

Challenge #1: Paper Helicopters

In this activity, you will have fun creating a simple helicopter from paper. Enjoy watching your paper helicopters spin to the ground and learn the basic science aspects of lift and spin.

Challenge Objective

The objective of this challenge is to create a simple helicopter following the instructions provided below and using the pattern provided.

When you complete your helicopter and drop it from a height (maybe the top of a staircase) the auto-rotation or spin caused by the air passing above the rotors produces the lift needed to slow the helicopter's fall.

What You'll Need

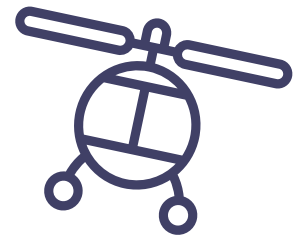
- 1 sheet of 8.5" x 11" paper
- Scissors
- A ruler
- Tape
- Paperclips
- A pencil

Instructions

1. Using a pencil and ruler as a straightedge, trace or copy the pattern provided here onto a clean sheet of paper, making sure to copy the dashed lines as they are pictured.
2. Using a pair of scissors, cut out the shape; be sure to cut only on the lines that appear solid, and fold on the dashed lines.
3. Bend the "wings" at the top of the pattern back in opposite directions, so that they are perpendicular to the rest of the helicopter.
4. Finally, fold up the bottom flap and tape it in place.
5. Holding the helicopter gently, drop it from a high, safe location when the air is calm; it will auto-rotate to the ground.
6. Attach a paper clip to the bottom to add weight and see how that changes how it spins to the ground.
7. You can also try making a different design with heavier construction paper.
8. Be creative and decorate your helicopter!

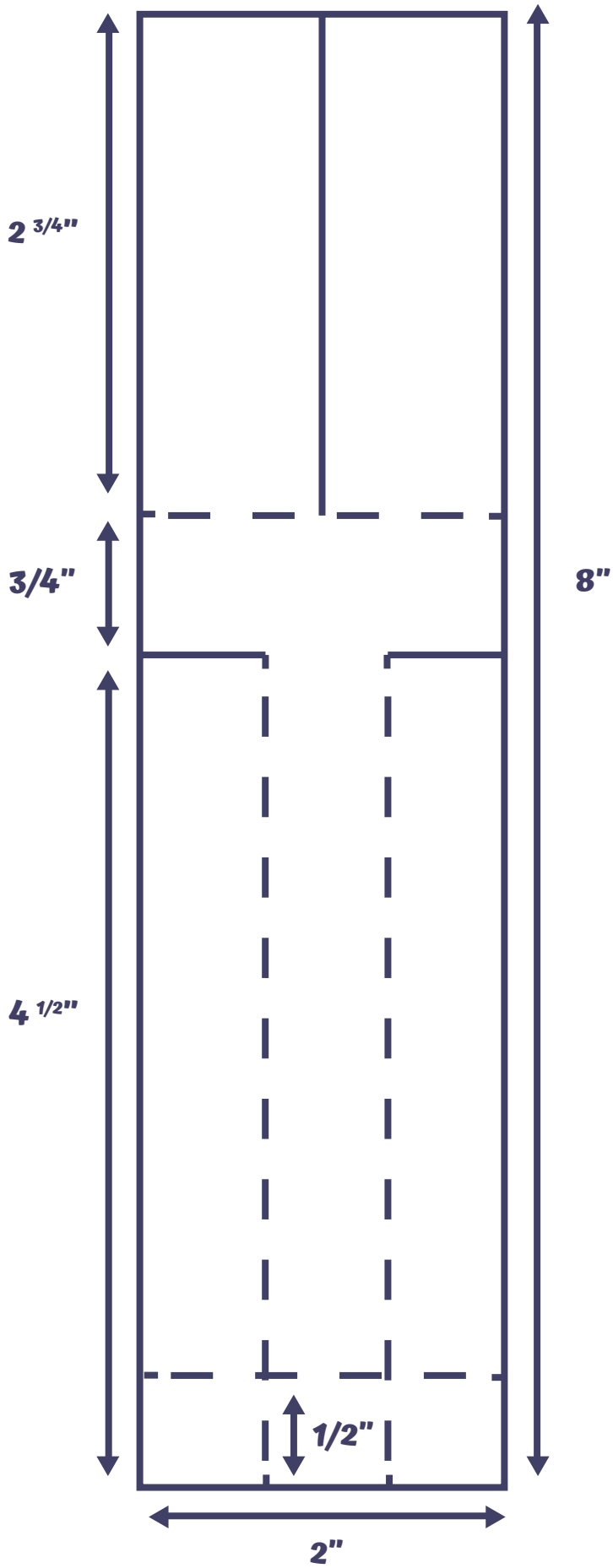
DID YOU KNOW?

