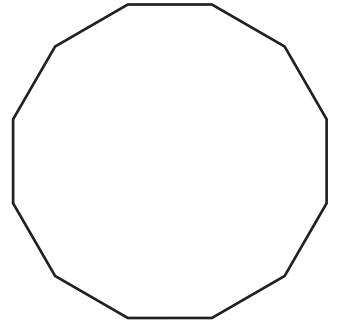
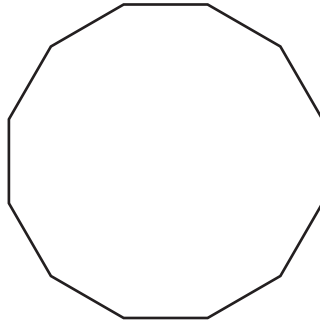
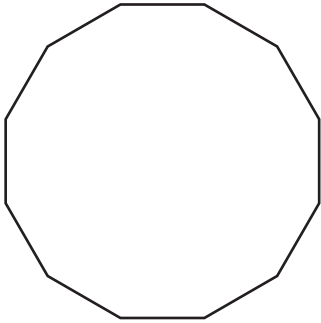
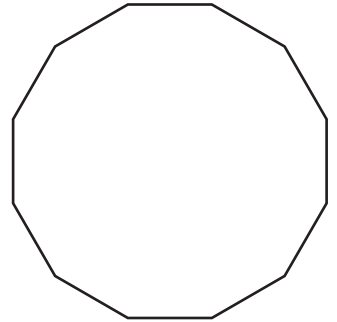
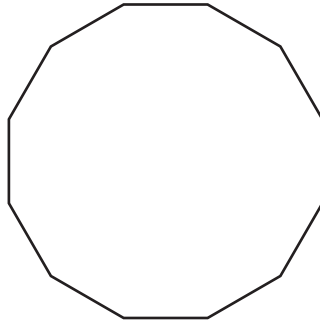
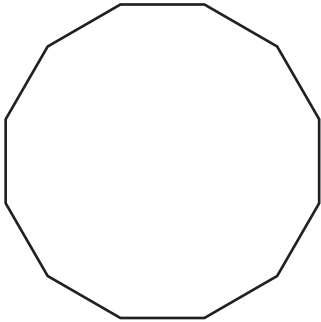
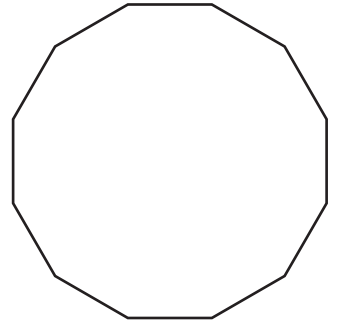
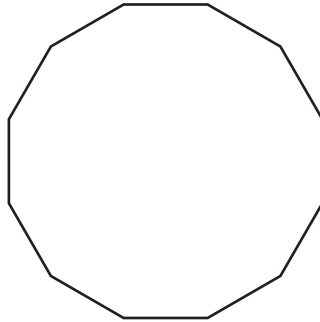
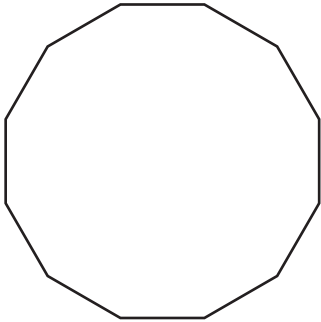
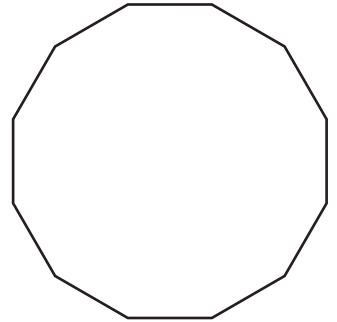
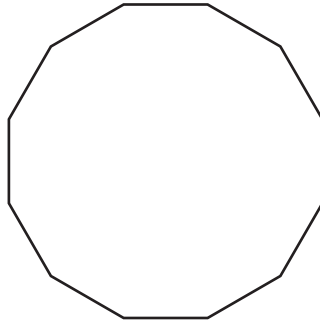
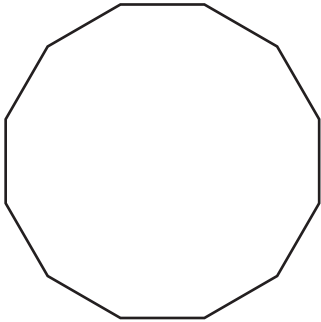
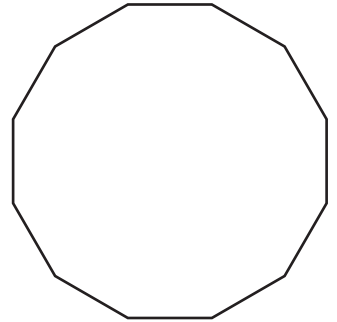
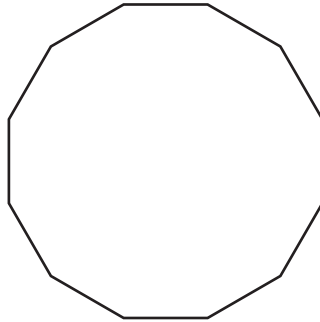
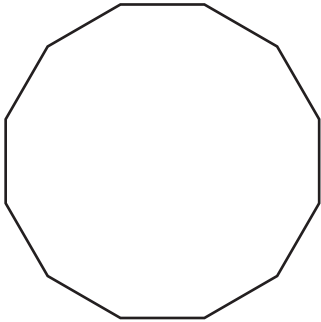
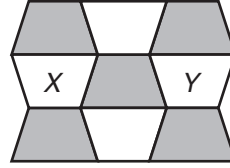
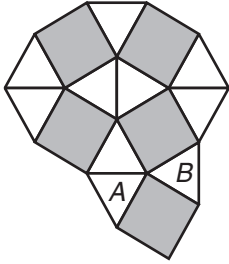


