

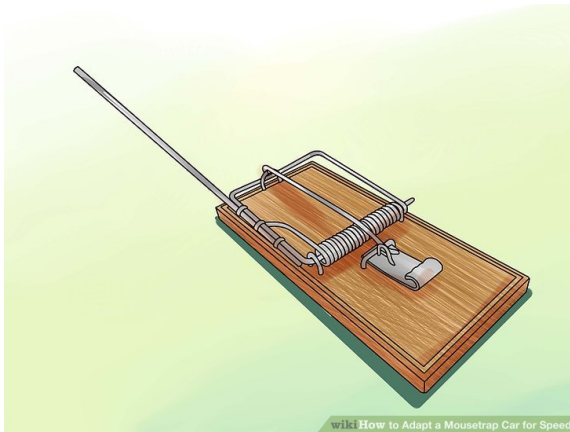
How to Adapt a Mousetrap Car for Speed

Two Methods: [Increasing Acceleration](#) [Reducing Resistance](#)

You can purchase kits online that provide you with all the parts necessary to put together a mousetrap racer.^[1] However, most mousetrap racers are built to travel as far as possible, not as fast as possible. Most adaptations you make to a racer will not increase max speed, but rather acceleration, usually at the expense of distance. In other words, if speed is your goal, you will need to adapt your racer to travel shorter distances quicker.^[2]

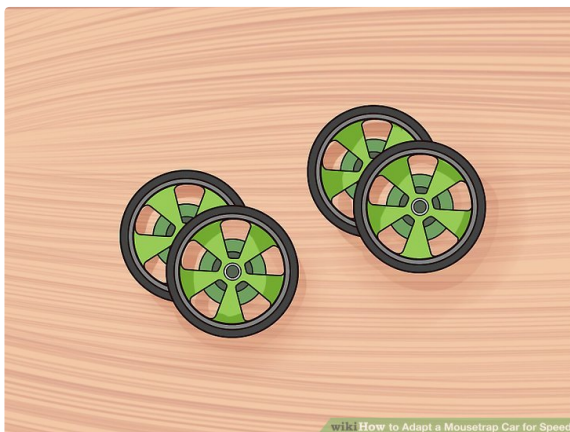
Method
1

Increasing Acceleration



1 Shorten the lever arm. Installing a shorter lever arm is the best way to adapt a racer for speed. However, if the lever is too short, it will spin out. There is no precise formula for how long the lever should be. Experiment to see how short you can get the lever while maintaining control of the car.^[3]

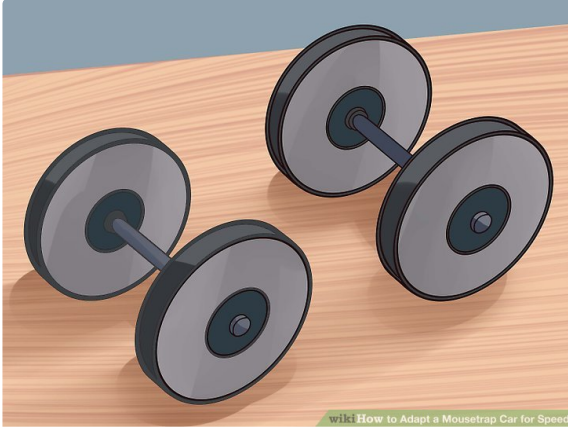
- Longer lever arms will extend the time in which the axle is pulled. This will make it travel longer distances before the car reaches maximum speed. As a result, it will go slower, but move further. Which is why the length of the lever arm is the most important factor in whether a racer is fitted for distance or speed.^[4]



2 Find smaller wheels. When you increase the size of the wheel, the amount of torque necessary to begin a rotation increases as well. A smaller wheel is easier to turn. So you should make sure that your driving

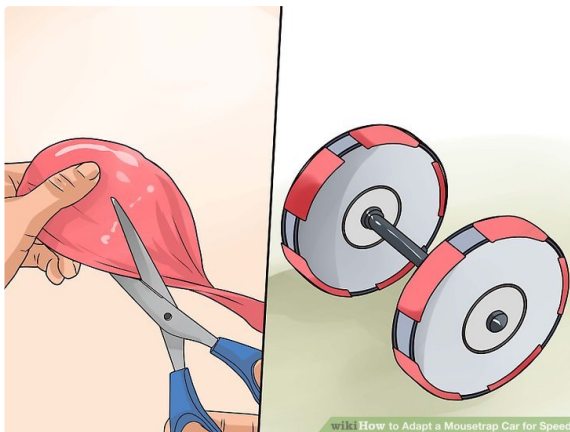
(front) wheel is as small as possible. A good standard is approximately 3 inches in diameter. Use materials that are as lightweight as possible.^[5]

- A larger wheel means more rotational inertia, which keeps the wheel moving once it gets going, but reduces acceleration.
- As with the shorter axis, a smaller wheel is a trade-off between distance and speed. The overall distance traveled will decrease as you reduce the size of the driving wheel. You always need to experiment to determine what the most functional design is.

