Answer on Question#37674 - Math - Other

If a set A has 3 elements and set B has 4 elements, then number of injections that can be defined from A into B is

a) 144
b) 12
c) 24
d) 64

Solution. Let us consider two sets: $A = \{a, b, c\}$ and $B = \{A, B, C, D\}$.

Recall that a function f is called *injective* if it never maps distinct elements of its domain to the same element of its codomain. In our case, this means that $f(a) \neq f(b) \neq f(c)$.

Now let us count the number of possible injections.

We start by choosing the value of $f(a)$. There are **4** ways to do this:

1. $f(a) = A$
2. $f(a) = B$
3. $f(a) = C$
4. $f(a) = D$

For every value of $f(a)$, we need to choose the values of $f(b)$ and $f(c)$.

After we have defined $f(a)$, there are **3** ways to define $f(b)$, since $f(b) \neq f(a)$ (e.g. if we define $f(a) = A$, then the possible values for $f(b)$ are B, C, D).

Next, for every pair of values $f(a)$ and $f(b)$, there are **2** ways to define $f(c)$.

Finally, to calculate the total number of possible injections, we need to multiply:

$4 \times 3 \times 2 = 24.$

Answer. c) It is possible to define $\mathbf{24}$ injections from A into B.