**LESSON**  
**10•1**

# Regular Dodecagon Templates



# Tessellation Exploration



1. What transformation would move Figure *A* onto Figure *B*?  
\_\_\_\_\_
2. What transformation would move Figure *X* onto Figure *Y*?  
\_\_\_\_\_
3. Pick one or more polygons from the Geometry Template that you know will tessellate. In the space provided below, draw a tessellation made up of the polygon(s).



4. Tell whether the tessellation you drew is regular or semiregular. Explain how you know.  
\_\_\_\_\_  
\_\_\_\_\_

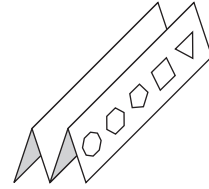
**Practice**

**5.**  $5.67 * 20.2$   
\_\_\_\_\_

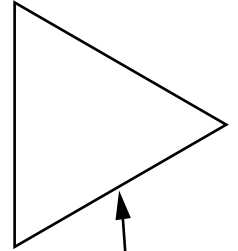
**6.**  $443.6 * 0.08$   
\_\_\_\_\_

**7.**  $6.76 * 0.005$   
\_\_\_\_\_

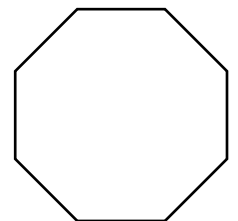
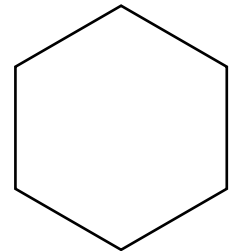
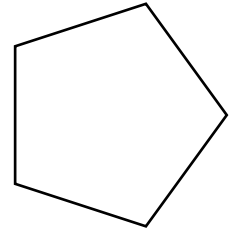
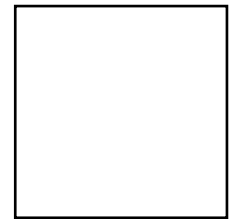
**8.**  $14.09 * 2.25$   
\_\_\_\_\_

**LESSON**  
**10•1****Regular Polygons**

Fold the page like this and then cut out four shapes at a time.



Cut on the lines.



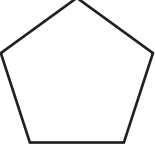
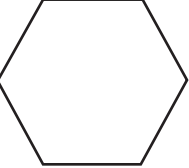
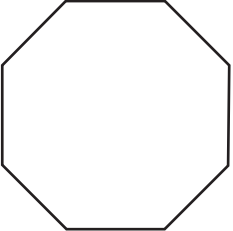


**LESSON**  
**10•1**

# Same-Tile Tessellations



Decide whether each polygon can be used to create a same-tile tessellation. Write the name of the polygon. Then record your answers in Column A. In Column B, use your Geometry Template to draw examples illustrating your answers in Column A.






Polygon	A. Tessellation? (Yes or No)	B. Draw an example.
 _____		
 _____		
 _____		
 _____		
 _____		

**LESSON**  
**10•1**

# Investigating Same-Tile Tessellations



1. After you complete *Math Masters*, page 332, fill in the table below. Use your results from Column D to complete Column E.

Regular Polygon	Number of Sides ( $n$ )	C. Sum of interior angle measures $180 * (n - 2)$	D. Measure of one angle	E. Factor of 360°? (from Column D)
<b>Example:</b> Equilateral triangle 	3	$180^\circ * (3 - 2) =$ $180^\circ * 1 = 180^\circ$	$\frac{180^\circ}{3} = 60^\circ$	Yes. 60° is a factor of 360°.
Square 				
Regular pentagon 				
Regular hexagon 				
Regular octagon 				

2. Compare your results from Column A of the table on *Math Masters*, page 332 to Column E of the table above. What can you conclude about the relationship between a regular polygon's interior angle measurements and its ability to tessellate?

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3. A regular dodecagon has 12 sides. Can you use a regular dodecagon to create a same-tile tessellation? Explain.

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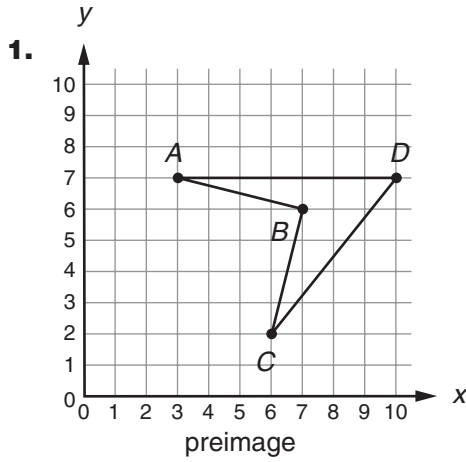
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**STUDY LINK**  
**10•2**

