MPACT
Math and Computational Thinking Through 3D Making

Make a Kite & Measure Stuff

For Grown Ups

- Overwhelmed with children at home while you are trying to work?
- Children bored?
- Not sure how math could make things better?

You've always had an important role in your kids' learning. But now things are more challenging. You can do these fun activities with your children or they can do them on their own.

You don't have to know all the answers. What's important is to **show curiosity** about learning math along with your child. Plus, an answer key is provided for you.

Just remember to keep asking, "What do you think?" "How do you know?" "How could we do this another way?"

For Children

Gather the following materials and get ready to make a kite. Along the way you'll learn a bit of math. If you get stuck in any step, take a breath and try again. You might need more than one sheet of paper. Good luck and have fun!

Materials you'll need
- A print-out of these pages (print out at actual size setting)

- 8.5 x11 paper (any color, scratch paper is ok; several sheets; if possible color one side.)

- Scissors

- About 8-10 feet of thread, string, yarn (Note that thread is a bit trickier to knot).

- Clear or masking tape

- Pencils, colored pencils

Make & Fly a Kite

Use a regular size piece of paper. Follow the steps to make your own kite.
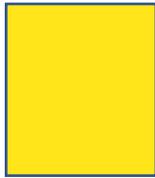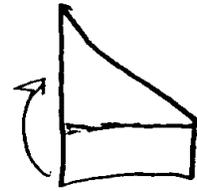
Piece of paper

Fold so top right corner meets left side.
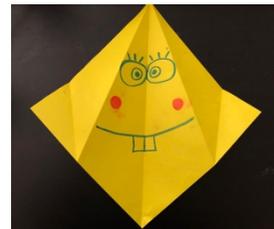
It should look like this.

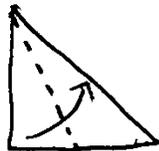Fold up the bottom

Cut along the bottom crease.

Now you have a triangle and a rectangle.

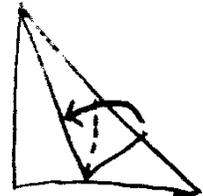At this point, you can stop to decorate the inside of the triangle and the rectangle.

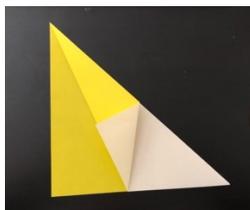Remember, the paper is folded so it *looks* like a triangle.
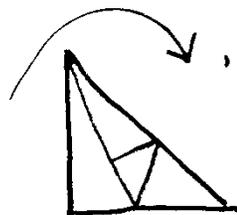
Fold the left corner to the opposite side. Follow the crease line.

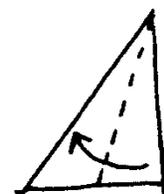Now the paper looks like this.

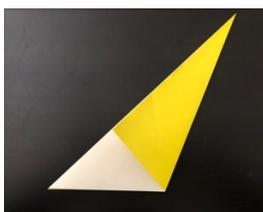Fold another little triangle…

…so it looks like this.

Flip it over.

So it looks like this.

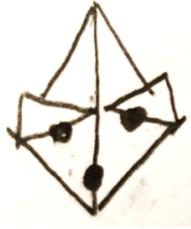Fold the bottom right corner to the opposite side.

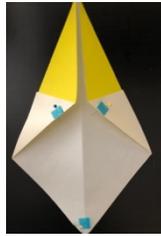Now the paper looks like this.

Then, fold another little triangle …

…so it looks like this.

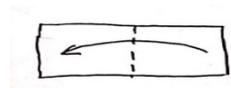Unfold along the diagonal to see your kite.

2

Put three pieces of tape: one near the bottom, and two in the middle of the creases as shown.
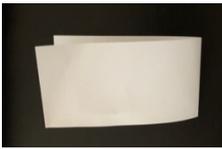

Then, poke one hole through each piece of tape. For best results, use a sharp pencil.
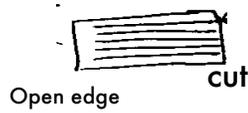

Now switch to the rectangular paper.

Fold it in half.

It should look like this.

Open edge   cut

Cut lines, from the folded side to the open side. Stop before the edge.

Your paper now looks like this.

Unfold the paper.

cut

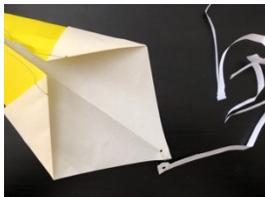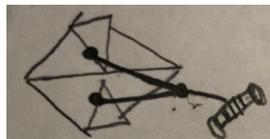Rip at alternating sides.