On September 14, 1939, the VS-300, the world's first practical helicopter, took flight at Stratford, Connecticut.



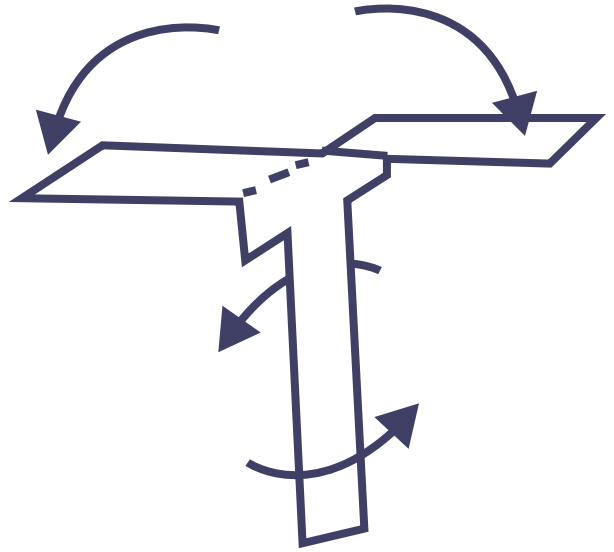
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REMINDER!

Cut only the solid lines and fold the dotted lines.



Challenge #2: Design a Marble Run In A Box

In this activity you will create a marble run by using materials listed below. You will create a pathway for the marble to travel from the top of the run to the bottom demonstrating friction and gravity.

Challenge Objective

The objective of this challenge is to design and create a marble run with a track for the marble to travel down. You can make it as big and with as many twists and turns as you like. Be creative!

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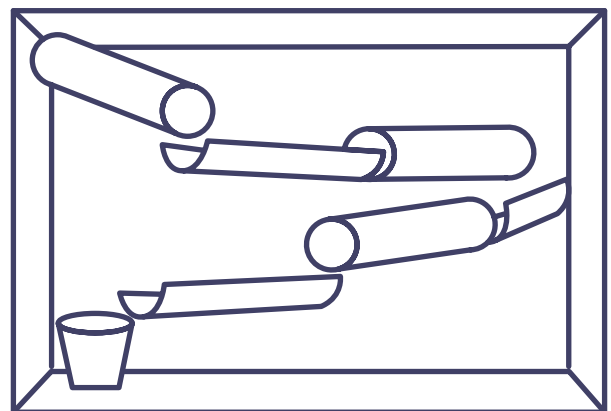
What You'll Need

- A large box
- Cardboard tubes (paper towel or toilet paper tubes) or straws
- Masking tape
- Glue
- Scissors
- Paper cup (optional)
- A marble

Instructions

1. Prepare your materials. If you are using cardboard tubes you can either use whole cardboard tubes or half tubes. You can also decorate the tubes with stickers and markers if you would like! If you are using straws, cut the straws up in different lengths.
2. Think about what you want your marble run to look like and lay it out before taping or gluing things down. How long can you make the run? How many different angles and turns?
3. Starting at the top of the box tape down a tube or a straw and test out how the marble runs down it.
4. To make sure the marble fits in and runs down all the pathways you have designed, test your track with a marble each time you add a new piece to the run.
5. If your marble gets stuck, adjust the tube or straw to see if you can fix the problem.
6. At the end of your run you can add a small paper cup to catch the marble.

EXAMPLE:



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Challenge #3: Higher, Faster, Farther

Inspired by Book 3 - "Let The Games Begin!"

In this activity you will experiment with different sizes and weights of paper to create paper airplanes and see which flies the fastest, the highest, and the farthest. You will learn about the forces acting on the paper airplane (thrust, gravity, drag, and lift).