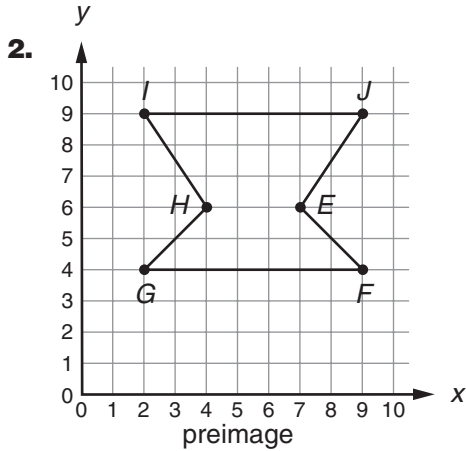
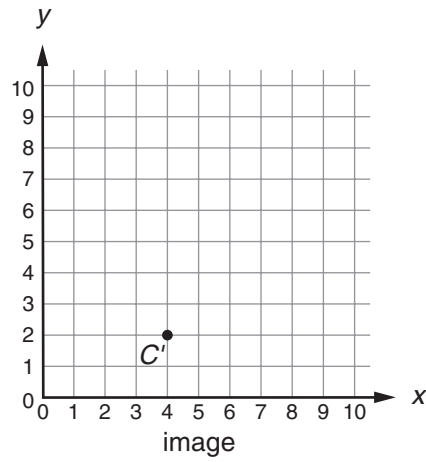
# Translations



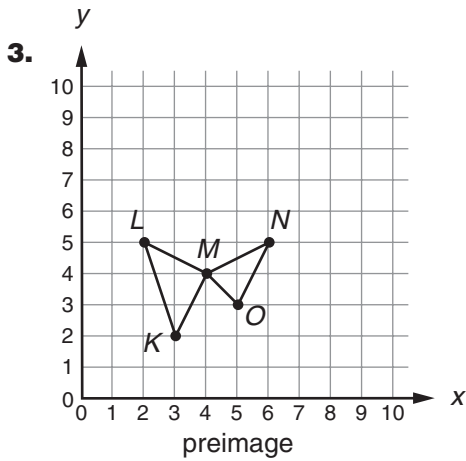
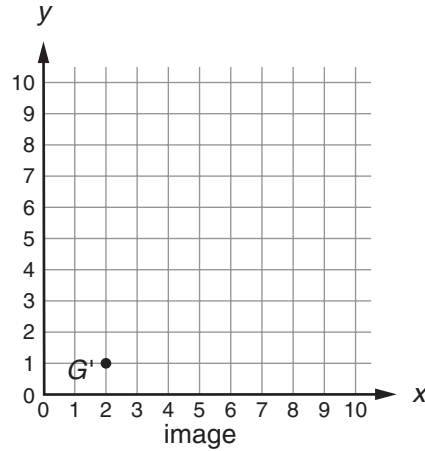
Plot and label the vertices of the image that would result from each translation.  
One vertex of each image has already been plotted and labeled.



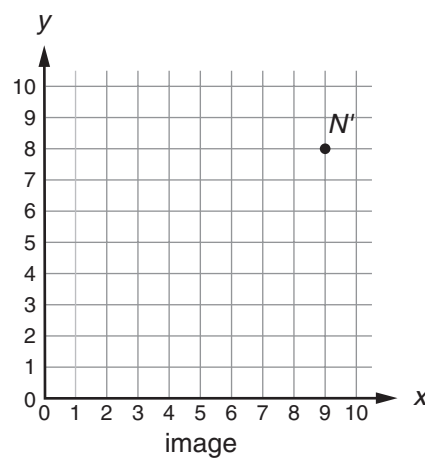
horizontal translation  
←



vertical translation  
↓



diagonal translation  
↗



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**Practice**

4.  $\frac{25.6}{32}$  \_\_\_\_\_

5.  $\frac{102.4}{64}$  \_\_\_\_\_

6.  $\frac{41.83}{4.7}$  \_\_\_\_\_

7.  $\frac{67.32}{13.2}$  \_\_\_\_\_

**LESSON**  
**10•2****An Angle Investigation**

Do all convex quadrangles tessellate? (A convex quadrangle is one in which all vertices are pushed outward.) To find out, do the following:

1. Draw a convex quadrangle on a piece of cardstock paper.
2. Measure the angles of your quadrangle. Write the measure of each angle on the angle.
3. Find the sum of the angles. Write the sum of the angles on your quadrangle.
4. Cut out your quadrangle and try to make a tessellation by tracing your quadrangle repeatedly. Draw your tessellation in the space provided below or on the back of this page.  
(*Hint:* Label your angles *A*, *B*, *C*, and *D* so you can be sure that all four angles meet at each vertex.)
5. Repeat Steps 1–4 for a different convex quadrangle. Try to tessellate your second quadrangle. Draw your tessellation on the back of this page.
6. Do both of your quadrangles tessellate? \_\_\_\_\_
7. Do you think that all convex quadrangles will tessellate? \_\_\_\_\_