Like this.
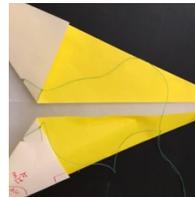

Now you have a tail for your kite.

Put tape on one end of the tail, then poke a hole in the middle of the tape.

Use a little thread or yarn to tie the tail to the bottom of the kite. Use a longer piece to help you tie the knots, then cut off the excess.

Measure another bit of thread, from the middle hole to the bottom hole and back. Cut the thread.

Tie the two ends of this thread to the middle holes, making a loop.

Tie a longer thread to the short loop you made.

Hurray! Now your kite is done!

Safely Fly Your Kite

1. Take your kite outside (with a grown up).

2. Take your tape along with you, in case you need to fix anything.

3. Go to an open space with no wires or tree branches less than 6 feet above you.

4. Have your grown up hold the kite with the tail pointed down.

5. Loosely stretch out about 6 feet of string.

6. Run a short ways with the kite behind you until it goes up in the air.

7. Stop and watch your kite in the air, moving the string to keep it in the air.

Reimagining your design

How could you change the kite design?

Could you make the tail from a different material, like yarn?

Or could you make a shorter tail? Or a longer one?

Could you add more weight to your tail, to stabilize the kite?

Kite Angles

This corner of the paper is a right angle, formed by the two sides of the paper that meet at the corner.
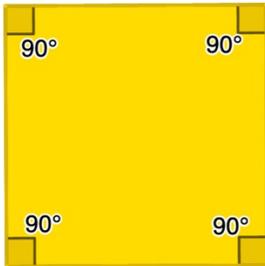
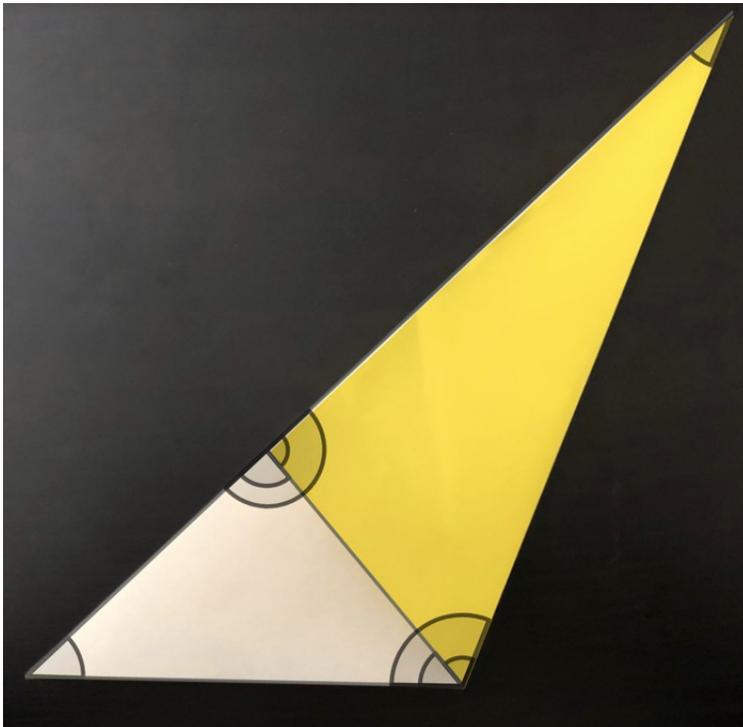A right angle measures 90° (90 degrees).

When you fold a square in half along the diagonal, you fold the right angle in half. (You did this when you made the kite.)

This new angle is less than 90°.

What is the measure of the marked angle? _____

Remember, the 90° angle (also known as a right angle) was folded in half.

You can find at least eight different angles in this folded kite.

1. Mark all the angles that are right angles (90°) in one color.

2. Mark all the angles that are less than 90° with another color.

3. Mark all the angles that are greater than 90° with another color.

BONUS: Guess the measure (number of degrees) of each angle.

Measuring Angles More Precisely

You learned about angles and how to tell if they are *less than* or *greater than* a 90-degree angle (which is also called a right angle, or a square corner). Now you will learn how to make angle wedges to measure some angles more accurately. Include folding into thirds which gives us more whole number wedges.

Materials: string or ribbon, a pencil, paper, and pushpin, scissors.

Draw a circle

Option 1: Trace around a circular object, like a glass or a plate (see page 7)

Option 2 (recommended): Use a homemade compass.

Cut a more thread or lace than the length you want for your radius.

