

**Solution:**

Given:

$$A = \{1, 2, 3\} \text{ and } B = \{2, 4\}$$

Now let us find:  $A \times B$ ,  $B \times A$ ,  $A \times A$ ,  $(A \times B) \cap (B \times A)$

$$\begin{aligned} A \times B &= \{1, 2, 3\} \times \{2, 4\} \\ &= \{(1, 2), (1, 4), (2, 2), (2, 4), (3, 2), (3, 4)\} \end{aligned}$$

$$\begin{aligned} B \times A &= \{2, 4\} \times \{1, 2, 3\} \\ &= \{(2, 1), (2, 2), (2, 3), (4, 1), (4, 2), (4, 3)\} \end{aligned}$$

$$\begin{aligned} A \times A &= \{1, 2, 3\} \times \{1, 2, 3\} \\ &= \{(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)\} \end{aligned}$$

$$\begin{aligned} B \times B &= \{2, 4\} \times \{2, 4\} \\ &= \{(2, 2), (2, 4), (4, 2), (4, 4)\} \end{aligned}$$

Intersection of two sets represents common elements of both the sets

So,

$$(A \times B) \cap (B \times A) = \{(2, 2)\}$$

