2-1A

NAME________________ CLASS ____________ DATE ____________

PRACTICE WORKSHEET – Conditional Statements

Section 1.6-1.7 Notes

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.

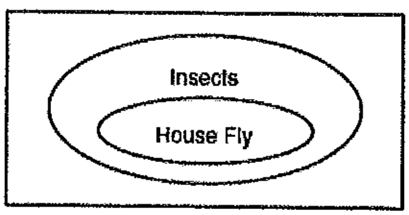
   ____

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. ____________

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 [the sides of a triangle are congruent]$_p$, then [the angles are congruent]$_q$.

Converse: If [the angles of a triangle are congruent]$_q$, then [the sides are congruent]$_p$.

Biconditional: [The sides of a triangle are congruent]$_p$ if and only if [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 ____________

2-4A 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 $2x = 2(7)$.

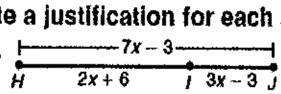
For Exercises 1–12, write the letter of each property next to its definition. The letters *a*, *b*, and *c* represent real numbers.

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

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2-4B 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. _______________

Perpendicular Lines

1. If line m is vertical and line n is horizontal, how are coplanar lines m and n related? ________.

2. If 2 lines are perpendicular, these lines meet to form ________ angles.

Relations

3. The relationship "is perpendicular to" relates lines while the relation "is equal to" relates ________.

4. By name, the three special properties used to characterize a relation are:
   a. ____________ Property: a R a
   b. ____________ Property: If a R b, then b R a.
   c. ____________ Property: If a R b and b R c, then a R c.

5. The Transitive Property for a relation, assuming one exists, can be used to relate the first object to the last object. Given that $\angle 1 \cong \angle 2$, $\angle 2 \cong \angle 3$, and $\angle 3 \cong \angle 4$, you may conclude ________.

6. When the relation "is congruent to" is used to relate angles, which properties (Reflexive, Symmetric, and Transitive) exist? ____________________.

7. When the relation "is greater than" is used to relate numbers, which properties (Reflexive, Symmetric, and Transitive) exist? ____________________.

8. When the relation "is perpendicular to" is used to relate lines, which properties (Reflexive, Symmetric, and Transitive) exist? ____________________.

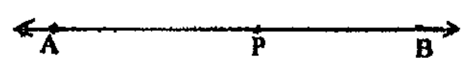
9. When the relation "is equal to" is used to relate numbers, which properties (Reflexive, Symmetric, and Transitive) exist? ____________________.

Constructions

10. a. Given point P on line t in plane Q, how many lines can be drawn in plane Q that are perpendicular to line t at point P? ____.

    b. Given point P on line t, how many lines can be drawn in space that are perpendicular to line t at point P? ____.

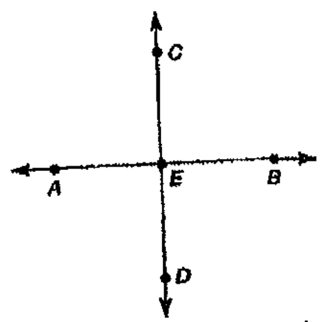
11. Construct the line that is perpendicular to $\overleftrightarrow{AB}$ at point P.



12. Construct the perpendicular-bisector of $\overline{AB}$.

Further Problems

13. Supply or complete missing *reasons* for the proof of the theorem, "If two lines are perpendicular, they meet to form a right angle."

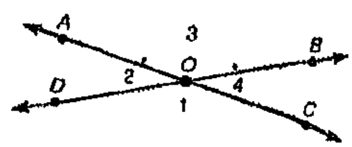


Given: $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$, intersecting at point E
Prove: $\angle$ AEC is a right angle

Proof

Statements	Reasons
(1.) $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$, intersecting at point E	(1.) ______
(2.) $\angle AEC \cong \angle CEB$	(2.) ______ lines form $\cong$ adjacent angles.
(3.) $m\angle AEC = m\angle CEB$	(3.) ______
(4.) $\angle AEB$ is a st. angle, so $m\angle AEB = 180^0$	(4.) ______
(5.) $m\angle AEC + m\angle CEB = m\angle AEB$	(5.) ______
(6.) $m\angle AEC + m\angle CEB = 180^0$	(6.) ______
(7.) $m\angle AEC + m\angle AEC = 180^0$, so $2 \cdot m\angle AEC = 180^0$	(7.) ______
(8.) $m\angle AEC = 90^0$	(8.) ______
(9.) $\angle$ AEC is a right angle	(9.) ______

14. In Example 3 of Section 1.6, we verify the theorem: "If two lines intersect, the vertical angles formed are congruent." Use information from this theorem to solve each problem.



a. If $m\angle 1 = 142^0$, then $m\angle 3 =$ ____.
b. If $m\angle 1 = x$, then $m\angle 3 =$ ____.
c. If $m\angle 1 = x$, then $m\angle 2 =$ ____.
d. If $m\angle 2 = 2x + 3$ and $m\angle 4 = 5x - 33$, then $x =$ ____.

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Hypothesis and Conclusion

1. In the conditional statement "If P, then Q," the hypothesis is the simple statement ____ and the conclusion is the simple statement _____.

