1. Make a conjecture. Draw a figure to illustrate your conjecture.

$\angle 1 \& \angle 2$ are vertical angles

Conjecture: ____________________________ Diagram:

______________________________

Determine whether each conjecture is true or false. If false, give a counterexample.

2. Given: $RS = ST$
   
   Conjecture: $S$ is the midpoint of $RT$

   True or False: __________

   Counterexample:

3. Given: $\angle 1 \& \angle 2$ are supplementary
   
   Conjecture: $\angle 1 \& \angle 2$ form a linear pair

   True or False: __________

   Counterexample:

Write each conditional statement in if-then form.

4. All squares have four right angles.

   If-then: ____________________________________________________________

5. Circle the hypothesis and underline the conclusion of the following statement.

   If a polygon is a pentagon, then it has five sides.

   Write the converse of each conditional. Determine if the converse is true or false. If it is false, give a counterexample with explanation.

6. If $\angle 1$ and $\angle 2$ form a linear pair then they are supplementary.

   Converse: __________________________________________________________

   True or False? ______  
   Counterexample:

7. If $\angle A$ is a right angle, then $m\angle A = 90$.

   Converse: __________________________________________________________

   True or False? ______  
   Counterexample:
Write the converse, inverse and contrapositive of the conditional. Circle if true or false. If false, give a counterexample.

8. If you live in San Diego, then you live in California.

Converse: ____________________________________________
True/False  Counterexample: _______________________________________
Inverse: ____________________________________________
True/False  Counterexample: _______________________________________
Contrapositive: _______________________________________
True/False  Counterexample: _______________________________________

Determine if a valid conclusion can be reached from the two true statements. If it can, state the conclusion and the law that is used. If a valid conclusion does not follow, write “no conclusion”.

9. (1) If two angles are right angles, then they are congruent.
   (2) \( \angle A \ & \ \angle B \) are congruent.

   \( \therefore \) ________________________________________  LAW: ______

10. (1) If a polygon is a rectangle, then it has four right angles.
    (2) Polygon ABCD is a rectangle.

   \( \therefore \) ________________________________________  LAW: ______

11. (1) If \( x + 6 = 10 \), then \( x = 4 \).
    (2) If \( x = 4 \), then \( x^2 = 16 \).

   \( \therefore \) ________________________________________  LAW: ______

Find the measures of the following angles using the given information. Validate your work with the appropriate theorem/postulate.definition (explain why you set up the equation you did).

12. \( \angle 1 = x + 10 \)
    \( \angle 2 = 3x + 18 \)

   \( \angle 1 = \) _______  \( \angle 2 = \) _______

Because: _______________________________________

13. \( \angle 1 = 4x - 26 \)
    \( \angle 2 = 3x + 4 \)

   \( \angle 1 = \) _______  \( \angle 2 = \) _______

Because: _______________________________________
14. If \( \angle 1 = x + 6 \) and \( m \angle 2 = 3x - 36 \), find \( x \).

\[ x = \underline{\quad} \]

15. Find \( m \angle AFE \) if \( m \angle BFC = 46^\circ \).

\[ m \angle AFE = \underline{\quad} \]

Write whether each sentence is true or false. If false, replace the underlined word to make a true sentence.

17. A postulate is a statement that has been proved.

18. A theorem is a statement that describes a fundamental relationship between the basic terms of geometry.

19. If \( p \) implies \( q \) is true and \( p \) is true, then \( q \) is also true by the Law of Syllogism.

20. If \( p \) implies \( q \) and \( q \) implies \( r \) are true, then \( p \) implies \( r \) is also true by the Law of Detachment.

21. The phrase immediately following the word then is called the conclusion of an if-then statement.

22. The phrase immediately following the word if is called the hypothesis of an if-then statement.

23. A false example is called a conjecture.

24. A conjunction is an educated guess based on known information.

25. Statements with the same truth values are said to be logically equivalent.

26. Deductive reasoning uses facts, rules, definitions, or properties to reach logical conclusions.
Fill in the blanks in the following proof.

27. Given: \( \angle ABD \cong \angle YXZ \)

Prove: \( \angle CBD \cong \angle WZX \)

\begin{align*}
\text{Statements} & \quad \text{Reasons} \\
1. & \quad \text{___________________________________________} \\
\angle ABD & \cong \angle YXZ \quad \text{1. Given} \\
\angle CBD & \cong \angle WZX \quad \text{2. Given from diagram} \\
2. \ & \quad \text{form linear pairs} \\
\angle YXZ & \cong \angle WZX \\
3. \ & \quad \text{___________________________________________} \\
m\angle ABD + m\angle CBD = 180 \\
m\angle YXZ + m\angle WZX = 180 \\
4. \ & \quad \text{___________________________________________} \\
m\angle ABD = m\angle YXZ \\
5. \ & \quad \text{Substitution} \\
m\angle YXZ + m\angle CBD = m\angle YXZ + m\angle WZX \\
6. \ & \quad \text{___________________________________________} \\
\angle CBD & \cong \angle WZX \\
7. \ & \quad \text{___________________________________________} \\
8. \ & \quad \text{___________________________________________} \\
\end{align*}

28. Write an algebraic proof for the following.

Given: \( 4x + 7 = 22 - x \)

Prove: \( x = 3 \)

\begin{align*}
\text{Statements} & \quad \text{Reasons} \\
\end{align*}

29. Complete the following proof.

Given: \( \overline{AB} \cong \overline{DE} \)
\( \overline{BC} \cong \overline{EF} \)

Prove: \( \overline{AC} \cong \overline{DF} \)
(This is a proof of the Theorem that states that all right angles are congruent—so you can’t use it)

30. Given: \( \angle 1 \) & \( \angle 2 \) are Right Angles
Prove: \( \angle 1 \cong \angle 2 \)

<table>
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<td></td>
</tr>
<tr>
<td>Prove: ( \angle 1 \cong \angle 2 )</td>
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31. Given: \( AB \cong CB \)
\( DB \cong EB \)
Prove: \( AD \cong CE \)

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32. Given: \( \angle ABC \cong \angle DBE \)
Prove: \( \angle ABD \cong \angle CBE \)

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