2-1A

NAME_____ CLASS _____ DATE _____

PRACTICE WORKSHEET – Conditional Statements

A **conditional statement** is a statement that can be written as an if-then statement, "if *p*, then *q*."

The **hypothesis** comes after the word *if*.

The **conclusion** comes after the word *then*.

If you buy this cell phone, then you will receive 10 free ringtone downloads.

Sometimes it is necessary to rewrite a conditional statement so that it is in if-then form.

Conditional: A person who practices putting will improve her golf game.
If-Then Form: If a person practices putting, then she will improve her golf game.

A conditional statement has a false **truth value** *only* if the hypothesis (H) is true and the conclusion (C) is false.

Identify the hypothesis and conclusion of each conditional.

1. If you can see the stars, then it is night.

Hypothesis: _____

Conclusion: _____

2. If x is an even number, then x is divisible by 2.

Hypothesis: _____

Conclusion: _____

Write a conditional statement from each of the following.

3. Three noncollinear points determine a plane.

_____

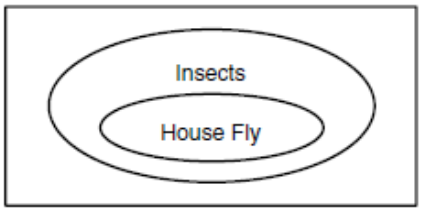
4. Congruent segments have equal measures.

_____

5. On Tuesday, play practice is at 6:00.

_____

6.



_____

Use the following conditional statement for Exercises 7- 8.
If it is a bicycle, then it has two wheels.

7. Give the hypothesis of the conditional statement. _____

8. Give the conclusion of the conditional statement. _____

1-1B

NAME_____ CLASS _____ DATE _____

PRACTICE WORKSHEET – Conditional Statements

Statement	Example
Conditional	H: If a figure is a square, then C: it has four right angles.
Converse: Switch H and C.	If a figure has four right angles, then it is a square.

Show that each conditional is false by finding a counterexample.

1. If it is 12:00 noon, then the sun is shining. _____
2. If a number is divisible by 3, then it is odd. _____

Write the converse of each conditional.

3. If you drink milk, then you will be strong. _____

_____

4. If a rectangle has four sides the same length, then it is a square. _____

_____

5. If a rectangle has four sides the same length, then it is a square. _____

_____

6. If you do not sleep, you will be tired. _____

_____

Write the converse and decide whether the converse is *true* or *false*.
If the converse is false, give a *counterexample.*

7. If the sun is shining, then it is 12:00 noon. _____

_____

_____

8. If the number is divisible by 3, then the number is odd. _____

_____

_____

9. If an angle is 90°, then it is a right angle. _____

_____

_____

2-2A

NAME_____ CLASS _____ DATE _____

PRACTICE WORKSHEET – Biconditionals and Definitions

A **biconditional statement** combines a conditional statement, "if *p*, then *q*," with its converse, "if *q*, then *p*."

Conditional: If $\overbrace{\text{the sides of a triangle are congruent}}^{p}$, then $\overbrace{\text{the angles are congruent}}^{q}$.

Converse: If $\overbrace{\text{the angles of a triangle are congruent}}^{q}$, then $\overbrace{\text{the sides are congruent}}^{p}$.

Biconditional: $\overbrace{\text{The sides of a triangle are congruent}}^{p}$ if and only if $\overbrace{\text{the angles are congruent}}^{q}$.

…where ***p*** = hypothesis and ***q*** = conclusion

For each conditional, write the converse and a biconditional statement.

1. Conditional: If the date is July 4th, then it is Independence Day.

   Converse: _____

   Biconditional: _____

2. Conditional: If a figure has 10 sides, then it is a decagon.

   Converse: _____

   Biconditional: _____

Write each definition as a biconditional.

3. An isosceles triangle has at least two congruent sides.

   _____

   _____

4. A cube is a three-dimensional solid with six square faces.

   _____

   _____

NAME_____ CLASS _____ DATE _____

2-2B PRACTICE WORKSHEET – Biconditionals and Definitions

1. A biconditional statement combines a conditional and its _____.
2. A biconditional statement can be written in the form "*p* if and only if *q*," which means "if *p*, then *q*, and if _____, then _____."

Write the converse from each given biconditional.

3. Biconditional: A cat is happy if and only if it is purring.

   Conditional: If a cat is happy, then it is purring.

   Converse: _____

4. Biconditional: A figure is a segment if and only if it is straight and has two endpoints.

   Conditional: If a figure is a segment, then it is straight and has two endpoints.

   Converse: _____

Write a biconditional from each given conditional and converse.

