Geometry 1-2 Reasoning & Angle Relationships	**UNIT 2**	Name:________________________ Teacher: ______________ Per:____

My academic goal for this unit is...

Check for Understanding Key:

- ● Understanding at start of the unit
- | Understanding after practice
- ▲ Understanding before unit test

	LEARNING TARGETS	How is my understanding?	Test Score	Retake?
2a	I can demonstrate inductive and deductive reasoning.	1 2 3 4		
2b	I can apply mathematical modeling to determine the *n*th term in a sequence.	1 2 3 4		
2c	I can identify angle relationships when two angles have a common vertex.	1 2 3 4		
2d	I can identify angle relationships when two parallel lines are cut by a transversal.	1 2 3 4		
2e	I can prove angle relationships using deductive reasoning.	1 2 3 4		

Define the following terms:

Induce:

Deduce:

List the first **10** square numbers:

List the first **10** prime numbers:

1 **Just starting**, Insufficient	2 **Yes, but...**, Minimal	3 **Yes**, Proficient	4 **WOW**, Excellent
I can't do it and am not able to explain process or key points	I can sort of do it and am able to show process, but not able to identify/explain key math points	I can do it and able to both explain process and identify/explain math points	I'm great at doing it and am able to explain key math points accurately in a variety of problems

Unit 2 Definitions

Term	***Definition***	***Diagram***
Inductive Reasoning		
Deductive Reasoning		
Transversal		
Corresponding Angles		
Alternate Interior Angles		
Alternate Exterior Angles		
Same Sided Interior Angles		
Same Sided Exterior Angles		

Unit 2 Conjectures

Title	*Conjecture*	*Diagram*
Linear Pair Conjecture	If two angles form a linear pair, then….	
Vertical Angles Conjecture	If two angles are vertical angles, then…	
Corresponding Angles Conjecture	If two parallel lines are cut by a transversal, then corresponding angles are ____________________.	
Alternate Interior Angles Conjecture	If two parallel lines are cut by a transversal, then alternate interior angles are ____________________.	
Alternate Exterior Angles Conjecture	If two parallel lines are cut by a transversal, then alternate exterior angles are ____________________.	
Parallel Lines Conjecture	If two parallel lines are cut by a transversal, then corresponding angles are ____________________, alternate interior angles are ____________________, and alternate exterior angles are ________________.	
Converse of the Parallel Lines Conjecture	If two lines are cut by a transversal to form pairs of congruent corresponding angles, congruent alternate interior angles, or congruent alternate exterior angles, then the lines are ________________.	

Notes

Notes

Notes

Lesson 2.1 • Inductive Reasoning

Name ________________________ **Period** __________ **Date** ____________

For Exercises 1–7, use inductive reasoning to find the next two terms in each sequence.

1. 4, 8, 12, 16, _____, _____

2. 400, 200, 100, 50, 25, _____, _____

3. $\frac{1}{8}, \frac{2}{7}, \frac{1}{2}, \frac{4}{5},$ _____, _____

4. $-5, 3, -2, 1, -1, 0,$ _____, _____

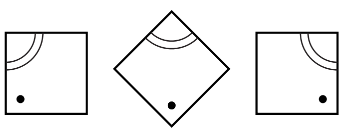
5. 360, 180, 120, 90, _____, _____

6. 1, 3, 9, 27, 81, _____, _____

7. 1, 5, 14, 30, 55, _____, _____

For Exercises 8–10, use inductive reasoning to draw the next two shapes in each picture pattern.

8.



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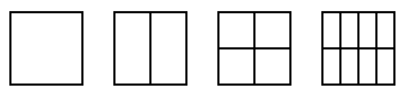

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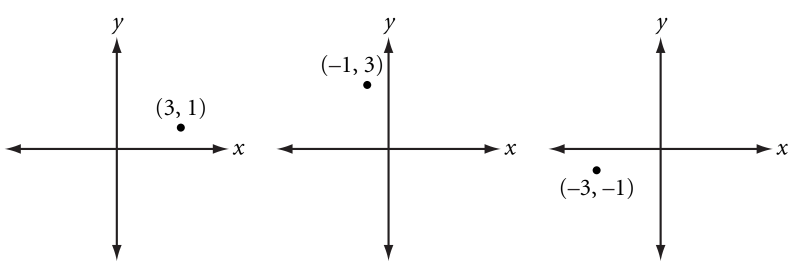


For Exercises 11–13, use inductive reasoning to test each conjecture. Decide if the conjecture seems true or false. If it seems false, give a counterexample.

11. The square of a number is larger than the number.

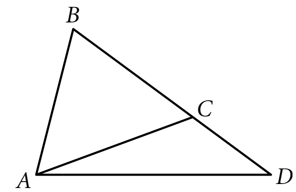
12. Every multiple of 11 is a "palindrome," that is, a number that reads the same forward and backward.

