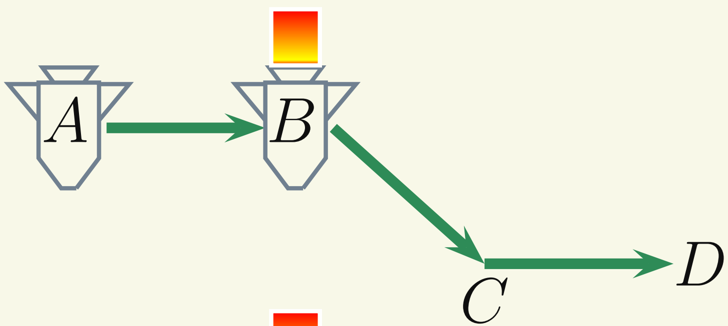

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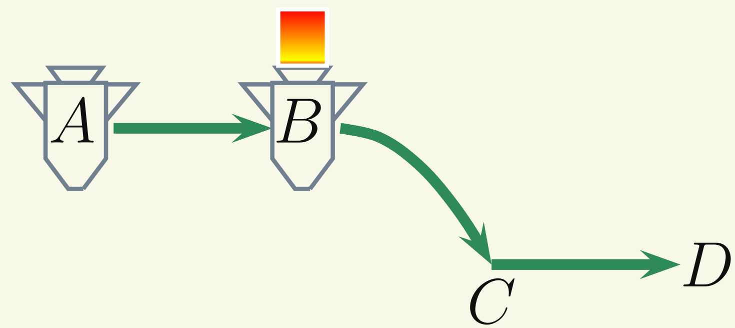

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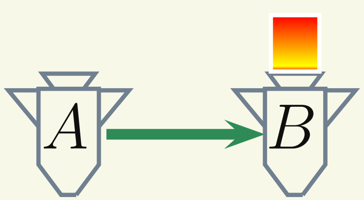

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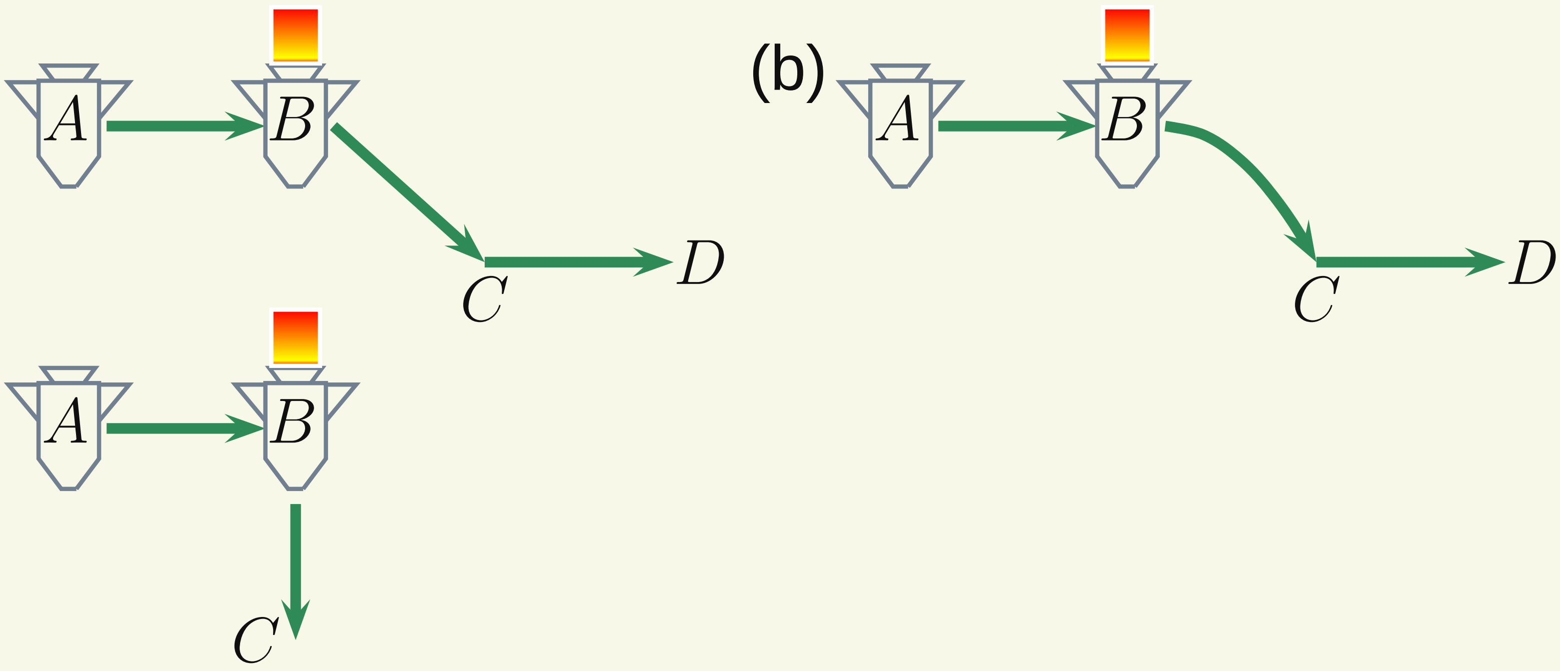

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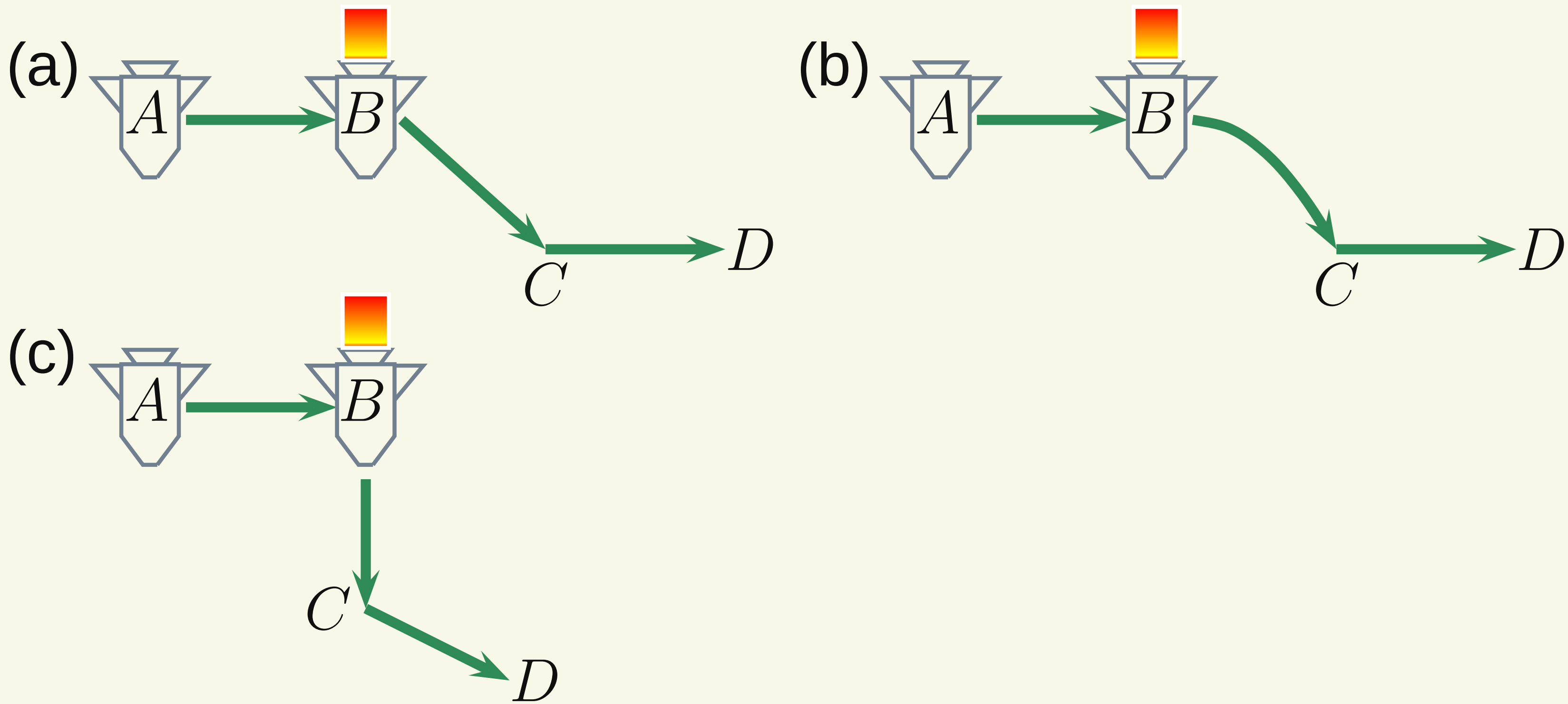