Why or why not? \_\_\_\_\_

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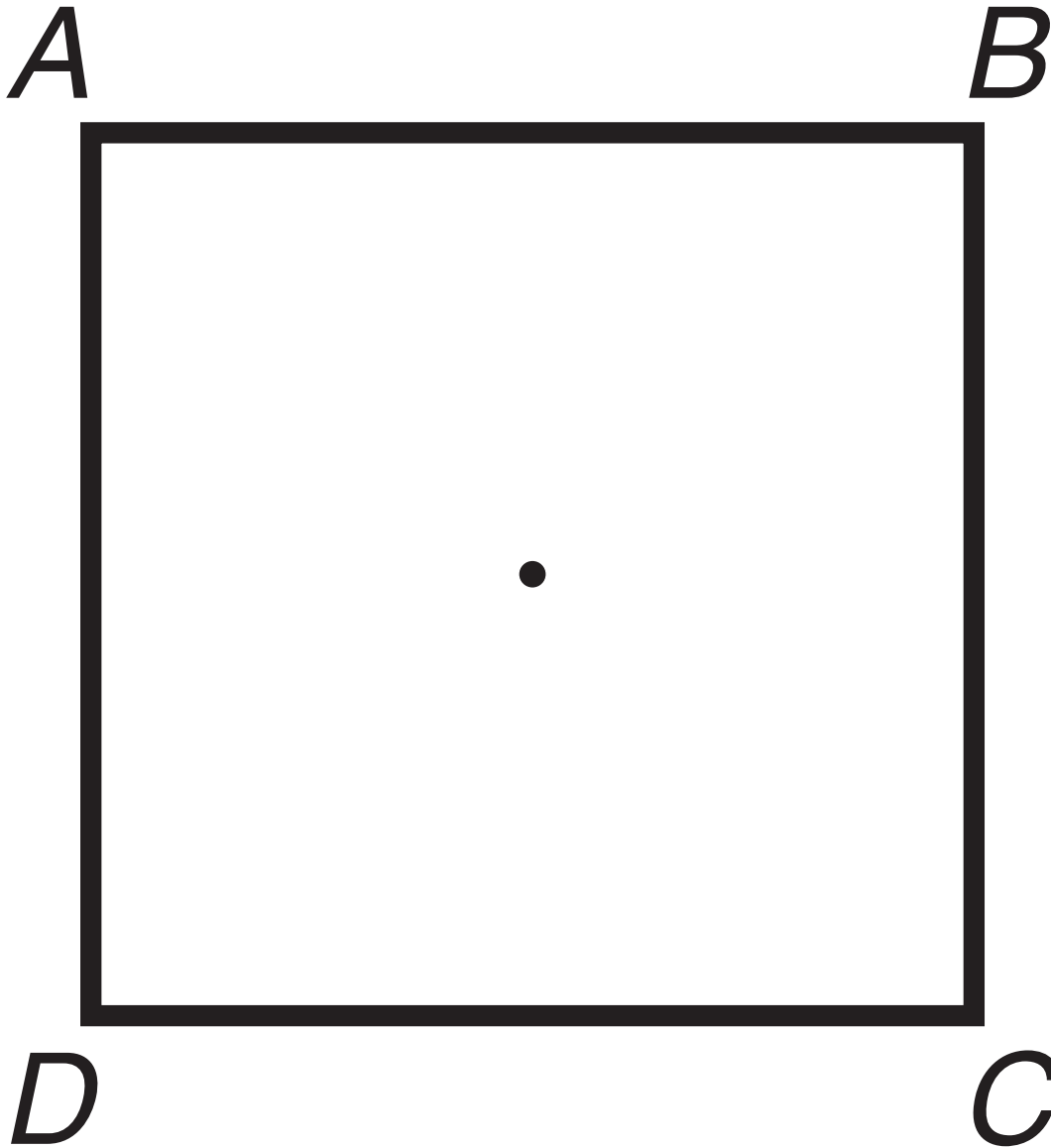
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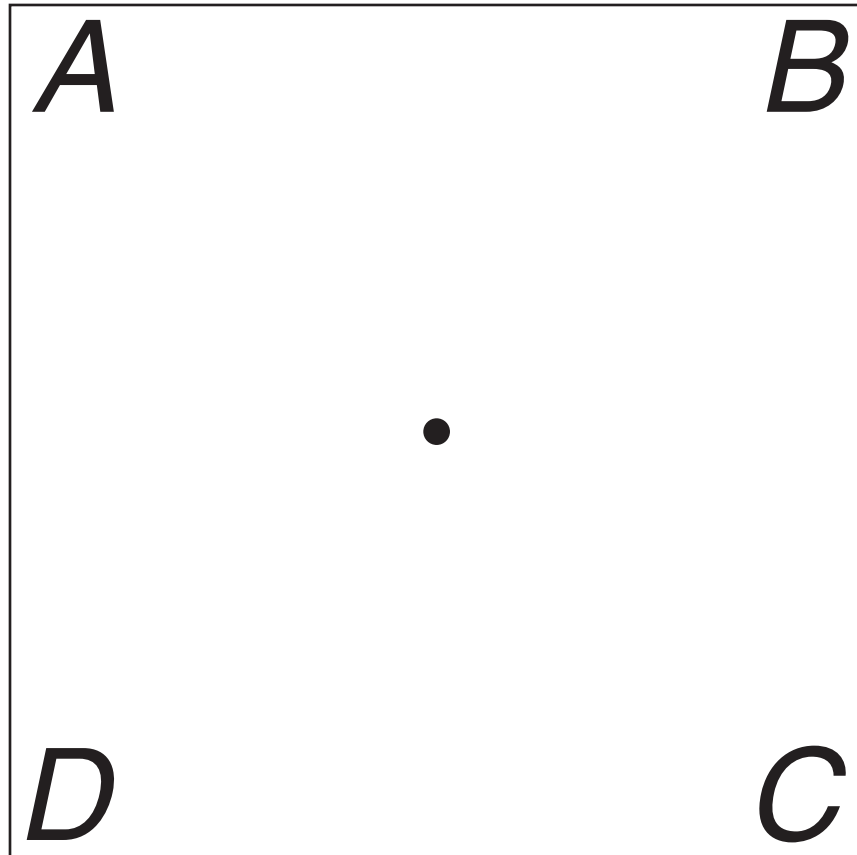
**LESSON**  
**10•3****Rotation Symmetry**

Use the square below to show the original position of Square  $ABCD$ .