13. The difference of two consecutive square numbers is an odd number.

Lesson 2.4 • Deductive Reasoning

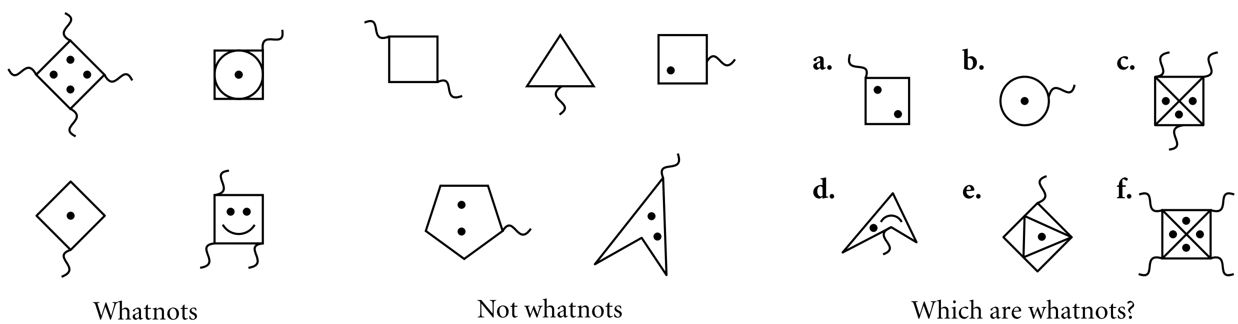
Name ____ **Period** _____________ **Date** __________________

1. $\triangle ABC$ is equilateral. Is $\triangle ABD$ equilateral? Explain your answer. What type of reasoning, inductive or deductive, do you use when solving this problem?



2. $\angle A$ and $\angle D$ are complementary. $\angle A$ and $\angle E$ are supplementary. What can you conclude about $\angle D$ and $\angle E$? Explain your answer. What type of reasoning, inductive or deductive, do you use when solving this problem?

3. Which figures in the last group are whatnots? What type of reasoning, inductive or deductive, do you use when solving this problem?



4. Solve each equation for x. Give a reason for each step in the process. What type of reasoning, inductive or deductive, do you use when solving these problems?

a. $4x + 3(2 - x) = 8 - 2x$ **b.** $\dfrac{19 - 2(3x - 1)}{5} = x + 2$

5. A sequence begins $-4, 1, 6, 11 \ldots$

a. Give the next two terms in the sequence. What type of reasoning, inductive or deductive, do you use when solving this problem?

b. Find a rule that generates the sequence. Then give the 50th term in the sequence. What type of reasoning, inductive or deductive, do you use when solving this problem?

Lesson 2.2 • Finding the *n*th Term

Name ______________________ Period __________ Date ______________

For Exercises 1–4, tell whether the rule is a linear function.

1.

n	1	2	3	4	5
$f(n)$	8	15	22	29	36

2.

n	1	2	3	4	5
$g(n)$	14	11	8	5	2

3.

n	1	2	3	4	5
$h(n)$	-9	-6	-2	3	9

4.

n	1	2	3	4	5
$j(n)$	$-\frac{3}{2}$	-1	$-\frac{1}{2}$	0	$\frac{1}{2}$

For Exercises 5 and 6, complete each table.

5.

n	1	2	3	4	5
$f(n) = 7n - 12$					

6.

n	1	2	3	4	5
$g(n) = -8n - 2$					

For Exercises 7–9, find the function rule for each sequence. Then find the 50th term in the sequence.

7.

n	1	2	3	4	5	6	. . .	n	. . .	50
$f(n)$	9	13	17	21	25	29	. . .		. . .	

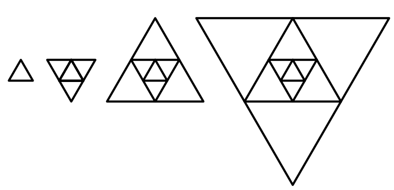
8.

n	1	2	3	4	5	6	. . .	n	. . .	50
$g(n)$	6	1	-4	-9	-14	-19	. . .		. . .	

9.

n	1	2	3	4	5	6	. . .	n	. . .	50
$h(n)$	6.5	7	7.5	8	8.5	9	. . .		. . .	

10. Use the figures to complete the table.



n	1	2	3	4	5	. . .	n	. . .	50
Number of triangles	1	5	9			. . .		. . .	