Then, tie it to a pencil or pen.
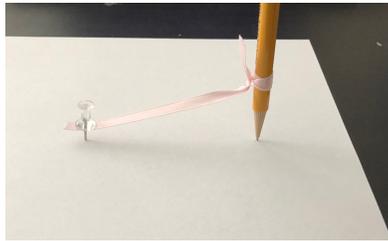
Fix the other end of the thread or lace with a pushpin to the place on paper where the center of your circle should be.

Use a piece of cardboard underneath so you don't ruin the furniture.
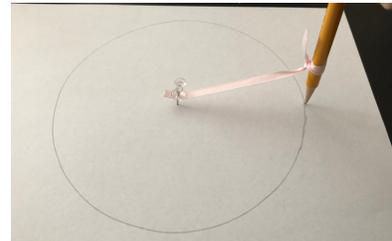
Draw a circle with the pencil. Make sure the thread or lace is kept tight.

You will make a full turn with your pencil around the center of the circle. The full turn measures 360 degrees (360°).

Make the angle wedges

Cut out your circle.
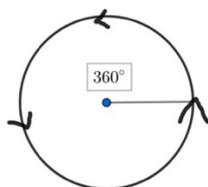
The full turn measures 360°.

Fold the circle in half.

Fold the half circle in half.
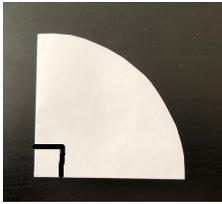
Notice that you have marked the center and a right angle (90°)

Unfold it.
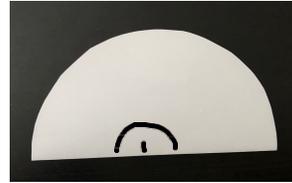
What is the measure of marked angle?

Re-Fold the half circle in half.

Fold the quarter circle in half.

What is the measure of marked angle?

You could keep folding in half to get smaller and smaller wedges. We will stop here.

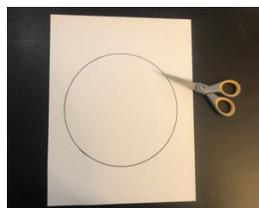Unfold the paper all the way to all the angles you marked.

Cut the circle to make **different** sizes of angle wedges. Label each wedges with its angle measurement.

You have now made a 180°, 90°, and 45° angles. We need to make a 60° angle.

Make another circle. Here we show option 1.

Cut out the circle.

Fold the circle in half like this.

Fold the circle in half like this
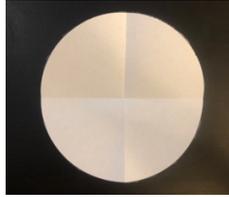
Unfold the paper. You have marked the center of the circle.
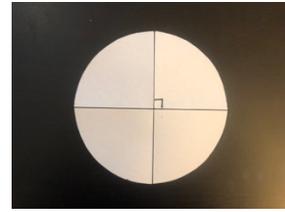
Mark the two lines you just made and this right angle—remember, this angle is 90°. How many other right angles are there?
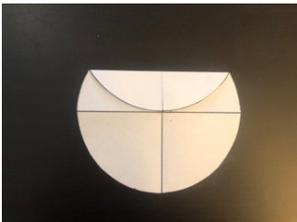
Fold the top most point of the circle exactly onto the center of the circle. Keep the crease aligned with itself.
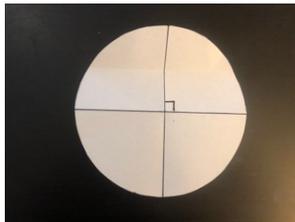
Unfold the circle. Notice where the new crease intersects with the circle.
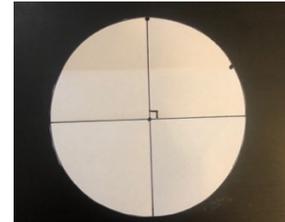
Mark these three intersections: The top, the center, and the intersection of the new midline with the circle.
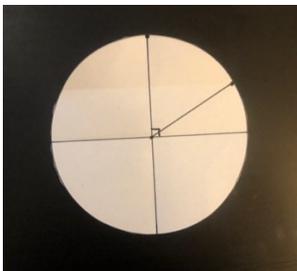
Draw a line from the center to this new point.
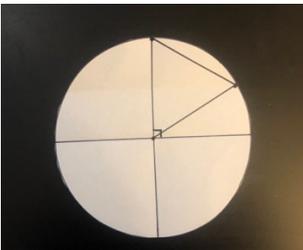
Complete the triangle.
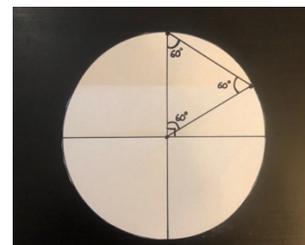
Each of the angles in this new triangle is 60° (degrees). Cut out the triangle and you can use it along with your other wedges. You can also fold the 60° angle to make 30° wedges.

