gettin' with GEOMETRY

a Family Math Night event

Participant Booklet

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discover the wonders of math...together

Gellin' with Geometry

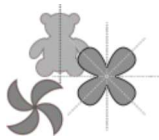
Welcome to Family Math Night! Tonight we present *Gellin' with Geometry™*, an exploration in 2- and 3-dimensional geometry.

Geometry is the study of figures and shapes. When we read a map we are using 2-D geometry. When we build things, we are using 3-D geometry. Studying geometry is important because it helps develop spatial reasoning and problem solving skills. A lot of professions use the skills developed by studying geometry: artists, mechanics, engineers, drafters, carpenters, architects, surgeons, fashion designers and many more.

Tonight, you and your child(ren) will have an opportunity to explore hands-on activities in geometry. Through origami and a friendly game of bingo, you'll be honing your geometric vocabulary. Working on puzzles will help develop persistence and spatial reasoning skills. And turning nets into solids will help make connections between 2-D and 3-D geometry. You'll even create some of your very own projects to take home.

So get ready to explore the visual side of math with our presentation of *Gellin' with Geometry*!

Symmetry

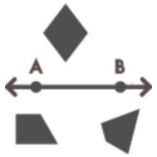


Beginning	Use the reflection mirrors and symmetry task cards to look for lines of symmetry in the pictures. Some of the pictures have only one line of symmetry while some have more than one line of symmetry. There is also one picture with no lines of symmetry. Can you find it?
Intermediate	Use the pattern blocks to complete the symmetrical patterns on the task cards by filling in the design that is already on the cards and then completing the other half of the design symmetrically. Try the two *Challenge!* task cards.
Advanced	Use the 3" x 3" tagboard to draw a shape that starts at one corner and ends at that same corner. Do not get too detailed in the design as it will be difficult to cut out. Trace it four times in a rotational pattern on the 7" x 7" tagboard. Color in and add details. See Station Facilitator for help.

Questions to ask your child:

- What strategy did you use to see if the design had more than one line of symmetry? (B)
- Can you name some objects in this room that have exactly one line of symmetry? (B, I)
- How many lines of symmetry does your design have? (A)
- How many lines of symmetry would a daisy with six rotating petals have? (Answer: 6) (A)

Geometry Bingo



Beginning	Play *Geometry Bingo* with your child until someone wins by getting three bingo chips either horizontally, vertically, or diagonally. If you like, play blackout where you need to fill their entire board with bingo chips.
Intermediate	Play *Geometry Bingo* with your child until someone wins by getting four bingo chips either horizontally, vertically, or diagonally. If you like, play blackout where you need to fill their entire board with bingo chips.
Advanced	Play *Geometry Bingo* with your child until someone wins by getting four bingo chips either horizontally, vertically, or diagonally. If you like, play blackout where you need to fill their entire board with bingo chips.

Questions to ask your child:

- Show me the triangle (square, circle, etc.) on your board. (B)
- What shapes fall under the category of parallelogram? (square, rectangle, rhombus, parallelogram) (I)
- What is the difference between a line segment and a ray? (A line segment has two endpoints and a ray has only one.) (A)
- What do we call an angle with a measurement less than 90°? (Acute angle. Obtuse angles are greater than 90°.) (A)

How To "Do" Family Math Night

- There are 8 stations to explore. Each station has one or two station facilitators to help with materials and questions.
- There is no particular order to complete the stations.
- If you become involved in one of the activities, stay there. You will learn more through an in-depth study.
- Each activity can be done on a variety of levels. You may choose to start at a beginning level (B), or you may choose to start at an intermediate (I) or advanced level (A). Loosely, the levels run K-1, 2-3, and 4-5.
- Work with your child. It is more fun to learn things together.
- At the bottom of each activity in this booklet are questions you may ask your child while doing the activity. They are a guide to help get your child to think about the math they are working on at a deeper level. This is a starter list. Feel free to ask your own questions. Question levels:

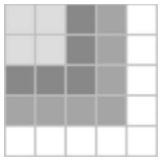
  B = Beginning

  I = Intermediate

  A = Advanced

- Some stations get you and your child involved in making a project. These are yours to take home and share with others.
- And, finally...HAVE FUN! Enjoy the time you are spending together.

Area



Beginning	Have your child use the colored tiles to make a design on the *Designs with Tiles Exploring Sheet. T*ransfer the design onto the *My Design* activity sheet using the square stickers. Help your child answer the questions at the bottom of the activity sheet.
Intermediate	Play the *Covered Area* game with your partner. Help your child determine the length, width and area of their rectangles and record it on the activity sheet. Try the *Challenge!* problem and determine whose rectangles have the greatest perimeter.
Advanced	Help your child use the 6" pipe cleaners to make the shapes on the *Shapes and their Areas* activity sheet. Determine the area of each shape. Make reasonable estimates for non-rectangular shapes. Complete the *Shapes and their Areas* activity sheet.