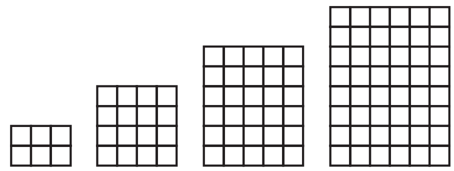
11. Use the figures above to complete the table. Assume that the area of the first figure is 1 square unit.

n	1	2	3	4	5	. . .	n	. . .	50
Area of figure	1	4	16			. . .		. . .	

Lesson 2.3 • Mathematical Modeling

Name ____ **Period** ____________ **Date** ________________

1. Draw the next figure in this pattern.

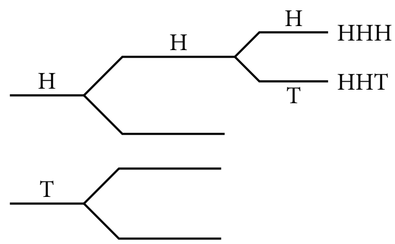


a. How many small squares will there be in the 10th figure?

b. How many in the 25th figure?

c. What is the general function rule for this pattern?

2. If you toss a coin, you will get a head or a tail. Copy and complete the geometric model to show all possible results of three consecutive tosses.



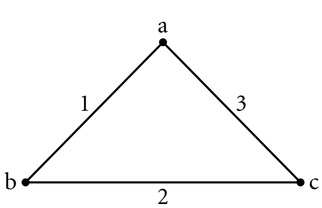
a. How many sequences of results are possible?

b. How many sequences have exactly one tail?

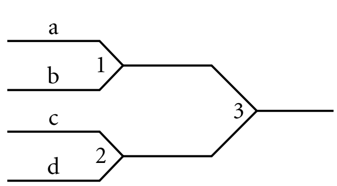
c. Assuming a head or a tail is equally likely, what is the probability of getting exactly one tail in three tosses?

3. If there are 12 people sitting at a round table, how many different pairs of people can have conversations during dinner, assuming they can all talk to each other? What geometric figure can you use to model this situation?

4. Tournament games and results are often displayed using a geometric model. Two examples are shown below. Sketch a geometric model for a tournament involving 5 teams and a tournament involving 6 teams. Each team must have the same chance to win. Try to have as few games as possible in each tournament. Show the total number of games in each tournament. Name the teams a, b, c . . . and number the games 1, 2, 3 . . . .



3 teams, 3 games
(round robin)



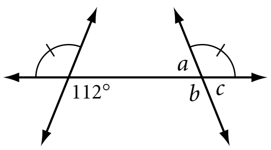
4 teams, 3 games
(single elimination)

Lesson 2.5 • Angle Relationships

Name ______________________________ **Period** __________ **Date** ____________

For Exercises 1–6, find each lettered angle measure without using a protractor.

1.



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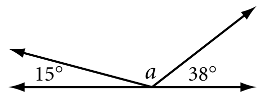

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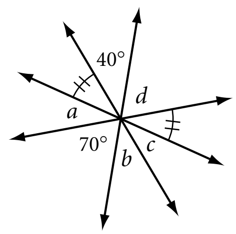

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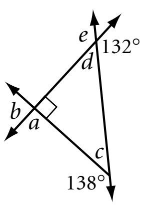

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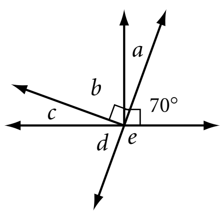

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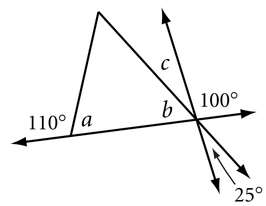


For Exercises 7–10, tell whether each statement is always (A), sometimes (S), or never (N) true.

7. ______ The sum of the measures of two acute angles equals the measure of an obtuse angle.

8. ______ If $\angle XAY$ and $\angle PAQ$ are vertical angles, then either X, A, and P or X, A, and Q are collinear.

9. ______ If two angles form a linear pair, then they are complementary.

10. ______ If a statement is true, then its converse is true.

For Exercises 11–15, fill in each blank to make a true statement.

11. If one angle of a linear pair is obtuse, then the other is ____________.

12. If $\angle A \cong \angle B$ and the supplement of $\angle B$ has measure 22°, then $m\angle A =$ ________________.

13. If $\angle P$ is a right angle and $\angle P$ and $\angle Q$ form a linear pair, then $m\angle Q$ is ________________.

14. If $\angle S$ and $\angle T$ are complementary and $\angle T$ and $\angle U$ are supplementary, then $\angle U$ is a(n) ________________ angle.

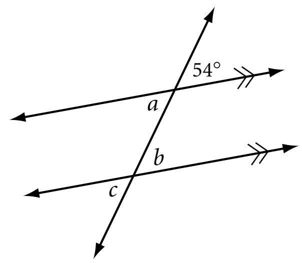
15. Switching the "if" and "then" parts of a statement changes the statement to its ________________.

