TAKE FLIGHT WITH YOUR OWN KITE

Experiment Express:

STEM Field of Study:

Math

Engineering

Specific STEM Area:

Aerodynamics

Physics

Age Group:

All

Cost:

Less than (<) $10

Time:

2+ Hours

Materials:

Lab Notebook; Pen; Pencil, Marker; Ruler; Cardboard; Large Garbage Bag; 3 Wire Hangers; Duct Tape; Scissors; Strong Yarn / Fishing Line.

Safety:

Adult Supervision Necessary

Individual Education Plan (IEP) Goals:

Academic

Behavioral

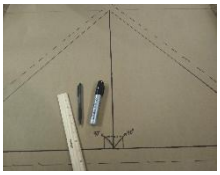
Motor

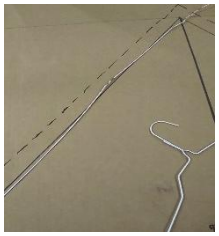
Social

Problem Question: Can you make your own kite for a beautiful spring flight?

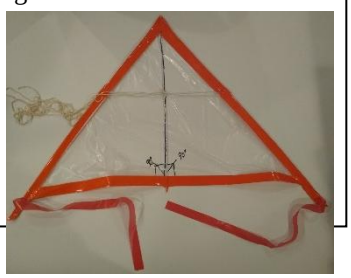
Hypothesis: Before you do this experiment; try to predict the answer to the question above. Write down your Hypothesis in your logbook. Make sure to use a pen.

Directions:





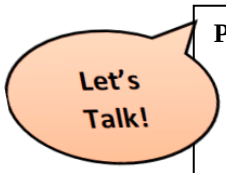
1. Gather all of materials together.
2. ⚠ Review safety precautions with an adult.
3. Using your ruler and pencil you're going to draw a triangle. To keep everything straight, try utilizing the base of the cardboard as your guide for the bottom line of the triangle. Make this line 24" long. After you draw the line, go ½ way on the line (at 12") & draw mark; this is your midpoint.
4. After drawing your midpoint, place your ruler at the midpoint and draw a vertical and straight line that is 18" long.
5. Now connect the top of the vertical line to the lower left and lower right corner of the horizontal lines to create a triangle. After drawing your kite triangle with a solid line; go back and draw a dashed line on the outside of the triangle. Do this for the sides and the bottom.
6. Using the wire coat hangers and your pliers, unbend each of the coat hangers so they are relatively straight. Set one of the coat hangers aside for now. Place a straightened coat hanger on the two top solid lines of the triangle, measure their length, then using the pliers – cut the wire hanger to the length you need. You may have to hold the hanger with the pliers and bend the wire back and forth until it snaps. It may be a good idea to allow an adult to do this and make sure to be careful – there might be sharp edges.
7. Taking the garbage bag and scissors, trim of the sides of the garbage bag but not the bottom. Place the garbage bag on top of the triangle and make sure it covers the triangle out to the dotted lines. Using the scissors, cut the plastic bag along the dotted line.
8. Place the wire hangers on top of the plastic bag on the solid line. Using the Duct Tape, securely tape the top wire hangers together. You may have to move the garbage bag out of the way to do this. Tear off four small strips of duct tape and place them where you can easily access them.
9. Now fold the outside edge of the plastic bag over the wire hanger and secure with a small piece of tape. After all the sides are taped, tear off a long strip of duct tape and go over the edge that was just folded over. You can also add tape along the bottom if you wish.
10. Take the 3rd wire hanger, you are going to make the shape of a cross for the center of the kite. Where the wires meet, you can secure them with either string or duct tape. Add a length of string to right and left side of the cross and leave about 12" after tied.
11. Keeping the wire cross on the kite; securely tape the corners of the wire cross to the kite with duct tape.
12. Tie a longer string to the existing strings on the kite and take it for a test flight outside.



TAKE FLIGHT WITH YOUR OWN KITE

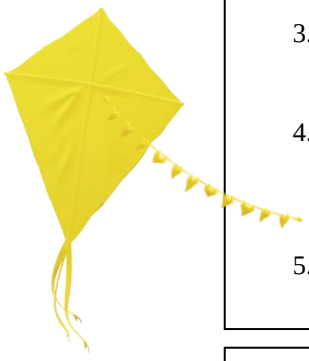
Post Experiment Questions:

1. What shape is the completed kite?
2. What type of triangles are created when a vertical line is drawn down the center of the Isosceles Triangle?
3. Are there any other shapes that are used to create kites?
4. Why do you think the kite is so light? Does it matter? Does something have to be light in order to fly?
5. Was your hypothesis correct?



Post Experiment Answers:

1. The completed shape of the kite is an Isosceles Triangle. Only the two sides are equal in length.
2. When a vertical line is drawn down the center of the Isosceles Triangle; it divides it into two smaller Right Triangles.
3. Yes. There are kites that are in the shape of: Quadrilaterals, Diamonds, Box, Hexagonal, Deltas and there are even kites that are in the shape of a butterfly, star, or dragon.
4. The kite is light so it is easier for us to fly. The weight of what you want to fly does matter. The heavier something is the more lift and thrust you need to get off the ground. One of the heaviest airplanes ever built weighs 175 tons… without any fuel or cargo.
5. If your hypothesis was correct, Congratulations! If not, do not worry – this is exactly why we do these experiments.



Draw Your Own Conclusion:

The history of kites is equally as fascinating as the toy itself. The exact origin of kites is unknown; however, they are thought to have flown first in ancient China as early as 206 B.C. The ancient pastime of kite flying grew as trade routes from China and Japan expanded. Kite flying wasn't just for fun; it was also used for fishing, research, and more importantly, allowed two brothers from Indiana to experiment with the possibility of flying. "The Wright Brothers tested their flying-machine as a kite before they flew it as the first manned airplane in 1903."

How wonderful it must have been for the Wright Brothers to make the leap from watching something fly to being watched while flying! The physics of kite flying truly helps you learn the more about this phenomenal accomplishment and the wonder of Mother Nature and Man working together to accomplish a task. However, what happens when there is no wind? Is it possible for you to make a kite fly even when there is no wind?

We highly encourage you to visit the Smithsonian Institutes website at: https://airandspace.si.edu/stories/editorial/how-kites-fly and learn more about the forces that impact flight. Who knows… maybe you'll discover if you can fly kites without wind!

Experiment Expansion:

We hope you had fun building and learning about kites and the forces that impact flight. To expand on this experiment, we would like for you to use your kite in another activity. If you hold your kite in front of you like so:

and dropped it; do you think it would fall faster to the ground than if you held it straight up and down? Try to predict what may happen first and write in your logbook and explain your reasoning. Then test your Hypothesis and discover the answer. Let us know about your results and happy flying!

Log Your Work:

Absolutely!

Real World Applications:

Aerodynamic Forces

Geometry

Lift, Drag, Weight, Thrust

Online Resources:

https://www.my-best-kite.com/

https://airandspace.si.edu/stories/editorial/how-kites-fly

https://www.kiteflying.cc/the-science-of-flying-a-kite/

http://howthingsfly.si.edu/

Literature Resources:

Kite books for designing, building, and flying kites you can make at home! by Glenn Davison (Author)

Kites for Everyone: How to Make and Fly Them by Margaret Greger