Challenge Objective

The challenge is to take 2-3 different sizes of paper in different weight, fold them into a paper airplane and see how far they go.

What You'll Need

- 2-3 pieces of paper of varying sizes and weights
- A pencil and paper

Instructions

1. Following the instructions provided on the following page fold your paper airplanes (if you know other ways to fold a paper airplane, experiment with different types of designs)
2. Pick a measurement that you want to track (how far it flies, how high it flies, or how fast it flies).
3. Measure 2 different flights for each of your planes.
4. In the box below write down what you noticed. Does the weight of the paper change how far or how fast the plane flies?

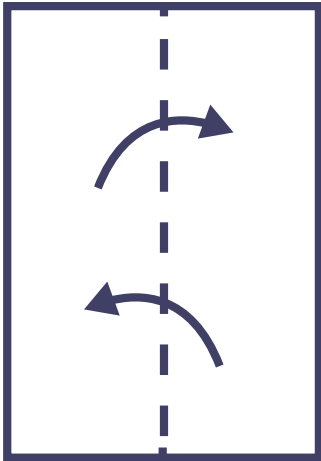
OBSERVATIONS:



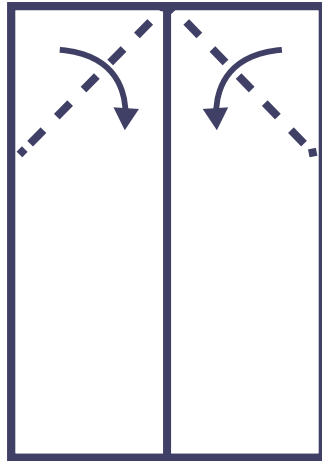
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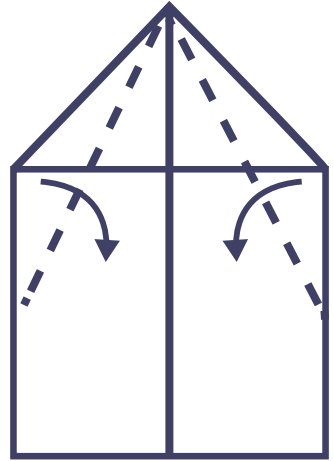
1.



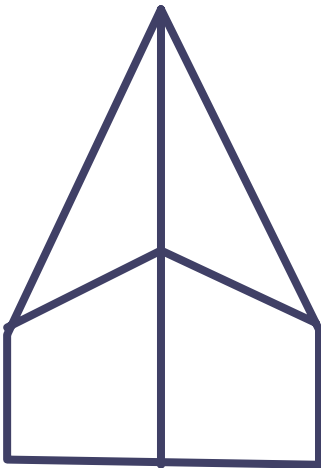
2.



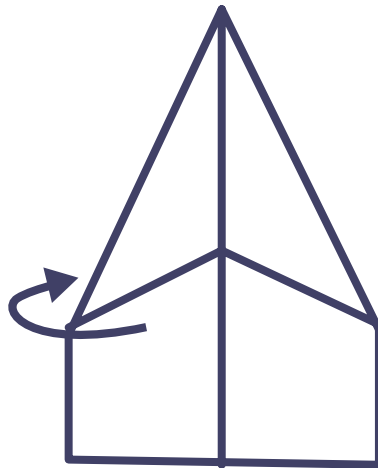
3.



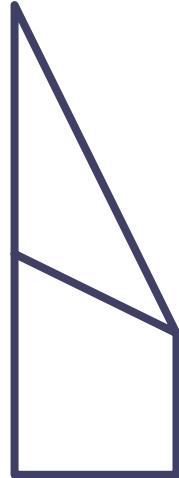
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5.



6.



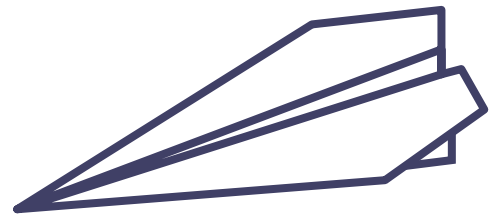
7.



8.



9.



Challenge #4: Design The Coolest Kite

In this activity you will design a cool looking kite and see how high you can fly it. Express your creativity and add your own design elements to the kite.

Challenge Objective

The objective of this challenge is to build a kite that is cool to look at and fun to fly!

