# Newton’s Law Blocks

In this activity, we will be investigating Newton’s laws by creating a series of scenarios with wooden blocks and rubber bands

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## Setting the Stage

In this lab, you will be using two different blocks with rubber bands attached. The block with a rubber band, a backboard, and no pegs sticking out will be referred to as “Block A” and the block with two rubber bands and two pegs sticking out will be referred to as “Block B”

Locate these two blocks, take photos of each and add them to the appropriate box below:

| Block A | Block B |
| --- | --- |
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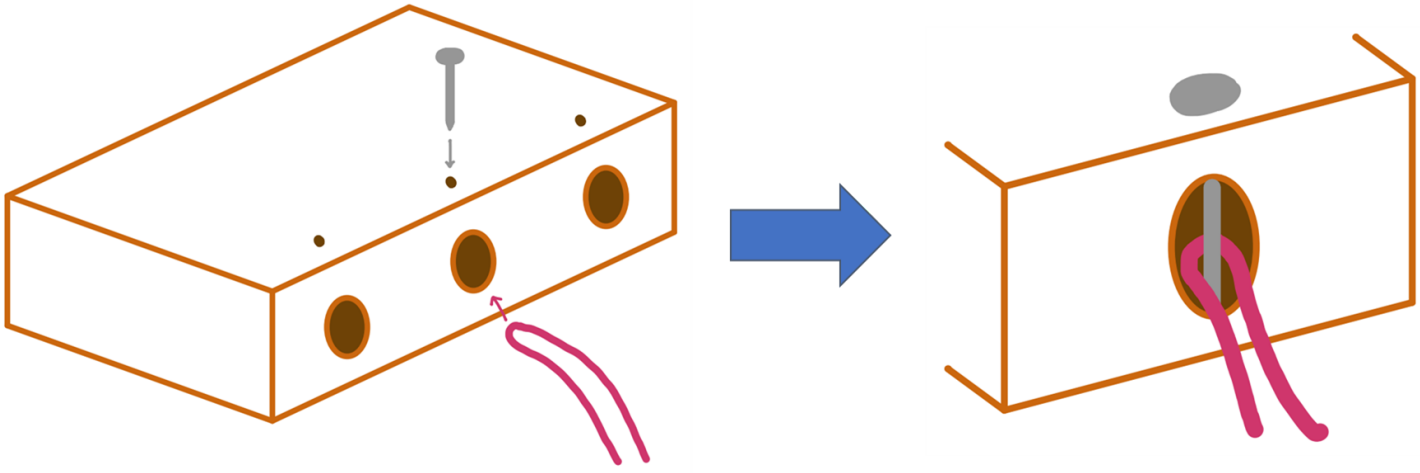
## Connecting the Rubber Bands

To connect the rubber bands to the baseboard, insert the rubber band loop into the larger hole and pin it in place using a nail through the smaller hole. You will be instructed on which blocks to connect where in the challenges laid out below



# Newton's 1st Law

*An object in motion stays in motion and an object at rest stays at rest unless acted on by an unbalanced force*

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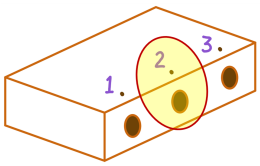
## Challenge #1 - "An object at rest, stays at rest"




1. Connect the rubber band for Block A to the baseboard using the method shown on the first page. Use position #2 as shown →
2. Loosely set an extra block on top of Block A
3. Holding on to Block A, stretch the rubber band back ~50 cm and release
4. What happens to the block on top when you release?

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## Challenge #2 - "An object in motion, stays in motion"

1. Connect the rubber band for Block A to the baseboard in position #2 like the last challenge
2. Rotate the flat piece of wood on the back of the block so that it is sticking up
3. Set an extra block on top of Block A so that it is resting on this new backboard
4. Holding on to Block A, stretch the rubber band back ~50 cm and release
5. What happens to the block on top when you release?

