

# CS:2210 Handwritten Homework #1

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#12. Let P, q, and r be the propositions

P: You have the flu

q: You miss the final exam.

r: You Pass the course.

f)  $(P \wedge q) \vee (\neg q \wedge r)$ :

You have the flu, and you miss the final exam

Or you don't miss the final exam and you pass the course.

Express each of the -se proposition as an English sentence.

a)  $P \rightarrow q$ :

$\therefore$  If you have the flu,  
then you will miss the final exam.

b)  $\neg q \leftrightarrow r$ :

$\therefore$  You don't miss the final exam,  
if and only if you pass the course.

c)  $q \rightarrow \neg r$ :

$\therefore$  If you don't miss the final exam,  
then you don't pass the course.

d)  $P \vee q \vee r$ :

$\therefore$  You have the flu or You miss the final  
or You pass the course.

e)  $(P \rightarrow \neg r) \vee (q \rightarrow \neg r)$ :

If you have the flu, then you don't pass the course  
or if you miss the final exam, then you don't pass  
the course.

#14. Let P, q, and r be the propositions

p: You get an A on the final exam

q: You do every exercise in this book

r: You get an A in this class.

Write propositions using P, q, and r and logical connectives (including negations).

a) You get an A in this class, but you  
don't do every exercise in this book.

$\therefore \neg r \wedge \neg q$

b) You get an A on the final, (and)

$\underbrace{p}_{\wedge} \quad \underbrace{q}_{\wedge}$

You do every exercise in this book,

and  $\underbrace{r}_{\wedge}$  You get an A in this class.

$\therefore p \wedge q \wedge r$

②

c) To get an A in this class,  
 $\frac{t}{\text{it is necessary for you to get}}$   
 $\frac{\text{implication}}{\text{an A on the final.}}$   
 $\frac{P}{r}$

$$\therefore r \rightarrow P$$

d) You get an A on the final,  
 $\frac{P}{\text{but you don't do every exercise in this book;}}$   
 $\frac{q}{\text{nevertheless, you get an A in this class.}}$   
 $\frac{r}{\wedge}$

$$\therefore P \wedge \neg q \wedge r$$

e) Getting an A on the final and doing  
 $\frac{\text{every exercise in this book is sufficient}}{q} \frac{\text{(implication)}}{\text{for getting an A in this class.}}$   
 $\frac{r}{\wedge}$

$$\therefore P \wedge q \rightarrow r$$

f) You will get an A in this class  
 $\frac{t}{\text{if and only if you either do every}}$   
 $\frac{\text{exercise in this book or get an A on the final.}}{\frac{q}{\wedge} \frac{v}{P}}$

$$\therefore r \leftrightarrow q \vee P$$

Everyday Cha

#28. State the Converse, ContraPositive, and inverse of each of these conditional statement.

a) If it shows tonight, then I will stay at home.  
 $\frac{P}{q}$   
 $\frac{\text{at home.}}{(P \rightarrow q)}$

① Converse:  $(q \rightarrow P)$

If I will stay at home, then it shows tonight.

② ContraPositive:  $(\neg q \rightarrow \neg P)$

If I will not stay at home, then it is not shows tonight.

③ Inverse:  $(\neg P \rightarrow \neg q)$

If it does not show tonight, then I will not stay at home.

b) I go to the beach whenever it is a sunny summer day.  
 $\frac{q}{P}$   
 $\frac{\text{sunny summer day.}}{(P \rightarrow q)}$

① Converse:

If I go to the beach, then it is a sunny summer day.

② ContraPositive:

If I don't go to the beach, then it is NOT a sunny summer day.

③ Inverse:

If it is not a sunny summer day, then I don't go to the beach.

③

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c) when I stay up late, it is necessary that I sleep until noon.

$$c) (P \rightarrow r) \vee (\neg s \rightarrow t) \vee (\neg u \rightarrow v)$$

values are 'P', 'r', 's', 't', 'u' and 'v' (6)

$$2^6 = 64 \quad \therefore \boxed{64} \text{ rows}$$

① Converse:

If I sleep until noon,  
then I stay up late.

$$d) (P \wedge r \wedge s) \vee (q \wedge t) \vee (r \wedge t)$$

values are, 'P', 'r', 's', 'q', and 't'. (5)

$$2^5 = 32 \quad \therefore \boxed{32} \text{ rows}$$

② Contrapositive:

If I don't sleep until noon,  
then, I don't stay up late.

③ Inverse:

If I don't stay up late,  
then I don't sleep until noon.

#30. How many rows appear in a truth table for each of these.

$$a) (q \rightarrow \neg p) \vee (\neg p \rightarrow \neg q)$$

values are 'p', and 'q'. (2)

so, rows are  $2^2 = 4 \quad \therefore \boxed{4} \text{ rows}$

$$b) (p \vee \neg t) \wedge (p \vee s)$$

values are 'p', 't', and 's' (3).

$$2^3 = 8 \quad \therefore \boxed{8} \text{ rows}$$