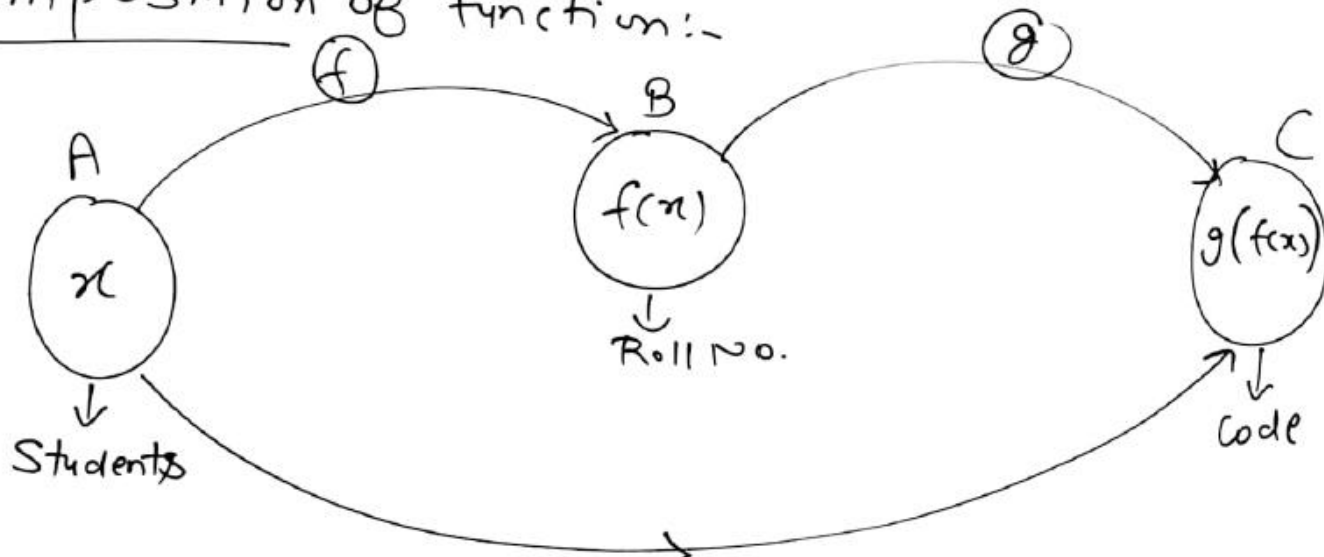


Relation & function

Composition of function :-



$f \circ g \rightarrow f(g(x))$

$\Rightarrow \underline{f: A \rightarrow B} \ \& \ \underline{g: B \rightarrow C}$

then a function

gof can also be define :-

$gof(x) = g(f(x)), \ \forall x \in A$
 $\left[\underline{gof: A \rightarrow C} \right]$

Relation & function

Composition of function:-

ex:- $f: \{2, 3, 4, 5\} \rightarrow \{3, 4, 5, 9\}$

$g: \{3, 4, 5, 9\} \rightarrow \{7, 11, 15\}$

be func. defined as:-

$f(2) = 3, f(3) = 4, f(4) = 5, f(5) = 5$

& $g(3) = g(4) = 7$ & $g(5) = g(9) = 11$

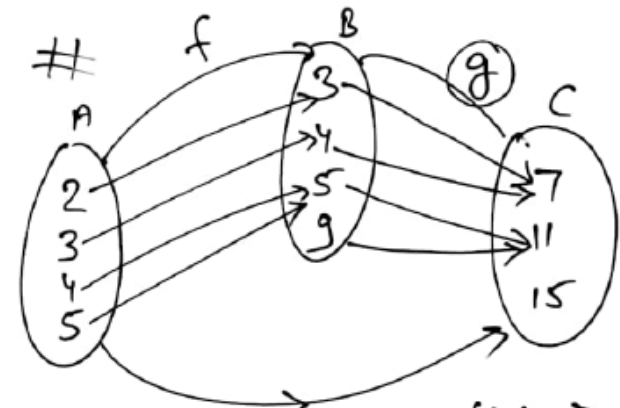
find:- gof.