1. Test your angle wedge by measuring this image.

60°
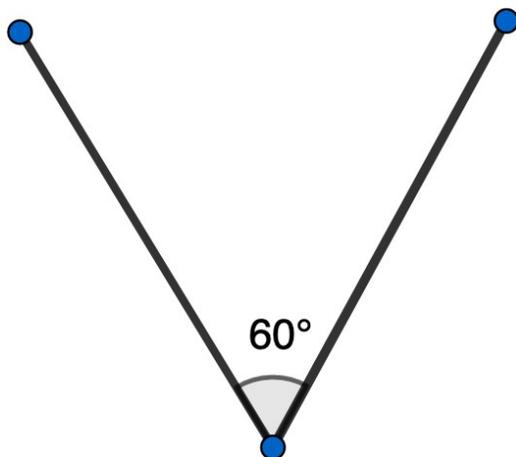
2. Find the measures of each marked angle using the wedges you just made.
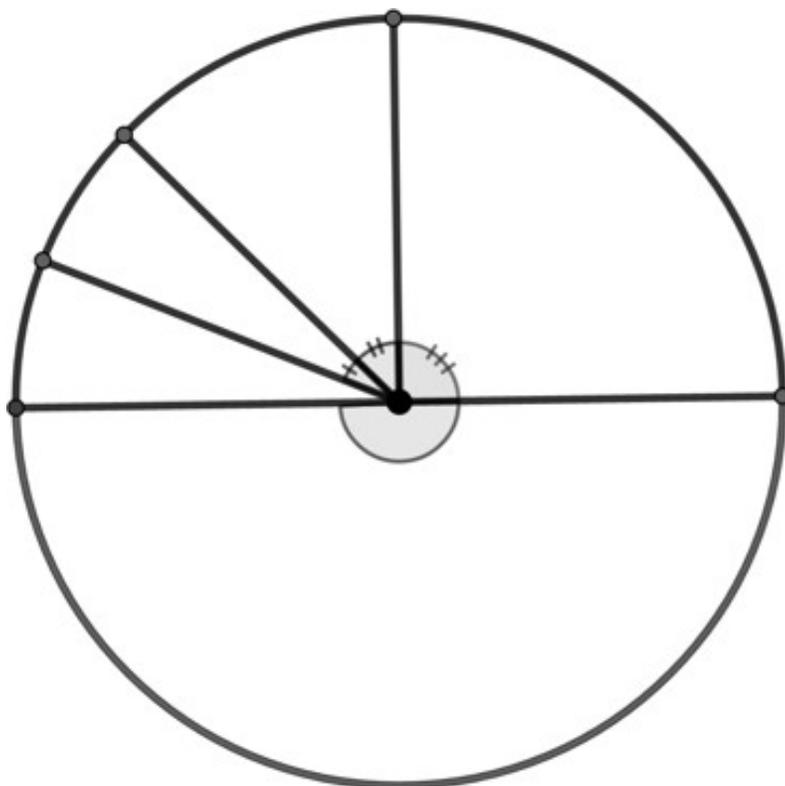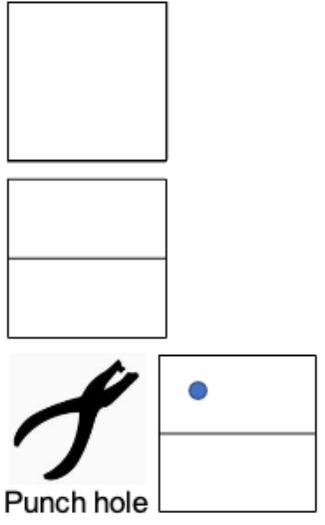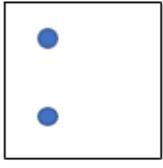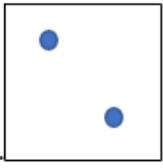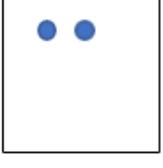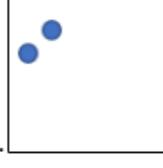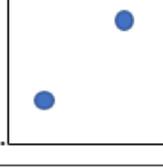
3. Use several wedges to measure the marked angles.
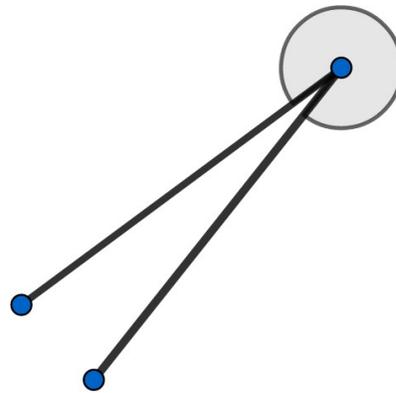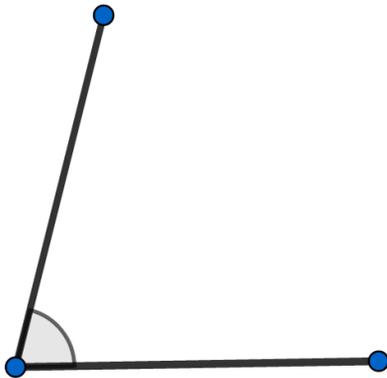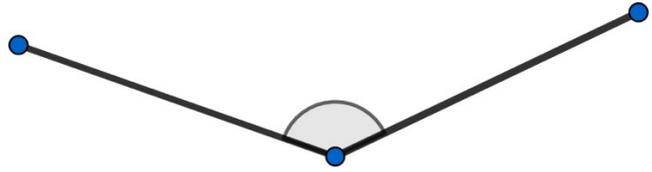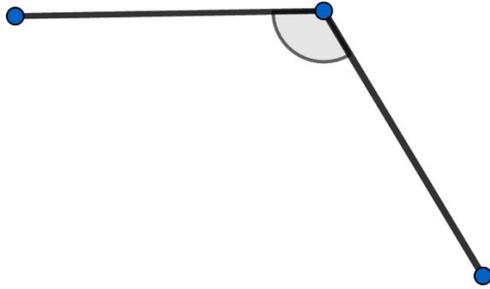
4. Make a larger circle. Make more 180°, 90°, 60°, 45° and 30° angle wedges. Do these angle wedges from the larger circle measure the same as your initial wedges? Use them to measure the angles above to check.
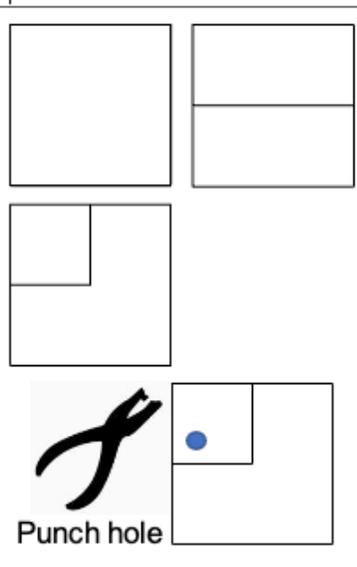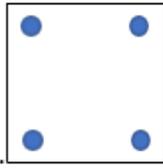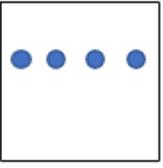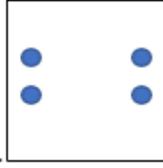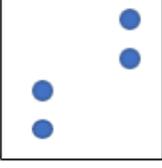
Brain Teasers