Lesson 2.6 • Special Angles on Parallel Lines

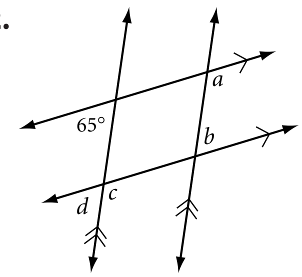
Name ______________________________ **Period** __________ **Date** ______________

For Exercises 1–3, use your conjectures to find each angle measure.

1.



2.



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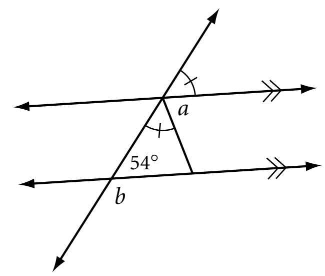
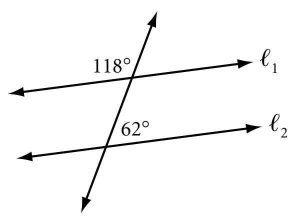


For Exercises 4–6, use your conjectures to determine whether $\ell_1 \parallel \ell_2$, and explain why. If not enough information is given, write "cannot be determined."

4.



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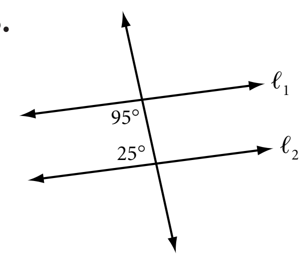

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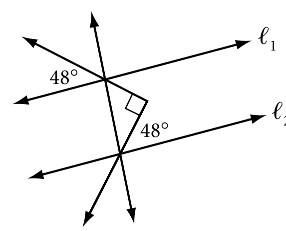
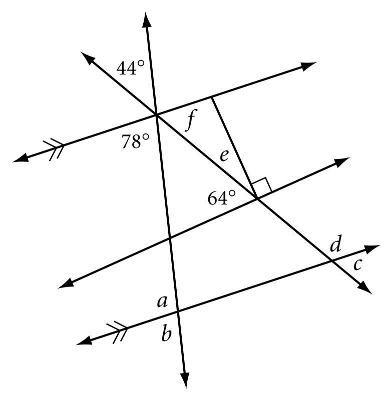
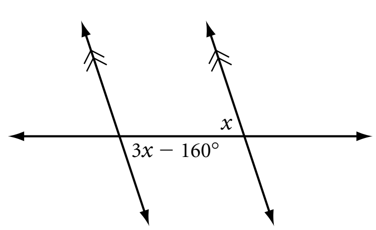


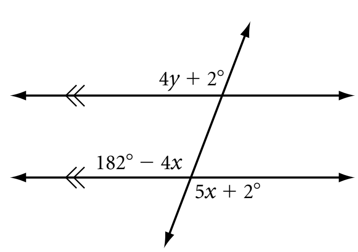
7. Find each angle measure.



8. Find x.



9. Find x and y.



Geometry 1-2 Name: ______________________________

Practice: Angle Relationships

Date: ____________________ Period: ______

Identify each pair of angles as corresponding, alternate interior, alternate exterior, same-side interior, vertical, or adjacent.

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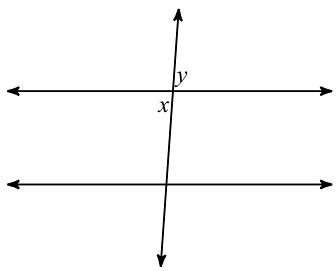

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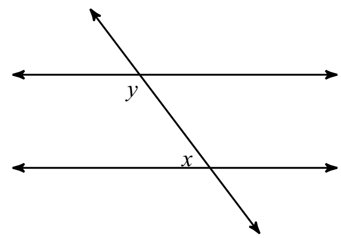

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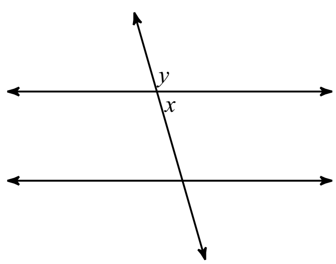

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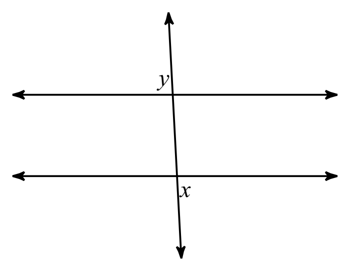