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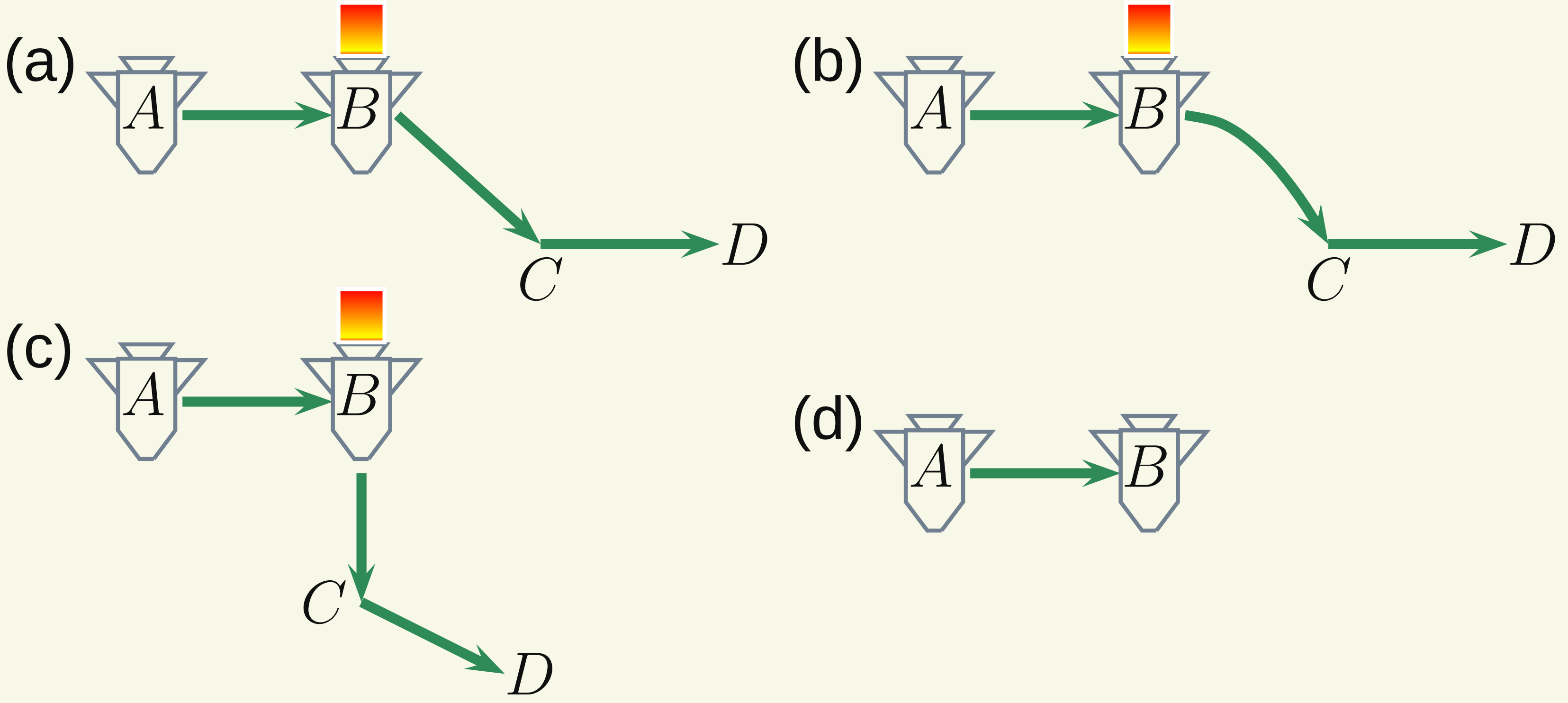

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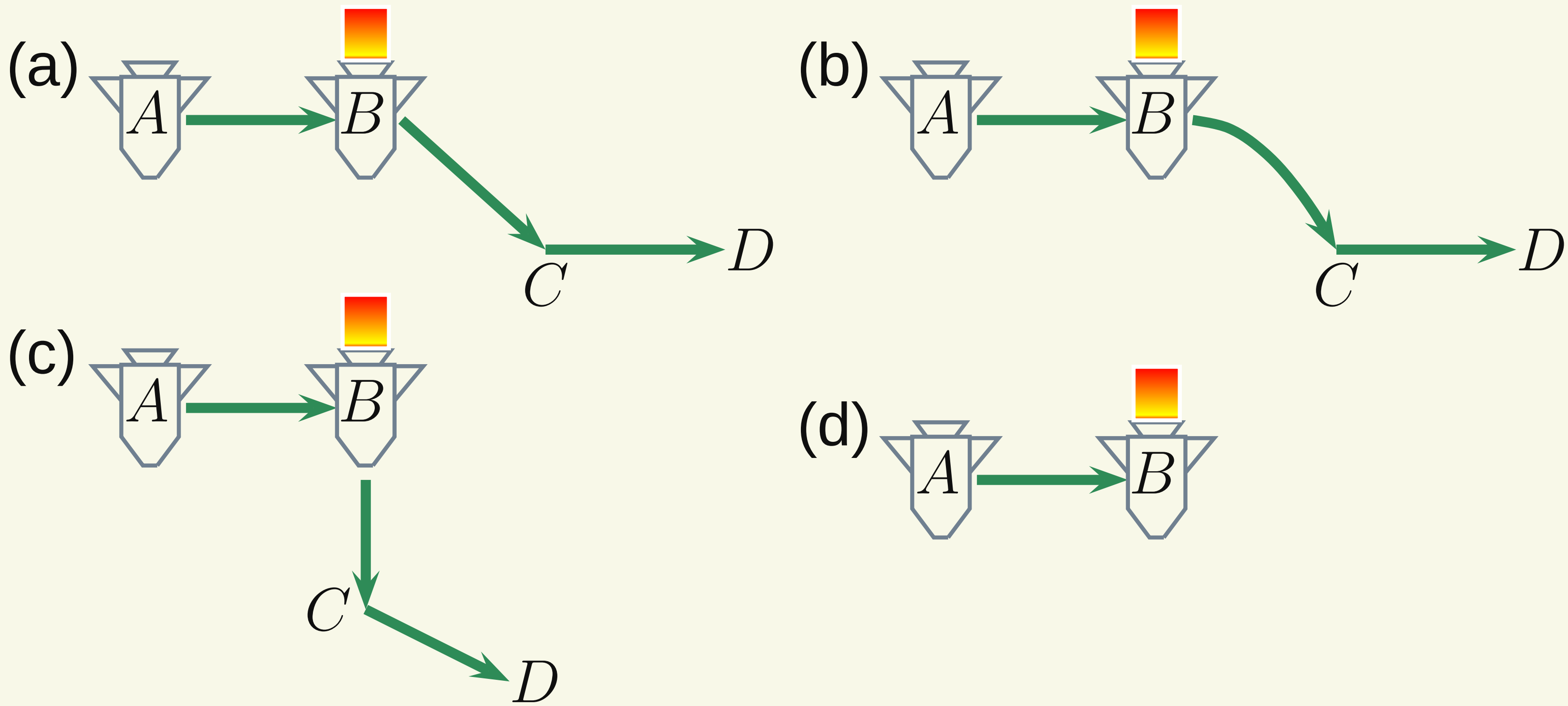

