

# Make a sailboat with keel

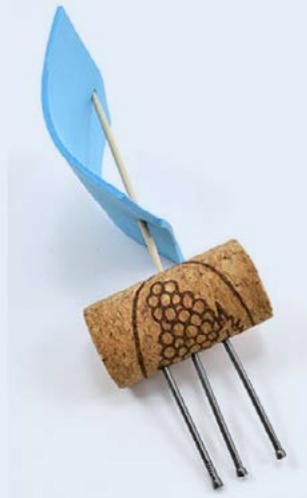
## What you need:



- Wine cork/pool noodle or piece of styrofoam (something that floats)
- Wooden skewer/toothpick
- Several nails
- Aluminium foil
- Milk or juice carton (for the sail)  
Whatever you use it must be waterproof
- Sink, bathtub or large container that can be filled with water
- Water

## Instructions:

1. If using a pool noodle or styrofoam or something similar, cut it down to the size you want your sail boat to be. Be aware that the shape/size of your sail boat will affect the way in which your boat sails.
2. Push the skewer/toothpick into your boat to make your mast.
3. Cut the Milk/juice carton to form a sail.
4. Make small holes in the sail and slide it onto your skewer/toothpick.
5. Put three nails into the bottom of your boat.
6. Cut a rectangular piece of aluminium foil and wrap it tightly around the nails to form a 'fin' shape. This is your keel.



7. Now test your boat and see how well it sails. Blow on the sail or use a hair dryer to form wind. Watch and describe what happens.

# Make a sailboat with keel

## Act Like a Scientist:



Try making several boats using different materials and shapes and test which works better.

- What happens if you change the size of your boat/sail/number of nails in the keel?
- What happens if you remove the aluminium foil?
- What happens if you have no nails in the base?
- Research the way in which America's Cup sailboats have changed over the years.

## The Science Behind it:

If you make a wide boat, it is likely to be more stable than if you make a very narrow boat. It's like standing with your feet tight together instead of spread out slightly – it's harder to balance. When you added nails to the bottom of your sailboat, you lowered its centre of mass and made it more stable. However, individual vertical nails don't do a very good job of pushing against water, as the water can flow right around them. That means the boat will struggle to go

straight. If you blew on your sail, your boat might have curved off to one side or spun in circles. When you wrapped the nails in aluminium foil and made it like a fin it can cut through the water very easily in one direction but provides a lot of resistance against the water in the other direction. That makes it easier for your boat to move forward and harder for it to move sideways. This is why real sailboats can be long, skinny and have tall sails.