What You'll Need

- A large piece of plastic sheeting (a plastic table cloth works great)
 - A yard stick or other long straight edge
 - Two 36" dowels and two 30" dowels
 - Heavy duty tape
 - String
 - Scissors
 - Markers
9. Cut a piece of string about twice the length of your horizontal dowel. Tie each end of the string to the ends of the dowel (where it is hanging over the edge on each side). When you are ready to fly the kite, you will attach the fly line to the center of this string (called the bridle).
 10. Now it is time to add a tail. Cut a piece of the remaining tablecloth approximately 3-4 times longer than the vertical height of the kite. Attach the tail to the bottom of the center vertical dowel with duct tape. Your kite is ready to fly! This is called a Delta Kite.
 11. But, you can still decorate it to make it unique! Use markers to draw a design on the kite!

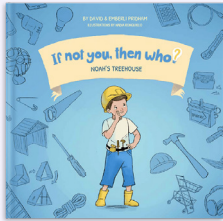
Instructions

1. Fold your plastic sheet in half. Along the fold, measure the length of your shortest dowel (30") and mark the spot.
2. Along the edge of the plastic, from the corner with the folded side, make another measurement the same length as the shortest dowel (30" from that corner).
3. With a straight edge connect the 2 dots. Keeping the plastic folded, carefully cut out your sail along the line you just marked. Unfold you newly cut sail, and lay it out flat, so that you have an isosceles triangle.
4. Take the shortest dowel and lay it down the middle of your triangle - from the top point to the widest side, use tape to secure it at the top and bottom.
5. Now take one of the longest dowels and lay it along one side. It should line up with the corner of the sail but not touch the center dowel. Repeat this on the other side.
6. With the sail laid out flat, take the last dowel and line it up perpendicular to the center dowel at the point where it leaves about an inch hanging over the edge on each side (see image below).
7. Tape this perpendicular dowel to the dowels on the edge on each side and then tape it in the middle to the center dowel and both dowels to the sail itself.
8. Turn the kite over so the frame is facing down.



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Challenge #5: Straw Tower Game

Inspired by Book 2 - "Noah's Treehouse"

In this activity you will invent a new game that focuses on building straw towers. Have fun as you create a challenging game for your friends and family to play while improving your skills in geometry and creating step by step instructions.

Challenge Objective

The objective of this challenge is to invent a new game that uses straws and masking tape as the main game parts. you will need to figure out what the rules are and how many players your game allows!

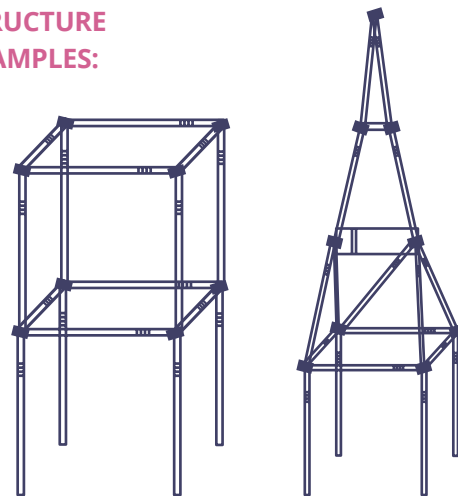
What You'll Need

- Paper
- A pencil
- Masking tape
- Straws
- Scissors

Instructions

1. Have you ever played any games that build towers? We can think of one where a tower collapses (Jenga ®).
2. Some of the things to keep in mind:
 - How many players can play?
 - Will you play in teams?
 - Will each player have a certain number of straws to start with?
 - What will the game play be? Adding a straw? Or maybe there is a timer.
3. Write down your rules, gather the materials needed for the game and test it out with your friends and family.
4. **Remember:** As with any invention, you may need to make changes to it until it works the way you want it to. Testing and refining is part of inventing!

STRUCTURE EXAMPLES:



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Challenge #6: A Quest For A Solution

In this activity you will go on a quest to find a solution to a problem you observe. Have fun brainstorming ideas while learning basic problem solving skills.

Challenge Objective

The objective of this challenge is to pick one person in your family to interview about a problem that they encounter in their everyday life and brainstorm solutions. What would you invent to help them?