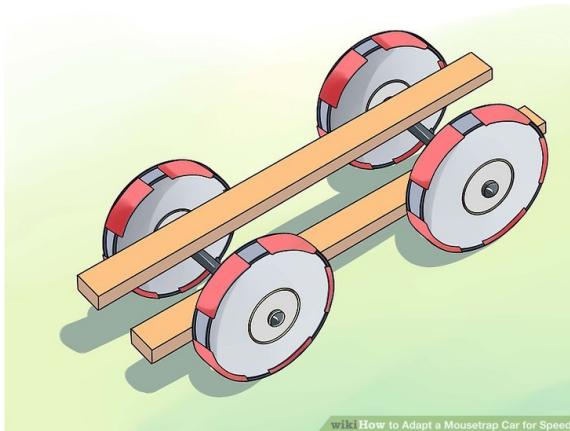


3 Increase the size of the axle. The greater the ratio of the diameter of the axle to the wheel, the less force will be required to accelerate the car. In other words, you should match a larger axle with a smaller wheel to increase acceleration.

- Conversely, a mousetrap racer built for distance should have a smaller axle and a larger driving wheel.^[6]
- One easy way to adapt the size of the axle is to wrap tape around it. You don't need to wrap tape around the entire length of the axle, which would likely be counterproductive, because it would increase friction. Just wrap tape around the center of the axle, where it does not come into contact with the frame. This added weight will increase the torque of the axle. You can easily experiment to find the correct amount of torque by adding and removing layers of tape.^[7]



4 Increase traction. For the wheel to pick up speed it needs to create pressure against the ground. For the wheel, use a material with a rough texture around the outside to give the wheel traction. Alternatively, cut something that has a rough surface such as a rubber balloon. Glue strips of this material to the outside of the wheel to give it traction.^[8]



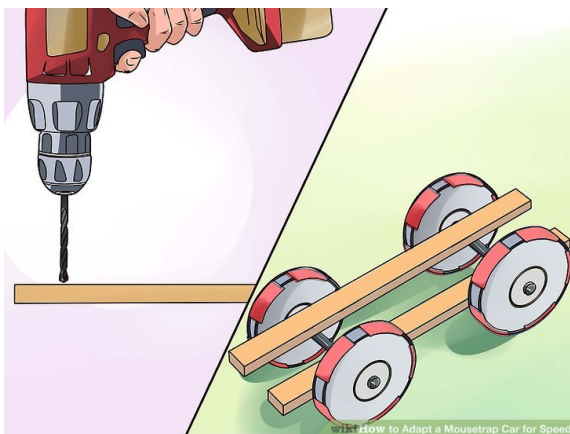
WIKI How to Adapt a Mousetrap Car for Speed

5 Keep on trying. There are so many variables involved in the physics of a mousetrap racer that even similarly built cars operate differently. The only way to perfect your model is to experiment with small variations in design to determine what works best.

- Similarly study mousetrap racers that have won competitions in the past. Learn from designs that you know work.^[9]

**Method
2**

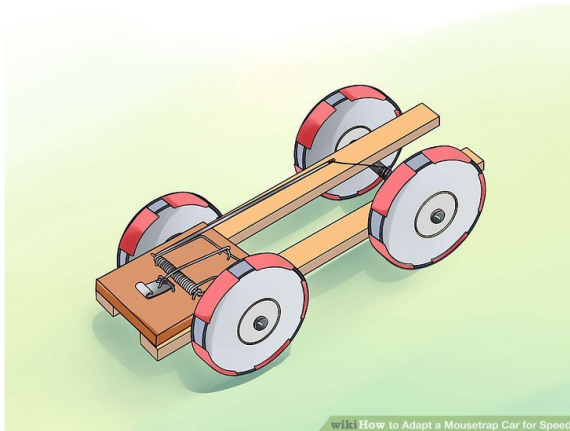
Reducing Resistance



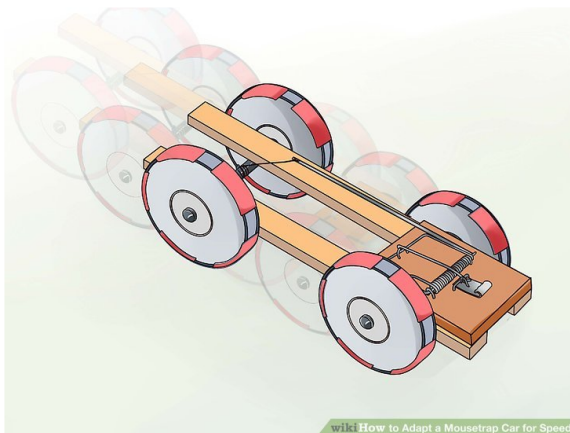
WIKI How to Adapt a Mousetrap Car for Speed

1 Reduce weight. Reducing the weight will lower rolling friction with the ground. Trim the deck down so it is only as large as necessary to support the mousetrap. When gluing down the deck, put it as close to the back wheels as possible without touching them.

