

## Activities with Paper

# How to Make a Cellphone Stand with Paper

Math/Art/Science

Grades 2-5

One Lesson





## Overview

Students will learn how to transform one sheet of printer paper into a sturdy cellphone stand. They may not realize it, but as students fold, they will be learning about surface tension, fractions, architecture, geometry and load bearing. This activity is equally valuable in the Math, Art or Science classroom.

Because this project requires over ten steps, it is appropriate for the upper range of elementary school; grades 2-5.

This lesson is also ideal for showing how precision in executing simple steps makes a big difference in the quality of the end result. We strongly recommend providing each student with a ruler and showing them how to press the ruler over their folds to make crisp folds. (They will not need the ruler to measure).

## Objectives

Students will

- Follow a fairly long sequence of steps with precision
- Learn to fold evenly and carefully
- Learn the difference between a “pinch mark” and a “fold”
- Practice measuring distance with their eye (estimating)
- Produce a usable cellphone stand
- Exercise patience, precision and persistence in manufacturing a complex product.

## Activities

**Set up:** Ask students to clear their desks. Distribute one piece of paper and one ruler to each student.

**Introduce the task:** Explain that great inventors and engineers often design their inventions in paper before moving to the actual material they will use to manufacture a product. This is because paper is cheap and easy to work with. Explain that today we will all learn how to make a cellphone stand using just one sheet of paper.

**Encourage scientific thinking:** Hold up one sheet of printer paper in one hand and a cellphone in another. Ask: Which is heavier? How can a light sheet of paper ever hold up a heavy cellphone? Elicit that the answer is folding. Direct students' attention to the door frames or window frames in the room. Ask students if they see triangles in those structures. Ask how triangles help hold up the door frame or window frame. Explain that today they will be making 3-D triangles that can support the weight of a cellphone.

## MATERIALS

Each student will need:

- One sheet of 8.5” x 11” printer paper
- A ruler to press neatly down on folds with.

## OTHER RESOURCES

Videos are often very helpful teaching tools. We recommend looking on Teacher Tube if you feel that a video showing the process may further help your students.

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**Emphasize the values that you will be evaluating:** Because this is a complex process, the most important goal of the activity is for all students to complete their cellphone stand. Point out that you will be looking for patience, the refusal to complain or give up in the face of challenge, the ability to ask others for help and to do things over as the key factors in your evaluation—in addition to the completed phone stand!

**Step One:** Emphasize that everyone's desk must be clear of everything except their sheet of paper and a ruler.

**Step Two:** Present the instructions on the SmartBoard or somewhere students can read them while they follow your steps. (While most students will benefit most from watching you make the cellphone stand, some learners will benefit from reading the instructions.)

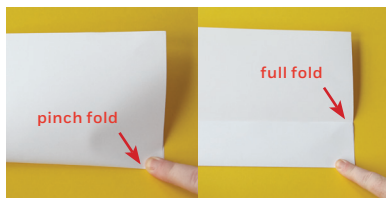
**Step Three:** Read each of these instructions and model each step; pausing at each step to make sure your students understand.

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Take a piece of paper and place it in landscape orientation on the desk. Check that all students have done this.

- Explain the difference between **pinch marks** and **full folds**. A **pinch mark** is when you make an indentation on the corners of a fold. This creates a little mark on each corner of a fold.

A **full fold** is when you press down on the entire fold to create an indented line. Use the picture below to show the difference.



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Have students lightly fold their paper horizontally and make pinch marks only on the corners of the fold.

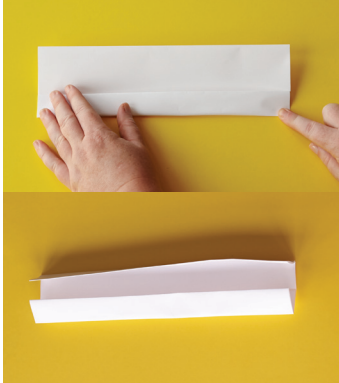
- Open up the page so that the pinch marks are visible. The pinch marks tell us where the center of the page is.

- 

Place your page in landscape orientation. Now, fold the bottom page so that it meets the pinch marks we just made in the center. This is a full fold so run your ruler over this fold. Use the picture above for guidance.

- 


Rotate the page and do the same to the other side of the sheet. Your page should now look like this.

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Next, lightly fold the bottom of your page so that it meets the lowest fold. Use pinch marks to indicate this fold. Rotate the sheet and do it on the other side as well.

