# STATION #1

Determine if each conjecture is true. If not, write or draw a counterexample.

1. For all nonzero integers, $-x < x$.

False → x could be a negative #

EX: let $x = -5$, $-(-5) < -5$

$5 < -5$ counterexample!

2. All integers are natural numbers.

False → Natural numbers are the counting #s (1, 2, 3, 4, ...)

EX: $-5$ is an integer, but not a natural #.

counterexample!

3. The quotient of two integers is an integer.

False → $\frac{2}{8} = \frac{1}{4}$ or 0.25 $\frac{1}{4}$ is NOT an integer!

counterexample!

4. The difference of two negative numbers is negative.

False → $-3-(-4) = -3+4 = 1$

counterexample!

5. If a number is divisible by 6, then it is divisible by 2.

True → $\frac{36}{6} = 6$ $\frac{36}{2} = 18$ ✓

$\frac{18}{6} = 3$ $\frac{18}{2} = 9$ ✓

$\frac{54}{6} = 9$ $\frac{54}{2} = 27$ ✓

$\frac{12}{6} = 2$ $\frac{12}{2} = 6$ ✓

# STATION #2

Determine if the conditional statement is true.

1. If two angles are adjacent, then they have a common ray.

TRUE! ⇝ By definition!

2. If you multiply two irrational numbers, the product is irrational.

(irrational: #s that can't be written as fractions!)

False ⇝ $\sqrt{7} \cdot \sqrt{7} = \sqrt{49} = 7$ ← rational number.

3. If a figure has four sides, then it is a square.

False ⇝ could be any quadrilateral.

4. If $x = 3$, then $5x = 15$.

True! $5(3) = 15$

$15 = 15$ ✓

5. If $y = 4$, then $y^2 = 16$.

True! $(4)^2 = 16$

$16 = 16$ ✓

# STATION #3

Write the converse, inverse and contrapositive of each conditional statement. Find the truth value of each statement.

1. If $< X$ is a right angle, then $m < X = 90°$. T

T Converse: If $m\angle X = 90°$, then $\angle X$ is a right angle.

T Inverse: If $\angle X$ is not a right angle, then $m\angle X \neq 90°$

T Contrapositive: If $m\angle X \neq 90°$, then $\angle X$ is not a right angle.

2. If $x$ is a whole number, then $x = 2$. F

T Converse: If $x = 2$, then $x$ is a whole number.

T Inverse: If $x$ is not a whole number, then $x \neq 2$.

F Contrapositive: If $x \neq 2$, then $x$ is not a whole number.

# STATION #4

Construct a Truth Table for the following:

A. $\sim u \vee v$

| $u$ | $v$ | $\sim u$ | $\sim u \vee v$ ("or") |
|---|---|---|---|
| T | T | F | T |
| T | F | F | F |
| F | T | T | T |
| F | F | T | T |

B. $\sim p \wedge (p \vee q)$

| $p$ | $q$ | $\sim p$ | $p \vee q$ (or) | $\sim p \wedge (p \vee q)$ |
|---|---|---|---|---|
| T | T | F | T | F |
| T | F | F | T | F |
| F | T | T | T | T |
| F | F | T | F | F |

C. $(p \vee \sim q) \wedge (q \wedge p)$

| $p$ | $q$ | $\sim q$ | $p \vee \sim q$ (or) | $q \wedge p$ | $(p \vee \sim q) \wedge (q \wedge p)$ |
|---|---|---|---|---|---|
| T | T | F | T | T | T |
| T | F | T | T | F | F |
| F | T | F | F | F | F |
| F | F | T | T | F | F |

# STATION #5

What conclusions can you reach when both premises are true?

1. If a quadrilateral is a trapezoid, then it has one pair of parallel sides. Quadrilateral ABCD does not have one pair of parallel sides.

p q ~q

indirect

~p: Quadrilateral ABCD is not a trapezoid.

2. If you order two Italian hoagies, then you get a bag of chips and a drink for free. Ms. Betschart ordered two Italian hoagies.

p q p

Direct

q: Ms. Betschart will get a bag of chips and a drink for free.

3. If Mrs. Palermo is driving to school, then it is a week day. If it is a week day, then Mrs. Palermo stops at the Country Store.

p q q r

Chain Rule

p→r: If Mrs. Palermo is driving to school, then she stops at the country store.

4. Sydney went to Homecoming or she went to the football game. Sydney did not go to the football game.

p q ~q

OR Rule

p: Sydney went to Homecoming.

5. If an integer $n$ is evenly divisible by 10, then $n$ is evenly divisible by 5. The number 5,698,453 is not evenly divisible by 5.

p q ~q

Indirect

~p: 5,698,453 is not evenly divisible by 10.

# STATION #6

Decide if each argument is valid or invalid. Explain your reasoning.

1.
$p \to q$
$r \to q$
$\therefore p \to r$

Invalid – chain error!

2.
$u \to v$
$\sim u$
$\therefore \sim v$

Invalid – Inverse error!

3.
$s \to t$
$t$
$\therefore s$

invalid - converse error!

4.
$s \vee t$
$t$
$\therefore \sim s$

invalid - OR rule

# STATION #7

Determine if each conjecture is valid.

1. If you want to go on a field trip, you must have a signed permission slip.
   Zola has a signed permission slip. q
   Therefore, Zola wants to go on the field trip. p

   Invalid - converse error.

2. If you fly from Texas to California, you travel from the central to the Pacific time zone.
   If you travel from the central to the Pacific time zone, then you gain two hours.
   Therefore, if you fly from Texas to California, you gain two hours.

   valid - chain rule

3. If a figure if a square, then it is a rectangle. If a figure is a square, then it is a parallelogram.
   Therefore, if a figure is a parallelogram, then it is a rectangle.

   Invalid - chain error

4. Thomas is at the football game or he is at the concession stand.
   Thomas is at the football game. p
   Therefore, Thomas is not at the concession stand. ~q

   Invalid - OR rule

5. If you go to McDonald's for dinner, then you order the Quarter Pounder meal.
   You do not go to McDonald's for dinner. ~p
   Therefore, you do not order the Quarter Pounder meal. ~q

   Invalid - inverse error

# STATION #8

1. Write the conditional statement and the converse within the biconditional.

*Perry can paint the entire living room if and only if he has enough paint.*
(p = Perry can paint the entire living room; q = he has enough paint.)

Cond. • If Perry can paint the entire living room, then he has enough paint.

Converse • If Perry has enough paint, then he can paint the entire living room

2. For the conditional statement, write the converse and biconditional statement.

*If two segments have the same length, then they are congruent.*

Converse • If two segments are ($\cong$) congruent, then the segments have the same length.

Bicond. • Two segments have the same length iff they are congruent.

3. Determine if the biconditional statement is true.
If false, give a counterexample.

$xy = 0$ if and only if $x = 0$ or $y = 0$. TRUE!
(p = $xy = 0$; q = $x = 0$ or $y = 0$.)

Cond. • If $xy = 0$, then $x = 0$ or $y = 0$. T

Converse • If $x = 0$ or $y = 0$, then $xy = 0$. T

4. Write the following definition as a biconditional statement.

*Parallel lines are two coplanar lines that never intersect.*

Two coplanar lines are parallel iff they never intersect.