5. Conditional: If two angles share a side, then they are adjacent.

   Converse: If two angles are adjacent, then they share a side.

   Biconditional: _____

6. Conditional: If your temperature is normal, then your temperature is 98.6°F.

   Converse: If your temperature is 98.6°F, then your temperature is normal.

   Biconditional: _____

Write the conditional statement and converse within each biconditional.

7. The tea kettle is whistling if and only if the water is boiling.

   Conditional: _____

   Converse: _____

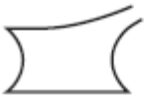
Some figures that are *piggles* are shown below, as are some *nonpiggles*.

piggles nonpiggles

8. **Definition of *piggle*:** _____

Tell whether each of the following is a *piggle*.

9. 

10. 

11. 

2-3A

NAME_____ CLASS _____ DATE _____

PRACTICE WORKSHEET – Deductive Reasoning

With inductive reasoning, you use examples to make a conjecture. With **deductive reasoning,** you use facts, definitions, and properties to draw conclusions and prove that conjectures are true.

One form of deductive reasoning that draws conclusions from a true conditional $p \rightarrow q$ and a true statement p is called the **Law of Detachment**.

Law of Detachment	If $p \rightarrow q$ is true and p is true, then q is true.

- Tom knows that if he misses the practice the day before a game, then he will not be a starting player in the game.
- Tom misses practice on Tuesday.
- *Conclusion:* He will not be able to start in the game on Wednesday.

Another way to make a valid conclusion is to use the **Law of Syllogism**.

Law of Syllogism	If $p \rightarrow q$ is true and $q \rightarrow r$ is true, then $p \rightarrow r$ is also true.

- Given: If you have a horse, then you have to feed it. If you have to feed a horse, then you have to get up early every morning.
- Conclusion: If you have a horse, then you have to get up early every morning.

***Determine if a valid conclusion can be reached from the two true statements using the Law of Detachment or the Law of Syllogism. If a valid conclusion is possible, state it and the law that is used. If a valid conclusion does not follow, write* no valid conclusion.**

1. If Jim is a Texan, then he is an American.
Jim is a Texan.

_____

2. If Spot is a dog, then he has four legs.
Spot has four legs.

_____

3. If Rachel lives in Tampa, than Rachel lives in Florida.
If Rachel lives in Florida, then Rachel lives in the United States.

_____

4. If October 12 is a Monday, then October 13 is a Tuesday.
October 12 is a Monday.

_____

5. If Henry studies his algebra, then he passes the test.
If Henry passes the test, then he will get a good grade.

_____

NAME_____ CLASS _____ DATE _____

2-3B PRACTICE WORKSHEET – Deductive Reasoning

Use the Law of Detachment to draw a conclusion.

1. If the football team wins on Friday night, then practice is canceled for Monday.
   The football team won by 7 points on Friday night.

   _____

2. If a triangle has one 90° angle, then the triangle is a right triangle.
   In $\triangle DEF$, $m\angle E = 90$.

   _____

Use the Law of Syllogism to draw a conclusion.

3. If two lines are not parallel, then they intersect.
   If two lines intersect, then they intersect at a point.

   _____

4. If you vacation at the beach, then you must like the ocean.
   If you like the ocean, then you will like Florida.

   _____

If possible, use the Law of Detachment to draw a conclusion. If not possible, write *not possible.*

5. If a person lives in Omaha, then he or she lives in Nebraska.
   Tamika lives in Omaha.

   _____

6. If Robbie wants to save money to buy a car, he must get a part-time job.
   Robbie started a new job yesterday at a grocery store.

   _____

Use the Law of Detachment and the Law of Syllogism to draw conclusions from the following statements.

7. If it is raining, the temperature is greater than 32°F.
   If the temperature is greater than 32°F, then it is not freezing outside.
   It is raining.

   _____

8. If you live in Providence, then you live in Rhode Island.
   If you live in Rhode Island, then you live in the smallest state in the United States.
   Shannon lives in Providence.

   _____

NAME_____ CLASS _____ DATE _____

2-4A PRACTICE WORKSHEET – Reasoning in Algebra

A **proof** is a logical argument that shows a conclusion is true. An algebraic proof uses algebraic properties, including the Distributive Property and the properties of equality.