**LESSON**  
**10•3****Rotation Symmetry** *continued*

Use the square below to demonstrate the rotation of Square *ABCD*.



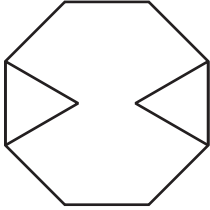
**STUDY LINK**  
**10•3**

# Rotation Symmetry



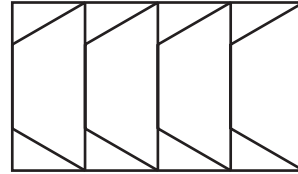
For each figure, draw the line(s) of reflection symmetry, if any.  
 Then determine the order of rotation symmetry for the figure.

1.



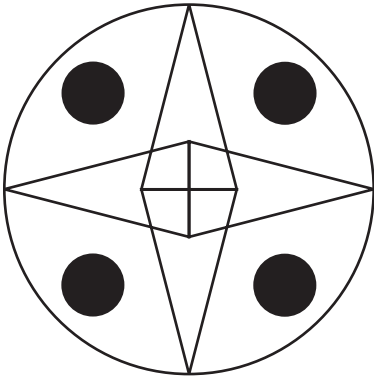
Order of rotation symmetry \_\_\_\_\_

2.



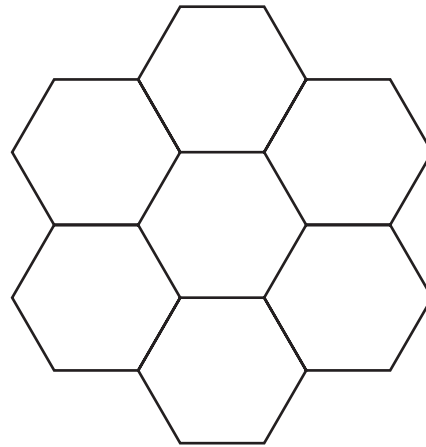
Order of rotation symmetry \_\_\_\_\_

3.



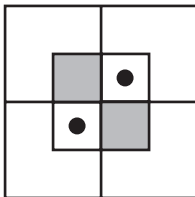
Order of rotation symmetry \_\_\_\_\_

4.



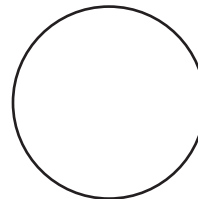
Order of rotation symmetry \_\_\_\_\_

5.



Order of rotation symmetry \_\_\_\_\_

6.



Order of rotation symmetry \_\_\_\_\_

**Practice**

Tell whether each number is divisible by 2, 3, 5, 6, 9, or 10.

7. 4,140 \_\_\_\_\_

8. 324 \_\_\_\_\_

**LESSON**  
**10•3**

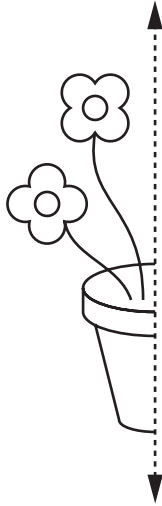
# Lines of Symmetry



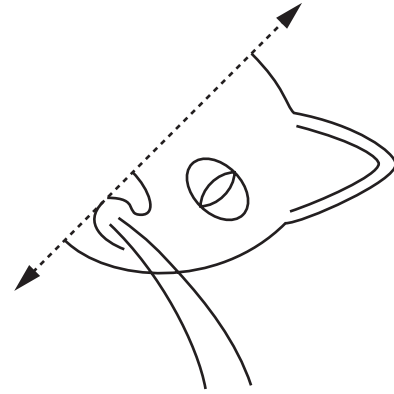
Use a transparent mirror to help you draw the missing half of each picture.



1.

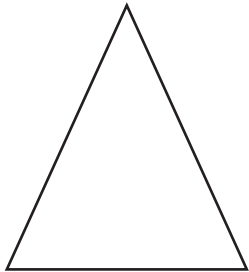


2.

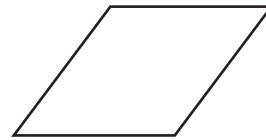


Use a transparent mirror to help you draw lines of symmetry for the following figures. Some figures have more than one line of symmetry; others may have none.

3.



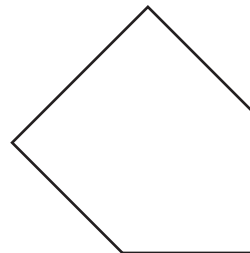
4.



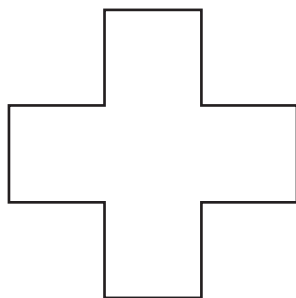
5.



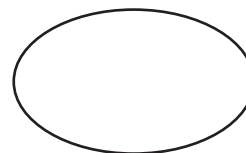
6.



7.



8.



**STUDY LINK**  
**10•4**

# A Topology Trick



Follow the procedure described below to tie a knot in a piece of string without letting go of the ends.

**Step 1** Place a piece of string in front of you on a table or a desk.



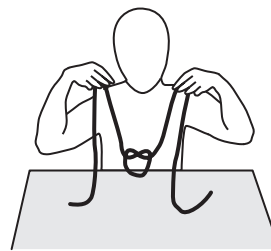
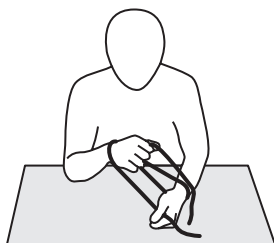
**Step 2** Fold your arms across your chest.



