SYMBOLIC ARGUMENTS

TEXT: 2.7

LAST NAME	FIRST NAME	DATE

1 (4 points)**.** Use a truth table to determine whether the following argument is valid:

$$\begin{array}{l} a \to b \\ (\sim a) \leftrightarrow b \\ \hline \therefore b \to a \end{array}$$

2 (4 points)**.** Use a truth table to determine whether the following argument is valid:

$$\begin{array}{l} a \leftrightarrow b \\ \sim (a \vee b) \\ \hline \therefore a \wedge (\sim a) \end{array}$$

3 (6 points)**.** Rewrite the argument in symbolic form, then use a truth table to determine whether the argument is valid:

> If I am a hound wolf, then I howl at the moon.
> I do not howl at the moon.
>
> Therefore, I am not a hound wolf.

$a =$ I am a hound wolf

$b =$ I howl at the moon

Symbolic form:

4 (6 points)**.** Rewrite the argument in symbolic form, then use a truth table to determine whether the argument is valid:

> I will buy a new car or a used truck.
> If I buy both a new car and a used truck, I will need a loan.
> I will buy a used truck and I won't need a loan.
>
> Therefore, I won't buy a new car.

$a =$ I will buy a new car

$b =$ I will buy a used truck

$c =$ I will need a loan

Symbolic form:

5 (6 points)**.** Use a truth table to determine whether the following argument is valid:

$$\begin{array}{l} \sim c \\ c \vee (\sim a) \\ b \rightarrow a \\ \hline \therefore (\sim b) \rightarrow c \end{array}$$

PROBLEMS WITH ANSWERS.

Use the indicated letters to write the argument in symbolic form. Then use a truth table to determine whether the argument is valid or invalid. Note that you can find many websites online that will construct truth tables for you, which is a great way to check these answers.

1. If the winds are from the east [e], then we will not have a big surf [s]. We do not have a big surf. Therefore, the winds are from the east.

Symbolic form:

2. If I have the music [m], then I have the rhythm [r]. If I have the rhythm, then I have the music. Therefore, I have both the music and the rhythm.

Symbolic form:

Use the indicated letters to write the argument in symbolic form. Then use a truth table to determine whether the argument is valid or invalid.

3. Rio will buy fresh apples [a] or fresh cherries [c]. Rio will buy fresh apples only if she goes to the farmers market [m]. If Rio wants to buy fresh cherries, she likewise needs to go to the farmers market. Therefore, Rio will go to the farmers market.

Symbolic form:

Use the indicated letters to write the argument in symbolic form. Then use a truth table to determine whether the argument is valid or invalid.

4. If I go to the mall [m], then I will buy new jeans [j]. If I buy new jeans, then I will buy a shirt to match [s]. Therefore, if I don't go to the mall, then I will not buy a shirt.

Symbolic form:

5. Determine whether the argument is valid.

$$\begin{array}{l} b \to i \\ m \to (\sim d) \\ i \to d \\ \hline \therefore\ b \to (\sim m) \end{array}$$

6. Determine whether the argument is valid.

$h \vee (\sim w)$

$p \vee q$

$w \wedge (\sim p)$

$\therefore h \wedge q$

7. Determine whether the argument is valid.

$$\begin{array}{l} P \vee Q \\ P \rightarrow R \\ Q \rightarrow S \\ \hline \therefore R \rightarrow S \end{array}$$

8. Determine whether the argument is valid.

$a \leftrightarrow (\sim b)$

$(a \rightarrow b) \rightarrow c$

$c \rightarrow (b \vee a)$

$\therefore c \vee a$

ANSWERS.

1.

Argument in symbolic form:

$$\begin{array}{l} e \to (\sim s) \\ \sim s \\ \hline \therefore e \end{array}$$

Truth table:

e	s	e	$\to$	$(\sim s)$	$\sim$	s	e	
T	T		F		F		T	
T	F		T		T		T	
F	T		T		F		F	
F	F		T		T		F	$\Leftarrow$ Invalid

3.

Argument in symbolic form:

$$\begin{array}{l} a \vee c \\ a \to m \\ c \to m \\ \hline \therefore m \end{array}$$

Truth table:

a	c	m	a	$\vee$	c	a	$\to$	m	c	$\to$	m	m
T	T	T		T			T			T		T
T	T	F		T			F			F		F
T	F	T		T			T			T		T
T	F	F		T			F			T		F
F	T	T		T			T			T		T
F	T	F		T			T			F		F
F	F	T		F			T			T		T
F	F	F		F			T			T		F

The argument is valid.

5. Valid

6. Invalid

7. Invalid

8. Valid