Sam folds a piece of paper and then punches a hole. Sam then unfolds the paper to see the design. For each puzzle, choose the result of Sam's folding and punching.
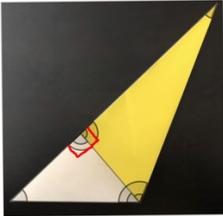
Puzzle 1

Puzzle 2

Hole punch icon by Blaise Sewell

Answer Key

p. 5   45°

1.

2.
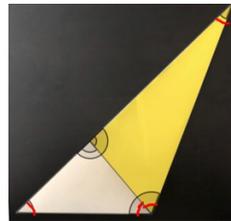
3.
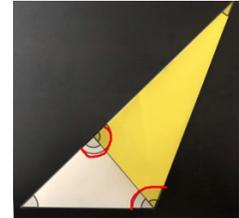
Bonus:
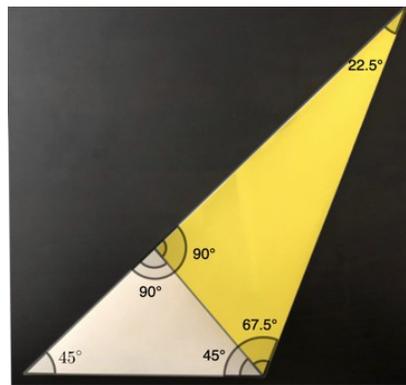
p. 7   180°, 45°

p. 9–10

        1. 180°, 90°, 45°, 22.5°

        2. 120°, 135°, 75°, 345°

        There are different ways to measure given a set of

        wedges. For example, you can fold 60° wedge in half to use for 30° angle.

p. 11   Puzzle 1. A, Puzzle 2. D