Questions to ask your child:

- How many more/less red tiles does your design have than blue tiles? (B)
- Can you see a relationship between length and width and the area? (Possible answer: Multiply the length times the width to get the area.) (I)
- If you made an octagon (8 sides) with a perimeter of 6", would it have a smaller or greater area than the hexagon? Why? (A)

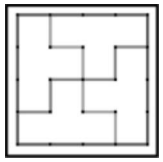
Tangrams

Beginning	Help your child use the tangram puzzle pieces to fill in the designs on the tangram task cards. Peek under the sticky note if you need help…or just have your child copy the answer. Use all seven pieces and don't combine your 7 pieces with other puzzle pieces.
Intermediate	Help your child use the tangram puzzle pieces to fill in the designs on the tangram task cards. All seven pieces must be used in each design. You cannot combine your 7 pieces with other puzzle pieces. The answer is under the sticky note.
Advanced	Use the tangram pieces to make the different shapes. You do not need to use all seven pieces. Trace the shapes that you make making sure to outline each piece. If you have the banner, cut out the shapes and place on the appropriate spot. Fill in the *Tangram Polygons* activity sheet.

Questions to ask your child:

- What is the name of this shape? (Do with each piece.) (B)
- How could you sort your tangram pieces into groups? (B)
- How can you make a square out of these two triangles? (B, I)
- What fraction of the square is the small triangle? (I)
- How can you prove that it's not possible to make a (name of shape) out of (number) tangram pieces? (A)

Fraction Action

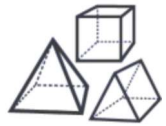


Beginning	Read the task cards to your child and have him/her create the shapes on the geoboard. Work together to complete the directions on the cards. Note: Equal parts does not mean those parts must look exactly the same.
Intermediate	Work with your child to complete the directions on the task cards. Note: Equal parts does not mean those parts must look exactly the same.
Advanced	Work with your child to complete the directions on the task cards. Note: Equal parts does not mean those parts must look exactly the same.

Questions to ask your child:

- Explain how you partitioned the shape into two equal parts? (B)
- Which fraction is larger, ¼ or ½? How do you know? (I)
- What does the bottom number of a fraction tell us? (I, A)
- Why don't the fractional parts on the geoboard need to look exactly the same? (I,A)
- Name an equivalent fraction for ½. (²⁄₄, etc.) (I, A)

Structures

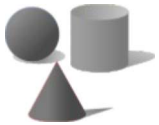


Beginning	Use the task cards to help your child build shapes and polyhedrons with the straws and twist ties. Or let your child build whatever creative piece he or she is interested in. Pinch the **ends only** of the twist ties when inserting them into the straws.
Intermediate	Use the straws and twist ties to build shapes, polyhedrons and any other creation your child is interested in. Pinch the **ends only** of the twist ties when inserting them into the straws.
Advanced	Use the straws and twist ties to build shapes, polyhedrons and any other creation your child is interested in. Try the *Challenge!* problem by completing the *Polyhedron Pattern Search* activity sheet.

Questions to ask your child:

- How many corners does a square/triangle, etc. have? (B)
- Which shape is the most rigid? (Answer: the triangle) (B, I, A)
- How would you add straws to the cube to make it sturdier so that if you applied pressure, it wouldn't collapse? (I, A)
- Why is understanding shapes and their properties important when you are building things? (I, A)

3-D Shapes



Beginning	Have your child pick one of the solids on the table. Now have him/her stick their hand into the feely bag and try to feel for the solid that matches the one they picked without peeking. When they think they have the correct solid, they bring it out of the bag and compare. Replace and repeat with a different solid.
Intermediate	Choose one of the 5 *Creating 3-D Solids* tagboard nets and try to match the net on the sheet with one of the solids on the table. When you think you know which solid the net matches, cut out the net and tape it together. Were you right?
Advanced	Choose one of the solids on the table then fill in the *Designing Nets* activity sheet. Next, make a net of your chosen solid by tracing it on the cardstock. Be sure to include all of the faces. Cut out and tape together.

Questions to ask your child:

- How did you know you had picked the correct solid from the bag? (B)
- How many faces does a cube, square pyramid, etc. have? (I)
- Explain why a cylinder has exactly 3 faces. (I, A)
- Name some objects where a net was used in the design. (Cereal boxes, soccer balls, sugar cone…) (A)

Origami

Beginning	Have your child choose one of the origami papers and help them follow the directions on the task card to make an origami dog. The dog is yours to take home! To create nice, crisp edges, crease the folds with your thumbnail.
Intermediate	Have your child choose one of the origami papers and help them follow the directions on the task card to make an origami samurai helmet. The helmet is yours to take home! To create nice, crisp edges, crease the folds with your thumbnail.
Advanced	Have your child choose one of the origami papers and help them follow the directions on the task card to make an origami box. The box is yours to take home! To create nice, crisp edges, crease the folds with your thumbnail.

Questions to ask your child:

- How do you know if a shape is a triangle? (B)
- Describe the shapes you see in your origami piece. (B, I)
- How did you figure out how much ⅓ was in step 6? (I)
- After your folds, what is the fractional area of…one square in step 1? (¼) …three triangles in step 2? (⅜) (A)
- What shape have you made in step 5? (hexagon) (A)