6. What happens to the block on top when Block A hits the baseboard?

# Newton's 2nd Law

*The force applied to an object is equal to its mass times the acceleration*

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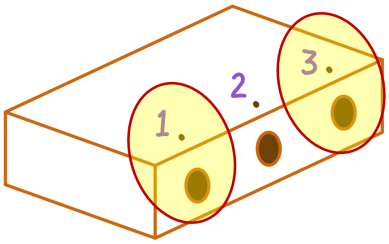
## Challenge #3 - Race between identical blocks




1. Remove any extra blocks from the previous challenge
2. Connect the rubber band for Block A to the baseboard and connect only one of the rubber bands for Block B to the baseboard. Use positions #1 and #3 so that both blocks fit.
3. You may need to wrap the second rubber band on block B around the pegs so that it doesn't drag along the table
4. Holding on to both blocks, stretch the band back ~50 cm and release at the same time
5. Which hits first? Why? (hint: it may help to get a slow mo video to analyze)

| | |
|---|---|
| Block A | |
| Block B | |
| It's a Tie! | |

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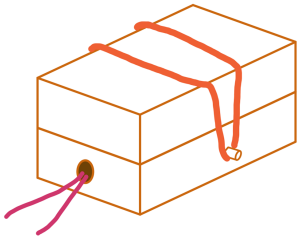
## Challenge #4 - Double the Mass



1. Keep blocks connected in the same way as the previous challenge
2. Take an extra block and set it on top of Block B. Secure it by stretching a rubber band over this extra block and connecting it to the side pegs as shown in the diagram on the right →
3. Holding on to both Blocks A and B, stretch the rubber band back ~50 cm and release at the same time
4. Which hits first? Why? (hint: it may help to get a slow mo video to analyze)

| | |
|---|---|
| Block A | |
| Block B | |
| It's a Tie! | |

5. Add another block (or two!) to the top of Block B and secure it in the same fashion, how does adding more mass affect the motion of the block?

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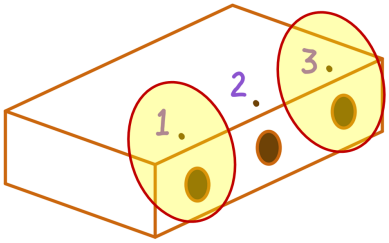
## Challenge #5 - Double the Force




1. Remove any extra blocks from the previous challenge
2. Connect the rubber band for Block A to the baseboard and connect BOTH of the rubber bands for Block B to the baseboard. Use positions #1 and #3 so that both blocks fit.
3. Holding on to both Blocks A and B, stretch the rubber band back ~50 cm and release at the same time
4. Which hits first? Why? (hint: it may help to get a slow mo video to analyze)

| | |
|---|---|
| Block A | |
| Block B | |
| It's a Tie! | |

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## Challenge #6 - Double the Force AND the Mass

1. Keep the same rubber band configuration from the previous challenge so Block A should be connected by one band and Block B should be connected by two bands.
2. Take an extra block and set it on top of Block B. Secure it by stretching a rubber band over this extra block and connecting it to the side pegs. When done, Block B should have two rubber bands and two blocks.
3. Holding on to both Blocks A and B, stretch the rubber band back ~50 cm and release at the same time
4. Which hits first? Why? (hint: it may help to get a slow mo video to analyze)

| | |
|---|---|
| Block A | |
| Block B | |
| It's a Tie! | |

# Newton's 3rd Law

*Every action force has an equal and opposite reaction force*

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## Challenge #7 - Tug of War

1. Remove blocks from the baseboard and instead connect the rubber bands for Block A and Block B to each other using a paper clip
2. Keeping both blocks on the table, have **one person** pull the blocks away from each other and release
3. When the blocks pull together, where do they meet? Does pulling back more or less affect this collision location?

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4. What if you connect both rubber bands from block B to the paperclip? Do the blocks still meet in the middle when released from the same locations as before?

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## Challenge #8 - Tug of War with Different Masses

1. Connect the rubber bands for Block A and Block B to each other using a paper clip
2. Take an extra block and set it on top of Block B. Secure it by stretching a rubber band over this extra block and connecting it to the side pegs.
3. Keeping both blocks on the table, have **one person** pull the blocks away from each other and release
4. When the blocks pull together, where do they meet? How is this different from the last challenge when the blocks had the same mass?

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