

Chapter 2

Reasoning and Proof

2.1

Use inductive reasoning

Inductive Reasoning

- When you _____ in _____ and then write a _____ for the _____.
- Conjecture: a _____ that is based on _____.
- EX: The volleyball team has won the _____. When asked if you think they will win the _____, you say _____.

EX:

- Describe the pattern and give the next 3 numbers:
- 1, 2, 4, 8
- 20, 18, 16, 14
- 0, 1, 3, 6,

EX:

- Numbers such as 3, 5, 7, and 9 are odd numbers. Make and test a conjecture about the product of any two odd numbers.

EX:

- Numbers such as 3, 4, and 5 are consecutive integers. Make and test a conjecture about the sum of any three consecutive integers.

Counterexample

- An _____ that shows a
_____ is _____.
- EX:
 - Conjecture: All angles are acute.
 - Counterexample:

EX:

- Show the conjecture is false by providing a counterexample.
 - Supplementary angles are always adjacent.
 - Counterexample:

EX:

- Show the conjecture is false by providing a counterexample.
 - The sum of two numbers is always greater than the larger number.
 - Counterexample:

2.2

Analyze Conditional Statements

Conditional Statement

- A statement that has _____,
a _____ and a _____
 - Hypothesis: _____
 - Conclusion: _____
- EX: If it is raining, then there are clouds in the sky.

EX:

- Rewrite the conditional statement in if-then form.
- All 90° angles are right angles.

- Tourists at the Alamo are in Texas.

Negation

- The _____ of the _____.
- EX:
- Statement: The ball is green.
- Negation: The ball is _____ green.

- Statement: The cat is not black.
- Negation: The cat _____ black.

Converse

- When the _____ and _____ of a statement are _____.
- EX:
 - Statement: If a dog is a Great Dane, then it is large.
 - Converse: _____

Inverse

- When the _____ and _____ are both _____.
- EX:
 - Statement: If a dog is a Great Dane, then it is large.
 - Inverse: _____

Contrapositive

- The _____ of a statement with both the _____ and _____ negated.
- EX:
 - Statement: If a dog is a Great Dane, then it is large.
 - Contrapositive: _____

EX:

- Write the if-then form, the converse, the inverse, and the contrapositive of the conditional statement. Tell whether each statement is true or false.
- Statement: Soccer players are athletes.
 - If-then form: _____

 - Converse: _____

EX cont.

- Inverse: _____

- Contrapositive: _____

Equivalent Statements

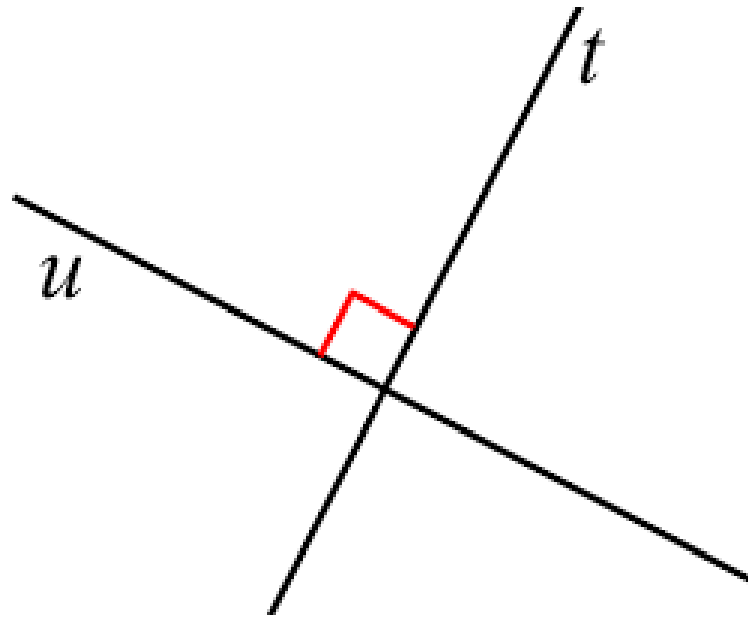
- When _____ statements are both _____ or both _____.
- EX:
 - A _____ and its _____.
 - The _____ and _____ of a conditional statement.

