

- a. Tell whether the original statement is true or false.  
b. State the converse, inverse, and contrapositive of each statement. Then state whether each is true or false.

\*\* Hint: translate the original statement into an *If*-, *then* - statement first.

6. *Statement:* This month is March, only if today is St. Patrick's Day. *if March then St. Pattys day* (Mar. | Fall)  
*Converse:* if St. Pattys Day then March (True)  
*Inverse:* if not March then not St. Pattys Day (True)  
*Contrapositive:* if not St. Pattys Day then not March (false) March 1<sup>st</sup>
7. *Statement:* The fact that an angle is  $23^\circ$  implies that it is acute. *if  $23^\circ$  then acute* (true)  
*Converse:* if acute then  $23^\circ$  (false)  $x = 27^\circ$   
*Inverse:* if not  $23^\circ$  then not acute (false)  $x = 27^\circ$   
*Contrapositive:* if not acute then not  $23^\circ$  (true)
8. *Statement:* Every figure with four right angles is a square. *if 4 rt.  $\angle$ 's then square* (false) Rectangl  
*Converse:* if square, then 4 rt.  $\angle$ 's (true)  
*Inverse:* if not 4 rt.  $\angle$ 's then not square (true)  
*Contrapositive:* if not square then not 4 rt.  $\angle$ 's (false) Rectangle
9. *Statement:* An integer ending in 5 implies that it is divisible by 5. *if int ends in 5 then  $\div$  by 5* (true)  
*Converse:* if  $\div$  by 5 then ends in 5 (false)  $x = 100$   
*Inverse:* if  $\nmid$  does not end in 5 then not  $\div$  by 5 (false)  $x = 100$   
*Contrapositive:* if not  $\div$  by 5 then does not end in 5 (true)

# Related Conditionals

1. Write the (a) converse, (b) inverse, and (c) contrapositive of

- $\sim q \rightarrow p$  in symbolic form. a.  $p \rightarrow \sim q$   
 b.  $q \rightarrow \sim p$  c.  $\sim p \rightarrow q$

Write the (a) converse, (b) inverse, and (c) contrapositive. Then (d) write which of these are true.

2. If  $x^2 = 0$ , then  $x = 0$ . true

- a.  $x=0 \rightarrow x^2=0$  true  
 b.  $x^2 \neq 0 \rightarrow x \neq 0$  true  
 c.  $x \neq 0 \rightarrow x^2 \neq 0$  true  
 d. \_\_\_\_\_

3. If  $\angle 1$  and  $\angle 2$  are right angles, then  $\angle 1 \cong \angle 2$ . true

- a.  $\angle 1 \cong \angle 2 \rightarrow \angle 1 + \angle 2$  rt  $\angle$  false  
 b.  $\angle 1 + \angle 2$  are not rt  $\angle$ 's then  $\angle 1 \cong \angle 2$  false  
 c.  $\angle 1 \neq \angle 2$  then  $\angle 1 + \angle 2$  are not rt true  
 d. \_\_\_\_\_

4.  $y$  is not a whole number if  $y$  is a negative integer.

- a. 0, 1, 2, 3  $\rightarrow$  if  $y$  is neg. int then  $y$  is not whole # true  
 b. \_\_\_\_\_  $\rightarrow$  if  $y$  is not whole # then  $y$  is neg int false (1,2)  
 c. \_\_\_\_\_  $\rightarrow$  if  $y$  is not neg. int then  $y$  is whole # false (1,2)  
 d. \_\_\_\_\_  $\rightarrow$  if  $y$  is whole # then  $y$  is not neg int true

5. A quadrilateral is a parallelogram only if it is not a trapezoid. true

b.  $x = y$  implies that  $x^2 = y^2$ . true

- a. if it's not a trap then it is parall.  
 b. if it's not parall. then it's trap.  
 c. if it's trap. then not parallel  
 d. \_\_\_\_\_

- a. if  $x^2 = y^2$  then  $x = y$  false  $x = -3$   $y = 3$   
 b. if  $x \neq y$  then  $x^2 \neq y^2$  false same  
 c. if  $x^2 \neq y^2$  then  $x \neq y$  true  
 d. \_\_\_\_\_

Let  $p$  represent " $\pi$  is irrational,"  $q$  represent " $2^4 = 4^2$ ," and  $r$  represent " $-1.5 > -1$ ." (a) Translate each sentence into English and (b) give its truth value.

8.  $p \rightarrow \sim q$  a. if  $\pi$  is irrational then  $2^4 \neq 4^2$  b. false

9.  $r \rightarrow p$  a. if  $-1.5 > -1$  then  $\pi$  is irrational b. true

10.  $\sim p \leftrightarrow \sim q$  a.  $\pi$  is not irrational iff  $2^4 \neq 4^2$  b. true

11.  $(\sim p \vee q) \rightarrow \sim r$  a. ( $\pi$  is not irrational or  $2^4 = 4^2$ ) then  $-1.5 \leq -1$

b. true

12.  $(p \wedge q) \leftrightarrow r$  a. ( $\pi$  is irrational and  $2^4 = 4^2$ ) iff  $-1.5 > -1$  b. False