Ex11 if a person is female and is a parent, then
p51 this person is someone's mother

→ Use predicate and quantifiers to express this.

for all x, x is a person, if x is a female, and x is a parent, then there exist y, y is a person, x is the mother of y.

Domain is set of all people.

let $F(x)$ = x is a female
$P(x)$ = x is a parent
$M(x, y)$ = x is the mother of y.

Step 1 - Domain
Step 2 :- Variables
Step 3 :- it complete form.

$$\forall x(F(x) \land P(x)) \longrightarrow \exists y(M(x, y)).$$

Ex12 Everyone has exactly one best friend.
p52

Domain consist of all people / persons.

for all x, x is a person, if there exist y, x is a friend of y, then for all other people z, z is a person. x is not a friend of z.

$$\forall x \exists y\ F(x, y) \rightarrow \forall z\ \neg F(x, z).$$

$F(x, y)$ = x is a friend of y.

Q9 Everybody loves Jerry
54

domain all people in world.

for all x, x is a person, x loves jerry

$L(x, y)$ = x loves y.

$L(x, jerry)$ = x loves Jerry

$$\forall x\ L(x, jerry).$$

9(b) Every body loves Some body.
54

for all x, x is a person, there exist y, y is a person.

54 for all x, x is a person, there exist y, y is a person. x loves y.

$L(x,y)$ = x loves y.

$\forall x \exists y \, L(x,y)$.

Rules of Inference.

59) → if you $\underbrace{\text{have a current password}}_{p}$ than you $\underbrace{\text{may log into the network}}_{q}$.

→ you have the current password.
therefore
→ you can log into the network

$$\left.\begin{array}{l} P1 \to p \to q \\ P2 \to \underline{\;p\;} \\ C \to \therefore q \end{array}\right\}$$

Alternate way of expressing.

Argument :- Premises followed by Conclusion.

Correct argument :-
Fallacy :-

$$\begin{array}{l} p1 \\ p2 \\ p3 \\ \vdots \\ \hline \therefore C \end{array}$$
} Conclusion.

$(p1 \wedge p2 \wedge p3 \wedge \dots \wedge pn) \to C$

= Tautology
Valid argument.
fallacy.

$$\begin{array}{l} P1 \to p \to q \\ P2 \to \underline{\;p\;} \\ C \to \therefore q \end{array}$$

$(p1 \wedge p2) \to C$

$((p \to q) \wedge p) \to q$ ✓ Valid.

p	q	$p \to q$	$(p \to q) \wedge p$	$((p \to q) \wedge p) \to q$
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T

→ Tautology

T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

$\Rightarrow$ Tautology

P60 E2. if $\sqrt{2} > \frac{1}{2}$ then $(\sqrt{2})^2 > \left(\frac{3}{2}\right)^2$

$\sqrt{2} > \frac{3}{2}$

therefore

$(\sqrt{2})^2 > \left(\frac{3}{2}\right)^2$

$p = \sqrt{2} > \frac{1}{2}$

$q = (\sqrt{2})^2 > \frac{3}{2}$.

$$\begin{array}{l} p \to q \\ p \\ \hline \therefore q \end{array}$$

BASIC RULES:-

Table 1 61

① $\begin{array}{l} p \\ p \to q \\ \hline \therefore q \end{array}$ Modus Ponens

⑤ $\begin{array}{l} p \\ \hline \therefore p \vee q \end{array}$ Addition.

② $\begin{array}{l} \neg q \\ p \to q \\ \hline \therefore \neg p \end{array}$ Modus Tolens

⑥ $\begin{array}{l} p \wedge q \\ \hline \therefore p \end{array}$ Simplification.

③ $\begin{array}{l} p \to q \\ q \to r \\ \hline \therefore p \to r \end{array}$ Hypothetical Syllogism

⑦ $\begin{array}{l} p \\ q \\ \hline p \wedge q \end{array}$ Conjunction

④ $\begin{array}{l} p \vee q \\ \neg p \\ \hline \therefore q \end{array}$ Disjunctive Syllogism

⑧ $\boxed{\begin{array}{l} p \vee q \\ \neg q \vee r \\ \hline \therefore p \vee r \end{array}}$ Resolution.

Ex3 p61. "it is below freezing now", therefore "it is either below freezing or it is raining now".

Sol:- p = it is below freezing.

q = it is raining now.

p ... it is a Valid argument

q: it is raining now.

$$\frac{p}{\therefore p \vee q}$$ it is a Valid argument Based on addition.

Ex4 "it is below freezing and raining now"
61 therefore
"it is below freezing now.

p: it is below freezing.
q: it is raining now.

$$\frac{p \wedge q}{\therefore p}$$ By Simplification This is a Valid argument.

Ex6 "it is not Sunny this afternoon and it is Colder than yesterday"
62. "we will go Swimming only if it is Sunny"
"if we do not go swimming then we will take a Conoe trip"
"if we take a Conoe trip then we will be home by Sunset".
Leads to Conclusion "we will be home by Sunset".

p: it is Sunny this afternoon.
q: it is Colder than yesterday.
r: we will go swimming.
s: we will take a Conoe trip.
t: we will be home by Sunset.

P1 → $\neg p \wedge q$ — (1) X
P2 → $r \to p$ — (2) X
P3 → $\neg r \to s$ — (3) X
P4 → $s \to t$ — (4) X
C → $\therefore t$

from (1) $\neg p$ — (5) X Using Simplification
from (2,5) $\neg r$ — (6) X Using Modus tolens. $\frac{p \wedge q}{\therefore p}$
from (3,6) s — (7) X Using Modus ponens.
from (7,4) t — (8) Using

$\hookrightarrow \therefore t$ from (7, 4) t — (8) ponens.

Using Modus ponens.

and this is Conclusions.

argument is Valid.

fallacy $\Rightarrow$ Unable to reach to Conclusion.