**Step 3** With your arms still folded, grab the left end of the string with your right hand and the right end of the string with your left hand.



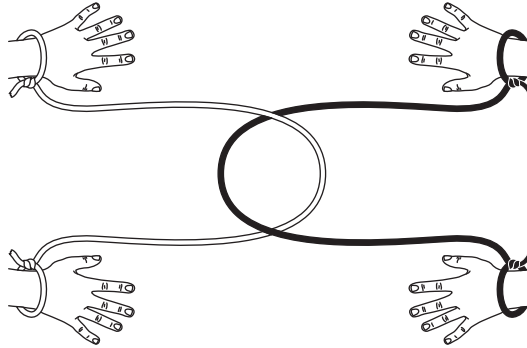
**Step 4** Hold the ends of the string and unfold your arms. The string should now have a knot in it.



This trick works because of a principle in topology called **transference of curves**. Your arms had a knot in them before you picked up the string. When you unfolded your arms, you transferred the knot from your arms to the string.

**LESSON**  
**10•4****Rope Puzzle**

1. Using a 4-foot length of rope, make a set of handcuffs by tying a loop at each end. Leave enough rope in the middle so you can step over the rope if you want or need to.
2. Before you and a partner each put on your set of handcuffs, loop them around each other so they are tied together as shown in the diagram below.



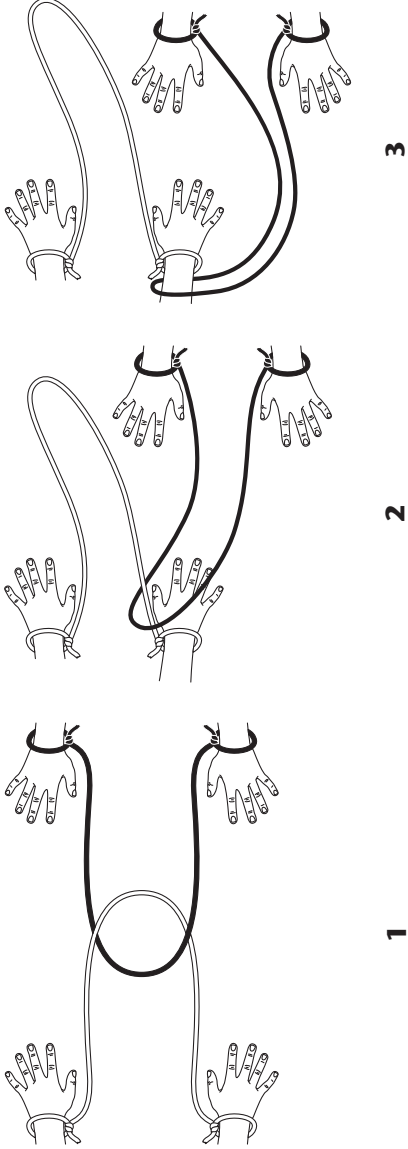
3. Stand within arms' reach of your partner. Without moving your feet, work to separate the two linked ropes while following these rules:
  - ◆ Do not remove your hands from the loops.
  - ◆ Do not cut or damage the rope in any way.
4. Be prepared to demonstrate the strategies and steps you used to separate the ropes.

**LESSON**  
**10•4**

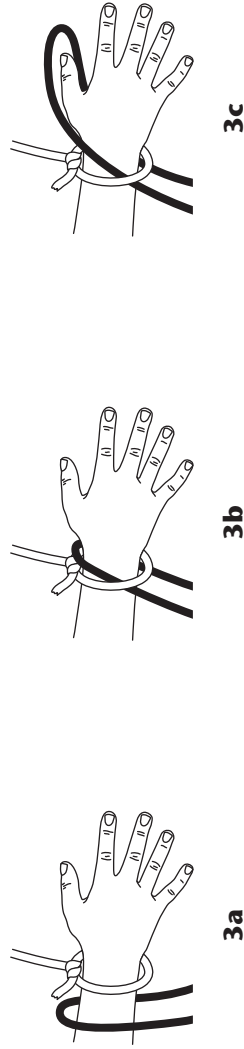
# Rope Puzzle Solution


**Steps 1–3**

Start by moving your partner's rope along yours until it is lying on your arm. Make sure your partner's rope is not wrapped around your rope; it should only be touching your arm.


**Steps 3a–3c**

Reach in through your handcuff with a thumb and finger, and grab your partner's rope.


**Steps 3d–3e**

Pull your partner's rope through your handcuff and over your hand so it is on the other side of your arm. Let your partner's rope go back through your handcuff. You should now be separated.



**LESSON**  
**10•4****Topology Puzzles****Puzzle #1**

Get a pencil and a piece of string.  
The string should be about  $1\frac{1}{2}$  times  
the length of the pencil. You will also  
need a shirt or a jacket with a buttonhole.

Tie the two ends of the string together  
at the top of the pencil so the string  
forms a loop, as shown in Figure 1.

Figure out how to attach the pencil  
to the buttonhole, as shown in Figure 2.



Figure 1

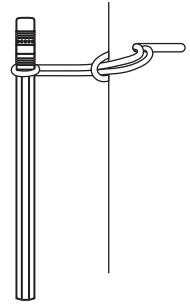


Figure 2

**Puzzle #2**

Get a pair of scissors, a piece of string,  
and a large button. The button must be  
larger than the finger holes in the scissors.

Tie the ends of the string to the holes  
in the button to form a large loop of string.

