

Q1

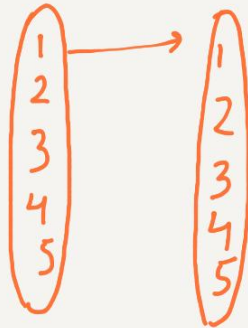
a) $A = \{1, 2, 3, 4, 5\} \rightarrow$ element's number = 5

Now Number of functions = element number
= 5^5

number of functions = 3125

b)

$1 \in R(f)$



We have to fix one element as 1

2 have 5 choices

3 have 5

4 have 5

5 have 5

so those function
which has not 1 as
image

$$\rightarrow 5^5 - [4 \times 4 \times 4 \times 4 \times 4] = 5^5 - 4^5 = 2101$$

c) $1 \in R(f)$ or $2 \in R(f)$
If 1 is not in $R(f)$ then total functions are 4^5
so 2 & 1 not there $\rightarrow 3^5$

$$\rightarrow 5^5 - 2 \cdot 4^5 + 3^5 = 1320$$

d) $1, 2 \in R(f)$ then no. of functions in which
 $1, 2 \notin R(f)$

$$\rightarrow \begin{aligned} \text{Total} &= 5^5 - 3^5 \text{ function} \\ &= 2882 \end{aligned}$$

Q2 a) as, $f(x) = 3x - 7$, let $y \in \mathbb{Z}$
let $y = 0$

$$\rightarrow 3x - 7 = 0$$

$$\rightarrow x = 7/3 \notin \mathbb{Z}$$

hence f is not onto function

b) as, $g(x) = \left\lceil \frac{x+3}{2} \right\rceil$

let $x_1 = 3$, $x_2 = 4$

$$g(x_1) = \left\lceil \frac{3+3}{2} \right\rceil = 3$$

$$g(x_2) = \left\lceil \frac{4+3}{2} \right\rceil = 3$$

$$c) f(x) = 3x - 7 \quad , \quad g(x) = \left[\frac{x+3}{2} \right]$$

$$\text{so, } fog : \mathbb{Z} \rightarrow \mathbb{Z} = 3 \left[\frac{x+3}{2} \right] - 7$$

$$\text{let } x_1 = 3 \text{ \& } x_2 = 4$$

$$fog(x_1) = 3 \left[\frac{3+3}{2} \right] - 7 = 3 \times 3 - 7 = 2$$

$$fog(x_2) = 3 \left[\frac{4+3}{2} \right] - 7 = 3 \left[\frac{7}{2} \right] - 7 = 2$$

$$fog(x_1) = fog(x_2) \text{ but } x_1 \neq x_2$$

$\Rightarrow fog$ is not one-one function

$$(d) \quad f(x) = 3x - 7 \quad \& \quad g(x) = \left\lceil \frac{x+3}{2} \right\rceil$$

$$g \circ f(x) = \left\lceil \frac{(3x-7)+3}{2} \right\rceil = \left\lceil \frac{3x-4}{2} \right\rceil$$

$$\text{now } g \circ f(x) : \mathbb{Z} \rightarrow \mathbb{Z}$$

$$x_1 = n, \quad x_2 = n+1$$

$$g \circ f(n) = \left\lceil \frac{3n-4}{2} \right\rceil \quad g \circ f(n+1) = \left\lceil \frac{3n-1}{2} \right\rceil$$

$$\text{for any } n \in \mathbb{Z}, \quad g \circ f(n) \neq g \circ f(n+1)$$

$$\text{hence for } g \circ f(x_1) = g \circ f(x_2)$$

$x_1 = x_2$ hence $g \circ f$ is one-one function

Q3 a) $A = \{1, 2, 3, 4, 5\}$

$f: A \rightarrow A$, let $f \circ f(x) = x+1$

then, $f \circ f(1) = 1+1=2$ & $f \circ f(2) = 2+1=3$

$\Rightarrow$ Hence it is possible.

b) let $g(x) = x$
& $f(x) = x+1$

now, $f \circ g = x+1$

$\Rightarrow f \circ g(1) = 1+1=2$

so true!

c) let $f(x) = x$
 $g(x) = x+1$

then $g \circ f(x) = x+1$

$g \circ f(1) = 2$

$\rightarrow$ Hence true!

d) $f(x) = x$ then

$f \circ f(x) = x$

& $f \circ f(1) = 1$

hence only 1 function