- Drill holes in nonessential components to reduce weight. Consider drilling holes in the frame and the wheels.^[10]
- The material used for the frame of the car should be as lightweight and as rigid as possible. Consider bamboo, balsa wood, or foam.^[11]
- Use glue whenever you need to attach something. Tape can be used too, but glue is smoother and weighs less. Whatever you do, don't use metal bolts. They add weight.

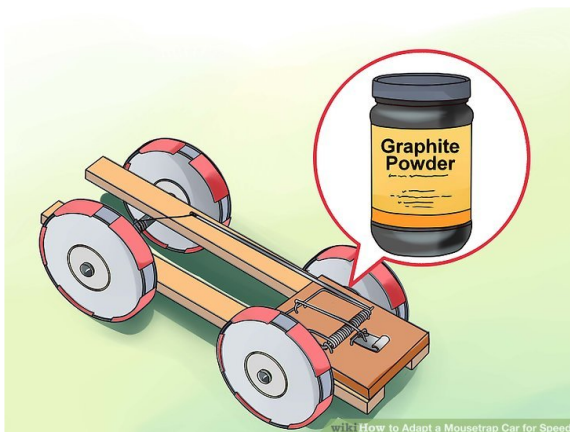


2 Cut down on the number of pulleys and gears. A complicated system of gears and pulleys can be useful when building a racer for distance, because they increase the overall torque. However, when building for speed, they principally serve to create more friction between the components. Consider connecting the lever directly to the axle when building a car for speed.^[12]



3 Limit air resistance. As speed increases, so too does air resistance, making it a progressively more likely to stop your car in its tracks. To prevent this from happening, make sure that as little surface area as possible is exposed. Experiment with different materials for frames to see what is most aerodynamic.

- If you are using a wood frame, sand it and paint it. This will make it more aerodynamic.^[13]
- Similarly, reduce the surface area of the car to reduce air resistance. For example, find a thinner frame and wheels.




4 Eliminate friction between the axle and the frame. Your car can lose a lot of energy at the point where the axle touches the frame. Watch these surfaces to see if the axle seems to get stuck. Try applying a lubricate, like graphite powder. Alternatively, redesign the axle. Consider installing ball bearings.^[14]

- You can search online for a chart of coefficients of friction, to determine which materials have the least friction when paired.


Community Q&A

How do I make a car mousetrap go farther?

wikiHow Contributor  Use a longer pole/stick attached to the mousetrap's hammer. A longer stick allows more string to be used, and makes it go slower, not faster.


Not Helpful 4 Helpful 12

Can you use wood for the body of the car?

wikiHow Contributor  Yes. The article states, "If you are using a wood frame, sand it and paint it. This will make it more aerodynamic."


Not Helpful 12 Helpful 20

When you put a big wheel on the back, why would you not put it in the front, too?

wikiHow Contributor  Having bigger back wheels and smaller front wheels is like going downhill, so it makes it go faster.


Not Helpful 20 Helpful 23

Do I have to make the string shorter to go farther?

wikiHow Contributor  No, if the string is shorter the lever arm won't be able to pull all the way through.


Not Helpful 3 Helpful 4

Why should I use small wheels if bigger wheels travel more distance per rotation, and speed is just how much distance I can cover in a certain amount of time, or how much time it takes for me to cover a distance? And why are big axles needed as well?

wikiHow Contributor  While yes, big wheels are simply best as smaller wheels do equal smaller distance in the same amount of time or per unit for work. A larger axle increases acceleration, but requires more string per revolution. Smaller axle = Less string per turn which increases distance. Larger axle = More string per turn which decreases distance but increases acceleration. It's the same concept as the placement of door handles. Place the door handle on the outer end(as is normally done), and you have push the handle a further distance but it's easy. Place the door handle in the middle and you decreased the distance the door has to be pushed but increased the resistance.


Not Helpful 35 Helpful 18

Are three or four wheels better for speed or distance?

wikiHow Contributor  Three is better for everything in this case, reducing weight and rolling resistance. The only downside is that it makes design harder, since you need to extend the chassis either forward or under the trap to mount it.

Not Helpful 3 Helpful 3

Will it travel at least one meter?

wikiHow Contributor  Yes, it will. if you follow all of these steps correctly, it should go much more than just one meter!

Not Helpful 2 Helpful 2

Warnings

- This is for speed, not distance. Don't be surprised if it doesn't go very far!

Sources and Citations

1. http://www.cfep.uci.edu/cspi/docs/lessons_secondary/Mouse%20Trap%20Car%20Lesson.pdf

2. <http://www.real-world-physics-problems.com/mousetrap-car-physics.html>
3. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
4. <http://www.real-world-physics-problems.com/mousetrap-car-physics.html>
5. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
6. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
7. <http://www.docfizzix.com/topics/construction-tips/Mouse-Trap-Cars/changing-gearing.shtml>
8. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
9. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
10. <http://www.real-world-physics-problems.com/mousetrap-car-physics.html>
11. <http://ideas-inspire.com/mousetrap-cars/>
12. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
13. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-speed-basics.shtml>
14. <http://www.docfizzix.com/topics/design-basics/MouseTrap-Cars/mousetrap-racers-friction.shtml>