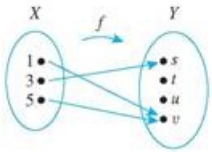
Chapter 7.1, Problem 1E

Problem

Let $X = \{1, 3, 5\}$ and $Y = \{s, t, u, v\}$. Define $f: X \to Y$ by the following arrow diagram.



a. Write the domain of f and the co-domain of f.

b. Find $f(1)$, $f(3)$, and $f(5)$.

c. What is the range of f?

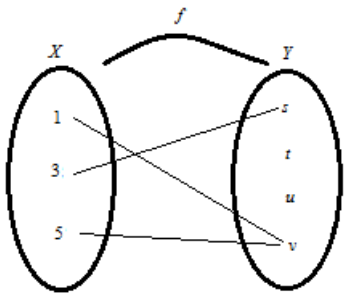
d. Is 3 an inverse image of s? Is 1 an inverse image of u?

e. What is the inverse image of s? of u? of v?

f. Represent f as a set of ordered pairs.

Step-by-step solution

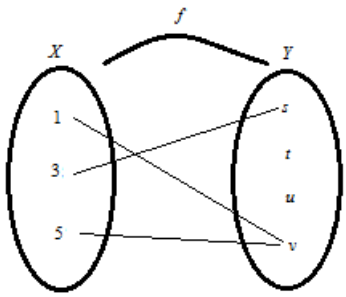
Step 1 of 5



(a) The given function f is from the set $X = \{1,3,5\}$ to the set $Y = \{s,t,u,v\}$.

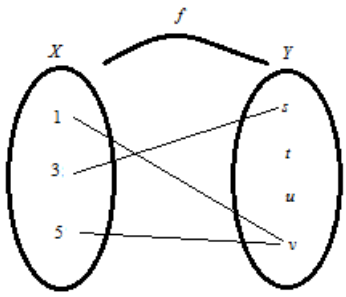
So, X is the domain of f and Y is the co domain

Step 2 of 5



(b) $f(1) = v$, $f(3) = s$ and $f(5) = v$

Step 3 of 5



(b) Even though the co-domain Y has 4 elements, only two of them are the images of the elements of *f*. They are *s* and *v* only. So,

The range of $f = \{s, v\}$

Step 4 of 5

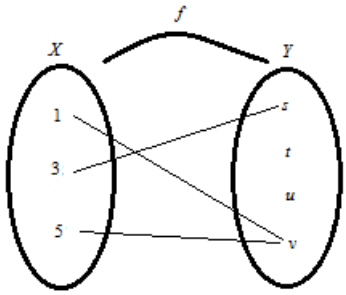
(d) From the mapping, we observe that *f* (3) = *s*.

This means *s* is the image of 3 under *f* and so, 3 is the inverse image of *s* under *f*.

On the other hand, *f* (1) = *v* and not *u* from the mapping.

So 1 is not the inverse image of *u*

(e)



From the mapping, we easily follow that *f* (1) = *v*, *f* (5) = *v*

So, *v* has two inverse images under *f* they are 1, 5.

Also, *u* is not mapped under *f* and so, *u* has no inverse image under *f*.

f (3) = *s* and so, the inverse image of *s* is 3

Step 5 of 5

(f) $f = \{(1, v), (3, s), (5, v)\}$