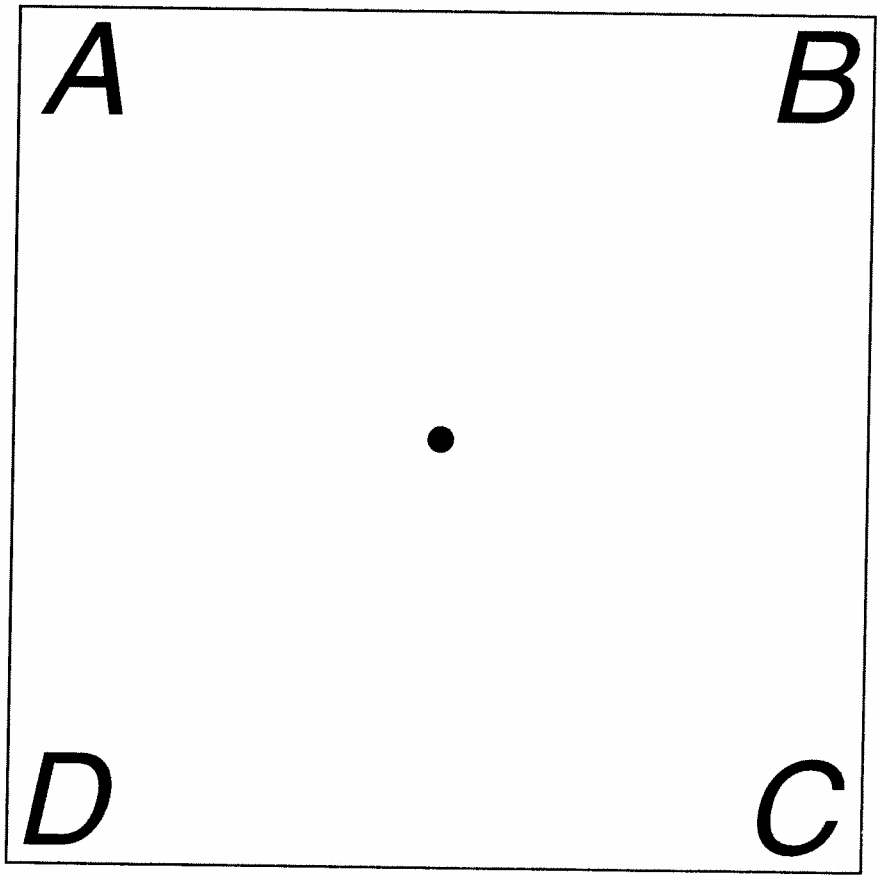
LESSON 10•3

Rotation Symmetry *continued*

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



Name Date Time

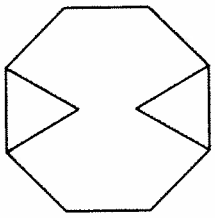
STUDY LINK 10•3

Rotation Symmetry

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

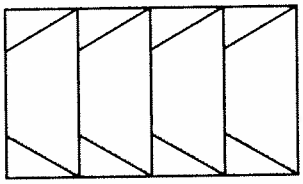
SRB 182 183

1.



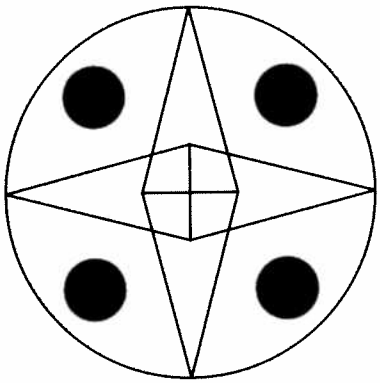
Order of rotation symmetry _____

2.



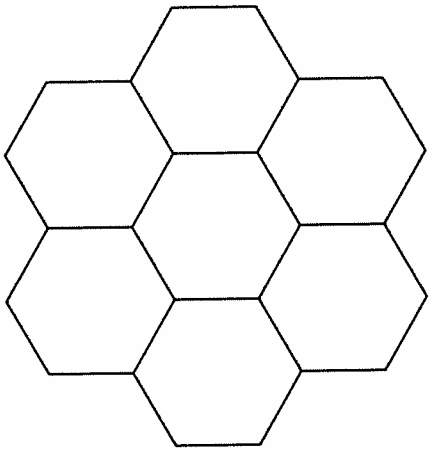
Order of rotation symmetry _____

3.



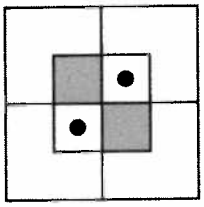
Order of rotation symmetry _____

4.



