Truth Tables for Arguments

(1) (a) Affirming the consequent. Not valid. Not sound.
(b) Denying the consequent. Valid, but not sound (since the first premise is false).
(c) Denying the antecedent. Not valid. Not sound.
(d) Affirming the antecedent. Valid. Possibly sound (the second premise may or may not be true).

(2) (a) Let p="High school graduates can't read at an adult level." Let q="High school graduates will be unable to compete in the modern world." Let r="High school graduates can't do math at an adult level."
In symbols, the argument is: If p, then q. If r, then q. Therefore, (If p, then r).

p	q	r	if p, then q	if r, then q	if p, then r
T	T	T	T	T	T
T	T	F	T	T	F
T	F	T	F	T	T
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	T	T
F	F	T	T	F	T
F	F	F	T	F	T

In row 2, the premises are true, but the conclusion is false. Thus, the argument is not valid and not sound.

(b) Let p="Venezuela has a large foreign debt." Let q= "Venezuela is a risky place to do business."
In symbols, the argument is: p. If p, then q. Therefore, q.

p	q	p	if p, then q	q
T	T	T	T	T
T	F	T	F	F
F	T	F	T	T
F	F	F	T	F

Whenever both premises are true, the conclusion is true. Thus the argument is valid. The argument is also probably sound; ask an economist.

(c) Let p="I watch baseball." Let q="I will be bored to tears." Let r="I think that the Rockies will go all the way this year."
In symbols, the argument is: If p, then q. (p and (not q)). Therefore, r.

p	q	r	if p, then q	(p and (not q))	r
T	T	T	T	F	T
T	T	F	T	F	F
T	F	T	F	T	T
T	F	F	F	T	F
F	T	T	T	F	T
F	T	F	T	F	F
F	F	T	T	F	T
F	F	F	T	F	F

There is no row where both premises are true, so the argument is valid by default. However, since it is logically impossible that both premises are true, the argument is unsound.

(d)

p	q	r	p or q	q or r	p or r
T	T	T	T	T	T
T	T	F	T	T	T
T	F	T	T	T	T
T	F	F	T	F	T
F	T	T	T	T	T
F	T	F	T	T	F
F	F	T	F	T	T
F	F	F	F	F	F

The argument is invalid and unsound (by row 6).

(e)

p	q	if (p and q), then p	q
T	T	T	T
T	F	T	F
F	T	T	T
F	F	T	F

The argument is invalid and unsound (by rows 2 and 4).

(f)

p	q	(not p) and (not q)	if p, then q
T	T	F	T
T	F	F	F
F	T	F	T
F	F	T	T

The argument is valid. Without knowing what p and q are, we don't know whether it is sound.

(g)

p	q	r	if p, then q	if (p and q), then r	r
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	T
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	T	F
F	F	T	T	T	T
F	F	F	T	T	F

The argument is invalid and unsound (by row 6).

(h)

p	q	r	if p, then q	if q, then r	not r	not p
T	T	T	T	T	F	F
T	T	F	T	F	T	F
T	F	T	F	T	F	F
T	F	F	F	T	T	F
F	T	T	T	T	F	T
F	T	F	T	F	T	T
F	F	T	T	T	F	T
F	F	F	T	T	T	T

Row 8 is the only row in which all three premises are true and in row 8 the conclusion is true. Thus, the argument is valid. Without knowing what p and q are, we don't know whether it is sound.