

Worksheet
Reasoning, Biconditionals, & Algebraic Proofs

Name: _____ pd: _____

1-4: Tell whether each conclusion is a result of inductive or deductive reasoning.

1. Marcus learns in Social Studies that a presidential election happens every four years. He knows that the last presidential election was in 2004, so he concludes that the next presidential election will be in 2008. 1. _____

2. Cecile and her father talk about the election of President Carter in 1976 and the election of President Reagan in 1980 and 1984. She concludes that a presidential election happens every four years. 2. _____

3. The United States Census Bureau collects data on the earnings of American citizens. Using data for the three years from 2001 to 2003, the bureau concluded that the national average median income for a four-person family was \$43,527. 3. _____

4. A speeding ticket costs \$40 plus \$5 per mi/h over the speed limit. Lynne mentions to Frank that she was given a ticket for \$75. Frank concludes that Lynne was driving 7 mi/h over the speed limit. 4. _____

5. A biconditional statement combines a conditional statement and its _____.

Complete the following from each given conditional statement (CS).

6. **Conditional:** If two non-overlapping angles share a ray and a vertex, then they are adjacent.

Converse: _____

Inverse: _____

Contrapositive: _____

(hint – both the CS and Conv are true)

7. **Conditional:** An angle is obtuse when it measures between 90° and 180° .

Converse: _____

Inverse: _____

Contrapositive: _____

Write True or False for each statement. If the biconditional is false, give a counterexample.

8. **Conditional:** If it is 3:30 A.M., then it is dark outside. _____

Converse: If it is dark outside, then it is 3:30 A.M. _____

Biconditional: It is 3:30 A.M. if and only if it is night. _____

Counterexample: _____.

9. **Conditional:** If two angles share a ray, then they are adjacent.

Converse: _____

Biconditional: _____

Counterexample: _____.

For Exercises 10–21, write the letter of each property next to its definition.

- | | |
|-------------------------------------------------------------------------------------------------------|----------------------------------------|
| 10. If $a = b$, then $b = a$ _____ | A. Addition Property of Equality |
| 11. If $a = b$, then $ac = bc$ _____ | B. Subtraction Property of Equality |
| 12. $\overline{AB} \cong \overline{AB}$ _____ | C. Multiplication Property of Equality |
| 13. $a = a$ _____ | D. Division Property of Equality |
| 14. If $a = b$, then $a + c = b + c$ _____ | E. Reflexive Property of Equality |
| 15. $a(b+c) = ab + ac$ _____ | F. Symmetric Property of Equality |
| 16. If $a = b$ and $b = c$, then $a = c$ _____ | G. Transitive Property of Equality |
| 17. If $\angle P \cong \angle Q$, the $\angle Q \cong \angle P$ _____ | H. Substitution Property of Equality |
| 18. If $\angle A \cong \angle B$ and $\angle B \cong \angle C$, then $\angle A \cong \angle C$ _____ | I. Distributive Property |
| 19. If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$ _____ | J. Reflexive property of Congruence |
| 20. If $a = b$, then $a - c = b - c$ _____ | K. Symmetric Property of Congruence |
| 21. If $a = b$, then b can be substituted for a in any expression _____ | L. Transitive Property of Congruence |

Write a justification for each step:

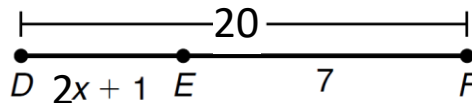
22. Solve the following. Write a justification for each step. $x + 1 = 9 - 3x$

| | |
|------------------|--|
| $x + 1 = 9 - 3x$ | |
| $3x = 3x$ | |
| $4x + 1 = 9$ | |
| $1 = 1$ | |
| $4x = 8$ | |
| $4 = 4$ | |
| $x = 2$ | |

23. Solve the following. Write a justification for each step. $x = 2(6 - x)$

| | |
|----------------|--|
| $x = 2(6 - x)$ | |
| $x = 12 - 2x$ | |
| $2x = 2x$ | |
| $3x = 12$ | |
| $3 = 3$ | |
| $x = 4$ | |

24. Solve the following. Write a justification for each step.



| | |
|-------------------|--|
| $DE + EF = DF$ | |
| $2x + 1 + 7 = 20$ | |
| $2x + 8 = 20$ | |
| $8 = 8$ | |
| $2x = 12$ | |
| $2 = 2$ | |
| $x = 6$ | |