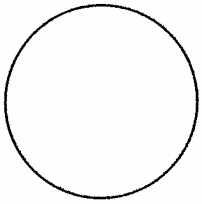
Order of rotation symmetry _____

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 _____

Name Date Time

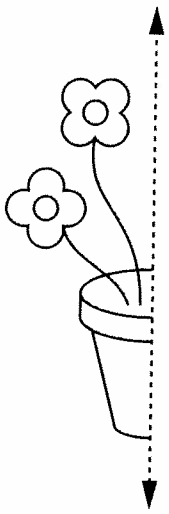
LESSON 10•3

Lines of Symmetry

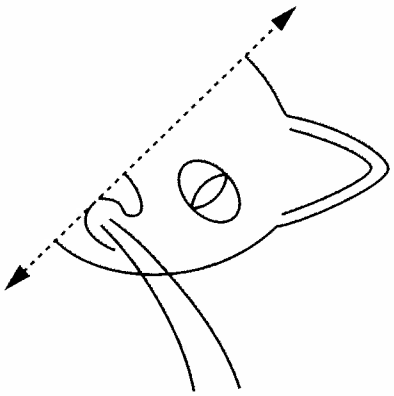
Use a transparent mirror to help you draw the missing half of each picture.

SRB 182

1.

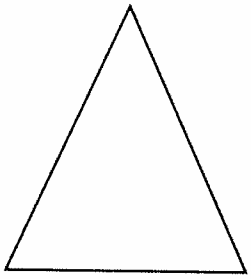


2.

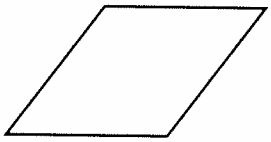


Use a transparent mirror to help you draw lines of symmetry for the following figures. Some figures have more than one line of symmetry; others may have none.

3.

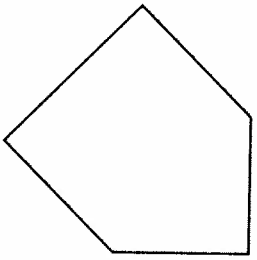


4.

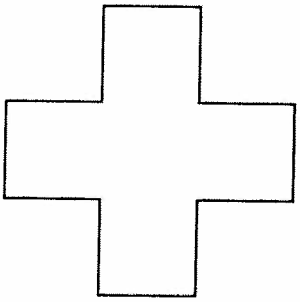


5.

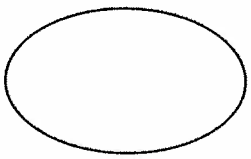
6.



7.



8.



Name Date Time

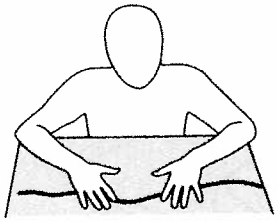
STUDY LINK 10•4

A Topology Trick

SRB 184 185

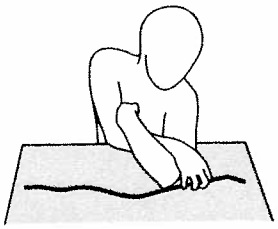
Follow the procedure described below to tie a knot in a piece of string without letting go of the ends.

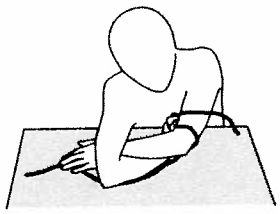
Step 1 Place a piece of string in front of you on a table or a desk.



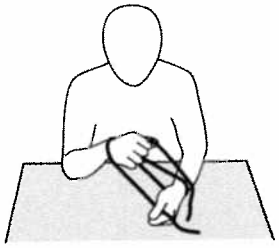
Step 2 Fold your arms across your chest.

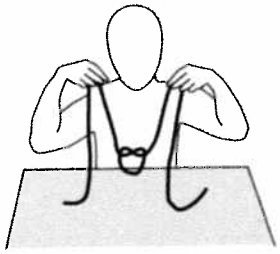
Step 3 With your arms still folded, grab the left end of the string with your right hand and the right end of the string with your left hand.





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.

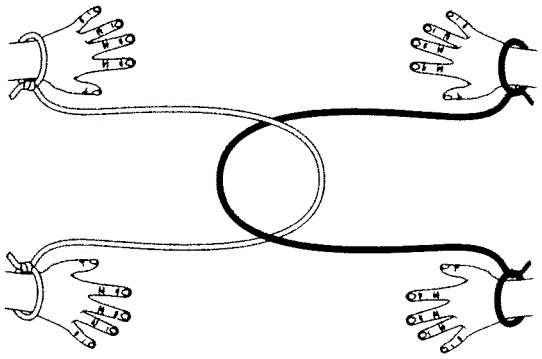
Name Date Time

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.

