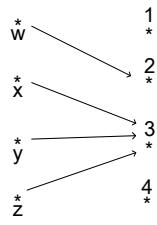


Study unit 7

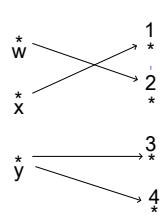
Activity 7-6

For each of the following diagrams, write down the corresponding relation it represents, then provide the reason(s) why the relation has the given property or properties.

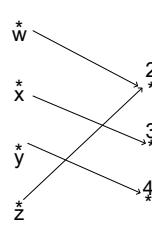
(a) a function



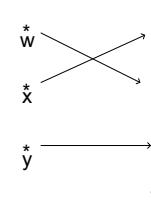
(b) not a function



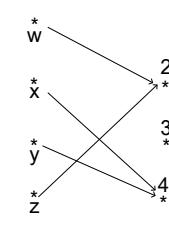
(c) surjective, not injective



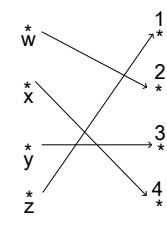
(d) injective, not surjective



(e) neither surjective, nor injective



(f) injective, and surjective



Note: The arrows that should be present in the graphs are not present in the graphs in the study guide.

$\{(w, 2), (x, 3), (y, 3), (z, 3)\}$ is a function: for each first co-ordinate there is only one corresponding second co-ordinate and the domain is the set $\{w, x, y, z\}$.

$\{(w, 2), (x, 1), (y, 3), (y, 4)\}$ is not a function since it is not functional: y appears twice as first co-ordinate, but y does not have only one corresponding second co-ordinate.

$\{(w, 2), (x, 3), (y, 4), (z, 2)\}$ is surjective since the range is the set $\{2, 3, 4\} = \text{codomain}$ but it is not injective since w and z share the same corresponding second co-ordinate namely 2.

$\{(w, 2), (x, 1), (y, 3)\}$ is injective since each first co-ordinate has a unique corresponding second co-ordinate, but not surjective since 4 is an element of the codomain $\{1, 2, 3, 4\}$ but not an element of the range $\{1, 2, 3\}$.

$\{(w, 2), (x, 4), (y, 4), (z, 2)\}$ is not injective since x and y share the same corresponding second co-ordinate namely 4 and w and z share the same corresponding second co-ordinate namely 2, and the relation is not surjective since 3 is not an element of the range $\{2, 4\}$ but 3 is an element of the codomain $\{2, 3, 4\}$.

$\{(w, 2), (x, 4), (y, 3), (z, 1)\}$ is injective since each first co-ordinate has a unique corresponding second co-ordinate, and it is surjective since the range is the set $\{1, 2, 3, 4\} = \text{codomain}$.