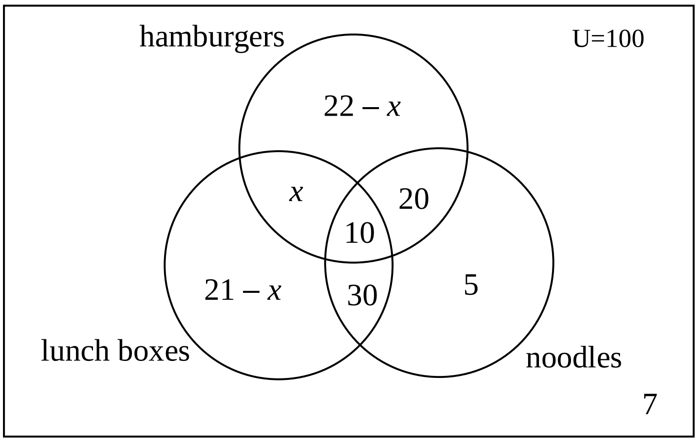
1. (a)



[minus 1 mark for each mistake]

(b) $7+5+30+10+20+21-x+x+22-x=100$
$x=15$
25 customers enjoy hamburgers and noodles.

(c) 22 – 15 = 7

2. $\left(A\cap\overline{B}\right)\cup\left(A\cap\overline{C}\right)$
$=A\cap\left(\overline{B}\cup\overline{C}\right)$
$=A\cap\overline{B\cap C}$
$=A\setminus\left(B\cap C\right)$

3. $f^{-1}(p)=(p-13)\bmod 26$

	N	A	G	U	E	N	K
p	13	0	6	20	4	13	10
$f^{-1}(p)$	0	13	19	7	17	0	23
	A	N	T	H	R	A	X

4. Let $p(n): 1+4+7+.....+(3n-2)=\dfrac{3n^2-n}{2}$
For $n=1$,
LHS = 1
RHS = $\dfrac{3(1)^2-1}{2}=1$
LHS = RHS $\Rightarrow$ p(1) is true.

Assume $p(k)$ is true;

i.e. $1+4+7+.........+(3k-2)=\frac{3k^2-k}{2}$

For $n = k+1$

$$\text{LHS} = 1+4+........+(3k-2)+(3k+1)$$
$$= \frac{3k^2-k}{2}+(3k+1)$$
$$= \frac{3k^2+5k+2}{2}$$
$$\text{RHS} = \frac{3(k+1)^2-(k+1)}{2}$$
$$= \frac{3k^2+5k+2}{2}$$

$\therefore$ LHS = RHS $\Rightarrow$ $P(k+1)$ is true

By Principle of MI, $p(n)$ is true for all +ve integer n

5.

p	→	[	q	v	~	(	P	→	q	)	]
T	T		T	T	F		T	T	T		
T	T		F	T	T		T	F	F		
F	T		T	T	F		F	T	T		
F	T		F	F	F		F	T	T		

Therefore, the statement is a tautology.

6.(a) Let

p = IP address of the computer is correct
q = the computer can access all workgroup computers within the local LAN
r = DNS address is correct
s = Gateway address is correct
t = the computer can access Internet

$p \to q$

$r \wedge s \wedge p \to t$

$q \wedge \sim t$

$\therefore \sim r \vee \sim s$

(b) The argument is valid.
Proved by Truth Table. [$(p \to q) \wedge (r \wedge s \wedge p \to t) \wedge (q \wedge \sim t) \to (\sim r \vee \sim s)$ is tautology]

7. Let p be a nonzero rational number and q be an irrational number.
Therefore

$$p = \frac{r}{s}$$

where r and s are integers.

Assume pq is a rational number
Then

$$pq = \frac{t}{u}$$

where t and u are integers.

$$\Rightarrow \frac{r}{s}q = \frac{t}{u}$$

$$\therefore q = \frac{ts}{ru}$$

Thus q is rational number (Contradiction)

Hence the product of a nonzero rational number and an irrational number is irrational.