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What You'll Need

- A person to interview
- A printed version of the worksheet provided
- A blank piece of paper
- A pencil

Instructions

1. Start by asking one person for an interview to find out what problems they have that you might be able to solve with a new invention.
2. Next, make a list of questions you might ask this person. Some suggestions are listed below.
3. During each interview, take notes about the problems and the tools they use.
4. After you have completed your interview, use the worksheet on the next page to brainstorm ideas of what your solution might be for the problem.
5. Finally, when you determine which idea will work best take your blank piece of paper and draw a picture of your solution!

SAMPLE QUESTIONS:

1. What problem would you like to see solved?
2. Is there something that you do at work or at home that you find difficult or frustrating?
3. Would a new product or tool help you? If so, what would it be?
4. Are there any tools or products that you use that don't work as well as you would like?
5. If you could invent something to make your life easier, what would you invent?



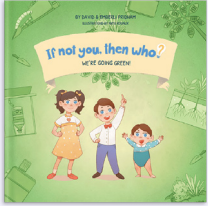
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Person You Interviewed:

Problem they had:

Solution	Reasons this is a good idea	Reasons it might not work
1.		
2.		
3.		
4.		
5.		



Challenge #7: Transportation Of The Future!

Inspired by Book 4 - "We're Going Green!"

In this activity you will have fun imagining what the future will be like! You will come up with a concept for some form of transportation that will get us from point A to point B, 25 years from now. And... it has to be good for the environment. This is a great activity to do in teams.

Challenge Objective

The objective of this challenge is to use your imagination and creativity to invent some form of transportation in the future. How will we get from one place to another? Airplane? Boat? Helicopter? Flying car? What will it look like? How will it run? Remember, we want it to be good for the environment too.

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What You'll Need

- Poster board
- Colored pencils or markers
- Access to internet for research

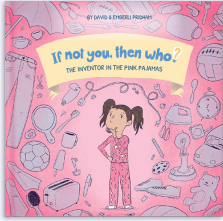
Instructions

1. Start by researching different types of clean renewable energy sources that can be used to power a car or other type of transportation.
2. Brainstorm on paper all of the various ideas of how you might be able to travel 25 years from now. By air, by ground, by water?
3. Now its time to use your imagination! In 25 years from now, what do you think the car of the future will look like? And... how will it work
 - Will it travel on the ground ?
 - Will it fly?
 - Maybe it will be able to travel over water.
 - Will it fit a whole family or will each person have their own?
 - Will you need to learn to drive the car or will the car do it all on its own?
 - Will it be run by a robot?
 - Will it be fast or slow?
 - How will it be powered to keep the environment clean
4. Make notes of what you think the car of the future will look like and then draw a picture of it. Be creative! Have fun!
5. Make sure to name your new transportation vehicle!
6. Write a description on the poster – it might help to label the parts of the vehicle in your drawing.



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Challenge #8: Game Time!

Inspired by Book 1 - "The Inventor In The Pink Pajamas"

As an inventor you will need to take time to observe the world around you. Inventors are problem-solvers. They see a problem or a challenge and come up with ways to make it better. In this activity you will have a chance to identify a problem and come up with some of your own solutions.

Challenge Objective

The objective of this challenge is to take an existing sport or game and make it better! Using your problem solving skills come up with some solutions on how you can re-invent what has already been done and then draw a picture of what your solution might look like,

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What You'll Need

- A printed version of the worksheet provided
- A pencil

Instructions

1. What is your favorite sport or game?
2. List two problems you have while playing that game.
3. Once you have completed the list, prioritize your items in order of importance.
4. Now, you are the inventor. How could you solve the problems you have identified above? Using the worksheet on the next page, come up with 2 possible solutions for each problem.
5. Pick one of your solutions and draw out what it might look like.

DID YOU KNOW?

The game of tennis originated in 12th century French monasteries as "jeu de paume" or game of the palm. This was because the modern tennis racquet was not yet in use and the ball was hit with the hand.

In the 16th century wooden rackets were introduced. The racket heads were much smaller than they are now.

Today, tennis is a much more fast-paced game of power. Rackets are now much lighter because they are made of graphite and composite materials. Racket heads are also much bigger. This means there is a larger sweet spot, which is key for the evolution of today's faster and powerful style of playing.



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View from the top

View from the bottom

View from the left side

View from the right side