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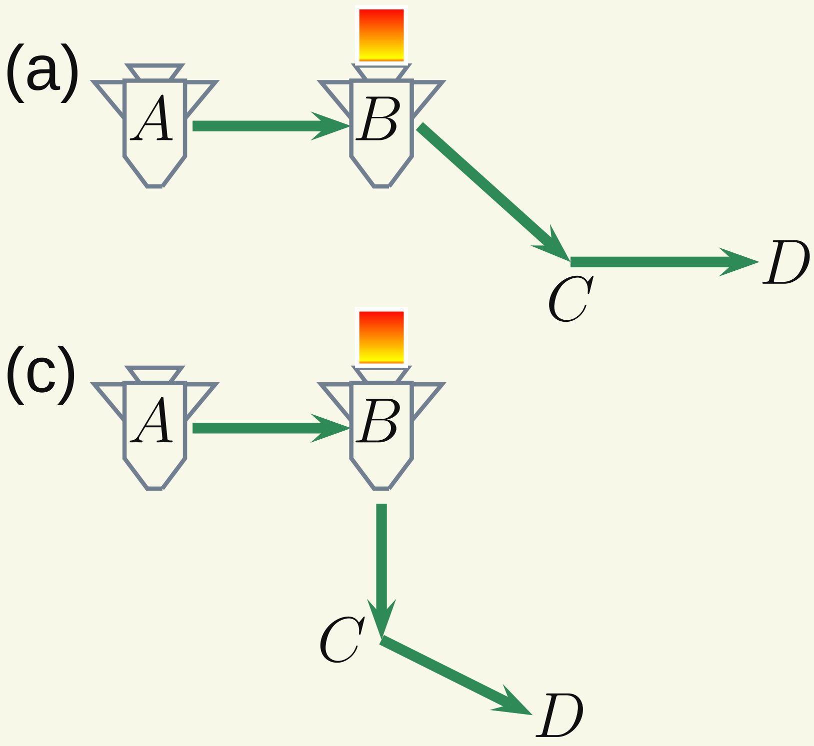

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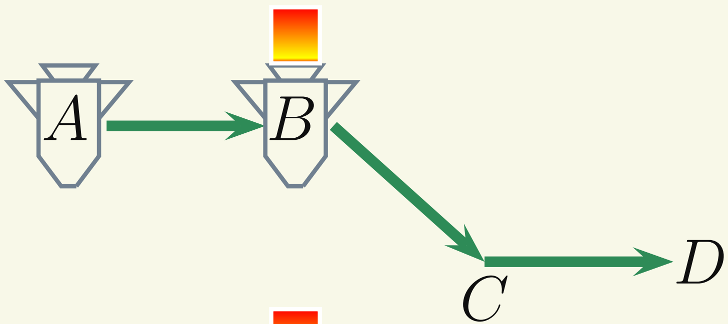

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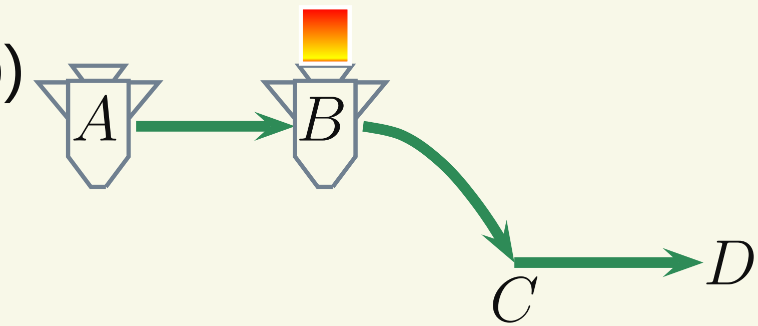

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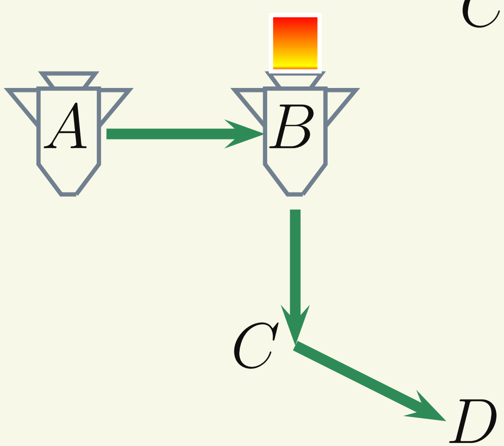

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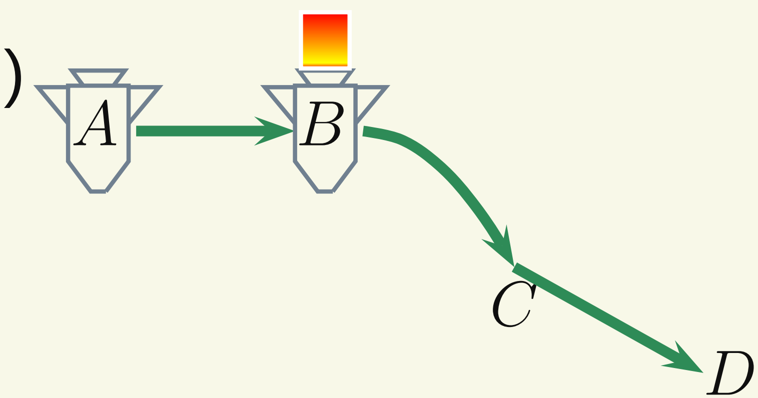

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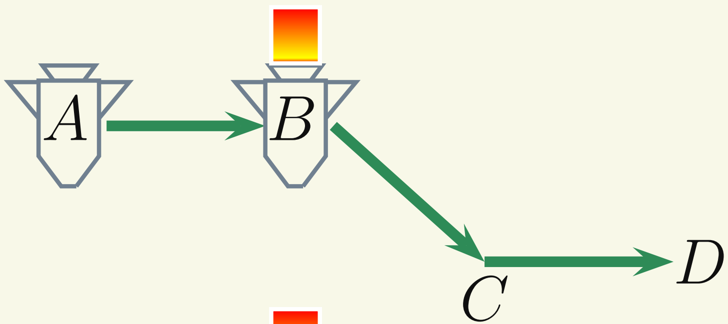

