Q.

18.15. $\mathbb{Z} \times \mathbb{Z} \to (a,b)$, $a,b \in \mathbb{Z}$.

units of $\mathbb{Z}$ is $-1, 1$.

unit of $\mathbb{Z} \times \mathbb{Z} = (1,1)\ (1,-1)\ (-1,1)\ (-1,-1)$.

18.16. $\mathbb{Z}_5 = \{0,1,2,3,4\}$.

$1 \cdot 1 = 1$, $2 \cdot 3 = 1$, $3 \cdot 2 = 1$, $4 \cdot 4 = 1$

∴ unit of $\mathbb{Z}_5$ is $1, 2, 3, 4$.

18.19. $\mathbb{Z}_4 = \{0,1,2,3\}$.

$1 \cdot 1 = 1 \qquad 3 \cdot 3 = 1$

∴ unit of $\mathbb{Z}_4$ is $1, 3$

18.44.a. if Ring R is $\subset R$ then $a \cdot b = b \cdot a$ $(a,b \in R)$.

Q.

$a^2 = a$, $b^2 = b$.

$(a \cdot b)^2 = abab = a^2 b^2 = ab$.

18.44.b. $\mathbb{Z}_6 \times \mathbb{Z}_{12}$

$\mathbb{Z}_6 = \{0,1,2,3,4,5\}$.

$\mathbb{Z}_{12} = \{0,1,2,3,4,5,6,7,8,9,10,11\}$,

idem of $\mathbb{Z}_6$ is $0, 1, 3$,

idem of $\mathbb{Z}_{12}$ is $0, 1, 4, 9$,

$(0,0)\ (0,1)\ (0,4)\ (0,9)\ (1,0)\ (1,1)\ (1,4)\ (1,9)$

$(3,0)\ (3,1)\ (3,4)\ (3,9)$.

18.48 $0 \in S$, $(a-b) \in S$, $ab \in S \iff S$ is subset of ring R,

Q.