

# Activity 11: Changing Force Strength and Mass

Name \_\_\_\_\_

Date \_\_\_\_\_

Class \_\_\_\_\_

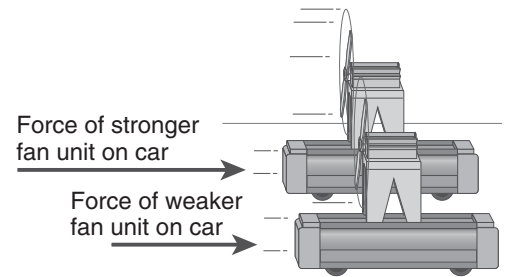
## Key Questions

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

## Learning the Ideas

### Speeding Up

1. If the cars start out from rest, will one car speed up more quickly than the other car, or will both cars speed up in the same way? If one speeds up more quickly, which one will it be? Explain your answer.



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2. What did you observe? Which car sped up more quickly?

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\_\_\_\_\_

\_\_\_\_\_

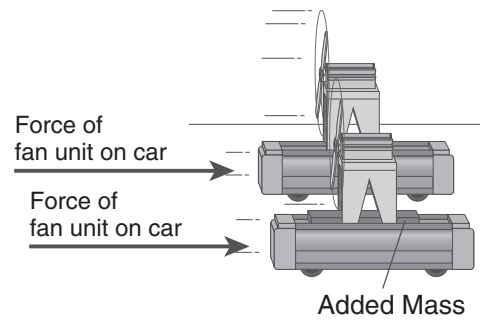
3. If the cars start out from rest, will one car speed up more quickly than the other car, or will both cars speed up in the same way? If one speeds up more quickly, which one will it be? Explain your answer.

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4. What did you observe? Which car speeds up more quickly?

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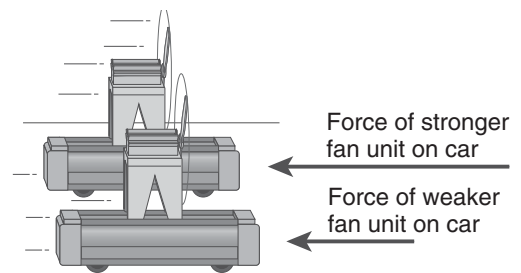
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**Slowing Down**

5. Imagine you have two identical low-friction cars, with fans attached. One fan exerts a greater force than the other fan. The cars start with about the same speed after a brief push in a direction opposite to the direction that the fans would push the cars. Which car would then slow down more quickly, or would they both slow down in the same way? Explain your answer.



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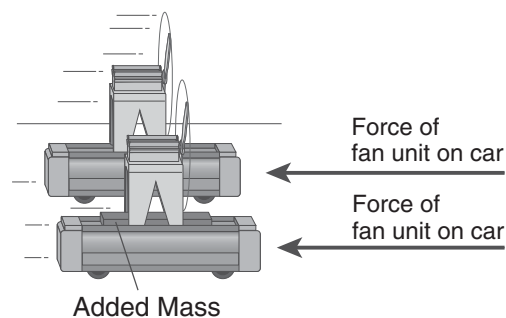
6. What did you observe? Which car slows down more quickly?

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7. Now imagine that you repeat the experiment, but with both fans pushing with the same strength. You add more mass to one of the cars. The cars start with about the same speed after a brief push in a direction opposite to the direction that the fans would push the cars. Which car, the one with more mass or the one with less mass, would then slow down more quickly, or would they both slow down in the same way? Explain your answer.




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8. What did you observe? Which car slows down more quickly?

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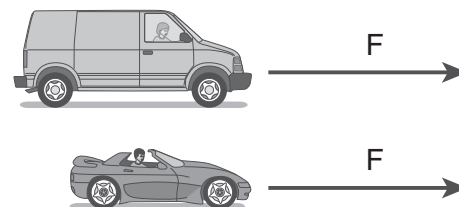
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**Force, Mass, and Acceleration**

9. Madeline drives a small, two-seat sports car, while Max drives a minivan. The minivan has three times the mass of the sports car. If Madeline and Max both start from rest, and forces of identical strength accelerate both cars, who will reach a speed of 65 mph first? What is your reasoning?




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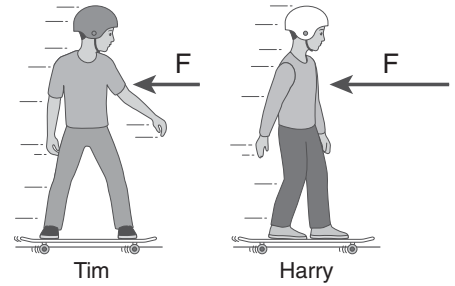


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10. Identical twin brothers Tim and Harry are skateboarding along a sidewalk at the same speed. Suddenly, a wind comes up and pushes against the pair! While Tim is turned sideways into the wind, Harry faces forward and takes the full brunt of the wind. Because Harry presents a larger surface for the wind to push against, the wind exerts a greater force on him than it does on Tim.



Which skateboarder comes to a stop first? What is your reasoning? Assume Tim and Harry have the same mass and that neither twin tries to speed up or slow down on his own.

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11. Sofia, a Little League pitcher, pitches baseballs and softballs with the same strength. In each case, she applies the same force to the ball. A baseball has a mass of 0.15 kg, while a softball has a mass of 0.20 kg.

Which ball has a higher acceleration (that is, which ball speeds up more quickly) when Sofia pitches it? What is your reasoning? (Assume drag can be ignored.)

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**What We Have Learned**

The key questions for this activity are:



**1. If a force acts on an object, how does its change in motion depend on the strength of the force?**

**2. How does its change in motion depend on the amount of mass?**

Answer the key questions.

1. 

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2. 

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