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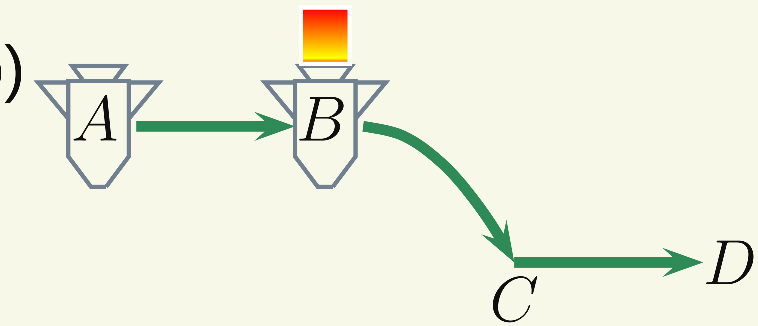

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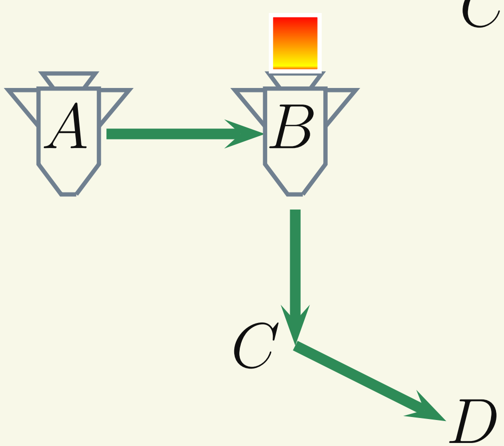

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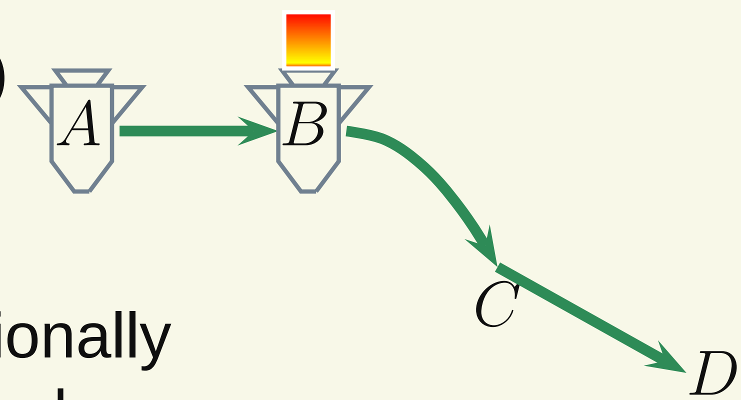

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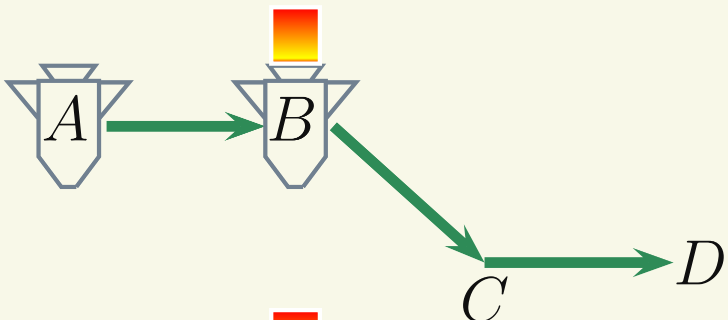

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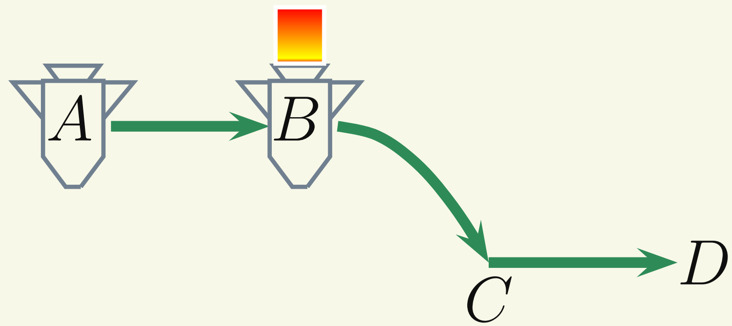

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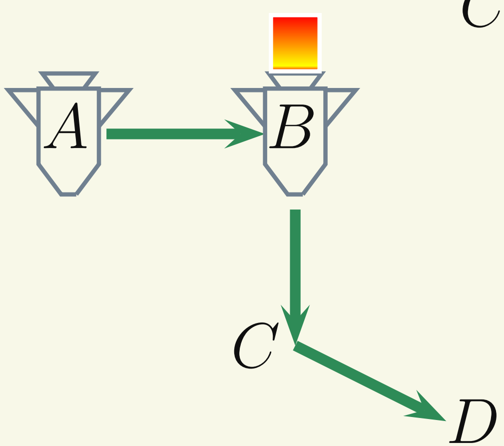

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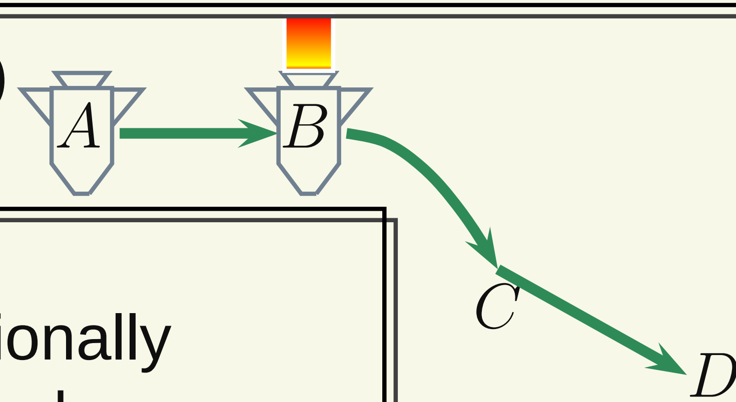

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Exercise Followup

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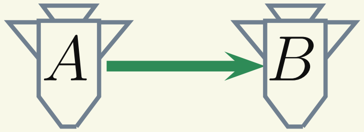

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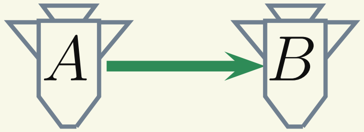

From A to B rocket goes on straight line since no force $\Rightarrow$ uniform motion

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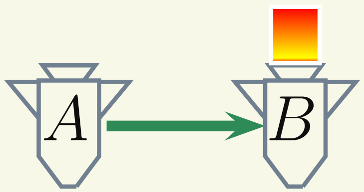

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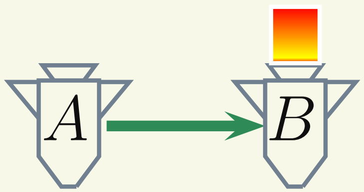

From A to B rocket goes on straight line since no force $\Rightarrow$ uniform motion

When rockets turned on this causes an acceleration in y-direction but *NOT* x-direction $\Rightarrow$ acceleration motion in y, uniform motion in x $\Rightarrow$ parabolic motion