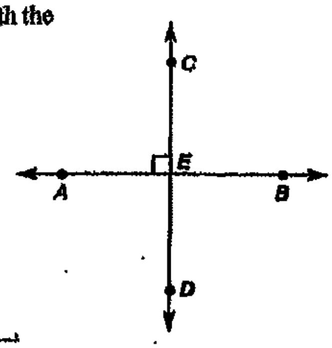
2. In the following statement, underline the hypothesis once and the conclusion twice.
   "If two lines intersect, then the vertical angles formed are congruent."

3. Rewrite the following statement in the form of the conditional statement "If P, then Q."
   "All isosceles triangles have a pair of congruent sides."
   ____.

The Written Parts of a Formal Proof

4. The five parts that must be shown in the formal proof of a theorem are:
   a. Statement of the ______________.
   b. Drawing representing the facts found in the ______________ of the theorem.
   c. Given, which describes the drawing based upon the ______________ of the theorem.
   d. Prove, which describes the drawing based upon the ______________ of the theorem.
   e. Proof, which provides statements and reasons in a logical order -- beginning with the ______________ statement and ending with the ______________ statement.

5. For the stated theorem and the related drawing, write the Given and Prove.
   "If two lines meet to form a right angle, then these lines are perpendicular."
   Given: ______________________________.
   Prove: ______________________________.



Converse of a Theorem

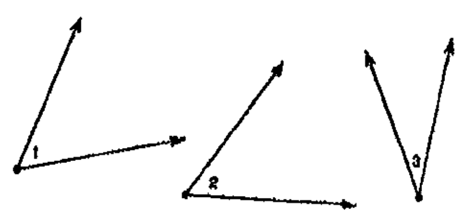
6. The converse of the statement "If P, then Q" is the statement ______________.

7. Is the converse of every conditional statement "If P, then Q" necessarily true? ________.

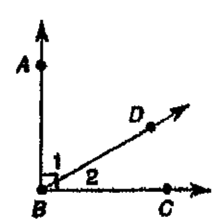
8. a. Write the converse of the statement, "If two lines are perpendicular, they meet to form a right angle." ____.
   b. Is the converse that was written in part (a) true or false? ______.

Theorems of Section 1.7

9. Suppose that (a) $\angle 1$ is complementary to $\angle 3$ and that (b) $\angle 2$ is also complementary to $\angle 3$. How are $\angle 1$ and $\angle 2$ related? ______________.



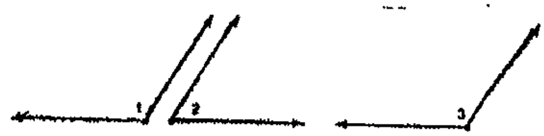
10. Consider the theorem, "If the exterior sides of two adjacent acute angles form perpendicular rays, then these angles are complementary." In the drawing, $\overrightarrow{BA} \perp \overrightarrow{BC}$. Given that $m\angle 1 = 28^0$, use the theorem to find $m\angle 2$. ______.



11. Supply or complete missing *statements* or *reasons* for the proof of the theorem, "If two angles are supplementary to the same angle, then these angles are congruent."

Given: $\angle 1$ is supplementary to $\angle 2$; $\angle 3$ is supplementary to $\angle 2$

Prove: $\angle 1 \cong \angle 3$



Proof

Statements	Reasons
(1.) $\angle 1$ is supplementary to $\angle 2$; $\angle 3$ is supplementary to $\angle 2$	(1.) ________
(2.) $m\angle 1 + m\angle 2 = 180$; $m\angle 3 + m\angle 2 = 180$	(2.) ________
(3.) $m\angle 1 + m\angle 2 =$ ________	(3.) Substitution Property of Equality
(4.) $m\angle 1 = m\angle 3$	(4.) ________ Property of Equality
(5.) ________	(5.) ________

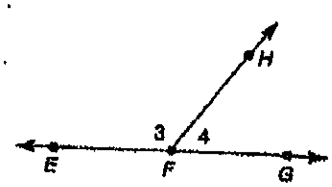
12. Consider the theorem, "If the exterior sides of two adjacent angles form a straight line, then these angles are supplementary."

In the figure, $\overleftrightarrow{EG}$ is a straight line.

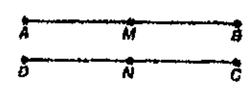
a. Given that $m\angle 3 = 128^0$, find $m\angle 4$. ____

b. Given that $m\angle 4 = 49^0$, find $m\angle 3$. ____

c. Given that $m\angle 3 = 3y$ and $m\angle 4 = y$, find y. ____



13. In the figure, $\overline{AB} \cong \overline{DC}$. M is the midpoint of $\overline{AB}$ and N is the midpoint of $\overline{DC}$. How are the four line segments $\overline{AM}$, $\overline{MB}$, $\overline{DN}$, and $\overline{NC}$ related? ________



14. In the drawing, $\angle ABC \cong \angle EFG$. Also, $\overrightarrow{BD}$ bisects $\angle ABC$ and $\overrightarrow{FH}$ bisects $\angle EFG$. If $m\angle ABC = 56^0$, find the measure of each of the four numbered angles. ________