1. If $A = \{a, b\}$ and $B = \{c, d\}$, then find $A \times B$, $B \times A$, $A \times A$, $B \times B$.

Solution:
$$A = \{0,2,4\}$$
$$B = \{-1,3\}$$

Then $A \times B = \{a, b\} \times \{c, d\}$
$$= \{(a, c)(a, d)(b, c)(b, d)\}$$

and $B \times A = \{c, d\} \times \{a, b\}$
$$= \{(c, a), (c, b), (d, a), (d, b)\}$$

2. If $A = \{0, 2, 4\}$, $B = \{-1, 3\}$, then find $A \times B$, $B \times A$, $A \times A$, $B \times B$.

Solution:
$$A = \{0,2,4\}$$
$$B = \{-1,3\}$$

Then $A \times B = \{0,2,4\} \times \{-1,3\}$
$$= \{(0,-1), (0,3), (2,-1), (2,3), (4,-1), (4,3)\}$$

$B \times A = \{-1,3\} \times \{0,2,4\}$
$$= \{(-1,0), (-1,2), (-1,4), (3,0), (3,2), (3,4)\}$$

$A \times A = \{0,2,4\} \times \{0,2,4\}$
$$= \{(0,0), (0,2), (0,4), (0,2), (2,2), (2,4),$$
$$(4,0), (4,2), (4,4)\}$$

$B \times B = \{-1,3\} \times \{-1,3\}$
$$= \{(-1,-1), (-1,3), (3,-1), (3,3)\}$$

3. Find a and b, if

Solution:

(i) $(a - 4, b - 2) = (2, 1)$

$a - 4 = 2$ and $b - 2 = 1$

$a = 2 + 4$ $\qquad b = 1 + 2$

$\boldsymbol{a = 6}$ $\qquad \boldsymbol{b = 3}$

(ii) $(2a + 5, 3) = (7, b - 4)$

$2a + 5 = 7$ and $3 = b - 4$

$2a = 7 - 5$ $\qquad b = 7$

$2a = 2$

$a = \dfrac{2}{2}$

$a = 1$

(iii) $(3 - 2a, b - 1) = (a - 7, 2b + 5)$

$3 - 2a = a - 7$ $\qquad\qquad$ and $\qquad b - 1 = 2b + 5$

$-2a - a = -7 - 3$ $\qquad\qquad\qquad b - 2b = 5 + 1$

$-3a = -10$ $\qquad\qquad\qquad\qquad -b = 6$

$$a = \frac{10}{3} \qquad\qquad b = -6$$

4. **Find the sets X and Y**
$$if \ X \times Y = \{(a, a), (b, a), (c, a), (d, a)\}$$

Solution:

$$X \times Y = \{(a, a)(b, a)(c, a)(d, a)\}$$
$$X = \{a, b, c, d\} \qquad (\text{First elements of ordered pairs})$$
$$Y = \{a\} \qquad (\text{second elements of ordered pairs})$$

5. **If $X = \{a, b, c\}$ and $Y = \{d, e\}$, then find the number of elements in**

Solution:

(i) $X \times Y$

Numbers of elements in $\qquad X = 3$
Numbers of elements in $\qquad Y = 2$
Numbers of elements in $X \times Y = 3 \times 2 = 6$

(ii) $Y \times X$

Numbers of elements in $\qquad Y = 2$
Numbers of elements in $\qquad X = 3$
Numbers of elements in $Y \times X = 2 \times 3 = 6$

(iii) $X \times X$

Numbers of elements in $\qquad X = 3$
Numbers of elements in $X \times X = 3 \times 3 = 9$