Definitions

- When a definition is written in _____
_____, then its _____ is
also true.
- EX: Definition of Perpendicular Lines
 - If-then form: _____

 - Converse: _____

- Symbol for perpendicular lines: _____



Biconditional Statement

- A statement that contains the phrase

_____.

- EX:

- Definition: If the sum of two angles is 180° , then the angles are _____.

- Biconditional: _____

EX:

- Rewrite the definition as a biconditional statement.
- Definition: An angle with a measure of 90° is a right angle.
- Biconditional: _____

2.3

Apply Deductive Reasoning

Review:

- Inductive Reasoning: Uses _____
and _____ to make a

- EX:

Deductive Reasoning

- Uses _____, _____,
_____, and the _____
_____ to form a logical
_____.

Deductive Reasoning

Examples:

1. *All students eat pizza.*
Claire is a student at ASU.
Therefore, Claire eats pizza.
2. *All athletes work out in the gym.*
Barry Bonds is an athlete.
Therefore, Barry Bonds works out in the gym.

Laws of Logic

- 1) Law of Detachment: If the _____ of a true _____ is true, then the _____ is also true.

Law of Detachment

Example 2:

Given: If I find \$20 in the street, then I'll take you to the movies. On October 10 I found \$20 in the street.

Conclusion: I will take you to the movies.

Laws of Logic cont.

- 2) Law of Syllogism:

- If _____, then _____

- If _____, then _____

- If _____, then _____



Law of Syllogism

- If $p \rightarrow q$ and $q \rightarrow r$ is true, then $p \rightarrow r$ is true.
 1. If **you wear yoga pants and violate the dress code**, then **you will need to go to the office**.
 2. If **you go to the office** then **you will need to change your clothes**.
 3. If you wear yoga pants and violate the dress code you will need to change your clothes.

EX: Use the Law of Detachment to make a valid conclusion.

- Mary goes to the movies every Friday and Saturday night. Today is Friday.
- If two angles are right angles, then they are congruent. Angle C and Angle D are right angles.

EX: Use the Law of Syllogism to write a new conditional statement.

- If Joe takes Geometry this year, then he will take Algebra II next year. If Joe takes Algebra II next year, then he will graduate.

EX: Use the Law of Syllogism to write a new conditional statement.

- If water is at room temperature, then it is a liquid. If water is a liquid, then it is not frozen.

EX: State the Law of Logic that is illustrated.

- If you get an A on your math test, then you can go to the football game. If you go to the football game, then you will see your friends. If you get an A on your math test, then you will see your friends.
- If Colin is enrolled at SMCC, then Colin has an ID number. Colin is enrolled at SMCC. Therefore Colin has an ID number.

EX: Decide whether inductive or deductive reasoning is being used.

- Each time Katie kicks a ball up in the air, it returns to the ground. So the next time Katie kicks a ball up in the air, it will return to the ground.
- All reptiles are cold-blooded. Parrots are not cold-blooded. Anna's pet parrot is not a reptile.

2.4

Use Postulates and Diagrams

Postulates

- Accepted _____ in geometry.
- Postulate 1: Ruler Postulate
- Postulate 2: Segment Addition Postulate
- Postulate 3: Protractor Postulate
- Postulate 4: Angle Addition Postulate

Postulates cont.

- Postulate 5: Through _____ there is _____.
- Postulate 6: A _____ contains at least _____.
- Postulate 7: Two _____ intersect at _____.

Postulates cont.

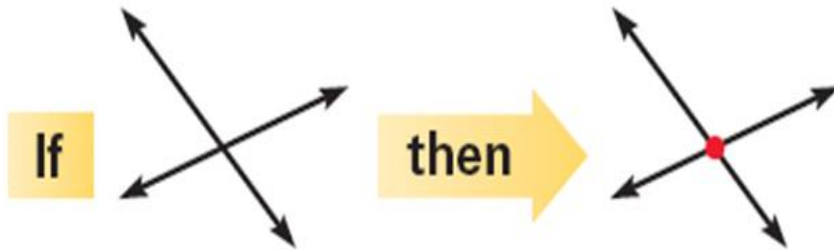
- Postulate 8: Through any _____
_____ points there is
_____.
- Postulate 9: A _____ contains at
least _____.