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8. 
- Now, take the bottom part of your folded paper and fold it so that it meets the lowest pinch marks you just made. This is a


**full fold** so go over the fold with a ruler. Use the picture for reference. Do this on both sides.

9. 
- Your paper should now look like this.


10. 
- Open out the last fold you made.
11. 
- Rotate the sheet so that it is now in portrait orientation (narrowest part on top)

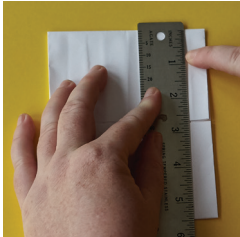
12. 
- Fold the page from bottom to top. This is a full fold so use your ruler to press down on the fold.

13. 
- Undo that last fold. You should see an indented line across the center.


14. 
- Fold the bottom half of the page so that it meets the indented line across the center. Use your ruler to press down on the fold.

15. 
- Do the same on the other side.

16. 
- Your paper should now look like this. Here comes the trickiest part of the activity. Have students place their folded paper on their desk as shown above.

17. 
- Ask them to estimate  $\frac{1}{3}$  of the distance between the top part of the page and the center.


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- They should then fold the top flap back at this  $\frac{1}{3}$  point, as shown left. This is a full fold.

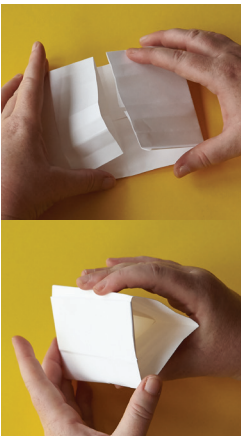
18. 
- Unfold the fold that was just made. Explain that the fold will now be reversed so that it points up, as shown below.

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19. Note that steps 14 and 15 are done ONLY to one side of the sheet.

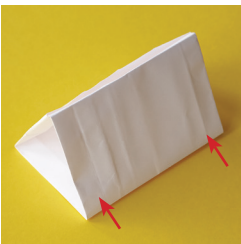
20.  Rotate the folded sheet so that it is in landscape orientation, as shown left. The side with the extra fold should be on the left.


21.  Explain that the right fold is going to be inserted into the left fold. If you squeeze the left fold, as you hold it, it should pop open. Use the images to help guide you and your students.


The right fold should go completely into the left fold's "envelope." Students may need patience to do this correctly.

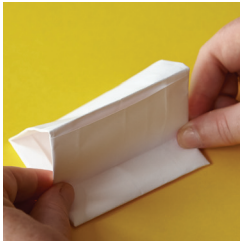
22.  Students should now have a sturdy triangular construct, as shown left.

23. Ask students to observe how solid their triangle seems! Explain that we are going to make it even stronger.

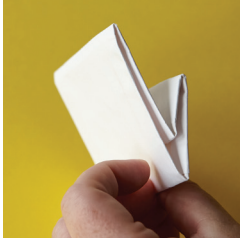
24.  Point out the indentations near the edge of the paper. These indentations were made by an earlier fold.


25.  Tell students to slowly and neatly fold these in—almost like they are folding a present.

26.  By the time they are done, the end product should look like this. Next, point out the 1/3 fold indentation in their object. Make sure everyone can find it on their object.

27.  Tell them to pinch down on that indentation. This will cause the triangle to partially collapse.

28.  Fold this section over the indentation that formed the top part of the triangle. Press until the triangle flattens completely.

29.  Look at your object in profile view. It should look like this.

30.  Fold the top part over the bottom part.





31.



Turn the paper over.  
It should look like this.

32.



Fold the corners so that  
it aligns with the line of  
indentation, as shown.  
Do this on both sides.

33.



Turn it over. Use your finger  
to open up the triangle. It  
should now stand on its  
own!

34. Have students initial their cellphone stand.

35. Place your cellphone on the cellphone stand!



## Evaluation

After class, review the cellphone stands. Provide feedback both on how well the stand was constructed and the behavior of the student during the activity. Grade students on production, patience, persistence, and precision.

## Discuss

- How is a single sheet of paper able to hold the weight of a cellphone?
- What is it about the triangular structure that enables the paper to bear something so much heavier than itself?
- What is the advantage of being able to make something using only one sheet of paper? Why not just make it with lots of materials?
- How did the act of folding help us make this cellphone stand?
- Would there be a better way to make a cellphone stand using just one sheet of paper?
- What was the hardest part of this activity?

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