Lesson 2 - 1

Using Inductive Reasonings to Make Conjectures

Find the next item in the pattern.

January, March, May, ...

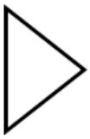
The next month is July.

Find the next item in the pattern.

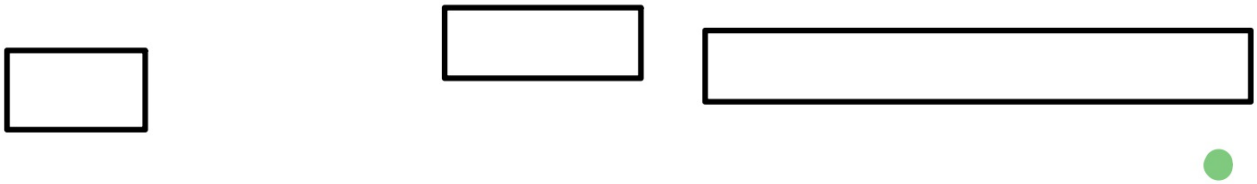
7, 14, 21, 28, ...

The next multiple is 35.

Find the next item in the pattern.

The next figure is  .

When several examples form a pattern and you assume the pattern will continue, you are applying *inductive reasoning*. **Inductive reasoning** is the process of reasoning that a rule or statement is true because specific cases are true. You may use inductive reasoning to draw a conclusion from a pattern. A statement you believe to be true based on inductive reasoning is called a **conjecture**.



Complete the conjecture.

The sum of two positive numbers is _?_.

List some examples and look for a pattern.

$4+4=8$ $8+6=14$ $11+3=14$

$2+2=4$ $9+3=12$ $14+1=15$

The sum of two positive numbers is **positive**.

$-2 \cdot 3 = -6$ $2 \cdot 9 = 18$ $4 \cdot 7 = 28$

$3 \cdot 4 = 12$ $11 \cdot 10 = 110$

Making a Conjecture

Complete each conjecture.

A **The product of an even number and an odd number is _?_.**

List some examples and look for a pattern.

The product of an even number and an odd number is even.

Complete the conjecture.

$1 \cdot 3 = 3$

The product of two odd numbers is __?__.

$9 \cdot 9 = 81$

List some examples and look for a pattern.

$5 \cdot 5 = 25$

$7 \cdot 3 = 21$

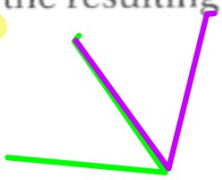
The product of two odd numbers is odd.

Write measures for several acute angles

Angle	1	2	3	4	5	6
Measure	70°	89	20	50	1	60
Double Angle Measure	140°	178	40	100	2	120

REFLECT

2a. Comment on the following conjecture: When an acute angle is copied so that the new angle is adjacent to the original angle, the resulting double angle is always obtuse.



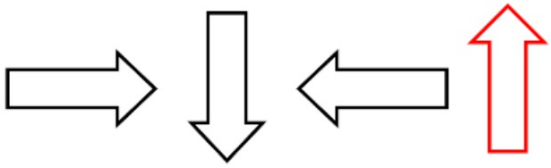
2b. How many angles must you test in order to determine that the conjecture above is not always true?

2c. For what angle measure will an angle along with its adjacent copy form neither an acute nor an obtuse angle? Explain.

Lesson Quiz

Find the next item in each pattern.

1. 0.7, 0.07, 0.007, ... 0.0007

2. 

Determine if each conjecture is true. If false, give a counterexample.

3. The quotient of two negative numbers is a positive number. true

4. Every prime number is odd. false; 2

5. Two supplementary angles are not congruent. false; 90° and 90°

6. The square of an odd integer is odd. true

counterexample - shows conjecture is false
(all prime numbers are odd)
--counterexample is 2, prime and not odd

HW 2.1

2.1 AP (skip #4)

2.1 PS (skip #4, 5)

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Find the next item in each pattern.

4. 

Complete each conjecture.

5. The product of two even numbers is __?__.

Show that each conjecture is false by finding a counterexample.

8. Kennedy is the youngest U.S. president to be inaugurated.

PRACTICE AND PROBLEM SOLVING

Find the next item in each pattern.

11. 8 A.M., 11 A.M., 2 P.M., ...
12. 75, 64, 53, ...
13. △, □, ⬠, ...

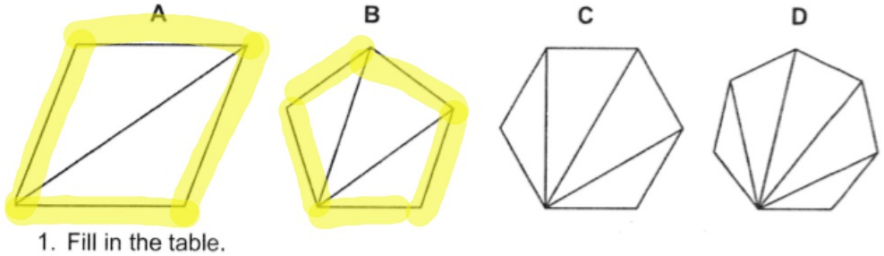
Show that each conjecture is false by finding a counterexample.