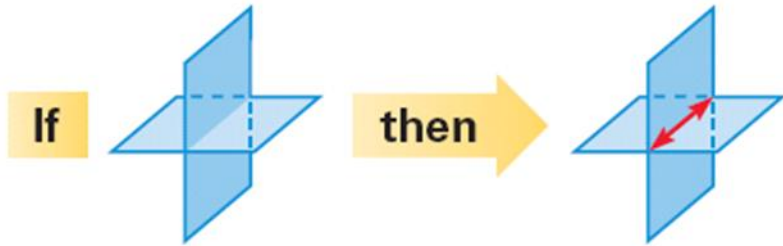
Postulate cont.

- Postulate 10: If _____ lie in a plane, then the _____ containing them is _____.
- Postulate 11: If _____ intersect, their intersection is a _____.

EX: State the postulate illustrated by the diagram.

a.



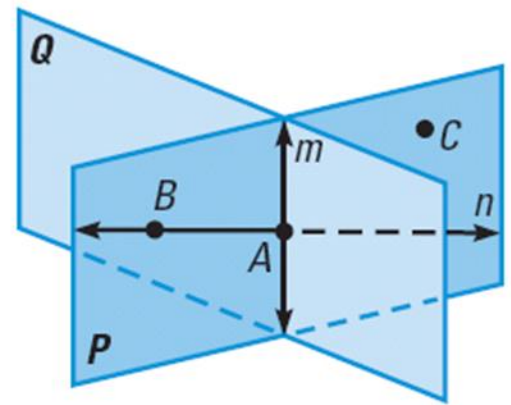


EX: Use the diagram to write examples of the following postulates.

■ Postulate 5:

■ Postulate 6:

■ Postulate 7:



2.5

Using Properties

Properties

- Reflexive Property: Anything _____
itself.
- Symmetric Property: The _____
of an _____ can be _____.

Properties cont.

- Transitive Property: If _____ and _____, then _____.
- Substitution: If _____, then _____ can be _____ in for each other.

EX: Name the property that illustrates the statement.

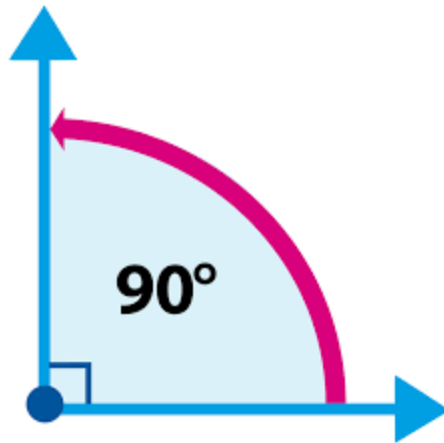
- If $m < 6 = m < 7$, then $m < 7 = m < 6$.
- **If $JK = KL$ and $KL = 12$, then $JK = 12$**
- $m < W = m < W$
- If $AB = 10$, then $AB + CD =$ _____