Figure out how to attach the button to  
the scissors, as shown in Figure 3.

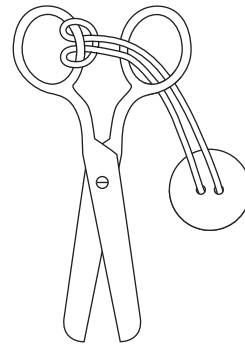


Figure 3

Explain how these puzzles involve topology.

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**STUDY LINK**  
**10•5**

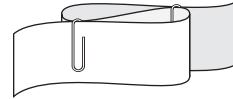
# Another Topology Trick



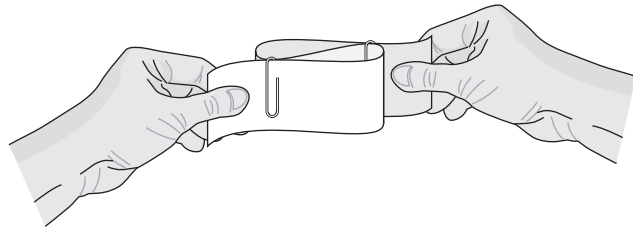
Follow the procedure described below to perform another topology trick that works because of transference of curves.

**Step 1** Gather the following materials: 2 to 8 large paper clips, a strip of paper  $1\frac{1}{2}$  by 11 inches, and a rubber band.

**Step 2** Curve the strip of paper into an S-shape. Attach two paper clips as shown at the right.



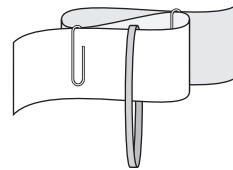
**Step 3** Straighten the paper by holding the ends and pulling sharply.



1. Describe your results.

---

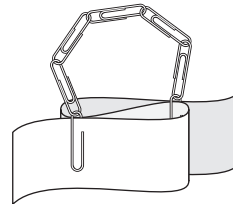
2. Add a rubber band as shown. Straighten the paper.



Describe your results.

---

3. Try including a chain of paper clips as shown.



Describe your results.

---

## Practice

Find the LCM of each pair of numbers by dividing the product of the numbers by their GCF.

4. 15 and 20

5. 10 and 50

6. 21 and 63

7. 17 and 29

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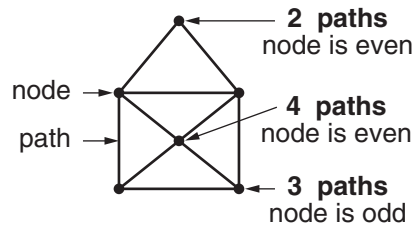
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**LESSON**  
**10•5**

# Networks



A network is a set of points, called nodes, which are connected by segments, or paths.



A node is odd if the number of paths leaving the node is odd. A node is even if the number of paths leaving the node is even.

A network is *traceable* if you can draw it without lifting your pencil or pen and without going over the same path twice.

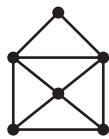


Figure A



Figure B

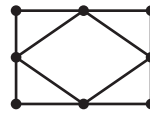


Figure C



Figure D

1. Count the number of odd and even nodes in Figures A–D. Complete the table below.

Figure	Number of Odd Nodes	Number of Even Nodes	Is the Network Traceable? (Yes or No)
A			
B			
C			
D			

2. Use your table to complete the following two-part statement.

A network is traceable if there are:

- only 2 \_\_\_\_\_ nodes, or
- all \_\_\_\_\_ nodes.

3. Test the statements in Problem 2 by creating traceable and untraceable networks on a separate sheet of paper.



## Congratulations!

By completing *Sixth Grade Everyday Mathematics*, your child has accomplished a great deal. Thank you for your support.

This Family Letter is intended as a resource for you to use throughout your child's vacation. It includes an extended list of Do-Anytime Activities, directions for games that you can play at home, a list of mathematics-related books to get from your library, and a preview of what your child might be learning in seventh grade.

## Do-Anytime Activities

Mathematics means more when it is rooted in real-world situations. To help your child review many of the concepts learned in sixth grade, we suggest the following activities for you to do with your child over vacation. These activities will help your child build on the skills that he or she has learned this year and are good preparation for a seventh-grade mathematics course.

1. Practice quick recall of multiplication facts. Include extended facts, such as  $70 * 8 = 560$  and  $70 * 80 = 5,600$ .
2. Practice calculating mentally with percents. Use a variety of contexts, such as sales tax, discounts, and sports performances.
3. Use measuring devices—rulers, metersticks, yardsticks, tape measures, thermometers, scales, and so on. Measure in both U.S. customary and metric units.
4. Estimate the answers to calculations, such as the bill at a restaurant or store, the distance to a particular place, the number of people at an event, and so on.
5. Play games like those in the *Student Reference Book*.
6. If you are planning to paint or carpet a room, consider having your child measure and calculate the area. Have him or her write the formula for area ( $A = l * w$ ) and then show you the calculations. If the room is an irregular shape, divide it into separate rectangular regions and have your child find the area of each one.
7. Ask your child to halve, double, or triple the amount of ingredients needed in a particular recipe. Have your child explain how they calculated each amount.
8. Help your child distinguish between part-to-part and part-to-whole ratios in relation to the wins and losses of a favorite sports team. Ask him or her to decide which ratio is being used. For example, wins to losses (such as 5 to 15) or losses to wins (15 to 5) are part-to-part ratios. Part-to-whole ratios are used to compare wins to all games played (5 out of 20) or losses to all games played (15 out of 20).
9. Provide extra practice with the partial-quotients division algorithm by having him or her divide 3-digit numbers by 2-digit numbers, 4-digit numbers by 3-digit numbers, and so on. Ask your child to explain the steps of the algorithm to you as she or he works through them.

