GEOMETRY

EL# 2 part 1

Vocabulary

- **Conjecture-Statement that is believed to be true**
- **Deductive reasoning-from law to specific case**
- **Inductive reasoning- process of making a law from cases**
- **Counterexample-an example to proof the conclusion or the conjecture is false.**

DEDUCTIVE /INDUCTIVE REASONING

- **DEDUCTIVE REASONING**
- **Reach a conclusion based on laws, rules**

- **INDUCTIVE REASONING**
- **Reach a conclusion based on an example**
- **Make a rule or statement based on specific cases**

Conditional Statements
A STATEMENT THAT CAN BE WRITTEN AS IF p THEN q

- HYPOTHESIS-
- Follows the if part

- CONCLUSION-
- Follows the then part

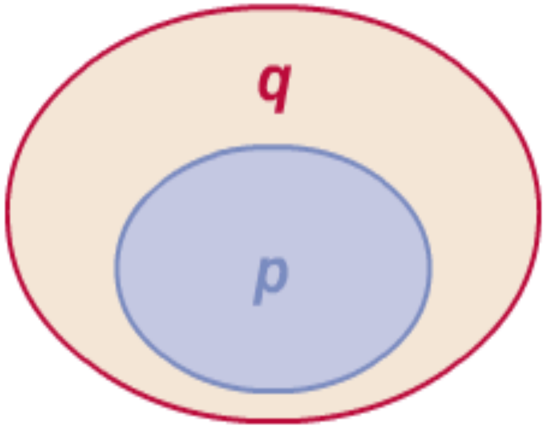
Conditional Statements

- If p, then q.
- If p, q.
- q, if p.
- p implies q.
- P, only if q.

CONDITIONAL STATEMENTS

A **conditional statement** can be written in the form "if p then q." Conditional statements are also called *if-then* statements.

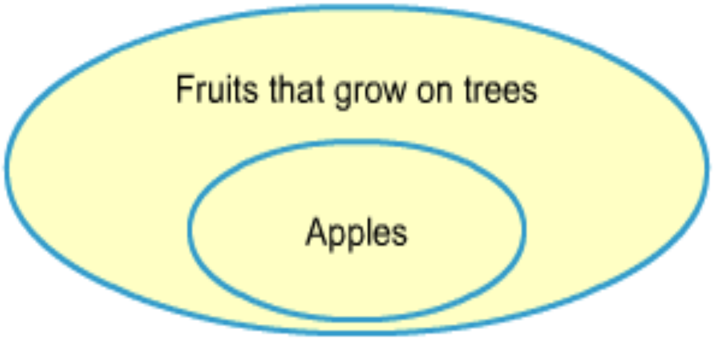
> p is the **hypothesis** of the statement.
> q is the **conclusion** of the statement.



If a conditional statement is true, the conclusion is always true when the hypothesis is true.

This Venn diagram shows the relationship between p and q.

"If a fruit is an apple, then it grows on a tree," is an example of a conditional statement.



Hypothesis: a fruit is an apple
Conclusion: it grows on a tree

The Venn diagram illustrates the fact that all apples grow on trees.

How to write a conditional statement

- Inner oval is hypothesis
- Outer shape is conclusions
- If the sky is blue, then it is not raining
- If hypothesis is True, and conclusion is false, statement is false, Find a counterexample to show conclusion is false.
- If the Hypothesis false, the statement is TRUE

Negation

- Not p
- ~p
- Addition of "NOT" to the hypothesis
- Makes true statement into a false statement
- Makes a false statement into a true statement

Related Conditional
$p \rightarrow q$

- Converse $q \rightarrow p$ exchange
- Inverse $\sim p \rightarrow \sim q$ negate original
- Contrapositive $\sim q \rightarrow \sim p$ both exchange and negate

DEFINITION	SYMBOLS
A conditional is a statement that can be written in the form "If p, then q."	$p \to q$
The **converse** is the statement formed by exchanging the hypothesis and conclusion.	$q \to p$
The **inverse** is the statement formed by negating the hypothesis and the conclusion.	$\sim p \to \sim q$
The **contrapositive** is the statement formed by both exchanging and negating the hypothesis and conclusion.	$\sim q \to \sim p$

2.3 Using deductive reasoning to verify conjectures

- To disprove a conjecture, come up with a counterexample
- To prove a conjecture is true, use deductive reasoning.
- Deductive reasoning is process of using logic to draw conclusions from given facts, definitions, and properties.