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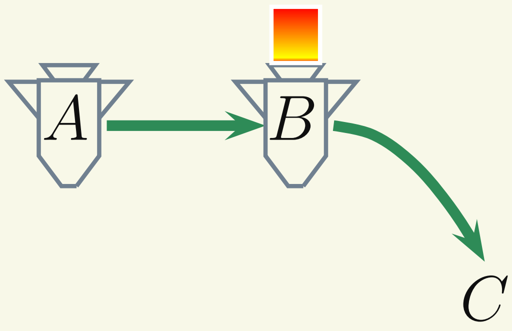

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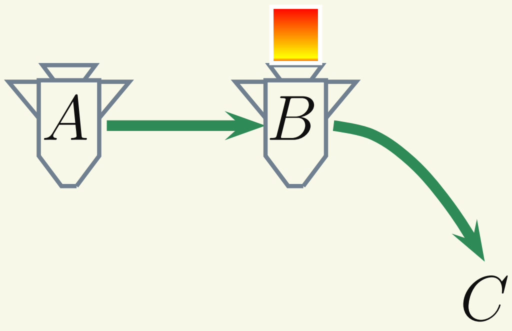

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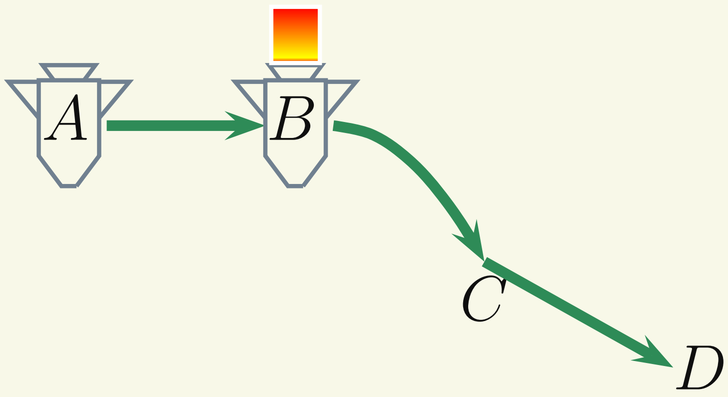

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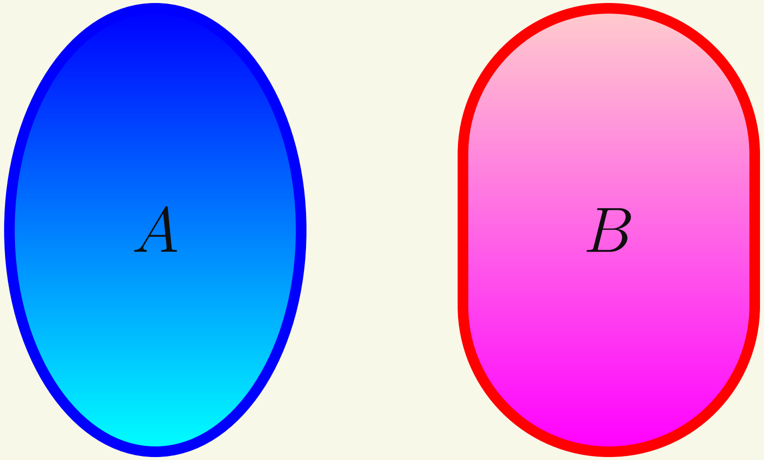

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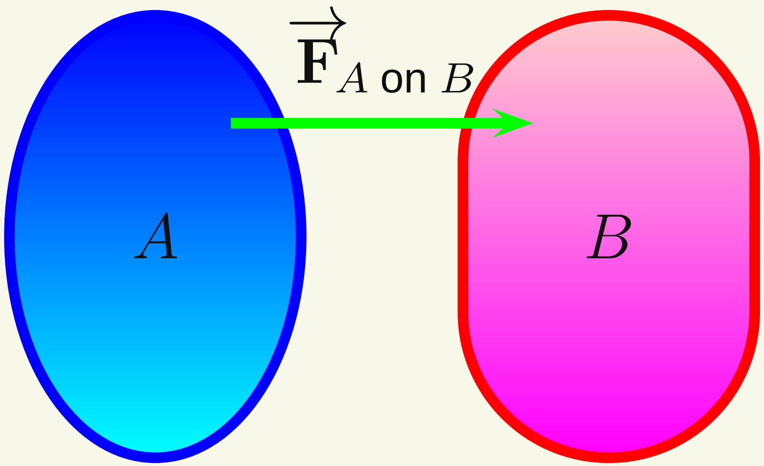

$\overrightarrow{\mathbf{F}}_{A \text{ on } B} =$ Force that A exerts on B

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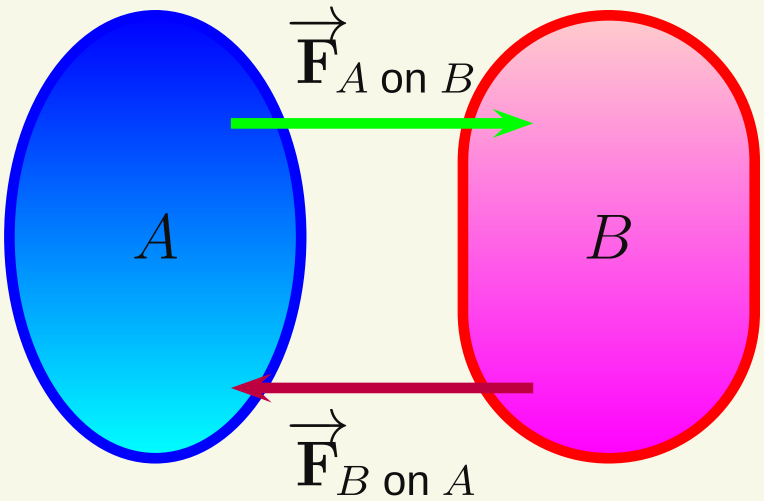

$\overrightarrow{\mathbf{F}}_{A \text{ on } B} =$ Force that A exerts on B

$\overrightarrow{\mathbf{F}}_{B \text{ on } A} =$ Force that B exerts on A

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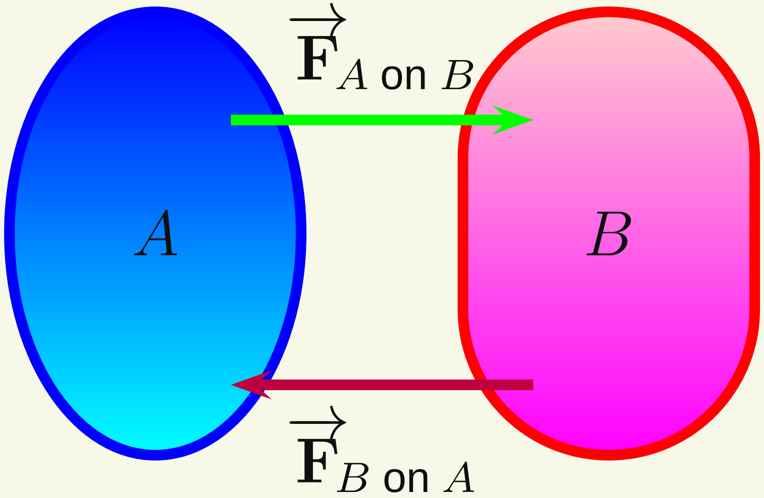

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Third Law: $\boxed{\vec{\mathbf{F}}_{B \text{ on } A} = -\vec{\mathbf{F}}_{A \text{ on } B}}$