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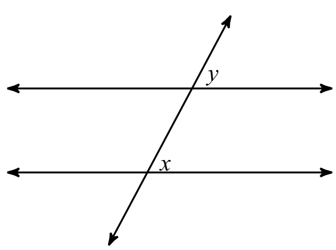

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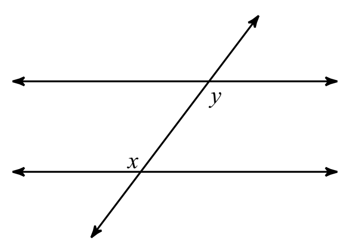
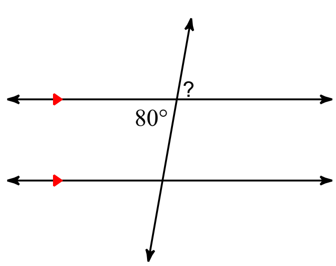


Find the measure of each angle indicated.

7)


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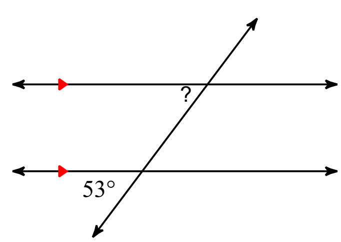

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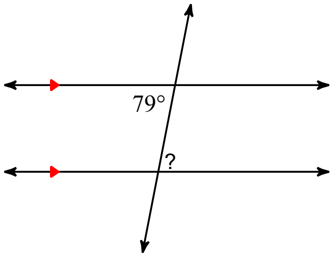

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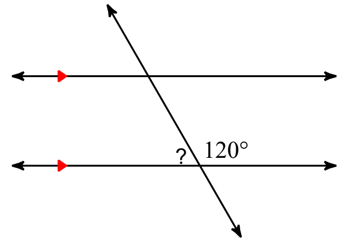
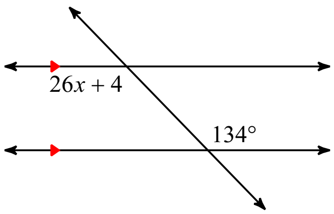


Solve for *x*.

11)



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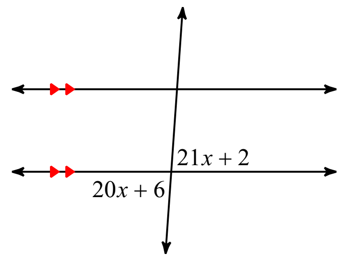

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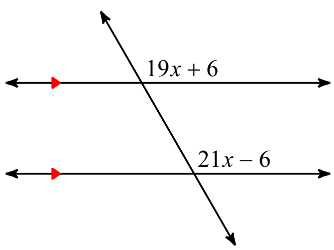

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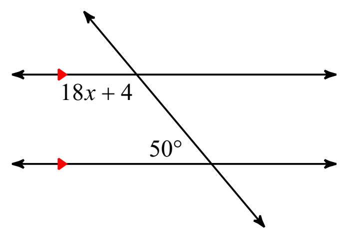
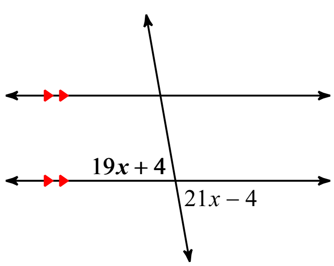


Find the measure of the angle indicated in bold.

15)



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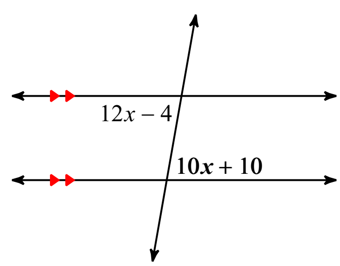

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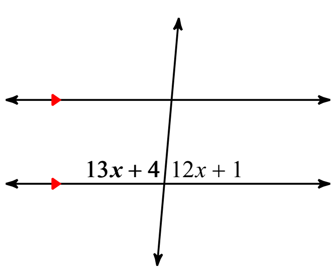

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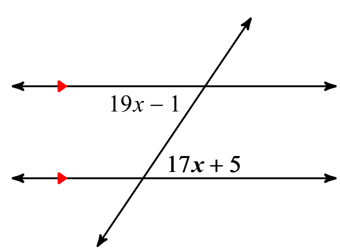


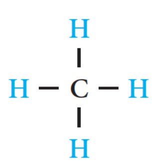
Unit 2 • Challenge Problems

1. (*Target 2a*)
   These patterns are “different”. See if you can determine the next term in each.