Properties of Equality	Symbols	Examples
Addition	If $a = b$, then $a + c = b + c$.	If $x = -4$, then $x + 4 = -4 + 4$.
Subtraction	If $a = b$, then $a - c = b - c$.	If $r + 1 = 7$, then $r + 1 - 1 = 7 - 1$.
Multiplication	If $a = b$, then $ac = bc$.	If $\frac{k}{2} = 8$, then $\frac{k}{2}(2) = 8(2)$.
Division	If $a = 2$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$.	If $6 = 3t$, then $\frac{6}{3} = \frac{3t}{3}$.
Reflexive	$a = a$	$15 = 15$
Symmetric	If $a = b$, then $b = a$.	If $n = 2$, then $2 = n$.
Transitive	If $a = b$ and $b = c$, then $a = c$.	If $y = 3^2$ and $3^2 = 9$, then $y = 9$.
Substitution	If $a = b$, then b can be substituted for a in any expression.	If $x = 7$, then $2x = 2(7)$.

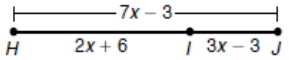
For Exercises 1–12, write the letter of each property next to its definition. The letters *a*, *b*, and *c* represent real numbers.

1. If $a = b$, then $b = a$. _____
2. If $a = b$, then $ac = bc$. _____
3. $\overline{AB} \cong \overline{AB}$ _____
4. $a = a$ _____
5. If $a = b$, then $a + c = b + c$. _____
6. $a(b + c) = ab + ac$ _____
7. If $a = b$ and $b = c$, then $a = c$. _____
8. If $\angle P \cong \angle Q$, then $\angle Q \cong \angle P$. _____
9. If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$. _____
10. If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$. _____
11. If $a = b$, then b can be substituted for a in any expression. _____
12. If $a = b$, then $a - c = b - c$. _____

A. Addition Property of Equality
B. Subtraction Property of Equality
C. Multiplication Property of Equality
D. Division Property of Equality
E. Reflexive Property of Equality
F. Symmetric Property of Equality
G. Transitive Property of Equality
H. Substitution Property of Equality
I. Distributive Property
J. Reflexive Property of Congruence
K. Symmetric Property of Congruence
L. Transitive Property of Congruence

Write a justification for each step.

13.



$HJ = HI + IJ$	Seg. Add. Post.
$7x - 3 = (2x + 6) + (3x - 3)$	_____
$7x - 3 = 5x + 3$	_____
$7x = 5x + 6$	_____
$2x = 6$	_____
$x = 3$	_____

When solving an algebraic equation, justify each step by using a definition property, or piece of given information.

Given: 2(x+3)=12

Prove: x=3

Statements	Reasons
1. 2(x+3)=12	1. Given
2. 2x + 6 = 12	2. Distribution
3. 2x = 6	3. Add/ Sub Property of Equality
4. x = 3	4. Mult/Div Property of Equality

2-4B

NAME_____ CLASS _____ DATE _____

PRACTICE WORKSHEET – Reasoning in Algebra

Properties of Congruence

Reflexive Property	$\overline{AB} \cong \overline{AB}$
	$\angle A \cong \angle A$
Symmetric Property	If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$
	If $\angle A \cong \angle B$, then $\angle B \cong \angle A$
Transitive Property	If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$
	If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$

Use the given property to complete each statement.

1. Symmetric Property of Equality
   If $MN = UT$, then _____.

2. Transitive Property of Equality
   If $SB = VT$ and $VT = MN$, then_____.

3. Reflexive Property of Congruence
   $\overline{JL} \cong$ _____.

Give a reason for each step.

4. $0.25x + 2x + 12 = 39$

   $2.25x + 12 = 39$ _____

   $2.25x = 27$ _____

   $225x = 2700$ _____

   $x = 12$ _____

Name the property that justifies each statement.

5. If $m\angle G = 35$ and $m\angle S = 35$, then $m\angle G = m\angle S$. _____

6. If $10x + 6y = 14$ and $x = 2y$, then $10(2y) + 6y = 14$. _____

7. If $\overline{JK} \cong \overline{LM}$, then $\overline{LM} \cong \overline{JK}$. _____

Give a reason for each step.

8. Prove that if $2(x - 3) = 8$, then $x = 7$.
   Given: $2(x - 3) = 8$
   Prove: $x = 7$

Statements	Reasons
a. $2(x - 3) = 8$	**a.** _____
b. $2x - 6 = 8$	**b.** _____
c. $2x = 14$	**c.** _____
d. $x = 7$	**d.** _____

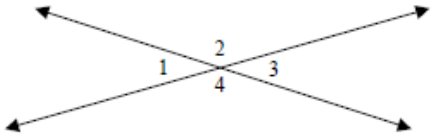
NAME_____ CLASS _____ DATE _____

2-5A PRACTICE WORKSHEET – Proving Angles Congruent

Theorem 2-1 - Vertical Angles Congruence Theorem

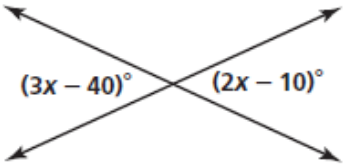
Vertical angles are congruent

$\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$



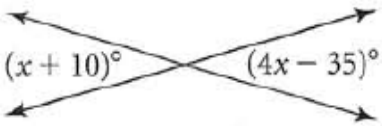
Find the values of the variables.