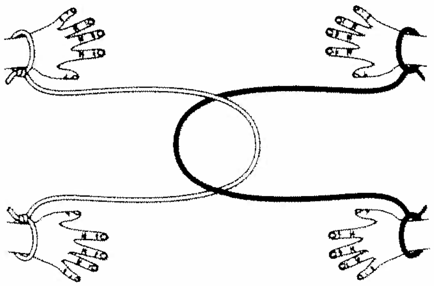
Name Date Time

LESSON 10•4

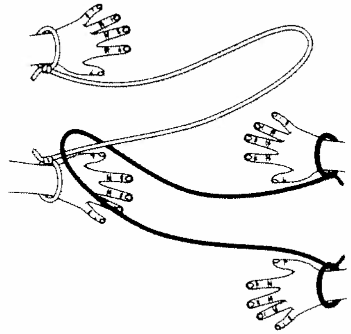
Rope Puzzle Solution

Steps 1–3

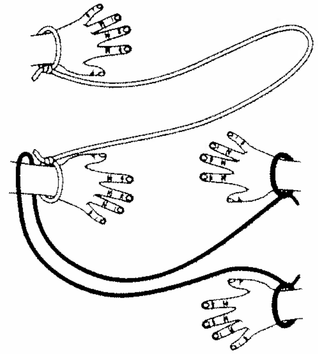
Start by moving your partner's rope along yours until it is lying on your arm. Make sure your partner's rope is not wrapped around your rope; it should only be touching your arm.



1



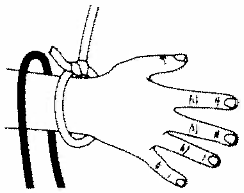
2



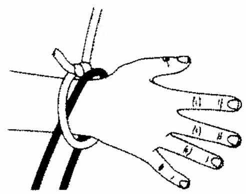
3

Steps 3a–3c

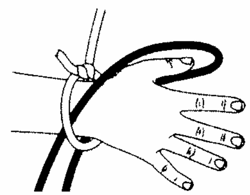
Reach in through your handcuff with a thumb and finger, and grab your partner's rope.



3a



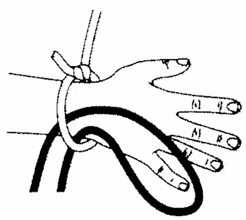
3b



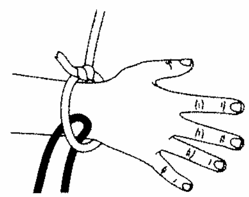
3c

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.



3d



3e

Name Date Time

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

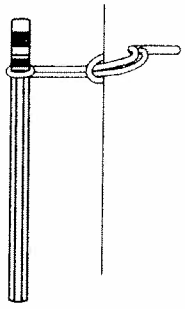


Figure 2

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.

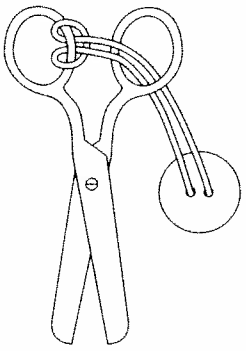


Figure 3

Explain how these puzzles involve topology.

Name Date Time

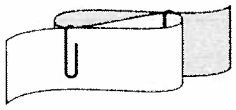
STUDY LINK 10•5

Another Topology Trick

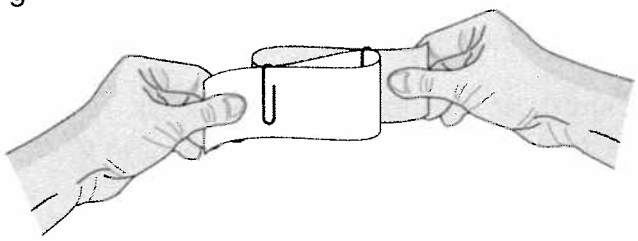
Follow the procedure described below to perform another topology trick that works because of transference of curves.

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.



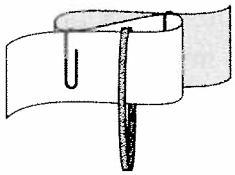
Step 3 Straighten the paper by holding the ends and pulling sharply.



1. Describe your results.

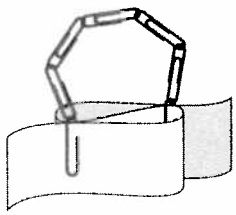
2. Add a rubber band as shown. Straighten the paper.

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 _____

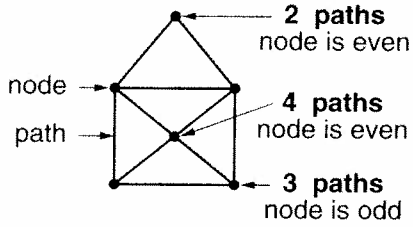
7. 17 and 29 _____

Name Date Time

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.

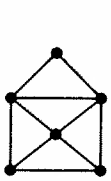


Figure A

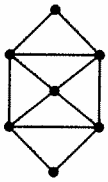


Figure B

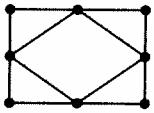


Figure C

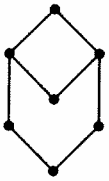


Figure D

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:

a. only 2 _____ nodes, or

b. all _____ nodes.

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

Name Date Time

STUDY LINK 10•6

Family Letter

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.