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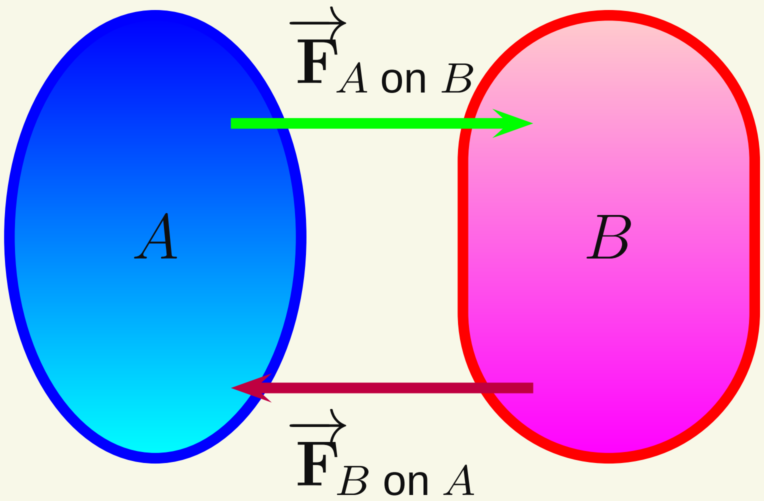

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Always remember: Action and Reaction are applied to different objects!

Third Law Exercise

Whenever Lionel Messi kicks a soccer ball, which of the following is a true statement?

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(a) Messi exerts a larger force on the soccer ball than it exerts on him.

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Whenever Lionel Messi kicks a soccer ball, which of the following is a true statement?

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(c) Messi exerts an equal force to the one the soccer ball exerts on him.

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(a) Messi exerts a larger force on the soccer ball than it exerts on him.

(b) The soccer ball exerts a larger force on Messi than he exerts on it.

(c) Messi exerts an equal force to the one the soccer ball exerts on him.

(d) Sometimes the force exerted by Messi is larger than what the football exerts on him. It depends on how hard he kicks it.

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Whenever Lionel Messi kicks a soccer ball, which of the following is a true statement?

(a) Messi exerts a larger force on the soccer ball than it exerts on him.

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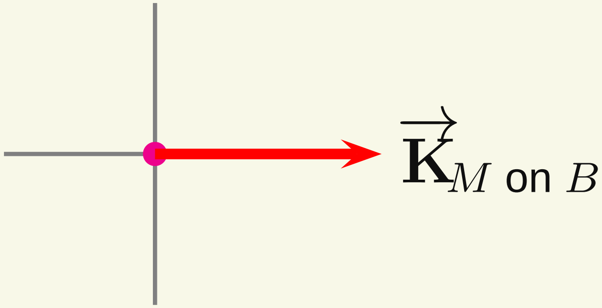

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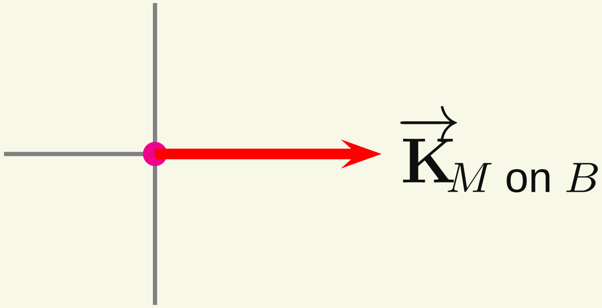

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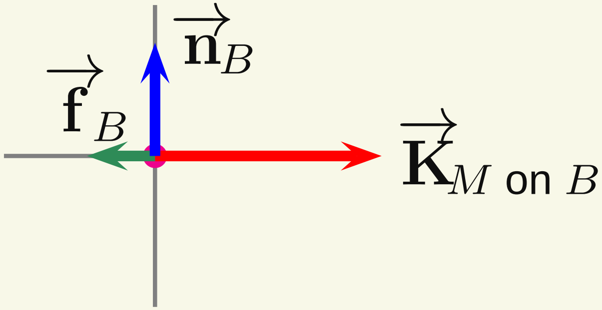

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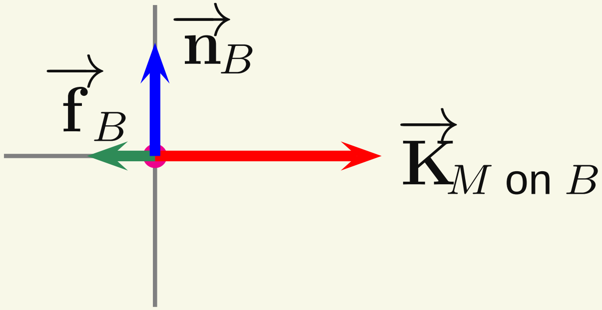

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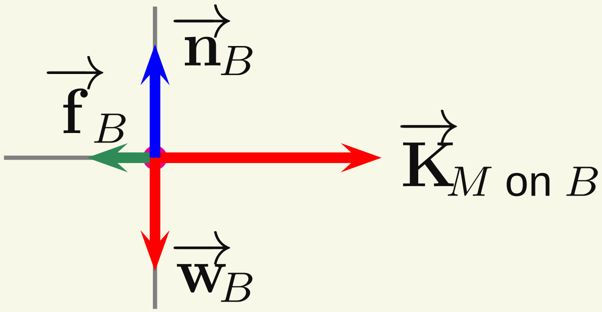

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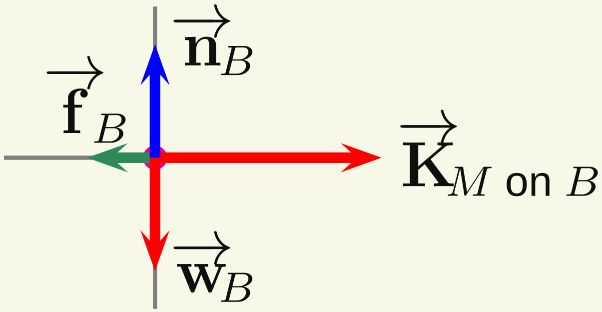

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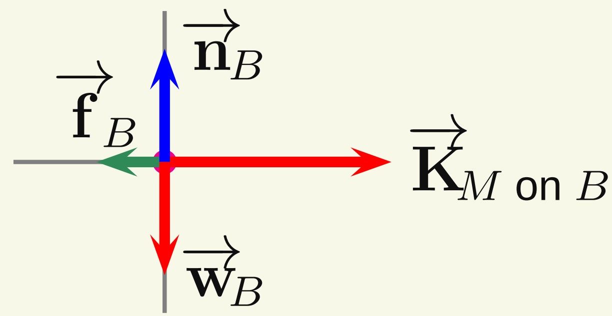

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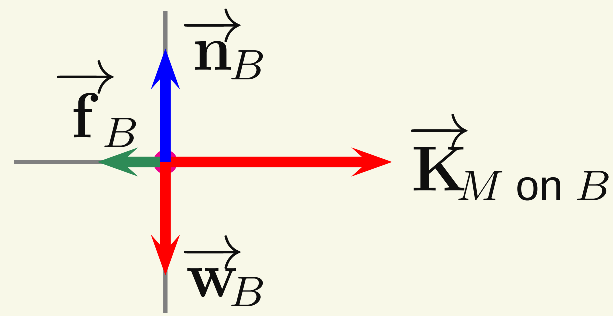