1.



x = _____

2.

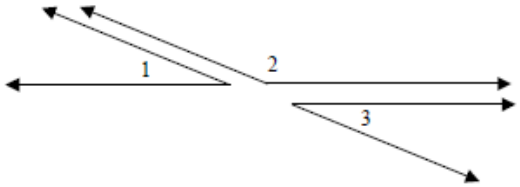


x = _____

Theorem 2-2 - Congruent Supplements Theorem

If two angles are supplementary to the same angle (or to congruent angles), then they are congruent.

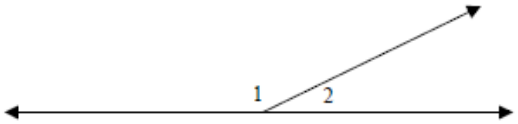
If $\angle 1$ and $\angle 2$ are supplementary and $\angle 2$ and $\angle 3$ are supplementary, then $\angle 1 \cong \angle 3$



Postulate - Linear Pair Postulate

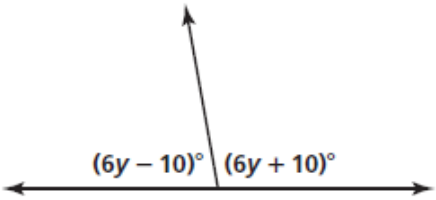
If two angles form a linear pair, then they are supplementary.

$\angle 1$ and $\angle 2$ are supplementary



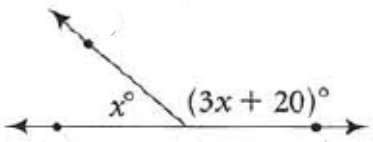
Find the values of the variables.

3.



y = _____

4.



x = _____

5. $\angle A$ is three times as large as its supplement, $\angle B$.

What are the measures of $\angle A$ and $\angle B$?

$\angle A$ = _____ $\angle B$ = _____

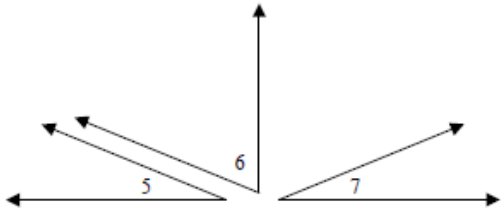
NAME_____ CLASS _____ DATE _____

2-5B PRACTICE WORKSHEET – Reasoning in Algebra

Theorem 2-3 - Right Angle Congruence Theorem
All right angles are congruent

Theorem 2-4 - Congruent complements Theorem
If two angles are complementary to the same angle (or to congruent angles), then they are congruent.

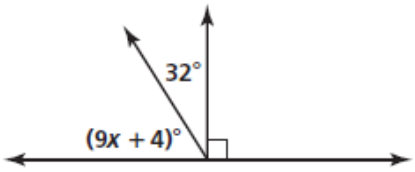
If $\angle 5$ and $\angle 6$ are complementary and $\angle 6$ and $\angle 7$ are complementary, then $\angle 5 \cong \angle 7$



Theorem 2-5 - If two angles that are congruent and supplementary, then each is a right angle.

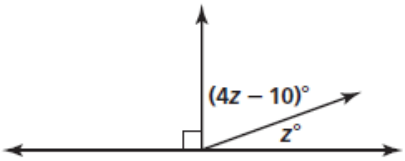
Find the values of the variables.

1.



x = _____

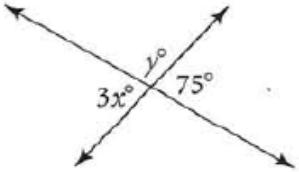
2.



z = _____

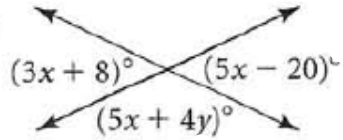
Find the values of the variables.

3.



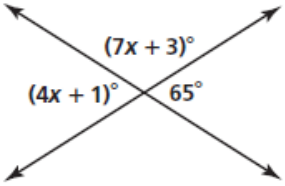
x = _____ y = _____

4.



x = _____ y = _____

5.



x = _____

6. $\angle A$ is one-eighth $\left(\frac{1}{8}\right)$ times as large as its complement, $\angle B$.

What are the measures of $\angle A$ and $\angle B$?

$\angle A$ = _____ $\angle B$ = _____