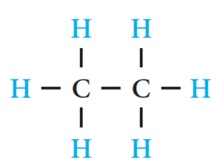
    1. 18, 46, 94, 63, 52, 61, _______
    2. O, T, T, F, F, S, S, E, N, _______
    3. 1, 4, 3, 16, 5, 36, 7, _______
    4. 4, 8, 61, 221, 244, 884, _______
    5. 6, 8, 5, 10, 3, 14, 1, _______
    6. **B, 0, C, 2, D, 0, E, 3, F, 3, G,** ________
    7. A E F H I K L M N T V W
       B C D G J O P Q R S U
       Where do the X, Y *and* Z *go?*

2. (*Target 2a*)
   Hydrocarbons are molecules that consist of carbon (C) and hydrogen (H). Hydrocarbons in which all the bonds between the carbon atoms are single bonds are called alkanes. The first four alkanes are modeled below.

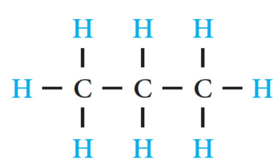
   Sketch the alkane with eight carbons in the chain. What is the general rule for alkanes (CnH?)? In other words, if there are n carbon atoms (C), how many hydrogen atoms (H) are in the alkane?



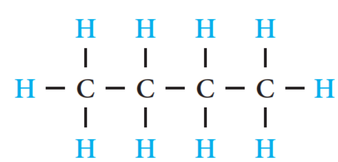
Methane
(CH_4)



Ethane
(C_2H_6)



Propane
(C_3H_8)



Butane
(C_4H_{10})

Unit 2 • Challenge Problems

3. (*Target 2a*)
   Walking down Jane Street, Ralph passed four houses in a row, each painted a different color. He passed the orange house before the red house, and he passed the blue house before the yellow house. The blue house was not next to the yellow house. How many orderings of the colored houses are possible?

4. (*Target 2a*)
   Five positive consecutive integers starting with *a* have average *b*. What is the average of 5 consecutive integers that start with *b*?

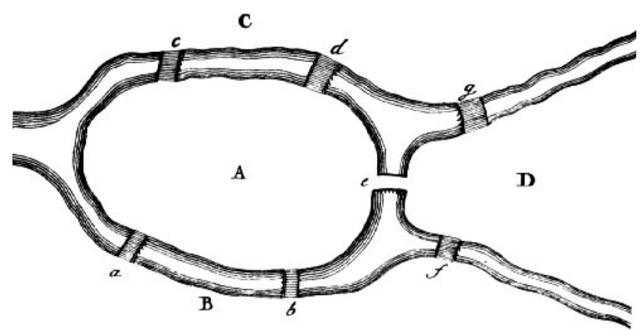
   (A) $a + 3$ (B) $a + 4$ (C) $a + 5$ (D) $a + 6$ (E) $a + 7$

5. (*Target 2b*)
   If 40 houses in a community all need direct lines to one another in order to have telephone service, how many lines are necessary? Is that practical? Sketch and describe two models: first, model the situation in which direct lines connect every house to every other house and, second, model a more practical alternative.

Unit 2 • Challenge Problems

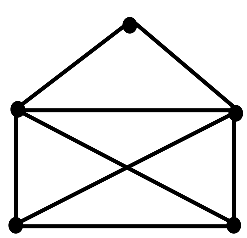
6. (*Target 2b*)
   Each person at a party shook hands with everyone else exactly once. There were 66 total handshakes. How many people were at the party?

7. (*Target 2c*)
   The River Pregel runs through the university town of Königsberg (now Kaliningrad in Russia). In the middle of the river are two islands connected to each other and to the rest of the city by seven bridges. Many years ago, a tradition developed among the townspeople of Königsberg. They challenged one another to make a round trip over all seven bridges, walking over each bridge once and only once before returning to the starting point.

   For a long time no one was able to do it, and yet no one was able to show that it couldn't be done. In 1735, they finally wrote to Leonhard Euler (1707–1783), a Swiss mathematician, asking for his help on the problem. Euler (pronounced "oyler") reduced the problem to a network of paths connecting the two sides of the rivers C and B, and the two islands A and D, as shown in the network at right. Using Euler's diagram, can you help determine a path across all seven bridges only once? (If after 15 minutes of trying to discover a path you can't, go to pages 118 and 119 in the textbook and see more about the problem.

   What about the network below? (a network is a closed system of arcs, lines and points) Can find a path through this network where you only travel over each segment once?