17. If $1 - y > 0$, then $0 < y < 1$.
19. Every pair of supplementary angles includes one obtuse angle.

counterexample - shows conjecture is false
(all prime numbers are odd)
--counterexample is 2, prime and not odd

Additional Practice

In each figure, all possible diagonals are drawn from a single vertex. Use the figures in Exercises 1 and 2.



1. Fill in the table.

Figure	A	B	C	D
Number of sides	4	5	6	7
Number of triangles formed	2	3	4	5

n

n-2

2. Use inductive reasoning to make a conjecture about the number of triangles formed when all possible diagonals are drawn from one vertex of a polygon with n sides.

Complete each conjecture.

3. The square of any negative number is _____.

4. The number of segments determined by n points is _____.

$(-2)^2 = 4$

$-2 \cdot -2 =$

$(-3)^2 = 9$

Show that each conjecture is false by finding a counterexample.

5. For any integer n, $n^3 > 0$.

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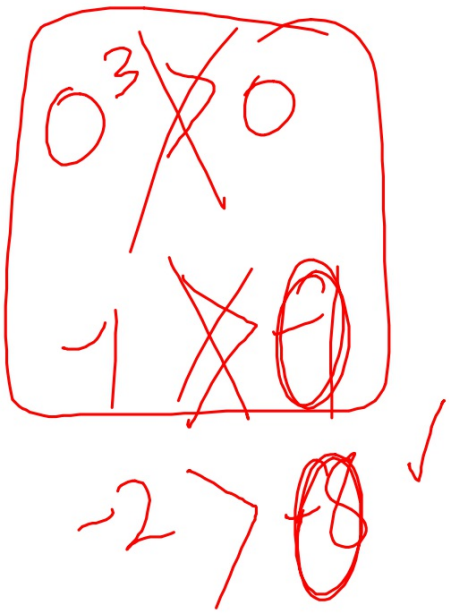
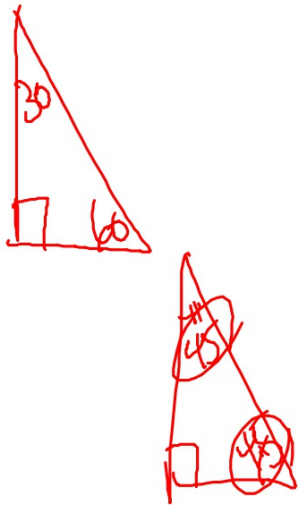
n^3 = positive



Show that each conjecture is false by finding a counterexample.

6. Each angle in a right triangle has a different measure.



7. For many years in the United States, each bank printed its own currency. The variety of different bills led to widespread counterfeiting. By the time of the Civil War, a significant fraction of the currency in circulation was counterfeit. If one Civil War soldier had 48 bills, 16 of which were counterfeit, and another soldier had 39 bills, 13 of which were counterfeit, make a conjecture about what fraction of bills were counterfeit at the time of the Civil War.

Problem Solving

1. Residents of an apartment complex were given use of plots of land in a community garden. Some of the plots were shaped like triangles. The lengths (in feet) of the three sides *a*, *b*, and *c* of some of the triangular plots are shown in the table. For each triangular plot, compare the sum of the lengths of any two sides to the length of the third side. Then use inductive reasoning to make a conjecture comparing the sum of the lengths of any two sides of a triangle to the length of the third side.

Triangle	*a*	*b*	*c*
D	6	8	10
E	9	6	5
F	5	7	5
G	10	15	9

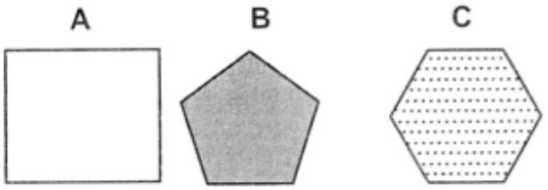
The times for the first eight matches of the Santa Barbara Open women's volleyball tournament are shown. Show that each conjecture is false by finding a counterexample.

Match	1	2	3	4	5	6	7	8
Time	0:31	0:56	0:51	0:18	0:50	0:34	1:03	0:36

2. Every one of the first eight matches lasted less than 1 hour.

3. These matches were all longer than a half hour.

For each of the tiles shown, all of the angles have the same measure. Use a protractor to find the measure of the angles for each tile. Select the best answer.



4. Which expressions could you use in the given order to complete the following statement: Figure ▯ has ▯ sides and the sum of the angle measures is ▯ × 180°.

   A B; 5; 3
   B A; 4; 4
   C C; 6; 3
   D A; 4; 3

5. Which is a reasonable conjecture?

F The sum of the angle measures of a polygon with n sides is $(4n)°$.

G The sum of the angle measures of a polygon with n sides is $n(360°)$.

H The sum of the angle measures of a polygon with n sides is $(n - 2)(180°)$.

J The sum of the angle measures of a polygon with n sides is $(n - 2)(360°)$.