Example 3 If A = {2, 4, 6, 9} and B = {4, 6, 18, 27, 54}, $a \in$ A, $b \in$ B, find the set of ordered pairs such that 'a' is factor of 'b' and $a < b$.

Solution Since A = {2, 4, 6, 9}

B = {4, 6, 18, 27, 54},

we have to find a set of ordered pairs (a, b) such that a is factor of b and $a < b$.

Since 2 is a factor of 4 and $2 < 4$.

So (2, 4) is one such ordered pair.

Similarly, (2, 6), (2, 18), (2, 54) are other such ordered pairs. Thus the required set of ordered pairs is

{(2, 4), (2, 6), (2, 18), (2, 54), (6, 18), (6, 54,), (9, 18), (9, 27), (9, 54)}.

1. Let A = {-1, 2, 3} and B = {1, 3}. Determine

(i) A × B

(ii) B × A

(iii) B × B

(iv) A × A

Solution:

According to the question,

A = {-1, 2, 3} and B = {1, 3}

(i) A × B

{-1, 2, 3} × {1, 3}

So, A × B = {(-1, 1), (-1, 3), (2, 1), (2, 3), (3, 1), (3, 3)}

Hence, the Cartesian product = {(-1, 1), (-1, 3), (2, 1), (2, 3), (3, 1), (3, 3)}

(ii) B × A.

{1, 3} × {-1, 2, 3}

So, B × A = {(1, -1), (1, 2), (1, 3), (3, -1), (3, 2), (3, 3)}

Hence, the Cartesian product = {(1, -1), (1, 2), (1, 3), (3, -1), (3, 2), (3, 3)}

(iii) B × B

{1, 3} ×{1, 3}

So, B × B = {(1, 1), (1, 3), (3, 1), (3, 3)}

Hence, the Cartesian product = {(1, 1), (1, 3), (3, 1), (3, 3)}

(iv) A × A

{-1, 2, 3} × {-1, 2, 3}

So, A × A = {(-1, -1), (-1, 2), (-1, 3), (2, -1), (2, 2), (2, 3), (3, -1), (3, 2), (3, 3)}

Hence,

the Cartesian product ={(-1, -1), (-1, 2), (-1, 3), (2, -1), (2, 2), (2, 3), (3, -1), (3, 2), (3, 3)}