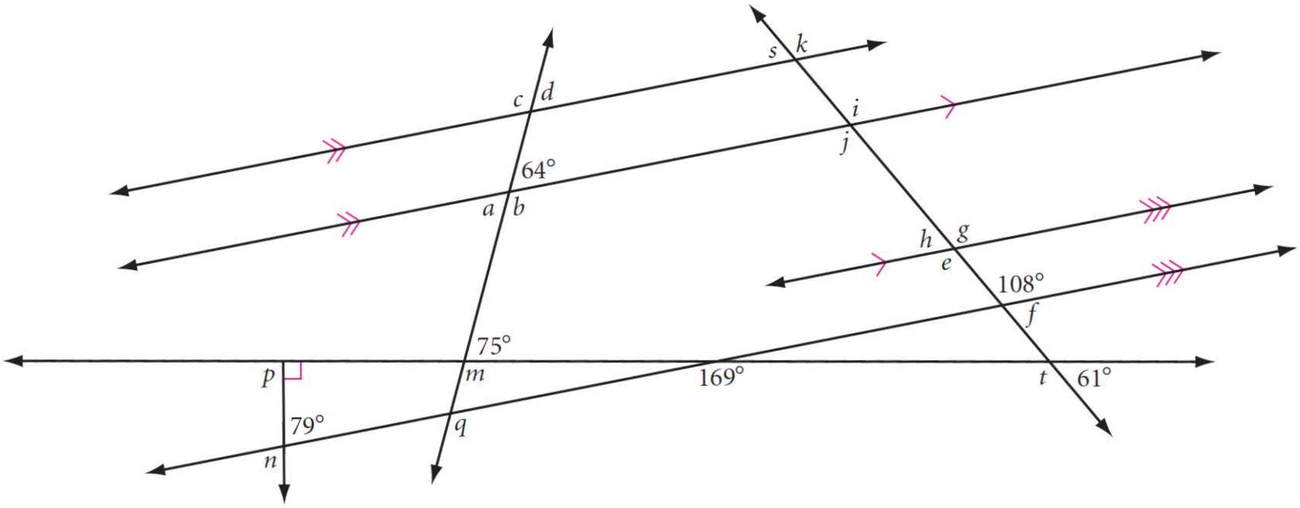
   

   After completing the above two tasks go to page 119 in the textbook and complete Steps 1, 3 and 4 and try to complete the additional conjecture.

   A network can be traveled if ____.

Unit 2 • Challenge Problems

8. (*Target 2d*)
Calculate each lettered angle measure.



9. *(Target 2e*)
The converse of an "if-then" statement reverses the "if" and "then" parts. The converse of a true "if-then" statement may or may not be true.
   a. Write the converse of each true statement below and tell whether it is true or false. If it is false, give a counterexample.
      i. If a polygon is a parallelogram, then it has four sides.

      ii. If Gil lives in France, then he lives in Europe.

      iii. If a parallelogram has four congruent angles, then it is a rectangle.

      iv. If two circles have the same diameter, then they are congruent.

      v. If Daphne has the flu, then she is ill.

   b. Write a true "if-then" geometry statement for which the converse is true. Give the converse.

   c. Write a true "if-then" geometry statement for which the converse is false. Give the converse. Prove the converse is false by giving a counterexample.

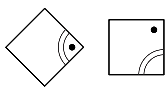
LESSON 2.1 • Inductive Reasoning

1. 20, 24 **2.** $12\frac{1}{2}, 6\frac{1}{4}$ **3.** $\frac{5}{4}$, 2

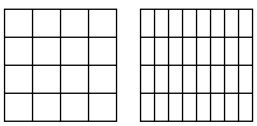
4. $-1, -1$ **5.** 72, 60 **6.** 243, 729

7. 91, 140

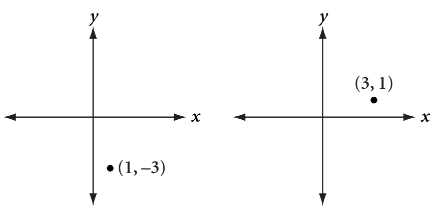
8.



9.



10.



11. False; $\left(\frac{1}{2}\right)^2 = \frac{1}{4}$

12. False; $11 \cdot 10 = 110$, $11 \cdot 12 = 132$

13. True

LESSON 2.2 • Finding the *n*th Term

1. Linear **2.** Linear **3.** Not linear

4. Linear

5.

n	1	2	3	4	5
$f(n)$	**−5**	**2**	**9**	**16**	**23**

6.

n	1	2	3	4	5
$g(n)$	**−10**	**−18**	**−26**	**−34**	**−42**

7. $f(n) = 4n + 5$; $f(50) = 205$

8. $f(n) = -5n + 11$; $f(50) = -239$

9. $f(n) = \frac{1}{2}n + 6$; $f(50) = 31$

10.

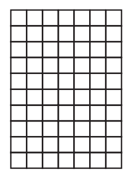
n	1	2	3	4	5	. . .	n	. . .	50
Number of triangles	1	5	9	**13**	**17**	. . .	$\mathbf{4n - 3}$	. . .	**197**

11.

n	1	2	3	4	5	. . .	n	. . .	50
Area of figure	1	4	16	**64**	**256**	. . .	$\mathbf{4^{n-1}}$	. . .	$\mathbf{4^{49}}$

LESSON 2.3 • Mathematical Modeling

1.