LAW of DETACHEMENT

- If p→ q is true and p is true, then q is true.
- Example: Verify the conjecture:
- if you are tardy 3 times, then you must go to detention. You are in detention. Conjecture: you were tardy 3 times.
- Step 1: identify hypothesis and conclusion
- "You are in detention" matches with conclusion, a true statement but does not mean the hypothesis is true. You could be in detention for another reason.

Law of Syllogism

- If $p \rightarrow q$ and $q \rightarrow r$ are true, then $p \rightarrow r$ is true.

2.4 Biconditional statements

- p ←>q means p→ q and q→ p
- P if and only if q
- P iff q
- p < -- > q
- If converse is false, then the biconditional statement is false.

Quiz 2.1-2.4

- Page 103

2.5 Algebraic proof

Solve the equation $-5 = 3n + 1$. Write a justification for each step.

$-5 = 3n + 1$	Given equation
$-1 \qquad -1$	Subtraction Property of Equality
$-6 = 3n$	Simplify.
$\frac{-6}{3} = \frac{3n}{3}$	Division Property of Equality
$-2 = n$	Simplify.
$n = -2$	Symmetric Property of Equality

Properties of equality

Properties of Equality

Addition Property of Equality	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	If $a = b$, then $ac = bc$.
Division Property of Equality	If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$.
Reflexive Property of Equality	$a = a$
Symmetric Property of Equality	If $a = b$, then $b = a$.
Transitive Property of Equality	If $a = b$ and $b = c$, then $a = c$.
Substitution Property of Equality	If $a = b$, then b can be substituted for a in any expression.

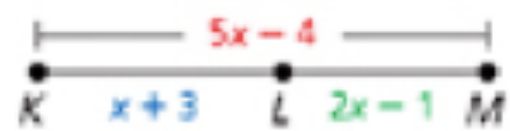
Solving equations in algebra

$sr = 3.6p$	Given equation
$(75)(6) = 3.6p$	Substitution Property of Equality
$450 = 3.6p$	Simplify.
$\frac{450}{3.6} = \frac{3.6p}{3.6}$	Division Property of Equality
$125 = p$	Simplify.
$p = 125$ pixels	Symmetric Property of Equality

Solving an equation in geometry

3 **Solving an Equation in Geometry**

Write a justification for each step.



$KM = KL + LM$	Segment Addition Postulate
$5x - 4 = (x + 3) + (2x - 1)$	Substitution Property of Equality
$5x - 4 = 3x + 2$	Simplify.
$2x - 4 = 2$	Subtraction Property of Equality
$2x = 6$	Addition Property of Equality
$x = 3$	Division Property of Equality

Properties of Congruence

Properties of Congruence

SYMBOLS	EXAMPLE
Reflexive Property of Congruence	
figure $A \cong$ figure A (Reflex. Prop. of $\cong$)	$\overline{EF} \cong \overline{EF}$
Symmetric Property of Congruence	
If figure $A \cong$ figure B, then figure $B \cong$ figure A. (Sym. Prop. of $\cong$)	If $\angle 1 \cong \angle 2$, then $\angle 2 \cong \angle 1$.
Transitive Property of Congruence	
If figure $A \cong$ figure B and figure $B \cong$ figure C, then figure $A \cong$ figure C. (Trans. Prop. of $\cong$)	If $\overline{PQ} \cong \overline{RS}$ and $\overline{RS} \cong \overline{TU}$, then $\overline{PQ} \cong \overline{TU}$.

Identifying properties of congruence and equality

Identify the property that justifies each statement.

A	$m\angle 1 = m\angle 1$	Reflex. Prop. of =
B	$\overline{XY} \cong \overline{VW}$, so $\overline{VW} \cong \overline{XY}$.	Sym. Prop. of ≅
C	$\angle ABC \cong \angle ABC$	Reflex. Prop. of ≅
D	$\angle 1 \cong \angle 2$, and $\angle 2 \cong \angle 3$. So $\angle 1 \cong \angle 3$.	Trans. Prop. of ≅