## Building Skills through Games

The following section lists directions for games that can be played at home. Regular playing cards can be substituted for the number cards used in some games. Other cards can be made from 3" by 5" index cards.

**Name That Number** See *Student Reference Book* page 329.

This game provides practice in using order of operations to write number sentences. Two or three players need a complete deck of number cards.

**Fraction Action, Fraction Friction** See *Student Reference Book* page 317.

Two or three players gather fraction cards that have a sum as close as possible to 2, without going over. Students can make a set of 16 cards by copying fractions onto index cards.

### **Name That Number**

**Materials**     4 each of number cards 0–10 and  
                   1 each of number cards 11–20

**Players**        2 or 3

**Skill**            Naming numbers with expressions

**Object of the game** To collect the most cards

### **Directions**

1. Shuffle the deck and deal five cards to each player. Place the remaining cards number-side down on the table between the players. Turn over the top card and place it beside the deck. This is the **target number** for the round.
2. Players try to match the target number by adding, subtracting, multiplying, or dividing the numbers on as many of their cards as possible. A card may only be used once.
3. Players write their solutions on a sheet of paper. When players have written their best solutions:
  - ◆ Each player sets aside the cards they used to match the target number.
  - ◆ Each player replaces the cards they set aside by drawing new cards from the top of the deck.
  - ◆ The old target number is placed on the bottom of the deck.
  - ◆ A new target number is turned over, and another round is played.
4. Play continues until there are not enough cards left to replace all the players' cards. The player who has set aside the most cards wins the game.

**Fraction Action, Fraction Friction**

- Materials**
- One set of 16 *Fraction Action, Fraction Friction* cards.  
The card set includes a card for each of the following fractions (for several fractions there are 2 cards):  
 $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{3}{4}, \frac{1}{6}, \frac{1}{6}, \frac{5}{6}, \frac{1}{12}, \frac{1}{12}, \frac{5}{12}, \frac{5}{12}, \frac{7}{12}, \frac{7}{12}, \frac{11}{12}, \frac{11}{12}$ .
  - One or more calculators

**Players** 2 or 3

**Skill** Estimating sums of fractions

**Object of the game** To collect a set of fraction cards with a sum as close as possible to 2 without going over 2.

**Directions**

1. Shuffle the deck. Place the pile facedown between the players.

2. Players take turns.

- ◆ On each player's first turn, he or she takes a card from the top of the pile and places it number-side up on the table.
- ◆ On each of the player's following turns, he or she announces one of the following:

**Action** This means the player wants an additional card. The player believes that the sum of the fraction cards he or she already has is *not* close enough to 2 to win the hand. The player thinks that another card will bring the sum of the fractions closer to 2, without going over 2.

**Friction** This means the player does not want an additional card. The player believes that the sum of the fraction cards he or she already has is close enough to 2 to win the hand. The player thinks that there is a good chance that taking another card will make the sum of the fractions greater than 2.

**Once a player says *Friction*, he or she cannot say *Action* on any turn after that.**

- 3. Play continues until all players have announced *Friction* or have a set of cards whose sum is greater than 2. The player whose sum is closest to 2 without going over 2 is the winner of that round. Players may check each other's sums on their calculators.
- 4. Reshuffle the cards and begin again. The winner of the game is the first player to win five rounds.

## Vacation Reading with a Mathematical Twist

Books can contribute to learning by presenting mathematics in a combination of real-world and imaginary contexts. Teachers who use *Everyday Mathematics* in their classrooms recommend the titles listed below. Look for these titles at your local library or bookstore.

For problem-solving practice:

*Math for Smarty Pants* by Marilyn Burns, Little, Brown and Company, 1982.

*Brain Busters! Mind-Stretching Puzzles in Math and Logic* by Barry R. Clarke, Dover Publications, 2003.

*Wacky Word Problems: Games and Activities That Make Math Easy and Fun* by Lynette Long, John Wiley & Sons, Inc., 2005.

*My Best Mathematical and Logic Puzzles* by Martin Gardner, Dover Publications, 1994.

*Math Logic Puzzles* by Kurt Smith, Sterling Publishing Co., Inc., 1996.

For skill maintenance:

*Delightful Decimals and Perfect Percents: Games and Activities That Make Math Easy and Fun* by Lynette Long, John Wiley & Sons, Inc., 2003.

*Dazzling Division: Games and Activities That Make Math Easy and Fun* by Lynette Long, John Wiley & Sons, Inc., 2000.

For fun and recreation:

*Mathamusements* by Raymond Blum, Sterling Publishing Co., Inc., 1997.

*Mathemagic* by Raymond Blum, Sterling Publishing Co., Inc., 1992.

*Kids' Book of Secret Codes, Signals, and Ciphers* by E. A. Grant, Running Press, 1989.

*The Seasons Sewn: A Year in Patchwork* by Ann Whitford Paul, Browndeer Press, 1996.

## Looking Ahead: Seventh Grade

Next year, your child will:

- ◆ increase skills with percents, decimals, and fractions.
- ◆ compute with fractions, decimals, and positive and negative numbers.
- ◆ continue to write algebraic expressions for simple situations.
- ◆ solve equations.
- ◆ use formulas to solve problems.

**Thank you for your support this year. Have fun continuing your child's mathematical experiences throughout the summer!**

**Best wishes for an enjoyable vacation.**