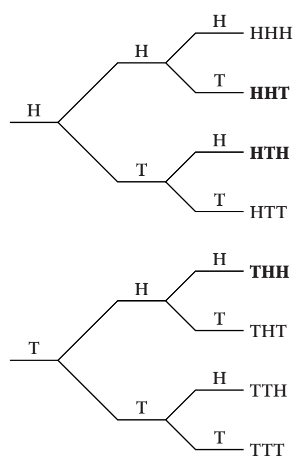


a. 240

b. 1350

c. $f(n) = 2n(n + 2)$, or $f(n) = 2n^2 + 4n$

2.



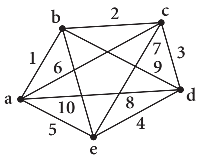
a. 8 sequences

b. 3 sequences have 1 tail.

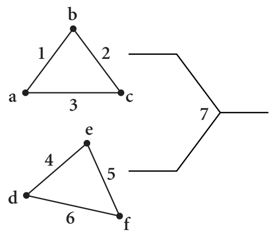
c. $\frac{3}{8}$

3. 66 different pairs. Use a dodecagon showing sides and diagonals.

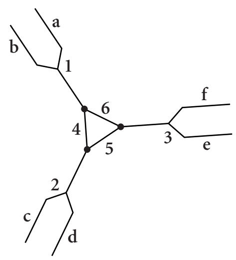
4. Answers will vary. Possible answers:



5 teams, 10 games



6 teams, 7 games



6 teams, 6 games

LESSON 2.4 • Deductive Reasoning

1. No. Explanations will vary. Sample explanation: Because $\triangle ABC$ is equilateral, $AB = BC$. Because C lies between B and D, $BD > BC$, so BD is not equal to AB. Thus $\triangle ABD$ is not equilateral, by deductive reasoning.

2. Answers will vary. $m\angle E > m\angle D$ ($m\angle E = m\angle D + 90°$); deductive

3. a, e, f; inductive

4. Deductive

a.

$4x + 3(2 - x) = 8 - 2x$	The original equation.
$4x + 6 - 3x = 8 - 2x$	Distributive property.
$x + 6 = 8 - 2x$	Combining like terms.
$3x + 6 = 8$	Addition property of equality.
$3x = 2$	Subtraction property of equality.
$x = \frac{2}{3}$	Division property of equality.

b.

$\frac{19 - 2(3x - 1)}{5} = x + 2$	The original equation.
$19 - 2(3x - 1) = 5(x + 2)$	Multiplication property of equality.
$19 - 6x + 2 = 5x + 10$	Distributive property.
$21 - 6x = 5x + 10$	Combining like terms.
$21 = 11x + 10$	Addition property of equality.
$11 = 11x$	Subtraction property of equality.
$1 = x$	Division property of equality.

5. a. 16, 21; inductive

b. $f(n) = 5n - 9$; 241; deductive

LESSON 2.5 • Angle Relationships

1. $a = 68°$, $b = 112°$, $c = 68°$

2. $a = 127°$

3. $a = 35°$, $b = 40°$, $c = 35°$, $d = 70°$

4. $a = 90°$, $b = 90°$, $c = 42°$, $d = 48°$, $e = 132°$

5. $a = 20°$, $b = 70°$, $c = 20°$, $d = 70°$, $e = 110°$

6. $a = 70°$, $b = 55°$, $c = 25°$

7. Sometimes **8.** Always **9.** Never

10. Sometimes **11.** acute **12.** 158°

13. 90° **14.** obtuse **15.** converse

LESSON 2.6 • Special Angles on Parallel Lines

1. $a = 54°$, $b = 54°$, $c = 54°$

2. $a = 115°$, $b = 65°$, $c = 115°$, $d = 65°$

3. $a = 72°$, $b = 126°$ **4.** $\ell_1 \parallel \ell_2$

5. $\ell_1 \nparallel \ell_2$ **6.** cannot be determined

7. $a = 102°$, $b = 78°$, $c = 58°$, $d = 122°$, $e = 26°$, $f = 58°$

8. $x = 80°$

9. $x = 20°$, $y = 25°$

Answers to Practice: Angle Relationships

1) vertical	2) same-side interior	3) adjacent	4) alternate exterior
5) corresponding	6) alternate interior	7) 80°	8) 53°
9) 79°	10) 60°	11) 5	12) 4
13) 6	14) 7	15) 80°	16) 80°
17) 95°	18) 56°		