2.1 Start Thinking

The statement "If you are able to open the door, then the door is unlocked" is always true.

Write a statement you know to be true in the same "if-then" form. Support your statement with as many reasons as you can think of to show it is true.

2.1 Warm Up

Complete the statement.

1. A _____ has six sides.

2. If two lines form a _____ angle, they are perpendicular.

3. Two angles that form a right angle are _____ angles.

4. A _____ angle has measure of 180°.

2.1 Cumulative Review Warm Up

The endpoints of $\overline{CD}$ are given. Find the coordinates of the midpoint M.

1. $C(4, -6)$ and $D(8, 8)$

2. $C(-3, 6)$ and $D(1, -4)$

3. $C(-1, -1)$ and $D(5, 8)$

4. $C(-7, -7)$ and $D(-3, 9)$

Name _____ Date _____

2.1 Practice A

In Exercises 1 and 2, copy the conditional statement. Underline the hypothesis and circle the conclusion.

1. If you like the ocean, then you are a good swimmer.

2. If it is raining outside, then it is cold.

**In Exercises 3 and 4, rewrite the conditional statement in if-then form.**

3. All children must attend school.

4. Congruent angles have equal angle measures.

5. Let p be "an animal is a puppy" and let q be "it is a dog." Write each statement in words. Then decide whether it is true or false.

   a. the conditional statement $p \rightarrow q$

   b. the converse $q \rightarrow p$

   c. the inverse $\sim p \rightarrow \sim q$

   d. the contrapositive $\sim q \rightarrow \sim p$

In Exercises 6 and 7, decide whether the statement about the diagram is true. Explain your answer using the definitions you have learned.

6. $\angle 1 + \angle 2 = 90°$
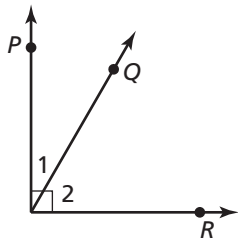
7. $\overline{AD} \cong \overline{DB}$
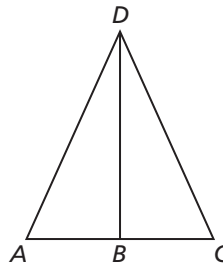
8. Rewrite the definition of the term as a biconditional statement: Obtuse angles are angles with measures greater than $90°$ and less than $180°$.

9. Rewrite the statements as a single biconditional statement: If two angles are supplementary, then the sum of their angle measures is $180°$. If the sum of two angles is $180°$, then they are supplementary angles.

10. If the negation of a statement is true, does that mean that the original statement is automatically false? Explain your reasoning.

11. Write a conditional statement that is false but has a true inverse.

2.1 Practice B

In Exercises 1 and 2, copy the conditional statement. Underline the hypothesis and circle the conclusion.

1. If you like to eat, then you are a good cook.

2. If an animal is a bear, then it is a mammal.

3. Let p be "a tree is an oak tree" and let q be "it is a deciduous tree." Write each statement in words. Then decide whether it is true or false.

   a. the conditional statement $p \rightarrow q$

   b. the converse $q \rightarrow p$

   c. the inverse $\sim p \rightarrow \sim q$

   d. the contrapositive $\sim q \rightarrow \sim p$

In Exercises 4 and 5, decide whether the statement about the diagram is true. Explain your answer using the definitions you have learned.

4. $\angle ACB$ and $\angle DCE$ are vertical angles.
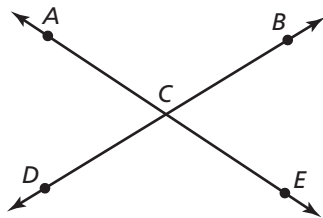
5. $\overline{KL} \perp \overline{LM}$
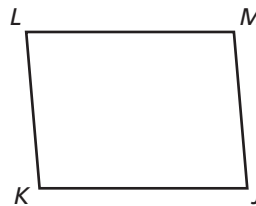
6. Rewrite the two statements as a single biconditional statement: A rectangle is a quadrilateral that has all perpendicular sides. If all sides of a quadrilateral are perpendicular, then it is a rectangle.

7. Your friend claims that only true conditional statements have a true contrapositive. Is your friend correct? Explain your reasoning.

8. Rewrite the conditional statement in if-then form: $3x + 2 = 23$, because $x = 7$.

9. Write a series of if-then statements that allow you to find the measure of each angle, given that $\angle ILH = 38°$. Use the definitions of supplementary and complementary angles that you have learned so far.
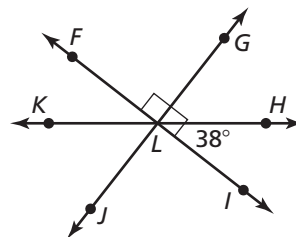
2.1 Enrichment and Extension

Logical Operators

The logical operator utilized in Lesson 2.1 to form a truth table is *logical implication,* in which a false value is produced when the *hypothesis* is true and the *conclusion* is false.

Another logical operator we can use to create a truth table is called *logical conjunction,* in which a true value is produced when both the *hypothesis* and *conclusion* are true. The symbol used in these tables is denoted as "∧."

Example: Construct a truth table using logical conjunction.

p	*q*	*p* ∧ *q*
T	T	T
T	F	F
F	T	F
F	F	F

In *logical disjunction,* a true value is produced if the *hypothesis* or the *conclusion* is true. The symbol in these tables is denoted as "∨."

p	*q*	*p* ∨ *q*
T	T	T
T	F	T
F	T	T
F	F	F

Complete the table below.

p	*q*	*p* ∨ *q*	~*p*	~*q*	~*p* ∧ ~*q*	~*p* ∨ ~*q*	(~*p* ∨ ~*q*) ∧ ~*p*	(~*p* ∧ ~*q*) ∨ ~*q*
T	T	T						
T	F	T						
F	T	T						
F	F	F						

Name_____ Date _____

2.1 Puzzle Time

What Is Smarter Than A Talking Bird?

Write the letter of each answer in the box containing the exercise number.

Complete the sentence.

1. A conditional statement, symbolized by $p \rightarrow q$, can be written as an "if-then" statement in which p is the _____.

2. A conditional statement, symbolized by $p \rightarrow q$, can be written as an "if-then" statement in which q is the _____.

3. You can determine the conditions under which a conditional statement is true by using a _____.

4. A conditional statement of "If p, then q" is expressed symbolically as _____.

5. A conditional statement that is expressed as "If q, then p" is called the _____.

6. If p = "you are a baseball player" and q = "you are an athlete," the following statement "If you are *not* a baseball player, then you are *not* an athlete" would be called a(n) _____.

7. A _____ statement is a statement that contains the phrase "if and only if."

8. If both p and q of the converse are negated, it is called a _____.

Use this statement. "If (a) you are a vegan, then (b) you eat vegetables" to answer the question.

9. What part is the hypothesis? (a) or (b)

10. Part (a) is the conclusion? yes or no

Complete the sentence.

11. The negation of "math is not fun" would be "_____."

12. "If and only if a polygon has three sides, it is a triangle" is a biconditional statement. True or false?

Answers

G. (a)

E. no

H. conditional

A. yes

E. $p \rightarrow q$

T. triconditional

I. biconditional

O. false

L. hypothesis

A. contrapositive

N. math is fun

Y. postulate

P. inverse

R. truth value

O. introversion

B. true

L. converse

E. conclusion

M. math is boring

S. truth table

Y. (b)

8		3	6	4	1	5	7	11	9		12	2	10