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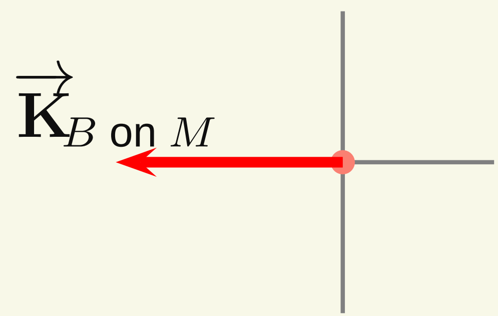

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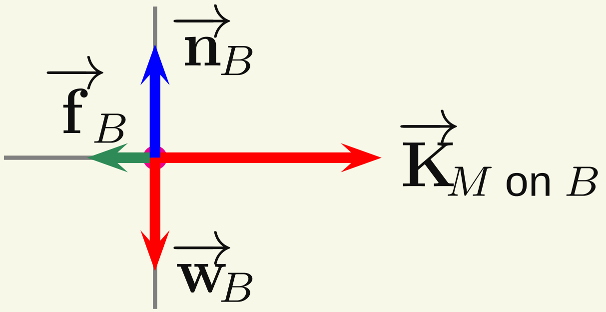

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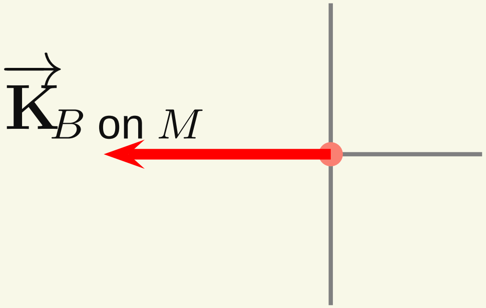

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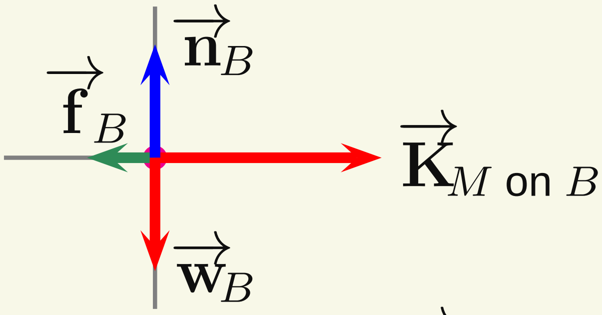

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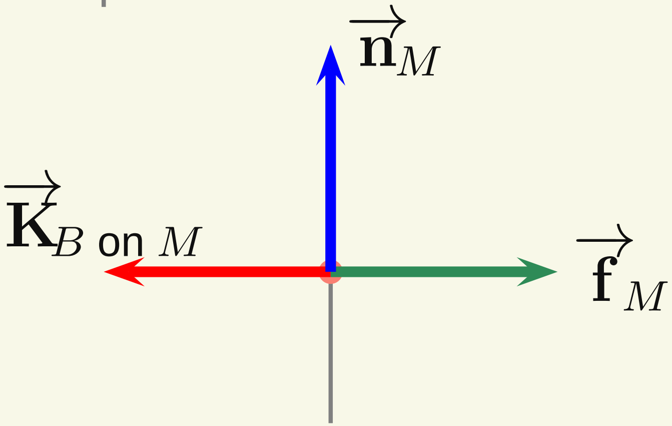

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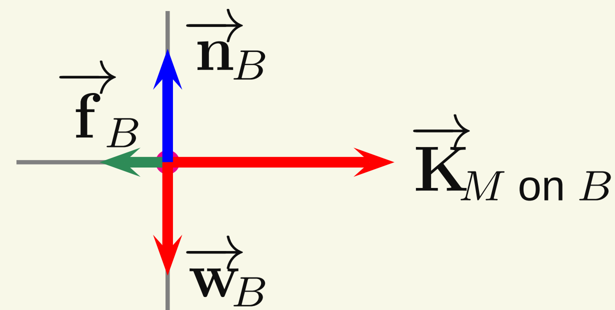

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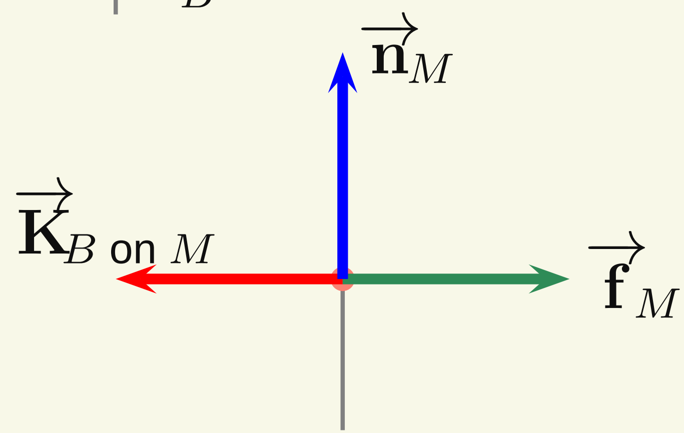

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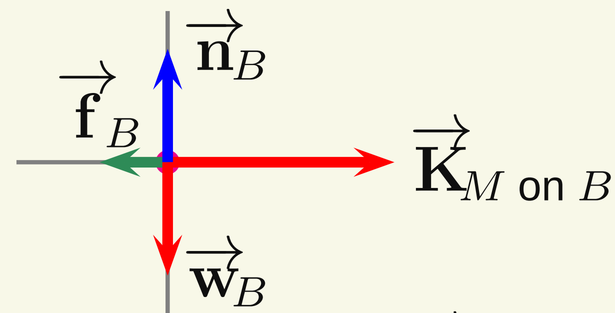

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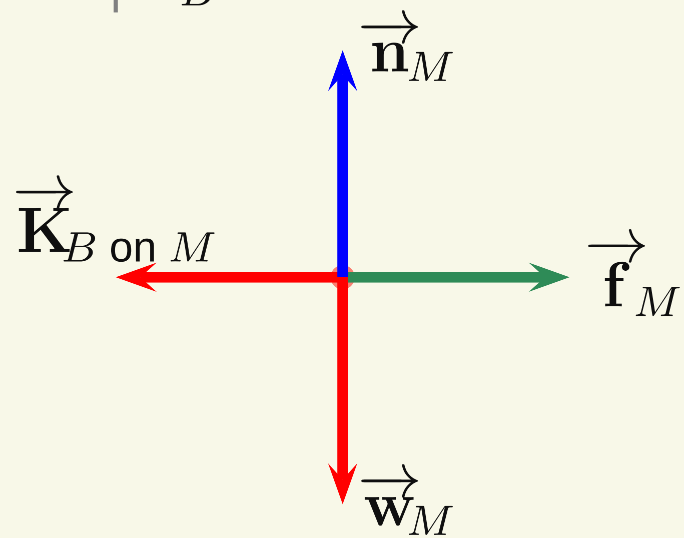

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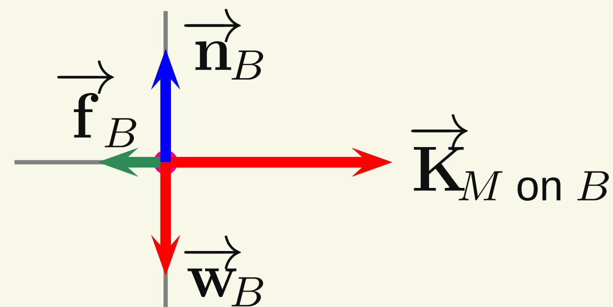