2.7

Angle Pair Relationships

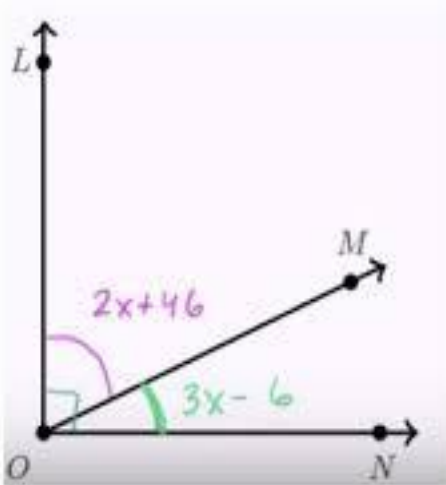
Right Angles

- Have a measure of _____
- All right angles are _____



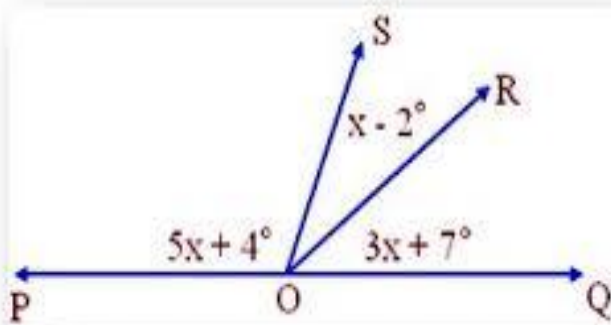
Complementary Angles

- Add to _____
- EX: Solve for x .



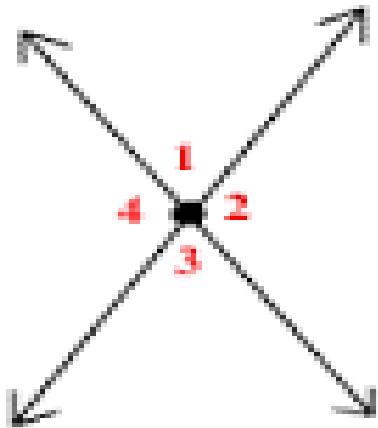
Supplementary Angles

- Add to _____
- EX: Solve for x .



Linear Pair

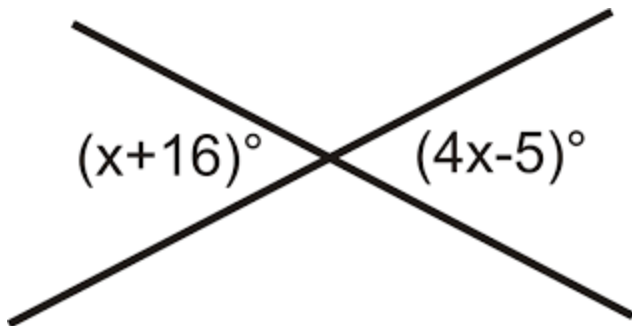
- Angles that are _____



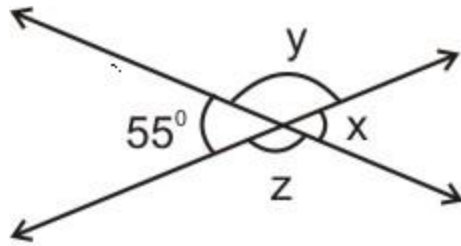
Vertical Angles

- _____ angle that are _____

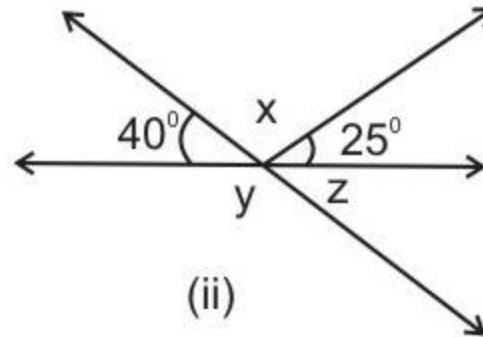
- EX: Solve for x.



Find x , y , and z in each diagram.

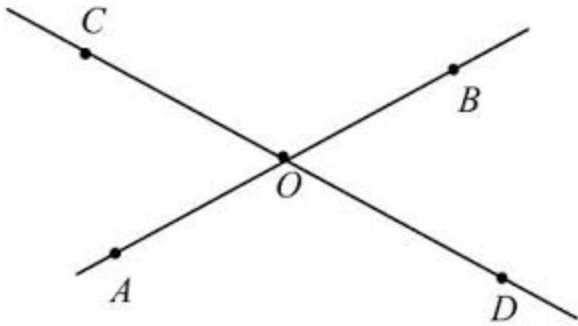


(i)



(ii)

EX: Find the value of x and y .



EX: Find the value of each angle.