Solⁿ: :- gof \rightarrow $gof(2) \Rightarrow gof(2) = g(f(2)) = g(3) = 7$ ✓

$\Rightarrow gof(3) \Rightarrow g(f(3)) = g(4) = 7$ ✓

$\Rightarrow gof(4) \Rightarrow g(f(4)) = g(5) = 11$ ✓

$\Rightarrow gof(5) \Rightarrow g(f(5)) = g(5) = 11$ ✓



gof \rightarrow $gof(2) = 7$
 $\rightarrow gof(3) = 7$
 $\rightarrow gof(4) = 11$
 $\rightarrow gof(5) = 11$

Relation & function

Composition of function:-

Ex:- Find gof & fog

if $f: \mathbb{R} \rightarrow \mathbb{R}$ & $g: \mathbb{R} \rightarrow \mathbb{R}$

are given by:- $f(x) = \cos x$
& $g(x) = 3x^2$

Show that:- $gof \neq fog$

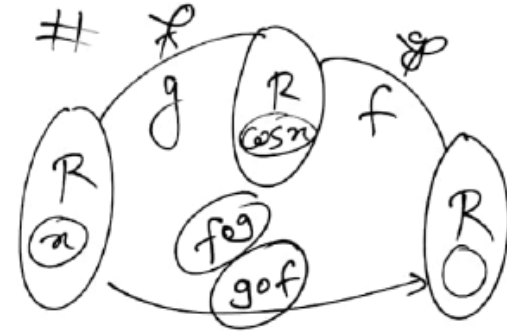
Solⁿ:- $gof :- gof(x) = g(f(x)) = g(\cos x)$
 $= 3(\cos x)^2$

$gof = 3\cos^2 x$

$\Rightarrow fog \Rightarrow f(g(x)) = f(3x^2)$

$fog = \cos(3x^2)$

Here $gof \neq fog$ H.P.



$g(x) = 3x^2$

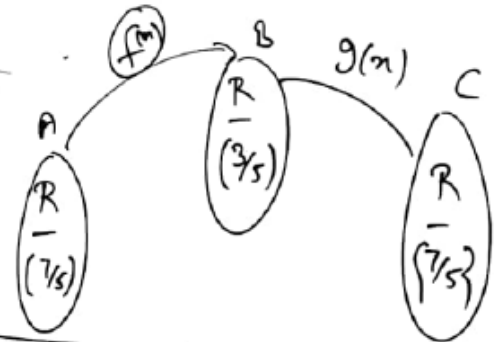
$x = 1 \Rightarrow g(1) = 3(1)^2$

$x = x \Rightarrow g(x) = 3x^2$

$x = \cos x \Rightarrow g(\cos x) = 3(\cos x)^2$

Relation & function

Composition of function:-



Ex:-
 $f(x) = \frac{3x+4}{5x-7}$; $f: \mathbb{R} - \{7/5\} \rightarrow \mathbb{R} - \{3/5\}$

& $g(x) = \frac{7x+4}{5x-3}$; $g: \mathbb{R} - \{3/5\} \rightarrow \mathbb{R} - \{7/5\}$

then:- $f \circ g = I_A$ & $g \circ f = I_B$

where $A = \mathbb{R} - \{3/5\}$, $B = \mathbb{R} - \{7/5\}$

& $I_A(x) = x$, $I_B(x) = x$, $\forall x \in B$

for $\forall x \in A$

Solⁿ:- $\therefore f \circ g \Rightarrow f[g(x)] = f\left[\frac{7x+4}{5x-3}\right] = \frac{3\left(\frac{7x+4}{5x-3}\right) + 4}{5\left(\frac{7x+4}{5x-3}\right) - 7} = \frac{21x + 12 + 20x - 12}{35x + 20 - 35x + 21} = \frac{41x}{5x-3} = \frac{41x}{41} = x = I_A$

$f \circ g = I_A$

$g \circ f(x) = g[f(x)] = g\left[\frac{3x+4}{5x-7}\right]$
 $g \circ f = \frac{7\left(\frac{3x+4}{5x-7}\right) + 4}{5\left(\frac{3x+4}{5x-7}\right) - 3} = \frac{21x + 28 + 20x - 28}{15x + 20 - 15x + 21} = \frac{41x}{41} = x = I_B$
 Here $f \circ g = g \circ f$
 Identity function