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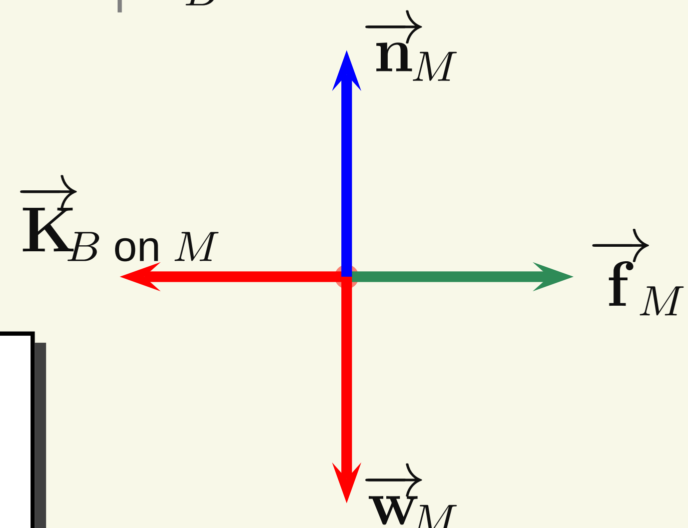

$K_{M \text{ on } B}$ is equal to $K_{B \text{ on } M}$, but since there is more friction on Messi, the ball moves, Messi does not.

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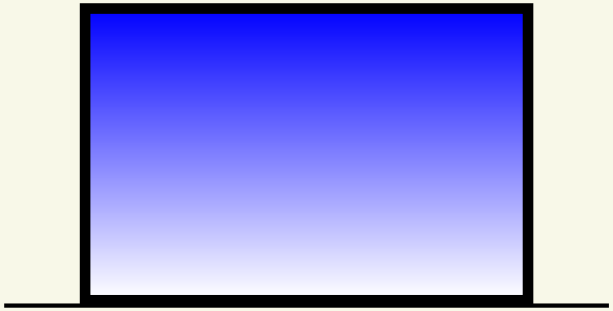
A 200-N crate is placed on a horizontal surface. The reaction to the force of gravity on the crate is:



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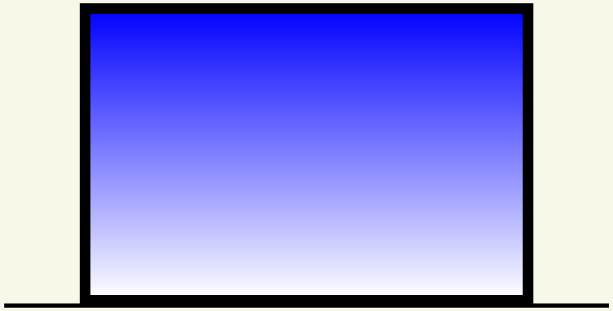

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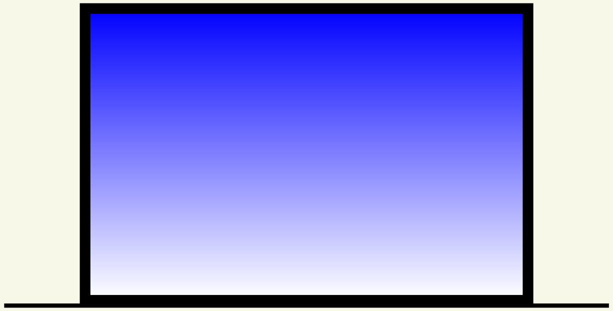

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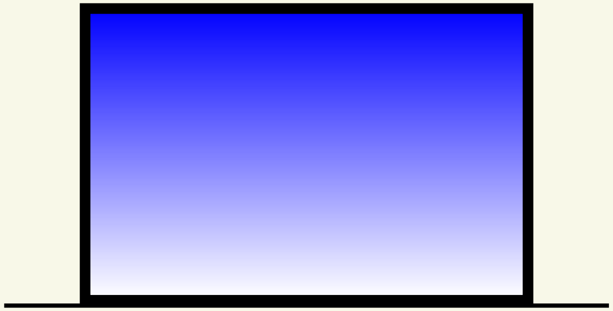

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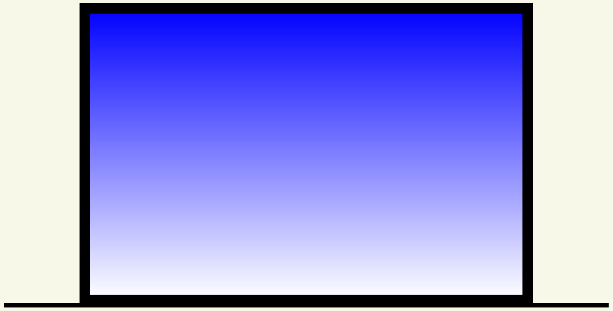

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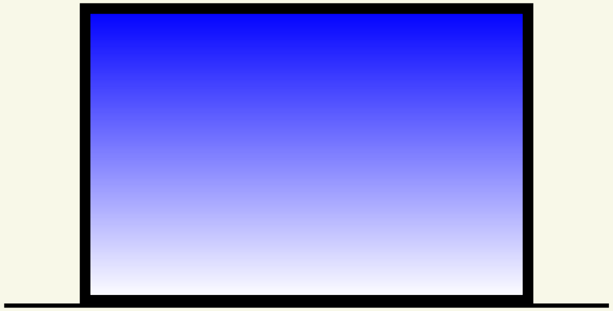

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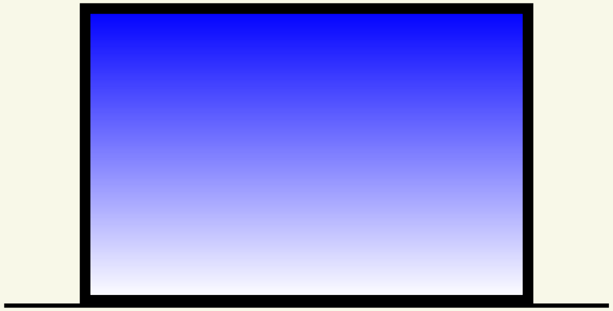

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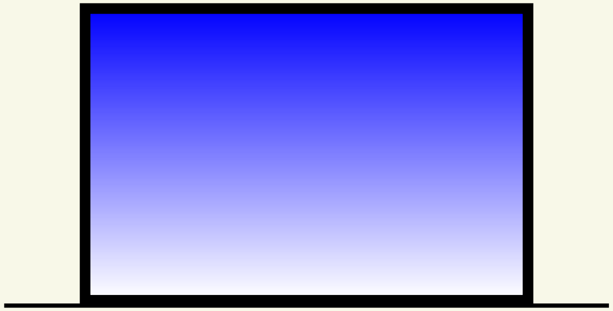

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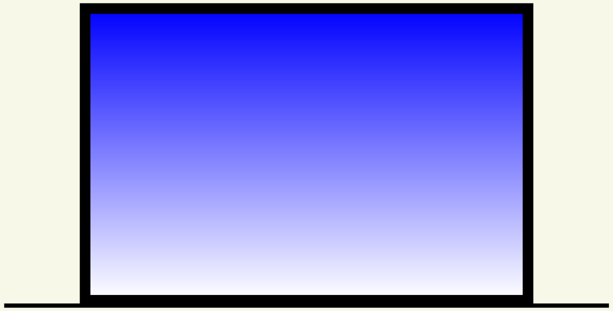

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